JUST AGRICULTURE

multidisciplinary e-Newsletter

VOL. 1 ISSUE-1

SEPTEMBER 2020 WWW.JUSTAGRICULTURE.IN

JUST AGRICULTURE
multidisciplinary e-Newsletter

INDEX

From the Founder Editor's desk

Dear Readers,

The last six months in Indian Agriculture have witnessed paradoxical circumstances. Amid the COVID crisis, besides the uncertainty in health, economy and others sectors, Agriculture is the only bright spot with spike of 3% growth sector in India. The Inter-Ministerial Committee has the target of Doubling the Farmer's Income (DFI) by 2022 which uplift the agriculture sector and enormous e–commerce and agribusiness models have started during this pandemic period. The young professionals understand the potential of this sector.

So, during this COVID, education and publishing sector effected. It will be difficult for the academicians to publish and get innovative knowledge about agriculture specialisation. So being as **Young Agriculture Professional**, I think about starting an e-newsletter which provides platform to bound all the agriculture students, scholars and research oriented people.

We are glad to introduce the first issue of **JUST AGRICULTURE e-Newsletter,** which also happens to be our first online publication. Carrying forward our vision of starting this agriculture e-magazine is to engage all the agriculture students, scholars and research oriented people and to increase the writing capacity of agriculture students.

The word **"Just Agriculture"** signifies the prominence given to the agriculture field and other allied sciences in today's era. Our magazine offers sufficient platform and broad coverage for agriculture researchers and scientists for deliberating connecting throughout India and globally. For the agriculture students endowed with inquisitive mind and driven by professional goals, this newsletter will be a voyage of discovery.

Keep Reading……..

Mohit Bharadwaj
Editor in Chief,
JUST AGRICULTURE e-Newsletter

D.P.S. BADWAL
Founder Editor,
JUST AGRICULTURE e-Newsletter

Message from Editor's Desk

Just Agriculture has been in service to educate the farmers of the India since its inception and publication of Magazine and Newsletter, both are those means towards this informal way. This Multidisciplinary e-Newsletter is a monthly platform for researchers being published monthly. I am quite happy that uninterrupted journey of this farmer's friendly e-Newsletter has started. Through this Newsletter, we try to our level best to make aware very latest, valuable, season-driven and scientifically proven technologies to the farmers for improving their farm practices and inturn to enhance their farm income. The authors of these important articles have shown their keen interest and expertise. I thank to all our authors for their valuable contribution and making this issue a source of knowledge.

On behalf of Chief Managing Editor of Just Agriculture e-Newsletter, I would like to express sincere thanks to the Editorial team of e-Newsletter for compiling questions/queries raised. Without proper co-operation of the all Editorial Advisory Board members to bringing out this issue in very sophisticated way.

*The present issue of "**Just Agriculture e-Newsletter**" is intended to provide its readers, specially the farmer, a wider choice from the above list to help them understand and follow the practices, which can help improve their production, productivity and incomes.*

Abhishek Dehal
Executive Editor,
JUST AGRICULTURE e-Newsletter

Ankur Sharma,
Chief Managing Editor,
JUST AGRICULTURE e-Newsletter

ALL INDIA COORDINATED RESEARCH & SEED HUB PROJECT ON LINSEED

Jawaharlal Neharu Krishi Vishwavidyalaya

Regional Agricultural Research Station,

Bhopal Road, Sagar, 470001 Madhya Pradesh

Dr.Devendra K. Payasi

Scientist & Incharge (Plant Breeding & Genetics)

Phone & Fax- 07282-288250, +919826144887, +917000917992 (M)

Email ID- dpayasi@gmail.com

No. RARS/Linseed/ 2020-21/

Dated 24.08.2020

Message

My best wishes to the team of Just Agriculture magazine for inviting & publishing popular and technical articles, success stories and short communications. This initiative will be helpful in increasing the thinking, writing and reading capacity of agriculture students and researchers.

It is a well known fact that agriculture is the backbone of Indian Economy but increasing population is becoming a threat to the food and nutrition security of the nation. To achieve the goal of food & nutrition security it is important to implement the scientific techniques in modern Indian Agriculture. This magazine can guide the farmers for practicing agricultural activities in a scientific manner.

It's my firm belief that this magazine will definitely increase the awareness among agricultural students & farming community and will act as a medium for all of them to join and share their innovative ideas.

I congratulate the entire team of the just agriculture magazine for conceiving of this idea.

24/08/2020

(Devendra Kumar Payasi)

Dr.V.K.Tripathi
M.Sc. Horticulture, Ph. D.
Officer-in-Charge

Department of Horticulture
&
Department of Fruit Science
C. S. Azad University of Agriculture & Technology, Kanpur-208 002, U.P. (INDIA)
Mobile : 9450331991, 8299373118
E-mail : drvktripathicsa@gmail.com
Date : **10.07.2020**

MESSAGE

Congratulations to the team at the **Just Agriculture Magazine** for coming up with the idea and publishing popular and technical articles, success stories, and short communications which aims to increase the writing capacity of researcher as well as available research. These inititives would be very useful for those who are engaged in agricultural activities as well as for the welfare and upliftment of farmer via use of scientific techniques in Agriculture.

The word **"Just Agriculture"** also signifies the prominence given to the field of agriculture in today's era.

I am highly confident that this magazine will certainly increase awareness among agriculturist and provide a magnificent effort to join and share the ideas of various researchers from both - National and International level.

I applaud the efforts of all the Editors of **Just Agriculture** for launching this very useful magazine.

(V.K.Tripathi)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA GWALIOR
CAMPUS COLLEGE OF HORTICULTURE, MANDSAUR
Telefax No. 07422-297178
E-mail: - dean.mandsaur@rvskvv.net

No. Dean/COH/ 2019-20/...713 Date ...26/8/2020

Message

Dear Editors

Just Agriculture Magazine,

Congratulations on doing such a great job of developing a new magazine "Just Agriculture" from your group.

The extra time you've been putting in on this has really paid off, and I believe that you have presented an ambitious and attainable set of goals for your team. This magazine may provide knowledge to our students and researchers on one hand and may improve the livelihood of Indian farmers on other hand as well. I hope that this type of knowledgeable work makes the dream of our Prime Minister true i.e. doubling farmer's income.

Best of luck for your team.

Sincerely,

Dean
College of Horticulture
Mandsaur

Dean
College of Horticulture
MANDSAUR (M. P.)

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ORGANIC FARMING – Preparation of Panchagavya

Navkiran Kaur
UIAS, Chandigarh University (Mohali), Punjab
Corresponding author:- navkiran5112@gmail.com

ARTICLE ID:001

Abstract

Panchagavya is an organic product produced by using five different by-products of cow like cow dung, cow urine, cow milk, cow ghee, cow curd and other ingredients. It has the potential to play the role of promoting growth and providing immunity in plant system thereby confers resistance against pest and diseases. Panchagavya contains several nutrients i.e. macronutrients like N, P, K and micronutrients which are required for the growth and development of plants and also contains various amino acids, vitamins, growth regulators like Auxins, Gibberellins and also beneficial micro organisms like pseudomonas, azotobacter and phosphor bacteria etc.

Introduction

Organic agriculture is a comprehensive production management system which promotes and enhances health of agro-ecosystem, including bio-diversity, soil biological activity and biological cycles. It gives importance to the use of management practices particularly the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. Panchagavya is a special preparation made from five by-products of cow along with certain other ingredients, has the potential to play the role of promoting growth and providing immunity in plant system. Panchagavya plays a major role in organic farming.

Ingredients used for preparation of panchagavya are,

Fresh cow dung- 10 kg

Cow urine- 10 lit

Cow milk- 2 lit

Cow curd- 2 lit

Cow ghee - 1 kg

Tender coconut water- 3 lit

Sugarcane juice- 3 lit

Ripened banana- 12 numbers

Grape juice - 2 lit

Sugarcane juice and coconut water are used to accelerate the fermentation which also help in minimizing the bad odour.

Importance

- Panchagavya is known to contain millions of microbes and adds life to soil thus considered to be effective organic manure.
- It is flower inducer and provides rich and attractive colors to crops, above all its proper use can increase production and reintroduce/increase beneficial bacteria into the most important part of 'The Soil'

Preparation of panchagavya

- Panchagavya has to be prepared in a wide mouth container made of mud, concrete or plastic. The container should not be made of any metal.
- The first step is to mix fresh cow dung and ghee in the container. Mix it twice a day.
- On the fourth or fifth day the remaining ingredients cow milk, cow curd and cow urine should be added to the container and kept for 7 to 8 days more.
- The ingredients in the container should be well mixed by stirring for 20 to 30 minutes.
- This stirring should be carried out both in the morning and evening to facilitate aerobic microbial activity.
- Then add tender cocunut,jaggey and grape juice .
- Then add banana by making banana paste.
- After 10 days the panchagavya should be prepared and used as a foliar spray for plants or crops.

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DOSAGE OF PANCHAGAVYA RECOMMENDED FOR FIELD APPLICATION

- **SPRAY SYSTEM** -3% solution is effective.3% of panchagavya mixed with every 100 litres of water is suitable for all crops.

- **FLOW SYSTEM** -the solution of panchagavya can be mixed with irrigation water at 48-58 litres per hectare either through drip irrigation or flow irrigation.

- **SEED/SEEDLING TREATMENT** -3% solution of panchagavya can be used to soak the seeds or dip the seedlings before planting.soaking the seeds or dipping the seedlings for 30 minutes is feasible.

GENERAL SCHEDULE OF APPLICATION OF PANCHAGAVYA

- **AT PRE-FLOWERING STAGE-**
  Once in 15 days
- **AT FLOWERING AND POD SETTING STAGE-**
  Once in 8-10 days
- **AT FRUIT/POD MATURATION STAGE**
  Once during fruit/pod maturation.

IMPACTS OF PANCHAGAVYA ON DIFFERENT PLANT PARTS

The effect of Panchagavya on different plant parts are as follows:

Leafs: Plants sprayed with Panchagavya produce bigger leaves; it also enhances the photosynthesis process.

Stem: It improves branching, and helps in producing more off shoots, which are sturdier.

Roots: Roots grow deeper, increasing the intake of nutrients and water. They also become denser and remain fresh for a longer time.

Yield: It has been usually observed that when farms are converted from inorganic to organic, their yield reduces; Panchagavya ensures that the yield is restored after the conversion.

Panchagavya also enhances the shelf life, aroma and taste of the produce.

Reduction in water consumption- panchagavya causes a thin layer of oil to form on the leaves and stems. This reduces water loss due to evaporation during the day. Also as Panchagavya cause the roots to grow longer, plants can withstand longer periods of dry. This way water consumption of the plant reduces by 30%.

USAGE

1. As fertilizer and pesticide.
2. As plant growth regulator, promoter and immunity enhancer.
3. Cow urine, is practiced in Ayurveda, curing several diseases, including certain type of cancer.
4. In animals it stimulates the production of antibodies.

BENEFICIAL EFFECTS OF PANCHAGAVYA ON COMMERCIAL CROPS

MANGO

- Induces dense flowering with more female flowers.
- continues fruit regularly.
- Flavour and aroma extraordinary.

ACID LIME

- Continuous flowering is ensured round the year.
- Fruits are plummy with strong aroma.
- Shelf life is extended by 10 days.

TURMERIC

- Enhances the yield by 22%.
- Extra long fingers.
- Helps in survival of dragonfly, spider extra which in turn reduce pest and disease load.
- Enriches the curcumin content.

VEGETABLES

- Yield enhancement by 18% and in few cases like cucumber, the yield is double.
- Wholesome vegetables with shiny and appealing skin.
- Extended shelf life.
- Very tasty with strong flavour.

BENEFICIAL EFFECTS OF PANCHAGAVYA ON SOIL FERTILITY

- Panchagavya improves fertility status in soils by incresing macronutrients, micronutrients and beneficial microorganisms thus increase soil health.
- It improves water hold capacity of soils because it acts as a organic manure.
- It encourages growth and reproduction of beneficial soil microorganisms.
- It increases nutrient uptake in plants and enhances plant growth.

BENEFICIAL EFFECTS OF PANCHAGAVYA ON PEST AND DISEASES

- It increases immunity power in plants thereby confers resistance against pest and diseases.
- Various beneficial metabolites produced by microorganisms such as organic acids, hydrogen peroxide and antibiotics, which are effective against various pathogenic microorganisms.

GENERAL ADVANTAGES OF PANCHAGAVYA OF PANCHAGAVYA

- It improves soil health and fertility.
- It is used against pest and diseases.
- It increases yield and quality of produce. No chemicals are used.
- Eco- friendly approach.
- Reduces cost of cultivation by reducing chemicals like fertilizers,pesticides,fungicides, growth regulators etc.

PROBLEMS IN ADOPTING PANCHAGAVYA

- Lack of awareness about its uses.

- Sometimes during fermentation contaminations occur.
- Slow action.
- Limited availability of its products in market.
- It encourages weed growth also as it is non selective.
- Less utilization by farmers.
- It may reduce quality of the produce.

CONCLUSION

The increasing concern for environmental safety and global demand for pesticide residue free food has evoked keen interest in crop production using eco-friendly products which are easily biodegradable and do not leave any harmful toxic residues besides conserving nature. So it is necessary to use natural products like Panchagavya to produce chemical residue free food crops and hence Panchagavya can play a major role in organic farming.

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Bumble bees: Potential and Prospective in Apiculture

Diksha Devi
PhD Scholar,
Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan

ARTICLE ID: 002

Bumble bees are one of the most important group of pollinators belonging to order Hymenoptera, tribe Bombini, Genus *Bombus* which consists of more than 250 species all over the world while only 48 species are found in India. The main species of *Bombus* that has been reported in Himachal Pradesh are *Bombus haemorrhoidalis*, *B. rufofasicatus*, *B. asiaticus*, *B. tunicatus*, *B. waltoni*, *B. keriensis*, *B. personatus* and *B. hiamlaynaus*.

Life cycle:

Bumble bees generally have annual life cycle i.e. completes only one generation in a year which is the major obstacle that prevent bumble bees to be designated as commercial pollinator. Under natural conditions, bumble bees start its life cycle on the onset of spring when they emerge from hibernation and spend maximum time in searching the location for nesting as well as foraging for nectar. After a suitable site has been identified the bumble bees start building nests by secreting wax (with the help of wax glands at 4^{th}–7^{th} abdominal segments. Initially, the queen itself forages for collection of nectar and pollen in order to develop their ovaries and thus they start laying whitish eggs in wax cups. After 1-2 days the eggs hatch and the egg, larval and pupal stage develop within wax covering which leads to production of first worker brood of workers. Reproductive individuals including males and new daughter queens (gynes) are produced at the end of summer season. Young queens and drones leave the colony and mate. Mated queens i.e. gynes develop fat reserves and search for nesting sites for the purpose of overwintering i.e. diapauses. Thus, these gynes by synthesising alcohol molecules (antifreezing molecules) entered in the diapauses for a period of time. And again comes out of hibernation during onset of spring and thus completes one cycle in a year.

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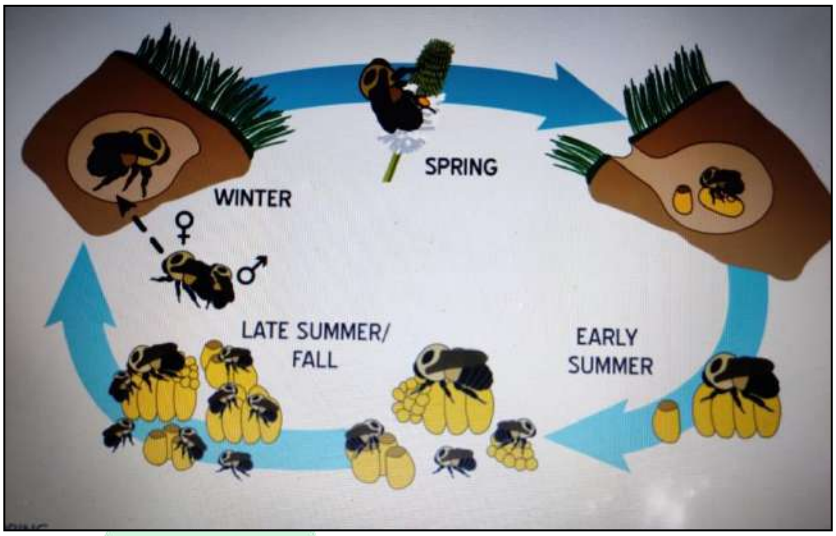

Pollination efficiency of bumble bees:

Bumble bees are considered as highly efficient pollinators as compared to honeybees or other pollinators due to:

1. They can fly or can become active at lower temperatures.
2. They have longer tongue length and thus are capable of pollinating even the plants having deep corolla.
3. ***Buzz pollination ability*** viz., a type of pollination in which bees use vibratory motions in order to remove or collect pollen from flowers incidentally fertilizing them.

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Some of the earlier workers have also reported a certain percent increase in economic yield of crops as described in Table 1.

Table 1: Impact of bumble bee pollination on fruit yield of different crops

Crop	Per cent increase in fruit yield/m^2 as compared to control	References
Sweet pepper	• 36%	• Dag and Kammer, 2001
Tomatoes	• 64.76%	• Yankit, 2016
Kiwifruit	• 191.75%	• Nayak, 2018
Bell pepper	• 89.42% • 82.35%	• Thakur, 2018 • Devi, 2019

Population Decline:

A decline in bumble bee's population has been observed due to a number of factors such as climatic factors, mechanization of agriculture, habitat destruction and collateral pesticide damage etc. Some researchers has reported that certain neonicotenoid pesticides such as clothianidin, imidacloprid, and thiamethoxam presented higher risk to bee's. These pesticides showed a considerable negative effect on colony growth of bumble bee's i.e. reduced growth rate of colony by 85%. Low levels of neonicotinoids can also reduce the number of bumble bee's in a well developed colony by as much as 55%, and thus caused disfunctioning of the bumble bees brains. Also, the bee colonies that had been affected by the neonicotenoids released more foragers and collected more pollen as compared to those bees who had not been exposed to neonicotinoid. Thus, the bees affected by the pesticides were able to collect more pollen and took a longer amount of time to do so.

Bumble Bee Specialist Groups (BBSG)

The existence of bumble bees specialist groups is to foster the conservation of bumble bees as well as their habitat all around the world. The main aim of these groups as an IUCN-SSC member is to produce Red List assessments of the Red List Status for each bumble bee species on a worldwide basis or to implement a comprehensive and detailed assessment of the global status of all bumble bee species based on IUCN Red List criteria as well as to promote bumble bee conservation worldwide.

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Challenges and Future Prospective

The population decline observed in honeybees as well as bumble bees proved to a challenging aspect as it causes reduction in fruit and seed set and disruption in plant pollinator interaction as well. Their population decline can thus cause decrease in economic yield and quality of crops. Thus bumble bee population decline can cause serious threat to socio-economic status of the country particularly India where the economic value of pollinated crops is $726 annually. This draws the attention of researchers towards the conservation, extension and exploitation of bumble bees in agricultural and wild plant pollination. Although to avoid such damage commercial rearing of bumble bees in some specific parts of India and other countries has been carried out successfully.

By the year 2004, worldwide about 99 thousand acres of greenhouse tomato production relied on bumble bee pollination with an estimation of $15 billion dollars. Apart from effective pollination, various workers have concluded that buzz pollination leads to higher yields and better fruit quality. In the international market, the each year growing demands of bumble bee pollination has significantly increased and strengthened the trade of bumble bee industry all over the world. Presently, the year round production of bumble bee hives exceeds one million in export business. However, India is native to about 48 *Bombus* species but till now only a few of them such as *B. haemorrhoidalis*, *B. breviceps*, *B. asiaticus*, *B. albopleuralis*, *B. simillimus* have been explored for their potential as large scale sustainable pollinators and thus, opens a door to unlimited scope for the growth of this industry. It is more beneficial to rear these species in their native places, providing most congenial conditions along with most preferred flora. Better efforts should be incorporated for engineering new and more reliable domicile boxes for bumble bee rearing that are favourable to species level as well as are easier to be transported. Thus, it is the need of the hour that the small entrepreneurs and private sector of the country explore the possibilities of commercialization of bumble bee rearing and buzz pollination.

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The Future of Solar energy

Krishangopal
RVSKVV, Gwalior(MP)
ARICLE ID: 003

Solar energy is a type of renewable energy generated by the sun. Most electricity is generated with steam turbines using fossil fuels, nuclear, biomass, geothermal and solar energy.

The sun emits enough power onto earth each second to satisfy the entire human energy demand for over two hours given that it is readily available and renewable solar power is an attractive source of energy. However as of 2018, less than 2% of the total world's energy came from solar. For human use of solar energy, solar panels are used.

What is Solar panels? "A panel designed to absorb the sun's rays as a source of energy for generating electricity".

How Do Solar Panels Work?

Solar panels capture the energy from the sun into usable energy for homes, buildings or swimming pools. A solar panel is made up of photovoltaic cells that convert the sunlight's energy to an electric current to power your home

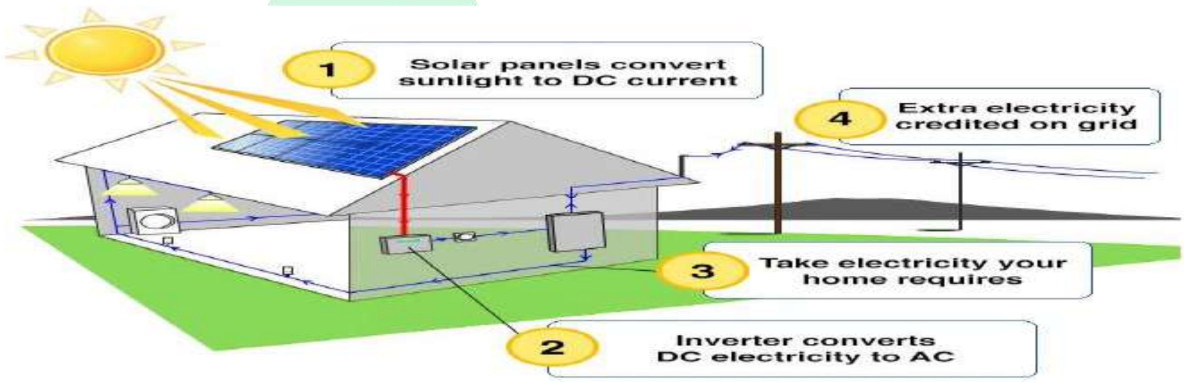
Advantages: Renewable energy sources among the most important thing is that solar energy is a truly renewable.

Reduces diverse applications, low maintenance costs. Compared to fossil fuels that leave the environment significantly polluted, solar energy is almost 100% clean.

Once the solar is installed, maintenance is relatively simple, panels do not have to be cleaned several times a year, only the inverter needs to be changed once every 5–10 years, and sometimes maintenance for cables.

Disadvantages: The initial cost of purchasing a solar system is fairly high, The average national Price to install solar panels is Approx 13.35 lakh Rupees(18,000 $), solar energy storage is expensive, weather dependent although solar energy can still be collected during cloudy and rainy days, the efficiency of the solar system drops.

Solutions: We have to be aware to improve the issue of solar energy, it is the responsibility of the government and every person to keep the environment of this earth clean and pollute free. Solutions offers the infrastructure and expertise you could possibly desire Refinery Train Package and by creating solar plant projects by the government, Spread this news through the news network, motivating people it and uses also, this is how we can produce eco friendly solar energy. Recently, Prime minister of India Shri Narendra Modi inaugurated Asia's largest 750 Mega Watt (MW) Rewa Ultra Mega Solar Power Project in Madhya



Pradesh on 10 July, 2020.

What is RUMPP (Rewa Ultra Mega Power Project) ?

Rewa Ultra Mega Solar is the first solar project in the country to break the grid parity barrier. It is one of the largest solar power plant in India. It is an operational ground mounted, grid-connected photovoltaic solar park spread over an area of 1,590 acres in the Gurh tehsil of Rewa district of Madhya Pradesh.

Owner: Solar Energy Corporation of India

Construction cost: 4,500 Crores INR

Units operational: 3 x 250 MW

Nameplate capacity: 750 MW

Commission date: 5 July 2018

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Inaugurated date: 10 July 2020.

We are all in an era where it is difficult to imagine without electricity. We produce more energy from non renewable resources, whose quantities are limited in our earth, so we should seek renewable resources for this. So there can be no alternative option better than solar energy.

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THE FUTURE OF AGRI INNOVATION

Lumpy Skin Disease

Annarao[1], Vivek R Kasaralikar[2], Ravindra B G[3] and Halmandage S. C.[4]

M.V.Sc Scholar[1] ,Professor and Head [2], Associate Professor[3] Assistant Professor[4]
Department of Veterinary Medicine ,Veterinary College Bidar KVAFSU Nandinagar Bidar, Karnataka

ARTICLE ID. 004

Introduction

Lumpy skin disease caused by virus of genus Capri pox and in form of brick shaped double stranded DNA belongs to family Pox viridae. The virus is highly host specific and causes disease only in cattle and buffalo. It's an emerging viral disease of Cattle and Buffalo in India. Lumpy skin disease was first reported in 1929 in Zambia. From 2012 it's spreading rapidly from African countries to Middle East Asia and South Eastern Europe. Lumpy skin disease causes high morbidity and low mortality. It is a deadly and devastating disease causing severe economical losses in terms of sudden fall in milk yield in female animals, loss of draft power in male animals, treatment cost and permanent damage to hide, although this skin disease doesn't have zoonotic importance. Infection spreads faster in warm and wet weather. In India Lumpy skin disease was first reported in Orissa state in August 2019.

Figure: 1 Bullock with nodules on the body

Transmission:

Direct contact from affected animals, contaminated feed and water, iatrogenic transmission from contaminated needles and from all biting flies including mosquitoes and ticks transmits the virus from infected animals to healthy animals. Virus has been isolated from blood, saliva, ocular discharge, nasal discharge and from semen of infected animals.

Figure: 2 Bullock with nodules on the body.

Incubation period: usually varies from 2 to 5 weeks.

Pathogenesis: After entry of virus from bite of the insects or other route of entry, there will be viremia followed by the virus localization in skin and mucus membrane which leads to formation of lumps of size 0.5- 5cm in diameter. Later lumps undergoes necrosis and become atrophied leading to formation of scab which detaches from the body leading to ulcers or wound formation. These wounds on secondary bacterial invasion leads to pyogenic wound or on fly strike leads to myiasis causing permanent damage to hide. The detached scab is abundant in virus and acts as potential source of infection.

Figure: 3 Brisket edema with nodules on the body of bullock

Clinical Signs: Varies from animal to animal. All age group of animals are equally susceptible. Among all animals young calves and lactating cows are more severely affected. Clinical signs include pyrexia(up to 106^0F), dullness, depression, anorexia, formation of raised unequal sized lumps on the skin and mucus membrane size varying from 1- 5cm diameter which are found all over the body of animal including head, neck, tail, udder, scrotum, perineum, genitelia and limbs. These lumps are raised from skin, firm and painful on palpation. Enlarged superficial lymph nodes, edema of brisket and limbs, sudden fall in milk yield, loss of draft power in male animals, excessive salivation, rhinitis, conjectivitis and lameness due to tendons affected by the lumps on the limbs and pregnant cows may abort. In the course of disease these lumps will becomes necrotic and ulcerate and may predispose to myiasis by fly strike. Animals with or without brisket edema and nodules, animals with or without nodules and having brisket edema, are observed by physicians. In aborted animals fetus having small coin like reddish lesions are seen all over the body having size approximately 0.5 to 1cm diameter.

Figure :4 Calf with various sized lumps

Outcome of disease: Recovered animals becomes emaciated and needs more care and time for complete recovery. Due to affection of tendon and joints animals may show permanent lameness. Infected bulls secrete the virus in semen and is source of infection to female animals. Permanent damage takes place to hide. Sudden fall in milk yield is noted. Abortion of pregnant animal and long standing anoestrus is seen in recovered animals leading to huge loss to dairy industry. Recovered animals have solid immunity. Bulls become temporary or permanent infertile. Disease predisposes the conditions like secondary pneumonia, emaciation and mastitis.

Figure : 5 Bullock with necrotic lumps on the body.

Post-mortem lesions:

Skin nodular lesions extending up to subcutaneous tissue and muscle with edema, congestion and hemorrhage. Lesions in the oral cavity and gastro-intestinal tract. Lumpy lesions in trachea and in respiratory tract including lung showing broncho-pneumonic changes.

Diagnosis

1. Based on clinical signs including pyrexia (up to 106^0 F), presence of lumps on skin and mucus membrane all over the body of animal having size of 1- 5cm diameter, enlarged superficial lymph nodes, anorexia and sudden fall in milk yield.
2. Necrotic nodular lesions, crusted nodules with or without ulcers on the body of animal, depression and emaciation in chronic phase of disease.
3. Laboratory diagnosis by PCR, ELISA, Western blot technique, Virus neutralization test. Isolation and identification of virus from blood and skin biopsy.
4. Based on post-mortem examination lesions: Skin nodular lesions extending up to subcutaneous tissue and muscle with edema, congestion and hemorrhages.
5. Histo-pathology of skin biopsy: Epithelial cell degeneration, necrosis, intercellular and intracellular edema and intracytoplasmic inclusion bodies.

Samples of choice for diagnosis:

1. Blood sample : a) EDTA Blood sample b)Serum sample
2. Skin Biopsy : a) Skin Biopsy in saline b) Skin Biopsy in Formalin

Differential diagnosis:

Ring worm infection, insect bite, urticaria, cuteneous leucosis, Bovine Herpes mammilitis, skin form of Thelieriosis, Bovine pseudo lumpy skin disease, photosensitization, and dermatophytosis.

Treatment:

There is no specific anti-viral therapy for lumpy skin disease. Anti-histamines and long acting non-steroidal anti-inflammatory agents @ calculated doses for 5 to 7 days. Systemic antibiotic therapy to avoid secondary bacterial infection . Isolation of affected animal and supportive treatment should be given in early stage of disease to avoid the complications. During the recovery of the disease care should be taken for the myiasis due to fly strike from skin lesions. Vitamins and minerals supplementation including Zinc will help the early recovery from the disease.

Vaccination:

LSD Vaccine Neethling strain is used in endemic areas 2ml s/c annually. In India goat pox vaccine Uttarkashi strain recommended from scientists for vaccination and control of Lumpy skin disease in India, dose 2ml s/c route at neck area to healthy animals.

Control:

Isolation of affected animals from healthy animals and should not be allowed to graze in the natural pastures, symptomatic treatment should be given to the affected animals. Avoid insect bite to animals because insect bites acts as source of the virus from infected to healthy animals in short period of time span. Control of all vectors including mosquitoes should be done using fly repellants and other vector control measures in both affected and unaffected areas. Culling of severely affected animals to avoid the source of infection. Proper cleaning, sanitization and hygiene practices in the cattle shed should be followed including all bio-security measures to avoid the infection spreading from fomites. Vaccination should be done in healthy animals and annual vaccination should be followed in endemic area. Strict quarantine measures to be followed for animals as well as animal by products like hide from one country to another country. Proper disposal of carcass of animal should be done in suspected or confirmed from the disease. Avoid animal movement in endemic area; don't mix the animals from different herds. Closure of local cattle market, cattle shows and gathering cattle festivals to avoid the spreading of disease in endemic area. Separate needles should be used to each animal for treatment and vaccination because iatrogenic transmission is possible.

Vol.1 Issue-1, September,2020

VERMICOMPOST PREPARATION

Swati
Chandigarh University (UIAS), Mohali
Corresponding author: singhswatisinghkriti@gmail.com
ARTICLE ID: 005

INTRODUCTION

Vermicompost (vermi-compost) is the product of the decomposition process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process is called vermicomposting, while the rearing of worms for this purpose is called vermiculture. Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming.

MATERIALS FOR PREPARATION OF VERMICOMPOST –

Any types of biodegradable wastes-Crop residue, Weed biomass, Vegetable waste, Leaf litter, Hotel refuse, Waste from agro-industries, Biodegradable portion of urban and rural wastes.

PHASE OF VERMICOMPOSTING

A. Phase 1: Processing involving collection of wastes, shredding, mechanical separation of the metal, glass and ceramics and storage of organic wastes.
B. Phase 2: Pre digestion of organic waste for twenty days by heaping the material along with cattle dung slurry. This process partially digests the material and fit for earthworm consumption. Cattle dung and biogas slurry may be used after drying. Wet dung should not be used for vermicompost production.
C. Phase 3: Preparation of earthworm bed. A concrete base is required to put the waste for vermicompost preparation. Loose soil will allow the worms to go into

soil and also while watering; all the dissolvable nutrients go into the soil along with water.

D. Phase 4: Collection of earthworm after vermicompost collection. Sieving the composted material to separate fully composted material. The partially composted material will be again put into vermicompost bed.

E. Phase 5: Storing the vermicompost in proper place to maintain moisture and allow the beneficial microorganisms to grow.

The Five Essential Compost worms need:

1. A hospitable living environment, usually called "bedding"
2. A food source
3. Adequate moisture (greater than 50% water content by weight)
4. Adequate aeration
5. Protection from temperature extremes

PROCEDURE

1. To prepare compost, either a plastic or a concrete tank can be used. The size of the tank depends upon the availability of raw materials.
2. Collect the biomass and place it under the sun for about 8-12 days. Now chop it to the required size using the cutter.
3. Prepare cow dung slurry and sprinkle it on the heap for quick decomposition.
4. Add a layer (2 – 3 inch) of soil or sand at the bottom of the tank.
5. Now prepare fine bedding by adding partially decomposed cow dung, dried leaves and other biodegradable wastes collected from fields and kitchen. Distribute them evenly on the sand layer.
6. Continue adding both the chopped bio-waste and partially decomposed cow dung layer-wise into the tank up to a depth of 0.5-1.0 ft.
7. After adding all the bio-wastes, release the earthworm species over the mixture and cover the compost mixture with dry straw or gunny bags.
8. Sprinkle water on a regular basis to maintain the moisture content of the compost.
9. Cover the tank with a thatch roof to prevent the entry of ants, lizards, mouse,

snakes, etc. and protect the compost from rainwater and direct sunshine.

10. Have a frequent check to avoid the compost from overheating. Maintain proper moisture and temperature.

ADVANTAGES OF VERMICOMPOST

1. Vermicompost is rich in all essential plant nutrients.
2. Provides excellent effect on overall plant growth, encourages the growth of new
3. Shoots / leaves and improves the quality and shelf life of the produce.
4. Vermicompost is free flowing, easy to apply, handle and store and does not have bad odour.
5. It improves soil structure, texture, aeration, and waterholding capacity and prevent soil erosion.
6. Vermicompost is rich in beneficial micro flora such as a fixers, P-solubilizers,cellulose decomposing micro-flora etc in addition to improve soil environment.
7. Vermicompost contains earthworm cocoons and increases the population and activity of earthworm in the soil.
8. It neutralizes the soil protection.
9. It prevents nutrient losses and increases the use efficiency of chemical fertilizers.
10. Vermicompost is free from pathogens, toxic elements, weed seeds etc.
11. Vermicompost minimizes the incidence of pest and diseases.
12. It enhances the decomposition of organic matter in soil.
13. It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc.

PESTS AND DISEASES OF VERMICOMPOST

Compost worms are not subject to diseases caused by micro-organisms, but they are subject to predation by certain animals and insects (red mites are the worst) and to a disease known as “sour crop” caused by environmental conditions.

DISADVANTAGES OF VERMICOMPOSTING

Following are the important disadvantages of vermicomposting:

1. It is a time-consuming process and takes as long as six months to convert the organic

matter into usable forms.

2. It releases a very foul odour.
3. Vermicomposting is high maintenance. The feed has to be added periodically and care should be taken that the worms are not flooded with too much to eat.
4. The bin should not be too dry or too wet. The moisture levels need to be monitored periodically.
5. They nurture the growth of pests and pathogens such as fruit flies, centipede and flies.

CONCLUSION

The vermicomposting of dry grass clippings, rice straw and cow manure using Eisenia foetida was successful. The produced vermicompost had a dark color, a mull-like soil odor and was homogeneous. It had all essential macro- and micro-plant nutrients like N, P, K, Ca, Mg, Mn, Cu, Zn and Fe, indicating the achievement of getting an environment friendly nutrient-rich fertilizer for the agriculture sector.

Migration in India & It's Impact

Sakshi Shastri[1] and Anindita Saha[2]
[1]Deptt. of Agri. Extension, Visva-Bharati Univerity, Bolpur, West Bengal- 731 23
[2]Assistant Professor, Department of Agri. Extension, Palli Siksha Bhavan (Institute of Agriculture), Visva Bharati University, Birbhum, West Bengal
Corresponding author: sakshishastri1996@gmail.com
ARTICLE ID: 006

Migration isn't a one-directional process; it's a colossal process that has been happening in all directions for thousands of years. **Mohsin Hamid**

Human Migration

Human migration is the movement of people from one place in the world to another. People can either choose to move (voluntary migration) or be forced to move (involuntary migration).The International Organization for Migration **(**The United Nations Migration Agency) defines a migrant as any person who is moving or has moved across **an** international border **or** within a state away from his/her habitual place of residence, regardless of:

- Person's legal status
- Whether the movement is voluntary or involuntary
- What the causes for the movement are
- What the length of the stay is

According to the International Migrant Stock 2019 report (released by the Population Division of the United Nations Department of Economic and Social Affairs), India with 17.5 million international migrants has emerged as the top source of international migrants, constituting 6.4% of world's total migrant population. India's urban population is expected to grow from 410 million in 2014 to 814 million by 2050.

The number of migrants who moved from rural to urban areas stood at 52 million out of a total population of 1.02 billion, as per the 2001 Census. About 450 million of 1.2 billion Indians migrated within the country according to recently released Census 2011 data. Women outnumber men in making the rural-to-urban shift. Of the 78 million, 55% were females and they outnumbered males in 554 of the 640 districts. The share of male rural-to-urban migrants in the total male population rose from 4.6% to 5.7%; for females, the share rose from 5.5% to 7.4%.

Rural to urban migration

In developing countries, urbanisation usually occurs when people move from villages to settle in cities in hope of gaining a better standard of living. The movement of people from one place to another is called migration. Migration is influenced by economic growth and development and by technological change (Marshall et al., 2009) and possibly also by conflict and social disruption. It is driven by pull factors that attract people to urban areas and push factors that drive people away from the countryside. About 89% of the migrants are from rural areas and over 50% of migrants, both male and female, are between 15-25 years old. Migration of youth is an important factor in shaping cities and towns.

Factors

- Migration is a global phenomenon caused not only by economic factors but many other factors like social, political, cultural, environmental, health, education are included under the broader classification of Push and Pull factors of migration. A study by Arup Mitra and Mayumi Murayama (2008) revealed that 77% of the population i.e. nearly 840 million Indians live on less than Rs.20 a day

Push-factors Countries of origin	**Migrants**	**Pull-factors** Countries of destination
⇒ Population growth, young age structure ⇒ Inadequate educational institutions, medicare and social security	**Demographic factors and social infrastructure**	⇒ Stable population, population decline, demographic ageing ⇒ Welfare state benefits, educational institutions, medicare, social security
⇒ Unemployment, low wages ⇒ Poverty, low consumption and living standard	**Economic factors**	⇒ Labour demand, high wages ⇒ Welfare, high consumption and living standard
⇒ Dictatorships, shadow democracy, bad governance, political upheaval ⇒ Conflict, (civil) war, terrorism, human rights violation, oppression of minorities	**Political factors**	⇒ Democracy, rule of law, pluralism, political stability ⇒ Peace, security, protection of human and civil rights, protection of minorities
⇒ Ecologic disaster, desertification, lack of natural resources, water shortage, soil erosion, lack of environmental policy	**Ecological factors**	⇒ Better environment, environmental policy, protection of natural resources and environmental protection
⇒ Decisions of the family or the clan ⇒ Information flows, media,	**Migrant flows and migrant stocks**	⇒ Diaspora, ethnic community ⇒ Information flows, media, transferred picture of

- **Rural push factors:** Push factors are those that compel **a** person to leave a place of **origin** (out-migration) and migrate to some other place includes poverty, inequitable land distribution, environmental degradation, high vulnerability to natural disasters, and violent conflicts while

- **Urban pull factors:** Pull factors indicate the factors which attract migrant (in-migration) to an area (destination) includes better employment and education opportunities, higher income, diverse services, and less social discrimination in the cities.

Home away from home: Where Indians go

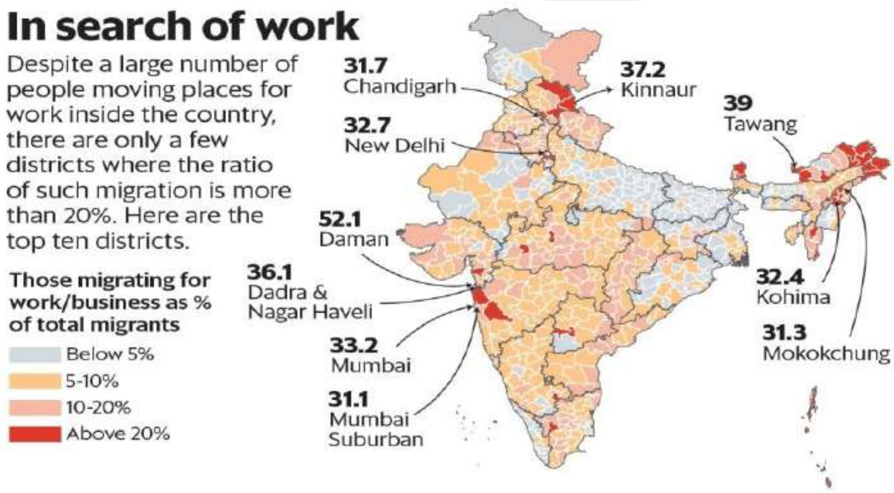
Rank	Country	No of Indians (in million)	% of total Indian diaspora
1	UAE	3.5	22.4
2	US	2.0	12.8
3	Saudi Arabia	1.9	12.1
4	Kuwait	1.0	6.4
5	Oman	0.7	4.5
6	UK	0.7	4.5
7	Qatar	0.6	3.8

Total 15.6 million

Types

People move for many reasons, based on which types of human migration include

a. **internal migration** (moving within a state, country, or continent)
b. **external migration** (moving to a different state, country, or continent).



Internal migration in India is primarily of two types:

- ✓ **Long term Migration,** resulting in the relocation of an individual or household.
- ✓ **Short term Migration,** involving back and forth movement between a source and destination.

- **Key Source States:** Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Andhra Pradesh, Chhattisgarh.

- **Key Destination States:** Delhi, Maharashtra, Gujarat, Haryana, Punjab and Karnataka.

Internal Migrants: The largest recipient was the Delhi region, which accounted for more than half of migration in 2015-16. This is consistent with our finding that of the five million leaving agriculture per annum there were 3.5 million from Uttar Pradesh and Bihar alone. The Report by the Working Group on Migration has identified 54 districts with a high level of inter-State out-migration intensity. These districts account for half the male inter-State out-migration in the country. Of these, 36 districts are concentrated in Eastern Uttar Pradesh and Bihar. Bilaspur in Chhattisgarh has the highest share of rural-to-urban migrants in its population (39%).

- **Female Migration:** Out of the total internal migrants, **70.7 per cent** are **women** (Census of India 2001) and **marriage** is one of the major reasons for **female migration** in both the rural and urban areas.

- **Male Migration:** Migration for **employment-related** reasons is one of the prominent reasons for **male migration** in both rural and urban areas.

- **Employing Sectors:** Migrants are mostly employed in **subsectors** like construction, domestic work, textile, brick-kilns, transportation, mines, quarries, and agriculture.

- **Urbanization:** Rates of urbanization influence **rural-urban wage** differences and an increase in the demand for labour in urban areas can push up urban wages and **increase migration.**

- **External Migration**

External migration in India can broadly be classified as:

a. **Emigration** from India to various parts of the world.

b. **Immigration** of people from different countries to India.

c. **Refugee Migration:** There had also been a significant trend of an involuntary or forced immigration to India in the form of refugees.

International Migration and Global action

In 2016 the United Nations General Assembly convened a high-level plenary meeting on addressing large movements of refugees and prepared the report "Safety and Dignity: Addressing Large Movements of Refugees and Migrants".

- United Nations member states adopted the New York Declaration for Refugees and Migrants, which commits to protect the safety, dignity, human rights and fundamental freedoms of all migrants, regardless of their migratory status.
- As a result of the New York Declaration, UN Member States agreed to cooperate in the elaboration of a Global Compact for Safe, Orderly and Regular Migration, adopted at an intergovernmental conference on international migration in December 2018 in Morocco.
- Every year, 8th December is celebrated as International Migrants Day.

Positive Impact

- Labour Demand and Supply: Migration fills gaps in demand for and supply of labor.
- Economic Remittances: Economic well-being of migrants provides insurance against risks to households in the areas of origin, increases consumer expenditure and investment in health, education and assets formation.
- Quality of Life: Migration enhances chances of employment and economic prosperity which in turn improves quality of life. The migrants also send extra income and remittance back home, thereby positively impacting their native place.
- Social Remittances: Migration helps to improve the social life of migrants, as they learn about new cultures, customs, and languages which helps to improve brotherhood among people and ensures greater equality and tolerance.
- Food and Nutrition Security: According to the 2018 State of Food and Agriculture report by Food and Agriculture Organisation (FAO), outmigration often leads to improved food and nutrition security for migrants.
- Climate Change Adaptive Mechanism: Migration has also emerged as a possible adaptive mechanism in the context of climate change and the occurrence of extreme weather events like floods, droughts, and cyclones.

Migrants and the SDGs

- The 2030 Agenda (with core principle to "leave no one behind," including migrants) for Sustainable Development recognizes for the first time the contribution of migration to sustainable development.
- 11 out of the 17 Sustainable Development Goals (SDGs) contain targets and indicators that are relevant to migration or mobility.
- The SDGs' central reference to migration is made in target 10.7, to facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies.

Negative Impact

- Demographic Profile: Emigration in large numbers can alter demographic profiles of communities, as most of the young men move out, leaving only the women and elderly to work on the land.
- Population Explosion and the Influx of workers in the place of destination increases competition for the job, houses, school facilities etc. and a large population puts too much pressure on natural resources, amenities, and services.
- Illiterate and Under skilled Migrants are not only unfit for most jobs, because of a lack of basic knowledge and life skills but are also prone to the victimization of exploitation, trafficking, psychological abuse, and gender-based violence in the case of female migrants.
- Increased Slum: Mass Migration results into an increase in slum areas, compromising quality of infrastructure and life at the destination, which further translates into many other problems such as unhygienic conditions, crime, pollution, etc.
- Brain Drain: Source state suffers from the loss of human capital.

Challenges

- Inclusion and Integration of Migrants: Internal migration is not viewed positively in India and policies are often aimed at reducing internal migration, as a result, there is a lack of integration of migration with the process of development.

- Psychological and Emotional Stress: Any person migrating to a new country faces multiple challenges, from cultural adaptation and language barriers to homesickness and loneliness.
- Employment challenges: Labor migrants are paid below their contract wage and may be forced to work long hours and denied regular time off. Systems like reservation of jobs in many states and countries for the locals (visa barriers in US, Saudi Arabia's Nitaqat law) pose as the main hurdle.
- Contract Wage System: The problems faced by migrants in destination countries range from contract violation, non-payment of salary, long working hours, and poor working conditions.
- Health Hazards: The poor and harsh living conditions coupled with difficult and risky working conditions, lack of information, and lack of medical health support also leads to several health problems of the migrants.
- For internal migrants also there is the Inter-State Migrant Workmen Act (1979), enacted to prevent migrant workers from being exploited, but it is rarely invoked and the penalty is minimal.
- Exclusion from social benefits: The need to provide proof of address, ration cards, Voter IDs and Aadhaar cards, which is difficult due to the fluidity of their lives, deprive them from accessing welfare schemes and policies.

Way Forward

The Human Development Report by United Nation Development Programme (2009) highlights that migration is integral to the process of human development and it plays a very important role in achieving sustainable development goals, thereby preventing migration could even be counterproductive.

Hence India needs to formulate migration centric policies, strategies, and institutional mechanisms in order to ensure inclusive growth and development and reduce distress induced migration, thereby increasing India's prospects for poverty reduction and achieving Sustainable Development Goals. The government at Centre needs to provide amenities and social securities for the migrant population which is riddled with the issues of inadequate housing; low-paid, insecure or hazardous work; extreme vulnerability of women and children to trafficking and sex exploitation etc.

For instance, schemes like Kerala government's Aawaz health insurance scheme, Apna Ghar project -accommodation for migrant workers, Portable Rights- ensures the basic rights to workers in their respective home state, even as they labour in other states.India's planners must manage these three processes much better over the next two decades as India's demographic dividend draws to a close by 2040.

Aeroponics System of Cultivation in Horticultural Crops

Deeptimayee Sahoo
Ph.D Research Scholar
Dept. of Vegetable Sciences,
Orissa University of Agriculture and Technology, BBSR, Odisha-751003
Mail- deeptimayeesahoo94@gmail.com
ARTICLE ID: 007

Population of earth is expected to rise by 3 billion people. It is estimated that approximately 109 hectares of additional traditional land will be needed to feed them. Only 80% of the Earth's arable land is suitable for farming now. A greater quantity of hectares with optimum inputs is needed every day to feed the rising population. This chain of high priority problems requires an improvement in the management of the use of resources so that human consumption has the priority in its use. To solve the problems mentioned, new farming methods have been searched, one of them being aeroponics. With this technique, the plants are held by certain structures that are maintained in a way that the roots are sustained up in the air.

Aeroponic literally means "growing in air." An aeroponic system is medium-less in that the roots of the plant are free hanging inside an open root-zone atmosphere. Aeroponics structure supplies optimum levels of water, nutrients and air to the growing chamber. Aeroponics is the process of growing plants in an air or mist environment without use of soil or an aggregate media. The word aeroponic is derived from the Latin word 'aero' (air) and 'ponic' means labour (work). This is an alternative method of soil-less culture in growth-controlled environments. The aeroponic culture technique is an optional device of soil-less culture in growth-controlled environments such as greenhouses. This method consists of enclosing the root system in a dark chamber and supplying a nutrient solution of mist device. This was widely used in horticultural species including potato, tomato, lettuce, cucumber and ornamental plants such as chrysanthemum. Aeroponic systems for seed production have been established following increased demand for more efficient high quality seed production methods. Aeroponic system has been applied successfully in Korea for potato seed tuber production. Aeroponic systems are more water resource efficient than hydroponic system. Another remarkable advantage of the aeroponics is the minimal contact between the support structure and plant, due to which the unconstrained growth of the plant is possible. The aeroponics systems are widely used for NASA space research programs.

Importance of Aeroponics in Vegetable crops

1. Use of water efficiently- Outcomes of using aeroponics system over their counter parts are more efficient use of water. Almost 99 percent of the water is used. Since pesticides and soil compatible fertilizers are not used, fruits and vegetables obtained are pure and doesn't need to be washed before use.

2. Efficient use of nutrient- Delivers nutrients directly to the plant roots, which results in a faster growth of crops. Fruits and vegetables obtained from an aeroponics-based greenhouse are healthy, nutritious, pure, rich, fresh and tasteful. Aeroponics system uses nutrient solution recirculation.

3. Uniform growth among all crops was also observed. The system has the ability to conserve water and energy., a limited amount of water is used. It comparatively offers lower water and energy inputs per unit growing area.

4. The aeroponics system optimizes root aeration. This is true because the plant is totally suspended in air, giving the plant stem and root systems access to 100% of the available oxygen in the air which promotes root growth. Such environment also gives plants 100% access to the carbon dioxide concentrations ranging from 450 to 780 ppm for photosynthesis hence, plants in an aeroponics environment grow faster and absorb more nutrients than regular hydroponics plants. This is in line with Sun *et al.* (2004) who reported that, the aeroponics system increased stomatal conductance of leaf, intercellular CO2 concentration, net photosynthetic rate and photochemical efficiency of leaf

5. Aeroponics method of propagation is one of the most rapid methods of seed multiplication. Another advantage of aeroponics system is that of easy monitoring of nutrients and pH. Aeroponics system also allows the measurement of nutrient uptake over time under varying conditions. Aeroponics production system is very space efficient, with plants taking up minimal room.

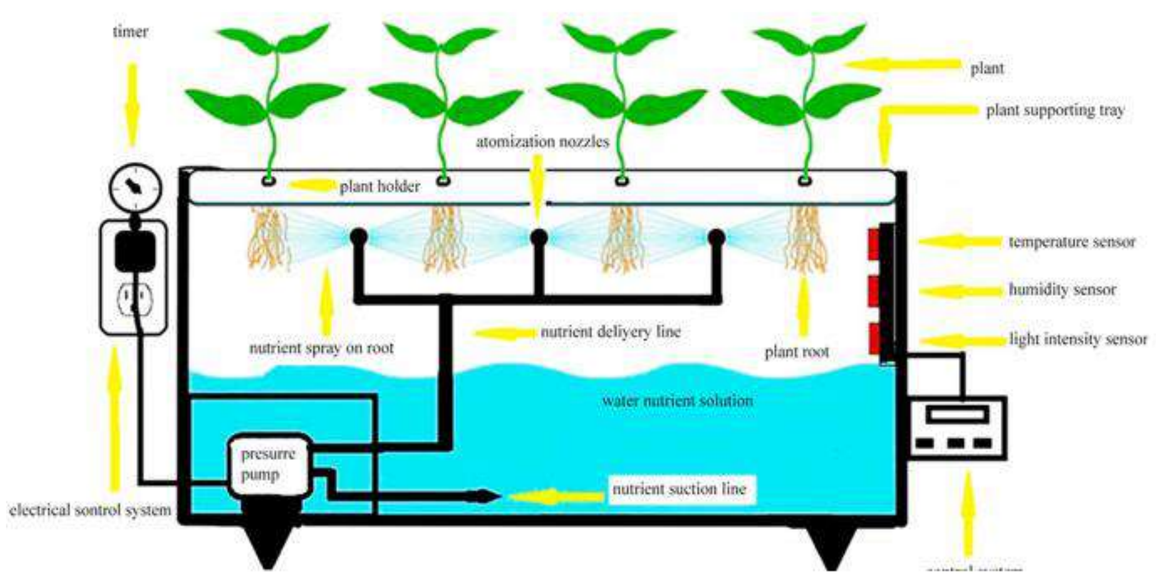
Nutrients used in aeroponics system

Carbon, oxygen and hydrogen are present in air and water. Water may contain a variety of elements with primary nutrients such as nitrogen, phosphorus, potassium and secondary nutrients viz., calcium, magnesium, and sulphur, micro-nutrients are iron, zinc molybdenum, manganese, boron, copper, cobalt and chlorine. The optimal pH for plant growth is between 5.8 and 6.3. In aeroponic system where water and nutrients are recycled, it is important to measure the acid/base or pH measurement to allow plants to absorb nutrients. Aeroponic using spray to nourish roots use much less liquid resulting in easier management of nutrient concentration with greater pH stability. The main nutrients used in aeroponics are:

Nutrient	Concentration (g/L)
N-NH4	0.54
N-NO3	0.35
P	0.40
K	0.35
Ca	0.17
Mg	0.08
Na	0.04

Aeroponics Growing System

The principles of aeroponics are based on the possibility of cultivating vegetables whose roots are not inserted in a substratum (the case with hydroponics) or soil, but in a container filled with flowing plant nutrition. In these containers root can be find the best condition regarding the best oxygenation and moisture. These conditions allow for the better plant nutrition assimilation in a more balanced way, with consequential faster development of the cultivated plant. The principles of Aeroponics are based on the possibility of cultivating vegetables whose roots are not inserted in a substratum (the case with hydroponics) or soil, but in containers filled with flowing plant nutrition. In these containers roots can find the best condition regarding oxygenation and moisture. These conditions allow for better plant nutrition assimilation in a more balanced way, with consequential faster development of the cultivated plants. Plant containers can be mounted on top of one another and because they are light and handy, they can be easily moved according to agricultural needs. Numerous plants are mounted in vertical columns within a greenhouse or shade house space. Nutrients are allowed to trickle down through the growth columns. Most agricultural plants need a direct exposure to the sun during the first vegetative development. Afterwards this direct exposure is no longer relevant. Based on this observation, plant containers are periodically displaced. Young plants are placed at the highest level of the growth column. Afterwards they are progressively lowered utilizing a rotational mechanical system. With the rotation periodically repeated, this permits constant production without any interruption. The Aeroponic system is agriculture with a non-stop production cycle. Plant nutrition is supplied into a closed circuit. Consumption is consequently limited to only the quantities absorbed by the plants, allowing for substantial water savings. The aeroponic system is a continuous-cycle in an enclosed space it reduces the agricultural labor into a series of mechanical routine operational tasks which are carried out daily and throughout the year. This enables workers to acquire considerable skill within a short period of time.



Components of aeroponics system

Spray misters

Atomization is achieved by pumping water through nozzles at high pressure. Nozzels come in different spray patterns and orifices. Larger nozzles and orifices reduce the chance of clogging but need pressure to operate and have high flow rates. Droplet size in a given spray may vary from sub microns to thousands of microns.

Droplet size

The ideal droplet size range for most plant species is 20 - 100 microns. Within this range the smaller droplets saturate the air, maintaining humidity levels within the growth chamber. The larger droplets 30 - 100 microns make the most contact with the roots. Spray droplets less than 30 microns tend to remain in the air as a fog. While any droplets over 100 microns tend to fall out of the air before containing any roots. Too large of a water droplet means less oxygen is available to the root system.

High pressure water pump

High pressure aeroponics requires a pump that can produce enough to pressurize the water to produce the ideal droplet size of 20 to 50 microns. These pumps are generally diaphragm pumps or reverse osmosis booster pumps. The pump must produce a steady 80 PSI with required nutrient flow.

Light and Temperature

Replacement for Sun light is very essential. It can be replaced by fluorescent tubes of required Intensity.15000-20000 lux – for vegetative growth.35000-40000 lux –for flowering and fruiting. The optimum temperature for all plants is 15°C – 25°C.

Misting Frequency and Nutrient Reservoir

Aeroponic systems may mist the root system continuously, or intermittently and both methods work well, since water logging and oxygen starvation are not a problem in aeroponics. The major advantage of intermittent aeroponics systems is the saving in running cost, since the pump is only on for a short period of time, but the roots are still contained within the nutrient, moisture and oxygen rich environment between mistings. As a general rule, a misting cycle of 1 -2 minutes of misting followed by 5 minutes off will ensure the root system does not dry out under most conditions.

Aeroponics Working Method

In aeroponic system the young plants can be either raised as seedlings using especially designed lattice pots or cuttings can be placed directly into the aeroponic system for rapid root formation. Lattice pots allow the root system to develop down into the aeroponic chamber or channel where it is regularly misted with nutrient. The base of the cutting is supplied with high levels of oxygen and moisture in a humid environment which prevents desiccation and accelerates root formation. Once the young plant has been established into the aeroponics system, the root system rapidly develops in the chamber or channel. What is important at this stage is that the optimum size of the droplets is maintained within the system for maximum efficiency. The principles of aeroponics are based on the possibility of cultivating vegetables whose roots are not inserted in a substratum or soil, hanging in a containers filled with flowing plant nutrition. In these containers root can be find the best condition regarding the best oxygenation and moisture. These conditions allow for the better plant nutrition assimilation in a more balanced way, with consequential faster development of the cultivated plant. Plant nutrition is supplied into a closed circuit. Consumption is consequently limited to only the quantities absorbed by the plants, allowing for water savings. For example: to produce a kilogram of tomatoes using traditional land cultivation requires 200 to 400 liters of water, hydroponics requires about 70 liters, aeroponics utilizes only about 20 liters.

Crop Production

Potato

The International Potato Center (CIP) has recently developed and promoted mini-tuber production based on a novel, rustic and publically available aeroponics system. Results showed that the aeroponics system is a viable technological alternative for the potato mini-tuber production component within a potato tuber seed system producing more number of tubers, high tuber yield tuber weight. Thus aeroponic system, has potential to increase income and reduce cost of production of quality seed, thereby, making it more accessible to growers in developing countries where potato production is heavily constrained by the use of poor quality seed tubers.

Yams

The aeroponics technology should be considered as an effective yam propagation method. Genotypes of both *D. rotundata* and *D. alata* were successfully propagated in it using both pre-rooted and fresh vine cuttings. Results of these studies revealed that vines cutting from five months old plants rooted successfully (95%) within 14 days in aeroponics.

Other vegetables like lettuce, tomato and leafy greens are also cultivated through aeroponics.

Advantages

1. Reduction in fertilizer use - Since all the nutrients are contained, they don't end up in groundwater or sinking too deep into the soil to be of any help.
2. Reduction in water use - Very important for space travel and those in arid climates. Much of the water lost in traditional gardening is from water evaporating out of the soil. The rest of it just sinks past the roots and the plants never get a chance to drink it.
3. More Cost Effective - Since less nutrient solution is needed as compared to hydroponics the costs to operate an aeroponic garden are less than to operate a hydroponic garden. There are also fewer moving parts and complicated systems involved.
4. Reduced Disease Damage - Because the plants are seperated from each other and not sharing the same soil, an infection in one plant has a much lower chance of spreading to the rest of your plants.
5. Faster and healthier growth since it has enough oxygen (in the root region) Increased harvest rate is 45–70% faster than conventional agricultural techniques.
6. Studies has shown that plants grown *via* the aeroponic system have an increase in flavonoids.

Disadvantages

1. .More expensive for long scale production.
2. Ordinary farmers will struggle to manage all these sophisticated instruments.

3. Mister spray heads may also have a tendency to clog and not produce mist when needed.
4. Many consumers believe that aeroponically grown plants are not as nutritious as other grown plants.
5. Maintenance of an aeroponics farm is very expensive.

Conclusion

Aeroponics growing allows plants and crops to grow without the use of pesticide and thus it will be disease free. The crops will grow in a natural healthy manner as the aeroponic system is very similar to nature environmental conditions. Aeroponics is conducted in air combined with micro-droplets of water, almost any plant can grow to maturity in air with a plentiful supply of carbon dioxide, water and nutrients. Aeroponics helps conserve water, land and nutrients, so the aeroponics system is the way of the future, making cultivation of crops easier. Aeroponics appeared to be a highly feasible method for the production of both aerial parts and roots as raw materials for the herbal dietary supplement and phyto pharmaceutical industries.

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Nano-fertilizers : A Novel Approach for Sustainable Crop Production under Changing Climate

Gargi Gautami Padhiary[1]* and Subha laxmi Mishra[2]

[1&2]Research Scholar, Department of Vegetable Science,
Odisha University of Agriculture and Technology, Bhubaneswar
*Corresponding author: nikigargi.15@gmail.com

ARTICLE ID: 008

Introduction

Outburst of world population in past decade has forced the agricultural sector to extend crop productivity to satisfy the needs of billions of people particularly in developing countries. Since green revolution, chemical fertilizers are deemed as an indispensable input of modern crop production systems, however these are associated with environmental and ecological consequences. This has necessitated the search for environmental friendly fertilizers significantly those with high nutrient use potency as nutrient fertilization plays a vital role in maintaining soil fertility and boosting crop productivity and quality. In recent years, nanotechnology has extended its relevance in plant science and agriculture. Advancement in nanotechnology has improved ways for large-scale production of nanoparticles of physiologically vital metals, which are now used to improve fertilizer formulations for enhanced uptake in plant cells by minimizing nutrient loss. This article briefly sheds light on the potential role of nanotechnology in developing nano-fertilizers, its formulation, functioning, advantages and limitations and some field evidences showing its significant role in sustaining crop production.

Potential role of Nano-technology in developing Nano-fertilizers

Nanotechnology is a novel scientific approach that involves the use of materials and equipments capable of manipulating physical moreover chemical properties of a substance at molecular levels. Nanotechnology utilizes nano-materials of less than 100 nm size which offer an unprecedented opportunity to develop concentrated sources of plant nutrients having high absorption rate, utilization efficacy and minimum losses. Like all other fields, the solid impact of nano-materials is being felt in agriculture sector.

Modern intensive farming systems utilize organic and mineral manures in order to supply essential plant nutrients, but this approach has resulted in serious deterioration of ecosystems and environment. Loss of nitrogen as nitrous oxide and nitrates leaching has resulted in eutrophication and manifesting the impacts of global warming and climate change. Phosphate fertilizers have even lesser nutrient use efficacy (NUE) that has been reported to be below 20%. A nano-fertilizer is any product that is made with nanoparticles or utilizes nanotechnology to enhance nutrient use efficiency owing to higher nutrients uptake caused by smaller surface area of nano-materials which increases nutrient-surface interaction. Along with boosting crop yield on sustainable basis, nano-fertilizers hold potential to minimize environmental pollution caused by fertilizers. Slow release fertilizers coated with nanoparticles significantly reduced nitrate leaching and de-nitrification. Moreover, controlled releasing fertilizers coated with nano-materials for reducing surface area may provide excellent source of supplying plant nutrients in future.

Formulation of Nano-fertilizers

Nano-sized particles have been prepared from urea, ammonia, peat and other synthetic fertilizers as well as plant wastes. A formulation process which involves urea deposition on calcium cyanamide resulted in nano-sized N fertilizer. In another formulation, grinded urea was mixed with different bio-fertilizers to prepare an effective nano-fertilizer to supply nutrients slowly and gradually for a longer period of time. In similar fashion, ammonium humate, peat and other synthetic materials were mixed to prepare nano-sized fertilizers. Mechanical cum biochemical approach is employed to prepare such nano-fertizers where materials are grinded to nano-sized particles through mechanical means and then biochemical techniques are put in action to prepare effective nano-scale formulations. Nano-emulsions are also being prepared by adding nano-sized colloids to emulsions. In short, fertilizers encapsulation with nanoparticles offers wide perspective for developing plant nutrient sources with greater absorption and nutrient use efficiency. The encapsulation of nutrients with nano-materials can be performed in three distinct ways;

1. Plant nutrients can be encapsulated within the nano-materials of varying nature and chemical composition.
2. Nutrient particles may be coated with a thin layer of nano-materials such as polymer film.
3. Nutrients may also be delivered in the form of emulsions and particles having dimension in the range of nanoparticles.

Functioning of Nano-fertilizers

Nano-fertilizers combine with the nano-devices in order to synchronize the release of fertilizer N and P with their uptake by crops, preventing undesirable nutrient losses to the soil, water and air via direct internalization by crop and avoiding the interaction of nutrients with soil, microorganisms, water and air. Nanostructured formulation might increase fertilizer efficiency and uptake ratio of the soil nutrients in crop production, and save fertilizer resource. Controlled release modes have properties of both release rate and release pattern of nutrients for water-soluble fertilizers might be precisely controlled through encapsulation in envelope forms of semi-permeable membranes coated by resin-polymer, waxes and sulphur. Effective duration of nutrient release has desirable property of Nanostructured formulation, it can extend effective duration of nutrient supply of fertilizers into soil. Nanostructured formulation can reduce loss rate of fertilizer nutrients into soil by leaching and/or leaking.

Advantages of Nano-fertilizers over conventional fertilizers

Mineral nutrients applied to crops in the form of nano-fertilizers offer numerous benefits for making the crop production more sustainable and eco-friendly. Some salient advantages are-

1. Nano-fertilizers feed the crop plants gradually in a controlled manner in contradiction to rapid and spontaneous release of nutrients from chemical fertilizers.
2. Nano-fertilizers are more efficient in terms of nutrient absorption and utilization owing to considerably lesser losses in the form of leaching and volatilization.
3. Nanoparticles record significantly higher uptake owing to free passage from nano-sized pores and by molecular transporters as well as root exudates. Nanoparticles also utilize various ion channels which lead to higher nutrient uptake by crop plants.

Within the plant, nanoparticles may pass through plasmodesmata that results in effective delivery on nutrient to sink sites.

4. Due to considerably small losses, these can be applied in smaller amounts in comparison to synthetic fertilizers which are being applied in greater quantities keeping in view their major chunk that gets lost owing to leaching and emission.
5. Nano-fertilizers offer the biggest benefit in terms of small losses which lead to lower risk of environmental pollution.
6. Comparatively higher solubility and diffusion impart superiority to nanofertilizers over conventional synthetic fertilizers.
7. Smart nano-fertilizers such as polymer coated fertilizers avoid premature contact with soil and water owing to thin coating encapsulation of nanoparticles such as leading to negligible loss of nutrients. On the other hand, these become available as soon as plants are in position to internalize the released nutrients.

Limitations of Nano-fertilizers

Despite of having numerous benefits pertaining to sustainable crop production,nano-fertilizers also have some limitations regarding research gap, absence of rigorous monitoring and lack of legislation which are currently hampering the rapid development and adoption of nanoparticles as a source of plant nutrients. A few limitations and drawbacks associated with use of nano-fertiliazers for sustainable crop production is enlisted below.

1. Nano fertilizers related legislation and associated risk management continue to remain the prime limitation in advocating and promoting nano-fertilizers for sustainable crop production.
2. Production and availability of nano-fertilizers in required quantities is another limiting factor and wide scale adoption of nano-fertilizers as a source of plant nutrients has remained the foremost limitation.
3. The higher cost of nano-fertilizers is a hurdle in the way of promulgating them for crop production under varying pedo-climatic conditions across the globe.
4. Another major limitation pertaining to nano-fertilizers is the lack of recognized formulation and standardization which may lead to contrasting effects of the same nano-materials under various pedoc-limatic conditions.

5. There are many products being claimed to be nano but in fact are submicron and micron in size. This dilemma is feared to remain persistent until and unless uniform size of nanoparticles (1–100 nm) gets implemented.

Field evidences of impact of Nano-fertilizers on sustainable crop production

In a field investigation ,it was proved that nano nitrogen fertilizers have ability to boost the productivity of rice. Nano nitrogen fertilizers can be used in place of mineral urea and it can reduce environmental pollution caused by leaching, de-nitrification and volatilization of chemical fertilizers. Similarly, exogenously applied nutrients as nano-materials increased the vegetative growth of cereals including barley, while in contrast, nano-fertilizers applied in conjunction with reduced doses of mineral fertilizers were found to be instrumental in boosting yield attributes and grain yield of cereals. Nano-fertilizer of zinc applied as ZnO was found to be instrumental in boosting peanut yield due to robust plant growth, increased chlorophyll content of leaves and significantly better root growth.

In agreement to these findings, it was also reported that nano-fertilizers of zinc improved the seed production of vegetables. Similarly, nano carbon incorporated fertilizers effectively reduced the days to germination and promoted root development of rice seedling. It was inferred that nano-composites have the potential to promote vital processes such as germination, radicle and plumule growth and development . Another aspect of nano-fertilizers was explored regarding crop cycle as nanoparticles which were loaded with NPK, reduced the crop cycle of wheat up to 40 days, while grain yield was also increased in comparison to mineral fertilizers applied at recommended rates. Slow release fertilizer coated with nanoparticles boosted the productivity of wheat-maize cropping system. In addition to soil applied nano-fertilizers, foliar application of chitosan was reported to be instrumental in boosting tomato yield by 20%, while it remained non-significant as far as carrot yield was concerned. However, growth promoting effect of foliar applied chitosan was also recorded for horticultural crops such as cucumber, beet-root etc. The significantly higher selenium uptake by many crops including green tea was observed when it was applied as nano-sized particles. There are various other impacts that can be imparted by nano-materials in different crops and some of these have been described in the table below.

Nano-fertilizers	Crops	Imparted characteristics
Nanoparticles of ZnO	Chickpea	Increased germination, better root development, higher indole acetic acid synthesis.
Nano silicon dioxide	Maize	Drought resistance, increment in lateral root roots number along with and shoot length.
Nano silicon dioxide	Maize	Increased leaf chlorophyll.
Nano silicon dioxide	Tomato	Taller plants and increased tuber diameter.
Colloidal silica + NPK fertilizers	Tomato	Increased resistance to pathogens.
Nano-TiO_2	Spinach	Improved vigor indices and 28% increased chlorophyll.
Polyethylene + indium oxide	Vegetables	Increased sunlight absorption
Polypropylene + indium–tin oxide	Vegetables	Increased sunlight utilization
Gold nanoparticles + sulfur	Grape	Antioxidants and other human health benefits.
Kaolin + SiO_2	Vegetables	Improved water retention.
Bentonite + N-fixing bacteria inoculation	Legumes	Improved soil fertility and resistance to insect-pest
Nanocarbon + rare earth metals + N fertilizers	Cereals	Improved nitrogen use efficiency
Stevia extract + nanoparticles of Se + organo-Ca + rare-earth elements + chitosan	Vegetables	Enhanced root networking and root diameter
Nano-iron slag powder	Maize	Reduced incidence of insect-pest
Nano-iron + organic manures	Cotton	Controlled release of nutrients acts as an effective insecticide and improves soil fertility status.

Impact of nano-fertilizers on different crops under varying pedo-climatic conditions

Conclusion

Nano-fertilizers applied alone or in conjunction with organic materials have the potential to reduce environmental pollution owing to significant less losses and higher absorption rate. In addition, nano-materials were recorded to improve germination rate, plant height, root development and number of roots, leaf chlorophyll and fruits antioxidant contents. Moreover, controlled and slow released fertilizers having coating of nanoparticles, boost nutrient use efficiency and absorption of photosynthetically active radiation along with considerably lower wastage of nutrients. The future of nano-fertilizers for sustainable crop production and time period needed for their general adaptation as a source of plant nutrients depend on varied factors such as effective legislation, production of novel nano-fertilizers products as per requirement and associated risk management. There is a dire need for standardization of nano-materials formulations and subsequently conducting rigorous field and greenhouse studies for performance evaluation. For sustainable crop production, smart nano-fertilizers having the potential to release nutrients as per plants requirement in temporal and spatial dimensions must be formulated. Lastly, researchers and regulators need to shoulder the responsibility by providing further insights in order to take full advantage of the nano-fertilizers for sustainable crop production under changing climate with the risk of causing environmental pollution.

Organic Farming: Its Objectives, Principles, Types, Techniques, Favourable Circumstances & Downsides.

Nitika Pathania
UIAS, Chandigarh University, (Mohali) Punjab
Corresponding author:-nitikapathania65957@gmail.com
ARTICLE ID: 009

Introduction:-

- Organic farming is that the production of crops and farm animals while not the employment of artifical chemicals and inorganic fertilizers suggests that cultivation of crops in natural ways.
- This method involves the utilization of biological materials, avoiding synthetic substances to require care of soil fertility and ecological balance thereby minimizing pollution and wastage.

Organic Farming :-

Organic farming system in India isn't new and is being followed from past .The term organic farming was initial employed by lord northbourne in the book of look at the land. Organic agriculture in Asian nation started long back 1900 by Sir Albert Howard, a British Agronomist ,in a native village of north Asian nation and Organic farming initial coined by North Bourne in 1946.The state of Sikkim associate degreed Uttaranchal Pradesh declared an organic state.

Organic farming system in Asian nation isn't new and is being followed from past. It's however of farming system that primarily aimed toward cultivating the land and raising crops in such a way, on keep the soil alive and in physiological condition by use of organic wastes (crop, animal and farm wastes, aquatic wastes) associate degree biological materials in conjunction with beneficial microbes (biofertilizers) to release nutrients to crops for increased sustainable production in an eco friendly pollution free environment.

As per the definition of the United States Department of Agriculture (USDA) study team on organic farming "organic farming might even be a system that avoids or largely excludes the utilization of synthetic materials such as fertilizers, pesticides, hormones, feed additives etc and to the maximum extent feasible depend on crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection".

FAO recommended that "Organic agriculture might even be a singular production management system that promotes and enhances agro-ecosystem health, as well as variety, biological cycles and soil biological activity, and usually often accomplished by victimisation on-farm agronomic, biological and mechanical ways in exclusion of all artificial off-farm inputs"

Key Facts:-

- It's a farming methodology that involves growing and nurturing crops while not the utilization of artificial primarily based fertilizers and pesticides. Also, no genetically modified organisms are permitted.
- It depend upon the ecologically balanced agricultural principles like crop rotation, manure, organic waste, biological blighter management, mineral and rock additives.
- Organic farming makes use of pesticides and fertilizers if they're thought about natural and avoids the utilization of varied petrochemical fertilizers and pesticides.
- Crop rotation is one amongest the constituents of this type of farming during this methodology of farming an excellent emphasis is laid on maintaining the health of the soil by crop rotation.
- After one crop, the farmers grow or cultivate leguminous plants on that land with other crops for recharge or fill the soil with atmospheric Nitrogen which may be a crucial mineral required for bumper crop production.
- These leguminous plants through their roots nodules fix Nitrogen into the soil to form it fertile once more.

Main crops organically grown in India :-

1. Cereals	Paddy,maize, wheat
2. Pulses	Redgram,blackgram ,greengram, bengal gram
3. Spices	Cardamom ,black pepper ,ginger ,turmeric clove , vanilla
4. Vegetables	Okra ,brinjal ,tomato,potato,onion,garlic

Objectives of organic farming:-

- To seek out the presence of chemical contaminants in conventional vs organically big crops.
- Promote a lot of usage of natural pesticides.
- Management pests, diseases and weeds.
- Cultivate the soil in right time in right manner.
- To push sensible soil structure, texture and fertility.
- To grief, read summary of organic agriculture.
- To check regarding the benefits and downsides of organic farming.
- To review the worldwide and indian situation of organic products.
- To seek out corporation dealing in organic products.
- To check the market scenario of organic products India.
- To check SWOT analysis of organic products in India.
- To seek out the opportunities and challenges of organic products in India.
- Turn out food with higher organic process / nutritional quality.
- Work with the natural system.
- Maintain and increase soil fertility.
- Use renewable resources as so much as attainable.
- Avoid pollution.
- Enable satisfaction to an agricultural producer.
- To integrate completely different farming systems like dairy farms, poultry, livestock, fishery, horticulture, sericulture, apiculture etc. with agricultural crop production.
- To extend farm resources use potency (land, labour and production/by-products) thus on increase farm financial gain and profitable employment opportunity.
- To push multi-cropping (out of the entire cropped areas of 2,65,816 ha only 46,697 ha (18%) is sown more than once) , for multi-layered crops of measure thus on sustain land productivity.
- To take care of environmental quality and ecological stability.

Principles of organic farming:

1 Principle of health.
2 Principle of ecology.
3 Principle of fairness.
4 Principle of care.

The Principle of Health:- Organic agriculture ought to sustain and enhance the health of soil, plant, animal, human and planet along and inseparable.

The Principle of Ecology:- Organic agriculture ought to supported living ecological systems and cycles, work with them, emulate them and facilitate sustain them.

The Principle of Fairness:- Organic agriculture ought to build upon relationships that guarantee fairness with relation to the common environment and life opportunities.

The Principle of Care:- Organic agriculture ought to managed during a preventative and accountable manner to protect the health and well-being of current and future generations and thus the environment.

Types of Organic Farming:-

1. Pure organic farming : - It involves the utilization of organic manures and biopesticides with complete dodging of inorganic chemicals and pesticides.

2. Integrated organic farming:- It includes integrated nutrients and blighter management. **I**t is the kind of farming during which production of crops from natural resources has the whole nutritious price and manages to forestall the crop or plants from the pests.

3. Integration of various farming systems:- Integration of various farming systems involves many alternative elements of farming like poultry, mushroom production, goat rearing, and pool at the same time with regular crop elements.

Techniques:-

Crop Rotation:-

- It's the technique to grow numerous varieties of crops within the same space, consistent with the various seasons, during a sucessive manner.

Green Manure:-

- It refers to the dying plants that square measure uprooted and became the soil to form them act as a nutrient for the soil to extend its quality.

Biological tormentor Control :-

- With this methodology , we have a tendency to use living organisms to manage pests with or while not employment of chemicals.

Compost :-

- Extremely made in nutrients, it's a recycled organic matter used as a fertiliser within the agricultural farm.

Mulching :-

- Mulching suggests that covering the bottom with a layer of loose material like dry grass, compost, straw, leaves, or crop manures.

Vermicomposting:-

- Vermi compost may be a stable fine granular organic matter ,when supplemental to soil and provides passage to air.

Favourable Circumstances and Downsides of Organic Farming:-

Advantages / Favourable circumstances of organic farming :-

- It creates higher natural levels of resistance to pests and illness.
- Organic farming permits for specialization opportunities.
- It helps to keep up environmental health by reducing the extent of pollution.
- It helps keep agricultural production at a property level .
- Organic farmers will usually produce their own fertilizers at their farming location.
- It helps to enhance the soil health.
- It ensures optimum utilization of natural resources for brief resources term profit and helps in protective them for future generation.
- It not solely saves energy for each animal and machine ,but conjointly reduces risk of crop failure.
- It improves the soil physical properties like granulation ,good tilth,good aeration ,easy root penetration and improves water holding capability and reduces erosion.
- It controls pests and diseases while not harming the surroundings.

- It improves the chemical properties like offer supply and retention of soil nutrients ,reduces nutrient loss into water bodies and surroundings and promotes favourable chemical reactions.
- It reduces human and animal health hazards by reducing the extent of residues within the product.
- Organic food style is best than typical .
- Organic farming doesn't leach any harmful chemicals into waterways .
- Eliminating the employment of synthetic fertilizers and pesticides .
- Organic food free from harmful chemicals,artificial flavors and preservatives.
- Ingestion organic foods might if truth be told, reduce the chance of heart attacks ,strokes and cancer.
- It produces nutrient food ,feed for animals and top quality crops to sell at an honest worth.
- In organic farming ,the emission of gas is a smaller amount than 40%
- Organic farming earns 3-6 * higher profitvfor farms .
- It performs better than conventional in adverse conditions like drought by as much as 40%.
- It will increase future soil fertility.
- It will curtail warming.
- It helps to extend the employment as a result of in organic farming a lot of sure – handed labour ought to be needed and during this manner it helps to decrease state.

Disadvantages/Downsides of organic farming :-

- Organic manure isn't profusely on the market and on plant nutrient basis it should be dearer than chemical fertilizers if organic inputs square measure purchased.
- Production in organic farming declines particularly through out the primary few years, that the farmer ought to be premium costs for organic manufacture.
- The rules for organic production, processing, transportation and certification etc square measure on the far side the understanding of normal Indian farmers.
- Selling of organic produce is additionally not properly efficient.
- Lack of technology information.

- Organic materials square measure large nature, terribly tough to store and high in worth.
- Bio management agents square measure on the market with solely a number of hand picked insect pests.
- Organic food is dearer than typical food as a result of farmers don't get the maximum amount out of their land as typical farmers do.
- Needed sure-handed labour.
- There are not any subsidies offered for many organic farming.
- Organic farmers should have specific information concerning the localized growing system.
- Organic farms and foods should under go a rigorous certification method.
- Due to the need for more labours for working labour the cost is also high.
- It takes a while in complete conversion of typical farming into organic farming .
- We've got no package for absolutely adopted organic farming.
- It needed a lot of work to supply product that square measure able to sell.
- Organic crops typically spoil quicker as a result of typical foods square measure treated with waxes or preservatives to keep up their freshness throughout the shipping process.

Conclusion:-

From the prior conversation, it tends to be construed that organic farming seems, by all accounts, to be a practical, financial, and eco-accommodating, since there is no danger of lingering poisonousness. It improves soil fruitfulness and yielded amount creation. An expansion of fertilizer arranged from squanders that is FYM, neem-cake, bio gas slurry, vermicompost and so forth keeps up organic manure in soil and now, we know that it has some disadvantages but also has lots of advantages that cover up or that have ability to ignore the downsides of organic farming.

Vol.1 Issue-1, September,2020

JUST AGRICULTURE
multidisciplinary e-Newsletter

Impact of coronavirus pandemic on Education

Vishal Vijayvargiya
M. Sc. (Horticulture), Bhagwant University, Ajmer, Rajasthan
Corresponding author: vishalvijay637@gmail.com

ARTICLE ID: 010

Introduction –

As we know that due to COVID pandemic spreading now in India, massive consequences to health and livelihood are feared.

COVID-19 is impacting almost every sector, the education sector is no exception. colleges, schools, and institutes are close even, and students are at home with the minimal contact with friends. All thanks to the COVID-19 pandemic seething over the world. Everything is virtual, with no physical movement, universities, colleges, schools, institutes of all levels have deferred or dropped examinations. The Corona virus pandemic has had a major impact on education - both negative and positive. What exactly are the risks and opportunities brought about by Corona virus pandemic?

Effect of COVID on education

1. As discussed above, all major entrance examinations are adjourned including medical, engineering, agriculture, law, fashion and designing courses, etc. This incalculability can be a ringing alarming bell mainly in private sector universities. Maybe some faculties and employees may face salary cuts, bonuses and increments can also be adjourned.

2. The lockdown has generated incertitude over the exam cycle. May be universities may face impact in terms of a slowdown in student internships and placements, lower fee collection that can create hurdles in managing the working capital.

3. Student counselling operations are also affected.

4. Several institutions may pause faculty hiring plans for existing vacancies which in turn affect quality and excellence.

5. Structure of schooling and learning includes teaching and assessment methodologies and due to closure, it will be affected.

6. In the time of Lockdown, technology can play an vital role like studying from home and working from home. In India, some private schools may adopt online teaching methods. Low-income private and government schools may not be able to adopt online learning methods. And consequently, e-learning will be completely shut down with no access to solutions. This can result in economic and social stress.

Solutions for interrupted education during COVID-19

- With the help of power supply, digital skills of teachers and students, internet connectivity it is necessary to explore digital learning, high and low technology solutions, etc.
- Students those are coming from low-income groups or presence of disability, etc. distance learning programs can be included.
- To provide support for digitalisation to teachers and students.
- The necessity to explore digital learning platforms.

Coronavirus pandemic :-Negative impacts and opportunities created for education

Given the current situation, it is important to see that What has happened and what is likely to happen with its effects and side effects in the field of global education

Negative impacts of Covid-19 on education

There are a number of areas of potential risks for global education. Theseare four negative impacts of Covid-19 on education:

1. **Lingering cross-border movement of students-**

Universities in many countries are highly dependent on cross-border movement of students. Parents will avoid sending students to other countries, states and districts. Higher education will be affected due to high risk of epidemic.

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2. Passive learning by students

In countries like India where online learning structure is not ready and online course is also not designed.

This situation has left most of our students at risk of becoming passive learners. Some part of India's population where network and light are not fully available. Most of the students there will move away from digital learning

3. Unprepared teachers for online education

Online learning is a special practice and not all teachers are good at it. Not all of us were ready for this sudden transition. In view of the current circumstances, everyone will have to face online learning which is not impossible, but difficult. Students can bear the brunt of this.

4. Changing format of student recruitment

Students from universities and colleges around the world may have to take a big risk in their admissions and retention. Because some board has decided to take admission of students without entrance examination. They will have to revisit their admission practices, admission criteria and their own overall recruitment process. New methods of outreach may have to be implemented.

Positive changes in education due to Covid-19

As we know, change is the law of the world. Any change that is so disruptive is also likely to bring with it some new opportunities Changing the higher education system worldwide and especially in a country like India that plans to bring about a planned reform Some of the key areas of eventuality are the following:

1. Rise in Blended Learning

Blended learning is a method of education. in this method learn through electronic and online platform like you tube, Institute application, website, whatsapp, zoom application, google

Classroom etc Also we can see each other in traditional learning. In this type of education method we can share assignments, notes, home work etc with each other.

2. Learning management systems to be the new norm

There is a golden opportunity for companies that are developing and strengthening teacher management systems for use by universities and colleges.

It has the potential to grow at a very fast pace, but must be of reasonable value and criteria for use by all institutions.

3. Improvement in learning material

Teaching materials used in teaching in school colleges and universities are a great opportunity to start improving the quality of education policy and also the process of learning as blended learning will be a new format of learning hence finding new ways of design and delivery A variety of platforms will emerge. This change of education system will bring more openness and transparency in the use of teacher management system.

4. Rise in collaborative work

The learning community has been largely untouched by digital learning and this is much more in India than in other countries. This situation is where we can convert disaster into opportunity and we can adopt new education model. Teachers can extend their online courses to the students of competing institutions, this can also be a reason for cooperation and teachers across the country can benefit from each other.

Bio-Farming- A Comprehensive Methodology For Social Advancement and Better Health

Ashish Sheera[1] and Sudheer k Pathak[2]

[1.] Research Scholar, Department of Genetics and Plant Breeding, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu
[2.] Assistant Professor, School of Agriculture, ITM University, Gwalior

ARTICLE ID: 011

Now a day's millions of people who must fight every day against acute **hunger** and **malnutrition**. More than 113 million people across 53 countries experienced **acute hunger** requiring urgent food, nutrition and livelihoods assistance (IPC/CH Phase 3 or above) in 2020.The food productions cost is mounting high by adaption of conventional farming pattern which includes application of inorganic fertilizers, pesticides, modern farming techniques. Conventional farming pattern results in degradation of eco system and contamination of food products which leads to poor health standards. Bio farming techniques have received world attention because of the growing concern about the degradation of the agriculture resource base. with the hiking input costs and the low commodity prices, the farmers are looking for low cost input and exploit biological system such as biological nitrogen fixation, vesicular arbuscular mycorrhizae (VAM), etc., to increase soil fertility improve the efficiency of applied fertilizer and thus to enhance soil productivity. Through there are naturally occurring associations, incolation of crop pants with the preparations of these microorganisms shown to or believed to stimulate productivity.

Bio farming helps in generating employment in farm sector and improves quality of products which yield better market price and results into social and economic up-liftment of farmers.

Benefits of Bio-farming

Bio farming help to produce food crops without the use and traces of toxic synthetic chemical product. In bio farming we will be using living organisms from the microscopic beneficial fungus and bacteria to insects and animals and other life forms.

- It is eco- friendly and maintaining ecological balance
- Bio farming helps in conserving natural resources

- It produces good quality products with less input cost
- It increases the soil fertility and its texture
- It easily cops up with adverse effect of climate change and reduce risk of crop failure
- Conservation of natural resources
- It minimize the contamination of food products
- It induces self protection mechanism in the plant
- It reduces the water requirement of the plant

Principal

1. Test and balance your soils and feed the crop a balanced, supplemented diet.
2. Use fertilizers that do the least damage to soil life and plant roots.
3. Apply pesticides and herbicides responsibly while relying on customized management practices to reach maximum genetic potential.
4. Create maximum plant diversity by using green manure crops and tight rotations.
5. Manage the decay of organic materials and the balance of soil, air and water.
6. Feed the soil using carbon from compost, green manures, livestock manures and crop residues.

Bio-farming approach yields more income general public because

- It expands the yield in long term in more steady way
- It is stronger to the environmental change (Temperature, flood, dry spell and soil disintegration)
- Little wastage of the crop through pest by adaption of supportable pest control strategies for bio pest control
- Mixed cultivating effortlessly
- Better nature of food grains yield more income

Consequently, bio-farming creates continually high income at lower cost through effectively accessible asset to the general public. Steady creation of crops at lower cost gives ranchers ordinary employment. At last, it causes the general public to move towards better personal satisfaction inferable from sound what's more, nutritious food combined with higher salary.

Why is bio Farming So Special?

As a completely natural and sustainable farm management practice, bio farming is based on unique values. In other words, bio farming is not only a farm practice but also a philosophy of working together with nature.

Bio farming includes the utilization of customary homestead rehearses in mix with cutting edge logical examination and current ranch developments. For instance, utilizing manuring and natural soil disinfestation.As a holistic farm management approach, bio farming aims to create a socially, environmentally, and economically sustainable food production system. More precisely, bio farming is based on managing the agro-ecosystem rather than relying on external farming inputs, such as pesticides, artificial fertilizers, additives, and genetically modified organisms.

Ground-breaking and Completely Natural Farm Practices

Bio farming are genuine lifelines who work hard to grow healthy and nutritious crops.. An extra duty regarding them is to keep up or improve the most significant of normal assets while securing the earth for the people in the future. In this manner, it's habitually thought about how natural ranchers deal with their yield creation. The appropriate response will for the most part rely upon the laws and guidelines of every nation. Be that as it may, probably the most well known natural homestead the executives rehearse is:

- Crop rotation, used to keep up soil ripeness and to improve crop security from different pest.
- Natural supplement the board, in view of progress of soil natural issue through manuring, fertilizing the soil, or mulching.

- Developing spread harvests, a helpful practice for controlling bug irritations and weeds, forestalling soil disintegration, just as improving the supplement content in the dirt.
- Preventive yield insurance measures, for example, picking safe assortments, transformation of planting or planting, and reaping time.
- Depending on characteristic predators as an organic bug assurance measure.
- Weeding as a non-concoction weed the board practice
- Anaerobic soil disinfestation that wipes out or diminishes soil-borne bothers
- Appropriate space between the harvests
- Mechanical soil development
- Reusing materials
- Depending on inexhaustible assets.

Scope and modes to promote bio farming

- Increment in biological activity makes lower profundity supplements accessibility possible.
- Increases water holding limit of the soil.
- Improves surface and structure of soil

Serious issues in showcasing indian natural items

- Price desires are excessively high corresponding to quality
- Low consistency of value
- Slow shipment, limitations for bringing in Indian natural items
- Time devouring and muddled desk work while managing send out specialists
- The helpless client care from the Indian merchants after deals is the serious issue in trade promoting
- Lack of legitimate advertising system an advertising usage
- Less exertion to create residential market

Conclusion:

The bio farming gives a few roads to the ranchers through which they create more pay and higher status in the society. It brought about better execution per unit territory when contrasted with traditional cultivating. Nonetheless, administrations engaged with bio farming give great possibilities to improve soil fruitfulness and limit soil debasement with the help of normal asset preservation and bio specialists. The Bio farming has made a great deal of sway in India during most recent couple of years, however need of segment explicit strategy of the legislature and research organizations which help in fortifying its situation in ranch society and spreading ability the nation over, accordingly an improvement in strategy causing issues to can further fortify the nation's economy as well.

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Burning of Crop Residues: How does it Affect Soil Health

Rajnish Yadav[*], M.I. Bhat[1], Sirazuddin[2], Rajbeer Singh[3], Roheela Ahmad[4], Seema Pooniyan[5]
[*,1]Division of Soil Science and Agricultural Chemistry, FAO, Wadura, SKUAST-Kashmir (J&K)
[2]Division of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, (J&K)
[3]Division of Agronomy, GBPUAT, Pantnagar, UK
[4]Division of Agronomy, FAO, Wadura, SKUAST-Kashmir (J&K)
[5]Division of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, (J&K)
Corresponding author: rajnishyadav1996@gmail.com

ARTICLE ID: 012

Introduction

India is the second largest agro - based economy with year round crop cultivation. A large amount of agricultural waste is generated every year, including crop residues. According to the Indian Ministry of New and Renewable Energy (MNRE), India generates on an average 500 Million tonnes of crop residue per year. Crop residue contains the remains of leaves, stems, awns and remaining small grains after harvesting the cereal crops. Combined harvesters used for harvesting the crop do not remove complete plants and large amount of standing stubble remains in the field. Due to lack of proper disposal practices, approximately 92 metric tonnes of crop waste are burned every year in India (Bhuvaneshwari *et al.* 2019). Farmers opt for burning the residue because it is a n easy and quick way to manage the large amount of crop residue and prepare the field for the next crop well in time.

Crop residue burning has become a major environmental problem causing health issues as well as contributing to global warming. The burning of crop residues generates numerous problems to the environment and human health. Emission of greenhouse gases leading to global warming, release of particulate matter and smog into the atmosphere that cause respiratory problems, loss of biodiversity of agricultural lands and the deterioration of soil health are the major detrimental effects of crop residue burning. Burning of crop residues greatly affects the soil health. There is a slow and steady reduction in soil health that eventually results in reduced productivity that cannot be overcome with increased additions of mineral fertilizers. Following are the harmful effects of crop residue burning on soil health:

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1. Physical properties:

Burning of crop residue declines the organic matter content of the soil which in turn deteriorates soil physical health. Crop residue retention plays an important role in protecting soil aggregates from raindrop impact (Turmel et al. 2014). Due to poor organic matter content, soil aggregates are broken down and soil structure gets destroyed. Retention of crop residue on the soil surface provides physical protection to the soil against wind and water. However, when crop residues are burnt, soil get exposed and becomes sensitive to wind and water erosion. Bare soil is directly exposed to harmful solar radiations which results in increased soil temperature, creating unfavourable conditions for plants and other soil organisms. Furthermore, there is rapid loss of moisture from the soil which can increase the risk of crop failure in areas facing water scarcity.

2. Chemical properties:

Burning of stubble can potentially result in changes in chemical properties of soil and disrupts nutrient cycles. Due to burning of crop residues, there is continuous loss of organic carbon from soil which can potentially deteriorate soil health and productivity in long-terms basis (Chan and Heena 2015). Due to decreased organic matter content, soil pH also rises towards alkalinity and reduces level of N and C in the top 0-15 cm soil profile. Poor organic matter content results in reduced cation exchange capacity, which is an important indicator of soil fertility. Crop residue is an important and cheap source of organic carbon and nutrient elements, however, when these burnt are lost.

It is estimated that when one tonne of paddy straw is burnt, it accounts for loss of approximate 5.5 kg nitrogen, 2.3 kg phosphorus, 25 kg potash, 1.2 kg sulphur, all secondary nutrients, 50 to 70 percent of various essential micro nutrients, as well as organic carbon (Anonymous 2014). On the other hand, if the crop residue is retained or incorporated in the soil itself, it gets enriched with organic matter and nutrients particularly with organic carbon and nitrogen.

3. Biological properties:

Burning of crop residue may increase the mineralization in short-term which result in increased nutrient available for the plants besides killing the pest and diseases associated with the stubbles and straw of preceding crops (Thakur et al. 2019). However, the heat generated from burning of crop residues raises the soil temperature causing the death of beneficial soil

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organisms. The heat from burning paddy straw penetrates 1 centimetre into the soil, elevating the temperature to 33.8 to 42.2 degree Celsius. This kills the bacterial and fungal populations critical for a fertile soil. Wheat straw burning can kill about 50 per cent of bacterial population in up to 2.5 cm of soil depth (Hesammi *et al.* 2014).

There is also considerable reduction in amount and activity of soil enzymes involved in nutrient cycling. Frequent residue burning leads to complete loss of microbial population, which is important for maintaining soil health. As a result, soil health depletes rapidly eventually leading to reduced productivity that cannot be overcome no matter how much mineral fertilizers are added. Burning of crop residue causes damage to many beneficial organisms present in the upper layer of the soil. Due to the loss of 'friendly' pests, the wrath of 'enemy' pests can increase and as a result, crops might become more prone to diseases and infestation.

What can be done?

Considering the adverse effects of crop residues burning on soil health, there is an urgent need to encourage the farmers to put it for beneficial uses instead of burning it. Some of the suggestions for sustainable management of crop residues are:

1. Crop residue can be corporation of into the soil through adoption of conservation agriculture practices to prevent soil erosion from wind & water and to augment the soil moisture content.

2. Farmers can also manage crop residues effectively by employing agricultural machines like happy seeder (for sowing of crop in standing stubble), rotavator (for land preparation and incorporation of crop stubble in the soil), zero till seed drill (for land preparations directly sowing of seeds in the previous crop stubble) etc.

3. Crop residue can be used for cultivation of mushroom particularly species like Agaricus bisporus (white button mushroom) and Volvriella Volvacea (straw mushroom).

4. Crop residues, instead of burning, can be converted into beneficial products such as biogas, biochar, bio-enriched compost or used as bedding material for cattle.

5. Training should be organised for farmers for creating awareness about effects of crop residue burning, adoption of conservation agriculture practices and resource conservation technology through all ongoing State/Centre Sector Schemes.

6. Awareness should be created of about various measures to prevent crop residue burning through mass media, print media, etc. just before the harvesting seasons.

Conclusion

Burning of crop residue is a very controversial issue. It not only pollutes the environment and creates severe health issues in human being, but also deteriorates soil health. Reduced soil organic matter, poor aggregation, reduced water and nutrient holding capacity, damage to soil bio-diversity, susceptibility to erosion are some of the many adversities arising due to the burning of crop residue. Although, several measures have been taken up by Government to eradicate this serious problem of crop residue burning, still it remains a burning issue. This indicates that there is still much needed to be done to tackle this issue. The management strategy of crop residue should be principally based on the local situation. It is highly important to create awareness among the farming community to understand the importance of organic carbon and emerging environmental concerns due to crop residue burning

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THE ROLE OF ORGANIC FARMING IN RURAL DEVELOPMENT

Anshika
UIAS, Chandigarh University
Corresponding author-anshiijaswal18@gmail.com
ARTICLE ID: 013

Abstract

The basic approach of this article is to access the conditions under which formally organized organic farming might become a factor for rural development. organic farming may improve farmers' social and economic conditions as well as the overall development of areas with a significant organic agricultural sector (proportionally to the local scale .Nowadays, as a result of continuous awareness towards a healthy life and environmentally sound products, more and more people tend to consume healthy /Organic Products .Indeed, Organic agriculture is increasingly gaining greater importance and is being recognized by Consumers, Farmers, Environmentalist and Policy Makers, as one of a number of Possible Models for Environmental, Social and Financial Sustainability in agriculture. More recently, it has been argued that organic farming can provide rural development benefits through enhanced employment and through closer connections with the local economy, reconnecting consumers with producers and stimulating positive economic multipliers.

Introduction

In this era of changing world and increasing production, the necessity of health is somewhere ignored, which in return causes many repercussions like soil pollution, environmental pollution, lost of biological diversity, etc. Thus, the rejuvenation of traditional farming in form of organic farming is adding health to environment and nutrition to the food. Organic Farming is the combine approach of soil management through maintaining the sustainability, soil fertility and biological diversity. This type of farming cause lowering of toxicity, encourages biological cycles of beneficial living organism, maintain soil fertility and many more additional advantages provided by this method shifting the contemporary era towards organic food and organic farming.

The EC Regulation

Organic farming can be defined as a system of management and agricultural production that combines a high level of biodiversity with environmental practices, that preserve organic farming,

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does not prohibit the use of pesticides and fertilizers and most farms in organic farming use fertilizers or pesticides. Some pesticides are allowed for example, copper sulfate is a pesticide used in organic farming in the wine industry. In total, there are several hundred pesticides and fertilizers authorized in organic farming which are listed in annex I and II of the EC Regulation n ° 889/2008.

- Rural development includes local population, its way of life, employment characteristics, income structure, dwelling conditions, service levels as well as cultural aspects just as traditional handcrafts, dishes, language, clothing and habits. New rural development policy of EU can be featured by Multi sectoral and integrated approach. Organic farming is based on the definition of ecology as former naming just as ecological biological represent it. Its basic aim is ensuring sustainable development whereas it uses again, from time to time to locally available reserves.
- It can be stated that market demand for organic products is the strongest in Europe, as much as 46% of the world's organic product output is sold in this continent which possibly can be explained by its economic development level. This overall development reached Hungary, too.
- In December 2002 the estimations showed 105.000 ha and within this 54.497 ha had been registered as approved organic area. In case of organic production quality is more important than quantity, since in farms using environment-friendly ecological methods smaller yield can be obtained.
- The gaining of the rural areas is an accelerating process which on the one hand is in connection with the most complex manifestation of rural functions (economic, ecological, community as well as cultural and social functions), on the other hand it comes from the idea stating that rural areas offer indispensable services for the whole society, therefore accepting and developing rural values is an interest of the society.

All this is connected with fact that in the EU the multifunctional Agricultural model is the main stream and agriculture has to have performances:-

1. It has to produce good quality, whole value and safe foods.
2. It is an economic function which has to be regulated by the market and not finance.
3. Since, commodity production is not financed in any other branches of economy.
4. It has to offer concrete eco-social services (they are environmental services which serve the maintenance and protection of the rural area, the natural habitat, waters, topsoil helping the people living there).
5. The intention of the European Union is to assist the accessing countries (among them Hungary) which have employment achievement and environment friendly policy at the same time.

Agricultural Economy in Rural Development:

When Agriculture economy is considered following point should be kept in mind to actually elaborate its significance in rural development.

- ✓ Within national economy sectors it is agricultural economy that has the strongest connection with rural areas mainly because the rural area itself delivers the operation field and labour base of agricultural economy (especially of agriculture and forestry).
- ✓ Agricultural economy ultimately determines the income positions of rural families and communities, therefore it is a settlement forming factor. It has strong and direct connections with living environment, renewable natural resources, so it has an effect on the state of its elements (primarily on soil, surface waters, flora and fauna).
- ✓ Organic farming delivers an ever growing and permanent market background for producers in rural areas.

Some Needs That Required For Organic Farming Mentioned Below:

- ✓ Organic farming has to be concerned as a complex and integrated system.
- ✓ On one hand that the shift to organic farming should include not only the production of organic raw materials but also the processing, packaging and marketing of them.
- ✓ On the other hand it is important to establish the organizational and interest forms and systems which cover the production itself, the equipment and genetic base supply, small and medium size processing facilities, packaging, advisory and marketing management.
- ✓ Regarding growing domestic and foreign consumption trends, good price positions, lack of export restrictions organic farming can turn itself into a new alternative employment segment in many areas of the country.
- ✓ In this way the previously ignored factor of rural development can potentially turn into a dynamizing engine of regional development.

Depending on the economic situation of organic farms, the development of organic Agriculture will especially depend on the three factors:

1. Technical Progress

Technical progress in organic and conventional farming will affect the relative future competitiveness of both types of farming. As organic farming is gaining in importance, one can also expect increased technical progress in this sector, which will have positive a impact on it.

2. Price Development

Even though prices for organically produced food have mostly remained strong in the last years, despite the strong expansions in organic farming, the risk of prices changing is still to be reckoned with. An EU wide regulation of organic livestock production and similar regulations for plant production can be expected to further strengthen this development.

3. Political Development

The direct support given to organic farming via area payment will continue to have a substantial impact on the economic viability of organic agriculture. Any decision regarding how current schemes within EC Reg. 2078/92 will be handled in the future, and what financial support will be available through them, is thus of major importance. CAP reform and an analysis of its impact on organic farming shows that it tends to improve the competitiveness of this type of farming.

Conclusion

Rural environment covers every aspect of natural environment (biodiversity, living spot and resources protection but also landscape protection) as well as of artificial environment (conserving traditional architecture, archaeological sites and other elements historical heritage). Rural development includes local population, its way of life, employment characteristics, income structure, Dwelling conditions, service levels as well as cultural aspects just as traditional handcrafts, dishes, language, clothing and habits. Since agriculture is a historically determining economic activity in rural areas its effects primarily determines the rural ways. And also provide employment for farmers and rural people which satisfy their financial needs and maintain their living standards.

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Web Blight of Moth bean: An Incite into a Chronic Disease and It's Management

Pramod Kumar Fatehpuria[1,*] and Rajni Singh Sasode[2]

[1,2]Department of Plant Pathology, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M.P.), India

*Corresponding author: pramodfatehpuria@gmail.com

ARTICLE ID: 014

Introduction

Moth bean is grow in about 8-9 lakh hectares area in India. The crop is known for poor plant type, more biomass and poor conversion old varieties used to spread like met on the ground, covering between the rows even if planting has been done at 60 cm apart. Moth bean has been so neglected as far disease management is concerned that, it has inspired few articles on practical diseases management during past half decade. However, there are a number of pathogens which affect moth bean crop causing substantial yield and quality losses to grain and fodder produce. Inspite of severe disease problems, the attempts on disease management through chemicals have not been undertaken at the farmers level but practically management strategies being employed, are the use of tolerant genotypes to some extent only. However, the important foliar disease of moth bean is discussed *viz.*, seedling blight and web blight.

Causal organism

Rhizoctonia solani Khun

Distribution and importance

This disease appears during heavy rains and high temperature. Disease occurs through soil, seeds and naturally infected hosts. Temperature of 25-30ºC and RH of 85% is most congenial for the development of this disease. Losses due to this disease are more severe at the seedling stage.

Symptoms

Light small round web like patches can be seen on both surfaces of the leaves. Small necrotic lesions (2-10 mm) in diameter with brown center and olive green margins found on leaves. The lesion becomes water soaked, enlarges and coalesces rapidly to take on a scalded appearance, and become covered by whitish to brown mycelium with small sclerotia.

Host range

Literature reveals that the fungus *R. solani* can infect 32 plant families. Singh and Malhotra (1994) carried out extensive study on the host range of the fungus *R. solani* causing web blight of winged bean and observed that urd bean, lobia, beans, soybean, groundnut, arhar, french bean, mung bean, paddy, castor, bottle gourd, bitter gourd, tomato, brinjal, chillies and okra were also infected by fungus while maize and raddish were found free from infection. Sharma and Tripathi (2001) have also worked on the host range of isolates of *R. solani* and found the wide host range belongs to family Leguminoceae, Solanacae, Brassicaceae, Malvaceae, Cucurbitaceae etc.

Biology and spread

R. solani is a common soil borne pathogen that has many hosts forms sclerota in/on soil and survives for a long period in the absence of a host either as sclerotia or thick walled brown hyphae in plants debries (Boosalis and Scnaren, 1959). Most of sclerotia occurred on the tap root of diseased plants and in the soil adjacent to the diseased root. Over 80 per cent sclerotia occurred in the top 10 cm of the soil and within 10 cm from the diseased roots. The similar results were reported by Leach and Devey (1938). Mycoparasitic and other antagonistic effect of soil microorganism on sclerotial germination and survival of *R. solani* in the soil has been reported by Naiki and Ui T (1981). *R solani* can survive in soil as sclerotia in association with crop residue by pathogenic growth on hosts or by sporophytic growth on fallen dry leaves and organic matter. Primary inoculum sources consist of sclerotia and hyphae or when the teleomorph *T. cucumeris* is present, (Baker and Martison, 1970). The pathogen can be disseminated by irrigation water, infected/ infested or contaminated seeds, transplanted material, air currents and rain splash, by soil through farm equipments. In the tropics where the teleomorph of *R. solani* develops regularly, the pathogen spreads rapidly by the production and dissemination of basidiospore (Galindo *et aI*, 1982).

Management

Use of resistant varieties. Seed treatment with carbendazim + Mancozeb @ 3 g/kg seed will be the economical control measures. Close planting may be avoided Inclusion of non-leguminous crop in the rotation. Incorprated of *Trichoderma viride, T. harzianum* and *Gliocladium virens* significantly reduces the mycelial and sclerotial production of *R. solani* (Dubey 1998). Foilar spray of Pyrochlostrobin @ 0.1/kg seed may result in complete elimination of seed-born infection.

Conclusion

Plant diseases constitute one of the major causes of crop losses all over the world. Crop losses in India have been estimated to vary between 10 to 30 per cent depending upon the crop region and the severity of the pest infestation amounting to an annual losses of about Rs. 60,000 crores (Agnihotri, 1999). And beside these a no of diseases are also responsible for qualitative losses which ultimately reduces the market value of produce hence it adversely affects the farmer income. Research investigations carried at various research organizations have led to development of host of ecofriendly management strategies against important diseases. However, proper dissemination of these strategies to the level of farmers has not occurred so far. This is an area which requires almost attention of researchers, policy planners and extension personnel, simultaneously; there is a need to develop low input sustainable technologies, Such as promation and ultilization of resistant/tolerant cultivars which are agronomically superior and recommended for the area promation of non-chemical management strategies such as alteration in sowing time field sanitation , use of bio agent , botanicals and animal waste etc. which can be adopted by small and marginal farmers of arid region. Forewarning of weather dependent diseases like blights, powdery mildew etc is also needed to minimize losses if farmers adopt prophylactic measures against weather dependent diseases.

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Genetic Divergence in Pod and Seed Traits of *Acacia nilotica (L.)*

Shubham Gupta[1], Afaq Majid Wani[2]
[1]PhD Student, [2]Associate Professor, College of Forestry
SHUATS, Prayagraj 211007 (UP), India
Email Id- gupta.shubham0239@gmail.com
ARTICLE ID: 015

Abstract

The aim of the study was to determine seed sources variation in *Acacia nilotica*. Seed collected from twenty locations of Uttar Pradesh were subjected to variation analysis. A significant seed source variation was observed in seedling height, collar diameter, inter nodal length, seed germination and biomass data (fresh shoot weight, fresh root weight, dry shoot weight, dry root weight, shoot/root ratio, total biomass of seedling). The seed source of S_{17} Pukhraya (U.P.) Twenty superior trees of *A. nilotica* were selected 20 different locations in Uttar Pradesh for the study of genetic divergence in pod and seed characters. The eight principal components (PC_S) explained large portion (105.88%) of the total variation. The study revealed that the cluster IV comprised highest number of ten superior tree.

Keywords*: Seeds, Genetic divergence, Cluster analysis, *Acacia nilotica

INTRODUCTION

Acacia nilotica Linn. (Babul or Desi babul), is a medium sized, thorny, nearly evergreen tree that can reach up to 20-25 m height but may remain a shrub in poor growing conditions **(Ecocrop, 2012; Orwa et al., 2009; Fagg et al., 2005).** Belongs to family leguminoceae. *Acacia nilotica* originated from Africa and the India subcontinent it is now commonly found or cultivated with in almost all tropical and subtropical areas of Africa, Asia, Australia **(Brenan, 1983).** *Acacia nilotica* is a multipurpose tree; it provides timber, fuel, food, shade, fodder, honey, dye, gum and fences. It also impacts on the environment through soil reclamation, soil enrichment, protection against fire and wind, and as a haven for biodiversity and ornament. It is widely used in ethno-medicine **(Orwa et al., 2009; Cook et al., 2005; Fagg et al., 2005).** The crown may be flattened or rounded. The leaves are 5-15 cm long.

Alternate and compound with 7 to 36 pairs of elliptical, 1.5-7 mm long 0.5-2 mm broad, grey-green hairy leafless. Their pods have a characteristic "neck lece" shape with constriction between the seeds.

The pioneer characteristics of *Acacia nilotica,* often on over grazed lands, result in an invasive propensity and the formation of thorny thickets **(Beniwal, R.S. 2011),** and it has become a major weed in Australia and java, indonasia **(Chauhan,K.C. and Kanwar, M.S. 2003).**

Acacia nilotica should not be introduced into humid and sub-humid areas, or into dry areas where there are adequate supplies of grazing and fuelwood. *Acacia nilotica* is a pioneer species that is relatively fast growing on arid sites. It is an important riverine tree in india, sudan and Senegal, where it is planted for timber described native range habitat types for several subspecies, tomentosa, adstringes and nilotica.

Acacia nilotica flowers at a relatively young age, around three to fours old in ideal conditions, on current- season growth during the rainy season. Flowering is prolific, and can occur a number of times during the year, depending on the availability of soil moisture. Peak flowering appears to occur from October-December and peak fruiting around April-June. Fruiting peaks in January for subspecies, Indian flowers from June to September and sometimes in December/January, and the ripen from April to june. Seeds are dispersed by mammalian herbivorous. The gum or bark is used for cancers and / or tumors (or ear, eye or testicles) and Induration of liver and spleen, and excess flesh. Bark, gum, leaves and pods used medicinally.

Materials and Methods

The present study was conducted at college of Forestry, SHUATS Allahabad to estimate the genetic divergence in pod and seed characters of *Acacia nilotica* collected from different locations of Uttar Pradesh. Trees growing at one location were considered to be one population. Twenty different locations with 5 random trees from each location were selected as seed source. Superior tree and four comparison trees almost of similar size free from an insect-pest and diseases representing each stand were selected and morphological observations were recorded both for comparison and superior trees. For taking observations on pod and seed character, 10pods /tree was collected randomly from different parts of the tree and average of 10 pods and 10 seeds measurement was recorded for pod and seed length, respectively. Out of these five, the best one was selected as superior Tree and marked + sign with yellow paint. Twenty superior Trees were marked and their pods were collected in month of January -May. The latitude and longitude with the help of GPS and other individual CPTs selected from 20 different locations. The pods were cleaned and stored in muslin relevant information of each selected Superior Tree are presented (Table 1).

More than 300 mature pods were collected from different parts of the crown of bags at ambient conditions. All lots were dried under similar temperature and humidity to reach constant weight. A total of three hundred healthy pods were counted and taken from each lot to make three replications containing 100 pods per replication. Ten pods were taken randomly from each replication for taking observations on pod. The average of 10 pods measurements was recorded for pod length, pod width and pod thickness and expressed in mm. Pod damage was calculated by counting the damaged pods containing in each replication and expressed in percentage.

Result & Discussion

Genetic diversity in plant species is a gift to mankind as it forms the basis for selection and further improvement. Genetic diversity analysis is an efficient method that facilitate the identification of superior germplasm, acceralates the collection, conservation, improvement of germplasm for breeding programmes and tree improvement. Information regarding genetic similarity measures can be used for selection of superior quality planting material for improvement or for use in tree hybridization program (Pavithra *et. al.,* 2010).

Persual of table 2 revealed that germination% (67.09), seedling height (41.87), fresh shoot weight(0.29), internodal length (2.73), dry shoot weight(0.20) and shoot/root weight(3.11) Recorded maximum mean value for cluster II whereas, maximum mean value of collar diameter (1.85), dry root weight (0.08) and seedling biomass (0.41) was observed in cluster V, V, IV, respectively, minimum mean value for germination% (58.09), seedling height (39.48), collar diameter (1.81), internodal length (2.47), fresh shoot weight(0.25), fresh root weight(0.11), dry shoot weight(0.17), seedling biomass(0.39) for cluster III, VIII, II, V, whereas, minimum number of dry root weight (0.06) and shoot/root weight(2.12) was observed cluster I and VIII. The study revealed that the maximum mean value was recorded in cluster II 5 traits whereas, minimum mean value was observed in cluster VIII 6 traits. Cluster II comprising six superior trees is delineated from cluster II based on significantly high means for majority of pod and seed traits (table 5). Superior trees cluster IV can be directly selected and utilized for with in group hybridization for maximizing biomass of seedling. Difference between means of different cluster was significantly different. Wide diversity exists between the cluster: crosses between these clusters may result in substantial segregates and further selection for overall improvement of species.

Table1: Details of morphological observations and other relevant information for 20 Superior trees of *Acacia nilotica*

S. No.	Seed Sources	Altitude (m)	Range of Temp. ºC	Latitude (ºN)	Longitude (ºE)	Rainfall (mm)
S_1	FARRUKHABAD	167	35-45 ºc	27º38'N	79 º59'E	896.2
S_2	KANNAUJ	143	30-45 ºc	27º05'N	79º91'E	868 mm
S_3	ALLAHABAD	98 m	32-46 ºc	25º45'N	81º84'E	1027 mm
S_4	KANPUR(C.S.A.)	126 m	25-45 ºc	26º49'N	80º30'E	820 mm
S_5	RAWATPUR	126 m	25-45 ºc	26º44'N	80º33'E	820 mm
S_6	BARRA	128 m	25-45 ºc	26º42'N	80º29'E	825 mm
S_7	BAREILLY	268 m	21-45 ºc	28º36'N	79º43'E	1093 mm
S8	SHUATS	98 m	20-45 ºc	25º41'N	81º84'E	1100 mm
S_9	GONDA	111 m	25-46 ºc	27º03'N	81º95'E	1240 mm
S_{10}	BANARAS	76 m	26-45 ºc	25º31'N	82º97'E	998 mm
S_{11}	LUCKNOW	121 m	24-45 ºc	26º84'N	80º94'E	1001 mm
S_{12}	DELHI	215 m	24-46 ºc	28º70'N	77º10'E	693 mm
S_{13}	FATEHPUR	124 m	25-44ºc	25º85'N	80º89'E	1052 mm
S_{14}	UNNAO	131 m	24-46 ºc	26º53'N	80º48'E	850 mm

S_{15}	MEERUT	226 m	24-46 ºc	28º98'N	77º70'E	933 mm
S_{16}	SITAPUR	141 m	25-45 ºc	27º58'N	80º66'E	1193 mm
S_{17}	PUKHRAYA	130 m	25-43 ºc	26º22'N	79º83'E	1015 mm
S_{18}	HARDOI	147 m	26-45 ºc	27º29'N	79º83'E	1103 mm
S_{19}	FAIZABAD	104 m	26-45 ºc	26º77'N	82º14'E	1143 mm
S_{20}	NURSURY	98 m	27-44 ºc	25º41'N	81º84'E	1027 mm

Table 2: Mean value for various traits in different cluster refer twenty superior tree progeny of *Acacia nilotica*

Cluster	**Germination %**	**Seedling height**	**Collar diameter**	**Inter nodal length**	**Fresh shoot weight**	**Fresh root weight**	**Dry shoot weight**	**Dry root weight**	**Seedling biomass**
I	60.16	40.73	1.82	2.51	0.29	0.12	0.19	0.06	0.41
II	67.09	41.87	1.81	2.73	0.29	0.12	0.20	0.07	0.40
III	58.06	41.54	1.83	2.53	0.26	0.12	0.17	0.07	0.39
IV	67.07	40.35	1.82	2.48	0.28	0.13	0.18	0.07	0.41
V	64.26	41.16	1.85	2.57	0.26	0.11	0.18	0.08	0.38
VI	61.05	42.70	1.81	2.56	0.26	0.12	0.19	0.07	0.39
VII	63.91	40.44	1.85	2.66	0.29	0.12	0.21	0.07	0.40
VIII	64.33	39.48	1.81	2.47	0.25	0.13	0.18	0.06	0.39

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Impact of National Honey Mission on Rural Lives

Sandra Thomas
College Of Co-Operation, Banking And Management,
Kerala Agricultural University

ARTICLE ID: 016

Introduction

Beekeeping is an important, sustainable, integral forest, social forest and agricultural supporting activity under the rural development programme in India, since it provides nutritional benefits, economic security & ecological balance, while providing employment. Knowledge of agro climatic conditions, diversified flora, changing agri/horticultural pattern of the crop, no. of species of bees available for farming coupled with management practices play a vital role in transforming the beekeeping entrepreneurship in India.

Until 1953, beekeeping in Indian subcontinent was a disorganized sector which was later taken over by All India Khadi & Village Industries Board and subsequently by the KVIC in 1957 and establishing Central Bee Research & Training Institute at Pune on 1st November, 1962. Because of the common (basic) level of investment and skills, the beekeeping industry offers direct employment to lakhs of rural poor especially hill dwellers, tribal and farmers. Sustainability of this industry is therefore vital to the India’s economic wellbeing. KVIC under took **the national honey mission** from august 2016 to January 2018 aimed at bringing together the beekeepers, farmers/growers, researchers, government agencies, agribusiness, conservation groups and manufacturers to improve the beekeeping practices in the country and also to supply necessary tools, disseminate technology & information, create awareness on good beekeeping practices and use as a potential pollinator for higher crop yield.

Objectives of National Honey Mission

1. To analyse the impact of national honey mission on rural development.
2. To create an end-to-end implementation framework for skill development in beekeeping, which will provides employment opportunities and income generation to agriculturists, beekeepers rural & urban unemployed youth
3. Enforce nationally acceptable standards of Good Beekeeping Practices (GPB) in the country

4. Develop a network of quality master trainers in the field of beekeeping for imparting Good Beekeeping / Apicultural Practices.
5. Offer a passage for overseas market for hive products.
6. Enable pathways from novice beekeepers to viable commercial beekeeping by handholding to credit linkages.
7. Promote convergence and co-ordination between all the stakeholders of beekeeping.
8. Maintain a national database, which will act as a portal for matching the demand and supply in the country. On the other hand, it will also serve as a platform for monitoring the performance of existing beekeepers and their skills, available bee colonies and their production in each state.
9. To tap the local & rural natural resources for generation of income and employment to rural & tribal people in selected pockets.
10. To bring qualitative & quantitative enhancement in honey & hive products for export and domestic market.
11. To promote beekeeping for increasing the crop productivity and pollination services avenue for beekeepers and farmers.

Results

In 1953 there were as many as 230 beekeepers that maintained around 800 bee colonies in modern bee boxes and were producing 1,200 KGs of honey annually. With the implementation of national honey mission programme it is estimated that with 25 lakh bee colonies, 2.50 lakh beekeepers and wild honey harvest around 56,579 MT of honey in the country, worth Rs 476.04 crores. The natural honey production in the country has increased from 35,000 metric ton in 2005-06 to 1.05 lakh metric ton in 2017-18. The export of natural honey has increased from 16,769 metric ton in 2005-06 to 61,333.90 metric ton (worth Rs 73,218.84 lakhs) in2018-19, showing an increase of 365.75 per cent. Apart from the natural honey, bee wax worth Rs 46 lakh, pollen worth Rs56 lakh, royal jelly worth Rs 3.6 crores and bee venom worth Rs 8 lakh is been produced from 1.45 lakh bee colonies.

2016-17		2017-18		2018-19	
Quantity(MT)	Rupees(lakhs)	Quantity(MT)	Rupees(lakhs)	Quantity(MT)	Rupees(lakhs)
45055.45	55779.04	51547.31	65357.61	61333.90	73218.84

Export of natural honey (APEDA, 2019)

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Beekeeping industry has opened up a large number of employment opportunities in the country. KVIC has alone provided direct employment to 10,200 individuals and indirect employment to 800 individuals. As per the latest government estimates, introduction of large-scale employment in the beekeeping sector is estimated to generate 3 lakh man-working days by maintaining 10,000 bee colonies. India has potential to keep about 120 million bee colonies that can provide self-employment to over 6 million rural & tribal families. 9170 bee keepers/ bee keeping and honey societies/firms/companies, etc. with 14.70 lakh have been registered as on 31st march 2019. This has opened up many new opportunities for the rural poor. Integration of beekeeping with agriculture is acting as an additional source of income for the farmers. According to experts integrating beekeeping with agriculture will increase the pollination, resulting in higher yield 15 to 3400 times more than agricultural alone.

Oil Seeds	**% Increase in Yield**	**Legumes/Puleses**	**% Increase in Yield**
Mustard	128.1 to159.8	Alfalfa	23.4 to 19,733.3
Rai	18.4	Berseeem and other clover	23.4 to 33,150
Rapeseed	12.8 to 139.3	Vetches	39 to 20,000
Torai	66 to 220	Broad beans	6.8 to 90.1
Sarson	222	Dwarf beans	2.8 to 20.7
Safflower	4.2 to 114.3	Kidney beans	500 to 600
Linseed	1.7 to 40	Runner beans	20.6 to 1,100
Sunflower	20 to 3,400	Arahar	21 to 30
Orchard Crop	**% Increse In Yield**	**Vegetables For Seed/Fruits**	**% Increse In Yield**
Apple varieties	180 to 6,950	Radish	22 to 100
Pears	240 o 6,014	Cabbage	100 to 300
Plums	6.7 to 2,739	Turnip	100 to 125
Cherry	56.1 to 1,000	Carrot	9.1 to 135.4
Straw-berry	17.4 to 91.9	Onion	353.5 to 9,878
Raspberry	291.3 to 462.5	Brinjal	35 to 36
Persimmon	20.8	Cucumber	2.1 to 411
Litchi	4,538 to 10,246	This boom in yield is in addition to the value of honey and other products. Bee pollination also improves the quality of seeds/fruits.	
Grapes	756.4 to 6,700		
Guava	70 to 140		

Increase in production of agricultural crops (Bee world 31st issue)

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Discussion

Implementation of national honey mission has made a huge impact on rural economy of the country. A lot of beekeepers have entered into this field. Beekeeping industry is now acting as a source of sustainable income for many small farmers. This industry does not require much investment and skill. Lack of technical knowledge is major reason that hinders the growth of beekeeping in the country especially in the rural areas. KVIC has undertaken many training and technical programs to help the people know more about the modern beekeeping methods. But these programs are not reaching their target. In 2017-18 the program actually aimed at training 14,300 but only succeed in training 12,100. So to overcome this better awareness campaign should be carried out.

High production is not merely enough for rural development. There should be proper markets for the products. For that all the local producers should be brought under a common umbrella so as ensure a steady and continuous market. The local producers could join together to form a marketing co-operative for this purpose. The farmer should shift their focus from just natural honey to other bee products such as bee wax, pollen, bee venom, royal jelly as these products have a huge global market. Even though the apiary business industries have grown in India, only 1.45 lakh bee colonies out of 2.5 lakh colonies is utilized to produce hive products.

The main hurdle for the progress of beekeeping industry in India is deforestation and neonicotinoids. The depletion of bee forage in the forests has resulted in the decrease of number of bee colonies and lowering honey production. Trees or large shrubs have to be planted to provide shelter to the bees. Indiscriminate use of insecticides on crops kills bees. Honey bees are also affected by a wide variety of diseases that can even kill the whole colony.

Conclusion

Introduction of modern beekeeping has proved to be a powerful tool for rural development, serving as source of continuous and sustained income for many rural poor and tribals. The implementation of honey mission has opened new opportunities, increased the production of natural honey and hives products, and helped in improving the quality of honey to meet the international standards and also to raise the export levels. Many new enterprises/ firms/ societies etc. has been initiated contributing immensely towards the rural economy. Over the years bee keeping has developed from a traditional industry to a modern apiculture.

Biodynamic Agriculture

Aishwarya Mann
University institute of agricultural science
Chandigarh university(Mohali),Punjab
Email- aishumann12@gmail.com
ARTICLE ID: 017

Introduction

Biodynamic agriculture is a form of alternative agriculture very similar to organic farming.but it includes various esoteric concepts drawn from the ideas of Rudolf Steiner (1861–1925). Initially developed in 1924, it was the first of the organic agriculture movement It treats soil fertility, plant growth, and livestock care as ecologically interrelated tasks, emphasizing spiritual and mystical perspectives.

Biodynamics has much in common with other organic approaches – it emphasizes the use of manures and composts and excludes the use of synthetic (artificial) fertilizers on soil and plants. Methods unique to the biodynamic approach include its treatment of animals, crops, and soil as a single system, an emphasis from its beginnings on local production and distribution systems, its use of traditional and development of new local breeds and varieties. Some methods use an astrological sowing and planting. Biodynamic agriculture uses various herbal and mineral additives for compost additives and field sprays; these are prepared using methods that are more akin to sympathetic magic than agronomy, such as burying ground quartz stuffed into the horn of a cow, which are said to harvest "cosmic forces in the soil".

Environmentally friendly

Biodynamic agriculture is undoubtedly the oldest organized agricultural movement in the world. It is considered as an organic agricultural farming approach and determined as the oldest organized alternative agricultural movement in the world. The great ecological effect of the application of the biodynamic agriculture is expressed in soil preservation and preservation of the living organisms in the soil, as well as maintenance of the natural balance in the vegetable and animal kingdom. The biodynamic calendar is based on the positioning of the stars and the moon. While many biodynamic farmers utilize the lunar calendar, it is not a requirement for Demeter certification.

The first known presentation of organic agriculture, were held in response to a request by farmers who noticed degraded soil conditions and a deterioration in the health and quality of crops and livestock resulting from the use of chemical fertilizers. The 111 attendees, less than half of whom were farmers, came from six countries, primarily Germany and Poland The lectures were published in November 1924; the first English translation appeared in 1928 as The Agriculture Course.

Today biodynamics is practiced in more than 50 countries worldwide and in a variety of circumstances, ranging from temperate arable farming, viticulture in France, cotton production in Egypt, to silkworm breeding in China. Demeter International is the primary certification agency for farms and gardens using the methods.

- In the United States, biodynamic farming dates from 1926. From 1926 through to 1938, 39 farmers and gardeners in USA pursued biodynamic practices. The Biodynamic Farming & Gardening Association was founded in 1938 as a New York state corporation.
- .In Australia, the first biodynamic farmer was Ernesto Genoni who in 1928 joined the Experimental Circle of Anthroposophical Farmers and Gardeners, followed soon after by his brother Emilio Genoni. Ernesto Genoni's first biodynamic farm was at Dalmore, in Gippsland, Victoria, in 1933.· The following year, Ileen Macpherson and Ernesto Genoni founded Demeter Biological Farm at Dandenong, Victoria, in 1934 and it was farmed using biodynamic principles for over two decades.
- In France the International Federation of Organic Agriculture Movements (IFOAM) was formed in 1972 with five founding members, one of which was the Swedish Biodynamic Association.

Biodyanamic Method of Farming

In common with other forms of organic agriculture, biodynamic agriculture uses management practices that are intended to "restore, maintain and enhance ecological harmony Central features include crop diversification, the avoidance of chemical soil treatments and off-farm inputs generally, decentralized production and distribution, and the consideration of celestial and terrestrial influences on biological organisms. Disease and insect control are addressed through botanical species diversity, predator habitat, balanced crop nutrition, and attention to light penetration and airflow. Weed control emphasizes prevention, including timing of planting, mulching, and identifying and avoiding the spread of invasive weed species.

Biodynamic agriculture differs from many forms of organic agriculture in its spiritual, mystical, and astrological orientation. It shares a spiritual focus, as well as its view toward improving humanity, with the "nature farming" movement in Japan. Important features include the use of livestock manures to sustain plant growth (recycling of nutrients), maintenance and improvement of soil quality, and the health and well being of crops and animals . Cover crops, green manures and crop rotations are used extensively and the farms to foster the diversity of plant and animal life, and to enhance the biological cycles and the biological activity of the soil.

Biodynamic farms often have a cultural component and encourage local community, both through developing local sales and through on-farm community building activities. Some biodynamic farms use the Community Supported Agriculture model, which has connections with social three folding.

Biodynamic preprations

This "agricultural course" Steiner prescribed nine different preparations to aid fertilization, and described how these were to be prepared. Steiner believed that these preparations mediated terrestrial and cosmic forces into the soil. The prepared substances are numbered 500 through 508, where the first two are used for preparing fields, and the other seven are used for making compost. A long term trial DOK experiment) evaluating the biodynamic farming system in comparison with organic and conventional farming systems, found that both organic farming and biodynamic farming resulted in enhanced soil properties, but had lower yields than conventional farming. Regarding compost development beyond accelerating the initial phase of composting, some positive effects have been noted: The field sprays contain substances that stimulate plant growth including cytokinins. Some improvement in nutrient content of compost is evident from the ingredients included, but not necessarily as a result of the practices and exact preparations as Steiner described them.

Field preparations

Field preparations, for stimulating humus formation:

500: A humus mixture prepared by filling a cow's horn with cow manure and burying it in the ground (40–60 cm below the surface) in the autumn. It is left to decompose during the winter and recovered for use as fertilizer the following spring.

501: Crushed powdered quartz stuffed into a cow's horn and buried in the ground in springtime and taken out in autumn. It can be mixed with 500 but is usually prepared on its own. The mixture is sprayed under very low pressure over the crop during the wet season, as a supposed antifungal.

Planting calendar

The approach considers that there are lunar and astrological influences on soil and plant development—for example, choosing to plant, cultivate or harvest various crops based on both the phase of the moon and the zodiacal constellation the moon is passing through, and also depending on whether the crop is the root, leaf, flower, or fruit of the plant. This aspect of biodynamics has been termed "astrological" and "pseudoscientific" in nature.

Seed production

Biodynamic agriculture has focused on the open pollination of seeds (with farmers thereby generally growing their own seed) and the development of locally adapted varieties.

Biodynamic Certification

The Demeter biodynamic certification system established in 1924 was the first certification and labelling system for organic production. As of 2018, to receive certification as biodynamic, the farm must meet the following standards: agronomic guidelines, greenhouse management, structural components, livestock guidelines, and post-harvest handling and processing procedures.

The term *Biodynamic* is a trademark held by the Demeter association of biodynamic farmers for the purpose of maintaining production standards used both in farming and processing foodstuffs. The trademark is intended to protect both the consumer and the producers of biodynamic produce.

In Egypt, SEKEM has created the Egyptian Biodynamic Association (EBDA), an association that provides training for farmers to become certified. As of 2006, more than 200 wineries worldwide were certified as biodynamic; numerous other wineries employ biodynamic methods to a greater or lesser extent.

Biosensors and its applications

Bhawana Kharayat
Research Scholar,
Department of Bioscience and Biotechnology,
Banasthali Vidyapith, Rajasthan
ARTICLE ID:018

Introduction

"Biosensor" term refers to analytical devices which are innovative as well as powerful by involving biological sensing element with wide range of applications, such as biomedicine, environmental monitoring, defence, diagnosis, drug discovery, security and food safety and processing. Since then, incredible progress has been made (Turner, 2013) both in technology and applications of biosensors with innovative approaches involving electrochemistry, nanotechnology to bioelectronics. Biosensors provide a basis to understand technological improvement in the instrumentation involving sophisticated high-throughput machines for quantitative biologists and portable qualitative or semi-quantitative devices for non-specialists.

Technical strategy

On the basis of label free and label based detection are the technical strategies which are used in biosensors (Turner, 2013). The target molecules which are not tagged or labelled are detected by the label free method (Sang et al. 2015). It has its wide applications in the field of environmental and medicine science. While the method of label-based detection is dependent on the specific properties of label compounds to target detection. It requires a target protein (immobilized) which is fabricated with specific sensing element.

Types of Biosensors

1. **Electrochemical Biosensors**

   First discovery of electrochemical biosensors is glucose oxidase based biosensors (Clark and Lyons, 1962). Because of monitoring blood glucose level in diabetic patients, these biosensors are widely used and popular in diagnostic clinic and in hospital. Due to inhomogeneity and instable activity of enzyme, these glucose biosensors have some drawbacks and some calibration is needed. By using biomaterials such as antibody, DNA and enzyme, surface (carbon and metal electrode) of electrochemical biosensors are prepared. These biosensors have asees to physiological system levels such as reactive oxygen species and antioxidant. Uric acid detection is the major application of this biosensors, which provide diagnostic tool for many diseases and clinical abnormalities and it is important to develop a method which is sensitive as well as cost-effective. In the measurement of hormones, it has been used successfully, but detail study should be needed (Bahadir and Sezginturk, 2015). On the targeted nucleic acid, biosensors occur an important potential area of technology

2. Optical or visual biosensors

In many sectors such as biosensing, biomedicine and drug discovery, fiber-optic chemical sensors have lot of relevance. By using fiber-optic biochemistry, DNA-based sensor, are emerging materials for immobilization, which are used by hydrogels (Dias et al., 2014). While compared with other materials, in hydrogels immobilization in occurs in 3D which allows loading capacity (high) for sensing molecules. Hydrogels (polyacrylamide) are hydrophilic cross-linked polymers (Khimji et al., 2013) and can be made into different forms for immobilization ranging from thin films to nanoparticles. Detailed methods for immobilizing DNA biosensors (Khimji et al., 2013) in monolithic polyacrylamide gels and gel micro particles are often considered as technical advancement in the field of biosensor technology. Single molecule detection has also been developed using electrochemical oxidation of hydrazine for DNA detection.

3. Silica, glass and crystal/ quartz biosensors

Due to their unique properties, use of silica, glass, crystal/quartz results in the biosensors development. Silicon based nanomaterials have potential and have numerous application (cancer therapy, bioimaging and biosensing) (Peng et al., 2014) because of its abundance, biocompatibility, mechanical, optical and electronic properties. These nanomaterials have less toxicity which is an important aspect for its application. In bioimaging, fluorescent silicon nanomaterials have long term applications. Considering the unique features of silica or quartz or glass materials, several new biosensors were developed with high-end technology for improving bioinstrumentation to biomedicine technology yet cost-effectiveness and biosafety requires attention (Peng et al., 2014).

4. **Nanomaterial based biosensors**

For developing biosensor immobilization, nanomaterials ranging from copper, silver, silicon and gold nanoparticles, which are based on carbon materials like grapheme, carbon and graphite are used (Sang et al., 2015). For development of biosensors, nanoparticle-based materials provide specificity and sensitivity. Gold nanoparticle is used potentially among all due to its stability against oxidation and no toxicity, while if silver nanoparticles used in drug delivery it causes toxic manifestation. For understanding nano-medicine delivery and microenvironment for tumor, quantum dots technology has been applied.

5. **Genetically encoded or synthetic fluorescent biosensors**

Tagged biosensor are developed for genetically encoded or synthetic fluorescence pathway which are used for understanding biological process which include various molecular pathway inside the cell (Randriamampita and Lellouch, 2014). Fluorescent-tagged antibodies are discovered first for developing image fixed cells. Unill the last decade, for understanding of mitochondrial physiology better, these pathways are related to reactive oxygen species, cAMP and energy production. For visualizing cAMP, Ca^{2+}, cGMP in cells, forster resonance energy transfer (FRET) based biosensors have been developed. In modern physiology, the best biosensors are fluorescence resonance energy transfer-probes for kinase sensing and small-angle X-ray scattering for developing calcium sensors. In terms of sensitivity and applications, optical- based biosensors in combination with small nanomaterials/molecules and fluorescence have gained much success.

Table.1 Types of biosensors and their application

S.No	Type	Principle	Applications
1.	Glucose oxidase based biosensor	Electrochemistry by using oxidation of glucose	Glucose analysis in biological sample
2.	Uric acid biosensor	Electrochemistry	clinical abnormalities detection

3.	Micro fabricated biosensors	Visual/optical biosensor by using enzyme (cytochrome P450)	Drug development
4.	Hydrogel based biosensor	Visual/ optical biosensor	Immobilization f biomolecules
5.	Silicon biosensor	Visual/ optical fluorescence	Cancer therapy, bioimaging and biosensing
6.	Crystal- quartz biosensor	Electromagnetic	Development of ultrahigh-sensitive detection of proteins
7.	Nanomaterial based biosensor	Visual/ optical fluorescence or Electromagnetic	Biomedicine (eg- diagnostic tool)
8.	Fluorescence tagged or genetically encoded biosensor	Fluorescence	Biological process understanding which includes molecular system
9.	Microbial fuel cell based biosensors	Optical	For monitoring toxicity in pesticides, environment and biochemical oxygen demand

Application of Biosensors

1. **Food Processing**

For detecting pathogens from food biosensors are used. If *Escherichia coli* is present in vegetables, then it indicates contamination (faecal) in food. In dairy industry enzymatic biosensors are employed. Updike and Hicks in 1967 first reported enzyme-based sensor. On the method of immobilization enzyme biosensors have been divided (i.e. ionic bonding, covalent bonding and enzymes adsorption by van der Waals forces).

2. Fermentation Process

For monitoring the presence of antibody, biomass, enzymes, products or byproducts, for measuring(indirectly) the process conditions biosensors are utilized. Because of its easy automation, low prices, simple instrumentation and formidable selectivity biosensors control the fermentation industry and produce reproducible results. In the process of ion exchange retrieval biosensors are also applied, where detection of change of biochemical composition is carried out. In online monitoring of fermentation process biosensors have attracted a lot of attention in the past years, due to its quick response and simplicity.

3. In medical field

Biosensors are growing rapidly the field of medical science. In clinical applications, for diagnosis of diabetes mellitus glucose biosensors are widely used. Diagnosis of urinary tract infection (UTI) with anti-microbial susceptibility and pathogen identification which is promising biosensor technology is under study. For early stage detection of human interleukin (IL), biosensor based on hafnium oxide (HfO_2) has been used. Other application of biosensors is: immunosensor array for clinical immunophenotyping of acute leukemia, effect of oxazabor- olidines on immobilized fructosyltransferase in dental diseases, effect of oxazabor- olidines on immobilized fructosyltransferase in dental diseases.

4. Fluorescent biosensors

They are imaging agents which are used for discovery of drugs and cancer. These biosensors can probe metabolites, protein biomarkers and ions with great sensitivity and can also detect the activity, status or presence of the target (cell extracts, serum) in complex solution. In programs of drug discovery, they are used for the identification of drugs by high throughput, for post-screening analysis of optimization and hits of leads high content screening approaches. For early detection of biomarkers in clinical and molecular diagnostics, fluorescent biosensors are used which monitors disease progression and response to treatment/therapeutics for image guided surgery and intravital imaging.

Table 2. Biosensor used in disease diagnosis

S.No	Biosensors	Medical applications
1.	Glucose oxidase based biosensors and HbA1c biosensor	Diabetes
2.	Uric acid biosensor	General disease and cardiovascular diagnosis
3.	Micro fabricated biosensor	Optical corrections
4.	Hydrogel based biosensor	Regenerative medicine

5.	Silicon biosensor	Development of cancer biomarkers and its applications
6.	Nanomaterials based biosensor	Therapeutic applications

Current trend in research, future challenges and limitation of biosensor technology

As the demand and need for using biosensor for rapid analysis with cost-effectiveness require bio-fabrication that will pave way to identify cellular to whole animal activity with a detection limit of high accuracy for single molecules. To work under multiplex condition, biosensor should be targeted. Detection of 2D and 3D are required with sophisticated transducers which quantifies and targets small analytes of interest. In recent years any discoveries are made with contact or non-contact-based patterning at different levels. Next level of development should aim for discovering more robust regenerative biosensors for long-term use. If this process success, then for therapeutic used new diagnostic biosensors can be developed which will help patients and clinicians in long run. Invention on this line leads to discovery of electrochemical biosensors as reliable analytical devices for pathogen detection of avian influenza virus in the complex matrices. Development in biosensors for the detection of biological warfare agents ranging from virus, bacteria and toxins is often attempted using various devices of biosensors ranging from nucleic acid, piezoelectric, optical and electrochemical which will have immense applications in health and military and as well in security and defense.

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Make a bright career in Agribusiness

Simarjit Kaur[1] and Rajneet Kaur[2*]
Department of Agriculture, G.K.S.M. Govt. College, Tanda Urmar, Hoshiarpur
*Corrsesponding author: rajneetk390@gmail.com
ARTICLE ID: 019

Introduction

John H. Davis and Goldberg used this term "Agribusiness" in 1957.In 1980s it was given three innovations: 1) Synonymous with term agriculture, 2) Synonymous with agricultural economics and 3) a modified concept of agriculture, excluding farming, or the off farm aspects of agriculture. At present, Agribusiness can be defined as all the business enterprises or sells to the farmers/ traders/ consumers.The transaction may involve either an input or service or a produce and encompasses items such as:-

1) Productive resources like feed, seed, fertilizer, equipment, pesticides, machinery etc.

2) Agricultural commodities – raw and processed commodities of food and fiber.

3) Facilitative services like credit, insurance, marketing, storage, processing, transportation, packing, distribution, consultancy and soil testing etc.

Definition- Agribusiness, as a concept, encompasses the whole range of activities from agro input manufacturing the processed food for the ultimate consumer. Agribusiness is sum total of all operations involved in the manufacture and distribution production activities on the farm and storage, processing and distribution of farm commodities from them (Goldberg and Davis, 1957). For example: Agri chemicals companies, Veterinary supply companies, Livestock supply companies, Biotechnology firms etc.

The Importance of Agribusiness

The contribution of agriculture in the development of the economy cannot be denied. The importance if agribusiness can be understood from the following factors:-

1) **Influence on National Income: -** The contribution of agriculture towards the Gross Domestic Production is substantial and it is not a surprise that agribusiness has a significant influence on the national income. Agribusiness accounts 17 percent of Gross Domestic Production.

- Employment opportunities
- Food for the Ever-increasing population
- A significant contribution to capital formation.

2) **Contribution to Industry: -** As agriculture contributes 17% to GDP, out of it 13 percent comes from agriculture-related industries (e.g., feed mills and biotechnology firms). These industries create value- added products from raw agricultural products. Value added products are improved through processing or manufacturing.

3) **Civilization and Domestication: -** Agriculture is the foundation of civilization. Domestication of plants and animals for agriculture purposes allowed humans to settle in the villages. As societies has developed, agriculture has remained important on the local, state, national and international levels.

4) **World Economy: -** For much of the world's population, agriculture of a subsistence activity. Due to agribusiness, the trade of agricultural goods on a global basis has increased. Trade, along with aid and technology, can enlarge agricultures role in global economy, resulting in the greater food security, economic development and environmental sustainability.

5) **Trade-** Agribusiness is done at different levels like local level, state level, national level and international levels, which can lead to harnessed in exports to increase the national income, national economy and domestic growth of one's country.

Scope of Agribusiness

Agribusiness is a very wide business. It is important field because of agriculture-related industry, from farming and livestock to food production and human nutrition, encompasses significant portion of career worldwide, providing employments to 1/2th of total Earth's population. So, there is large scope of agribusiness as below:-

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- Agribusiness is combining the diverse commercial enterprises, using heterogeneous combination of labour, materials, capital and technology.
- India is endowed with varied agro-climate, which facilitates production of all agricultural commodities.
- Agribusiness establishment leads to strengthening of infrastructural facilities in that area, expansion of credit; raw materials supply agencies, adoption of modern technology in the production of agricultural products.
- To fulfill the growing demand scope in production of seed, bio-control agents.
- Export can be harnessed as a source of economic growth.
- Livestock, forest resource, bee keeping, mushroom production, organic farming, production of seeds, hybrid and GM crops, all have the highest potential in India and foreign countries. The field of agriculture is little different from other sectors, and the government intervention is in the form of taxes, trade barriers etc.
- Agribusiness generates potential employment opportunities. It adds value to products and thereby increases net profits.
- Agribusiness provides crucial forward linkage as storage, processing, transportation and marketing aspects and backward linkage like supply of inputs, credit, production technology, farm services etc.

The Agribusiness System- As stated agribusiness encompasses all operations involved in the production of farm inputs, these of these inputs in the cultivation of crops and raising the livestock and processing of agricultural commodities. As agribusiness is INTERDEPENDENT SECTOR, the following five major sectors are involved: -

1) **The Input Sector-** This is the first subsystem from which all other agribusiness subsystems emanate. Here, all inputs (e.g. fertilizer, seed and machinery etc.) are manufactured, imported and distributed. This sector provides 75% of the input used in production agriculture.

Example – SEED SUPPLIERS: - Monsanto India Ltd.

2) **Production Sector-** It aims at producing crops, livestock and other products. Here, the inputs are directly used for the production of an agricultural commodity as end- product in itself. This sector is largely involving the changes due to the change in other sectors like technology.

3) **Processing / Manufacturing Sector** – The commodities from the production subsystem are transformed into various products. The level of transformation depends upon the level of processing which can be simple or complex depending on the product to be manufactured. It Employ millions of people in variety of businesses like processing plants to supermarkets to fast food restaurants.

Example: - ITC agribusiness

4) **The Marketing Sector** – This subsystem is concerned with the transfer of goods from the source to end – user. It includes all the handling procedures and infrastructures that move the commodities from one point to another. The marketing subsystem may include the following routes;

a. Transfer of agricultural inputs from manufactures to farm inputs

b. Transfer of commodities from production site to processing site

c. Transfer of commodities from processing site to end- consumers.

5) **The Supporting Sector** – The supporting sector consists of all the key players that provide services. However, optional, but crucial to the success of an agribusiness venture. These services are provided by the institutions such as Govt. agencies, commercial associations, credit and financing, research organizations and co-operations. Example – Banks: NABARD, R

Nature of Every Successful Agribusiness- Today the business has become very competitive and complex. So, the old dictum "PRODUCE AND SELL" has overtime into "PRODUCE ONLY WHAT CONSUMERS WANT" to be successful in the business, some of the requisites should be followed which are listed below;

- **Clean Objectives-** Determination of objective is one of the most essential pre-requisite for the success of business. The objective set forthshould be realistic and clearly defined. Objectives are destination points.
- **Planning-** It is defined as a pre-determined plan for action.Planning is a proposal based on past experience and present tends for future actions.
- **Sound Organization-** AN organization is the art or science of building up systematically whole by a number of but related parts. Organization of a business means to work jointly as a unit. It should be harmonic combination of employees, machinery and capital. Thus, work will be going to be done in efficient manner.
- **Research-** A business is influenced by many factors like cultural, social, personal and psychological. The business needs to know and appreciate these factors and then function properly. The knowledge of these factors acquired through market research. So, research isSystematic research for new knowledge.
- **Finance-** Finance is said to be life- blood of an enterprise. It brings together the land, labour, machine and its production. Agribusiness should estimate its financial requirements adequately so that business should be kept moving. Therefore, proper arrangements should be made for securing the required finance.
- **Proper Plan Location, Layout And Size-** The success of agribusiness depends to a great extent on the location and site where it is set up. As nearer to the market, availability of raw material, skill labour etc. Hence, one must care about the location, layout and proper site in the initial stage for the business.
- **Harmonious Relations With The Workers-** In agribusiness organization, the farmer operator occupies a distinct place as he/she is the main factor among all other factors. Or it is the human factor. Therefore, for successful business, one should be cordial and harmonious with his/her workers/labour to get their full co-operation in achieving business activities.

Like every other industry, there are some pros and cons of agribusiness. They are listed as below;

Pros

- Agribusiness has a low correlation to mainstream assets like equites, property, fixed income and cash.
- The population growth indicated the demand for food and agricultural products.
- Tax benefits to Government.
- It allows for the diversification as one has opportunities to work in different fields.

Cons

- Agricultural investments can be affected by environmental or climatic influences and have risks posted to natural disasters.
- The industry is based on the assets that have zero liquidity.
- High debts must be taken before you one can start drawing profits.
- Personal risks are also one of the cons in agribusiness.

Institutional Arrangement For The Promotion of Agro-Industries

- Agro-industries Development Corporation (AGROS) in each state mainly supplies agri-inputs, machinery and advisory to farmers.
- Small Industries Development Organization (SIDO) deals with the processing of food products, beverages, fruit and food preservation and pesticide formulation etc.
- Director General of Trade and Development looks after the industries engaged in manufacture of tractors, power tillers, diesel engines, pump sets etc.

Conclusion-

Agribusiness is going dominate all over the world as a potential business sector to which proper strategic management is essential to be developed and supply chain management ought to be improved.

It should be properly handled to raise national income, creation of employment opportunities, raising purchasing power and ultimate decreeing balance of the trade deficit and causing economic development of country.

Cultivation of Gladiolus in Gwalior Chambal Sambhag

Rajkumar Chaurasiya
Assistant Professor,School of Agriculture, ITM University, Gwalior M.P.
ARTICLE ID: 020

Introduction-

Botanical name- *Gladiolus* spp.

Family – Iridaceae

Origin- Mediterranean region & tropical South Asia.

- The name gladiolus was originated from the Latin word Gladiolus , meaning a sword, on account of the sword-like shape of the foliage.
- The common name of gladiolus is 'sword lily' because of its sword shaped foliage.
- Gladiolus is popularly known as green of bulbous ornamental plants and is native
- Gladiolus is grown in all parts of the world.
- In temperate countries the most important period is summer, in tropical and subtropical climate; it is grown in winter and spring.

Importance and Use

- Gladiolus is a very popular flowering plant in international cut flower trade.
- Its magnificent inflorescence with a variety of colures has made it attractive for use in herbaceous borders, beddings, pots and for cut flowers.
- For cut flowers, primulinus types are better as more spikes often come out from a corm and they may be planted in isolated borders.
- Grandiflorus and primulinus types look very attractive in mixed flower borders, but primulinus types are preferred as these do not need staking, and so, are also good for bedding.

Soil and Climate-

Soil –

- Gladiolus can be grown wide range of soils from a light sandy to a clay loam but deep, well drained, friable, and rich in organic matter and nutrients are preferable.

- For best result they require a slightly acidic soil of ph 5.5 to 6.5 where most of the nutrients become available to plants.

Climate-

- For successful cultivation of this crop, mid climate is ideal while very hot and too cold atmospheric conditions are harmful.
- The day temperature should range between 15 ^{o} and 20 ^{o} C. Temperature falling below 6 ^{o}C may cause frost injury to the plant.
- At the time of planting, the soil temperature should not be less than 10 ^{o}C.

Propagation-

- Commercially gladiolus is vegetative propagated through corm and caramels.
- For cut flower production gladiolus is propagated by corms however for generation of the planting materials it is propagated by cormels.
- Gladiolus is propagated by corms of at least 4-5 cm diameter.
- It should be healthy and disease free.
- Conical shaped corms preferred over flat one as it gives better flowers.
- Cold storage of corms at 3 to 7°C for 3 months or treatment with Ethrel (1000ppm) or GA3 (100ppm) or Thiourea (500 ppm) is adopted for breaking corm dormancy.

Time of planting and spacing-

- Under North Indian condition the gladiolus is planted in the month of oct- nov.
- For flower production and for any corm sizes a spacing of 30-45 cm from row to row and 15-20 cm corm to corm is maintained.
- Depending upon the soil condition & size of the corm the spacing may vary.
- The corm should not be planted too dip nor too shallow.
- The depth of planting should be 2-5 cm from the ground level.
- Corms are to be planted in staggered manner at an interval of 7-15 days to get continuous flower for a long period.

Nutritional Requirements:

- 5 kg of FYM/ square meter should be will incorporated at the time of land preparation.
- NPK@ 1:2:2 should be applied 56 gm/ square meter.
- Half of these nitrogen in the entire dose of P and K should be applied at the time of land preparation.
- The remaining half N should be applied 30-35 days after planting because at that stage the plant use to produce the spike.

Types and Classification

A total 23 species have so far been used in the development of modern gladiolus cultivars. Classification:

1. **Grandiflorus or large flower hybrids:**
   - These are large or exhibition type gladioli.
   - The plants are vigorous bearing long spikes with large flowers.
   - Florets are 10-20 cm wide, arranged closely and symmetrically on 90-150 cm spikes.
2. **Primulinus hybrids:**
   - They are also vigorous.
   - The stem grow up to a height of 70-105 cm, flowers 5-10 cm across and are well spaced on 40-45 cm long spikes.
   - The upper most inner petals are attractive; anthers& stigma appear above the petals.
3. **.Butterfly hybrids:**
   - The plants grow to a height of 75-120 cm. Spikes are shorter than 45 cm. The florets are 7.5 -10 cm across.
   - Having some markings or blotches on the petals. Florets are arranged symmetrically & closely of the spikes.
4. **Miniature hybrids:**
   - These hybrids are of relatively recent origin.
   - The plant height varies from 75-105 cm.
   - The florets are 2.5-5 cm across born on about 40 cm spike.

- Many of these hybrids have raffled sepals, they produce very small corms and multiply very slowly

5. **Face up:**

- The stem is dwarf, usually 60-90 cm tall.
- Florets are nearly 5-6 cm wide and face upward.

6. **Colville Hybrids:**

- The plants grow hardly more than 60 cm tall.
- Flowers are 5-7 cm across and star shape.
- These are early flowering hybrids and are more suitable for growing under Greenhouse.

7. **Orchideala hybrids:**

The new growth of gladiolus is dup in Israel. Spikes are light in weight with smaller florets on shorter stem

8. **Double gladiolus:**

- Normal gladiolus floret consists of 6 tepals.
- Any gladiolus > 6 tepals are known as double gladiolus.

9 **Dragons:**

These groups have long twisted tepals with attractive colours.

10. **Fragrant :** Some South African sp. Of gladiolus have fragrance and the quality of fragrance varies from apple blossom to rose smell.

Field preparation and planting:

- Beds of size 6 x 2 m are prepared and corms are planted at a depth of 5 cm adopting a spacing of 40 x 25 cm (88,888 plants/ha) or 25 x 25 cm (1,60,000 plants/ha).
- **Planting-season:**

  October for plains and March-April for hills.
- **Planting-system**

  Ridges and furrows system is adopted.

Intercultural Operations-

Irrigation: The frequency of irrigation depends largely on the type of soil and prevailing weather conditions

- During warm weather, watering should be done twice a week sufficiently to wet the roots.
- Regular irrigation at the intervals of 7 to 10 days depending upon weather is necessary.
- Over watering should be avoided.

Mulching

- Mulching is important for conserving the moisture and reducing the weed populations.
- Mulching is done between and across the rows.
- Fresh manure, chopped straw, dried grass, clippings, saw dust, peat, husk, bark and strips of black polythene may effectively be used as mulching materials.

Earthing up:

- Usually gladiolus corm need 12-15 days for sprouting .
- Initial few days the corm should not be disturbed except the removal of the initial weeds.
- Once the plant attain to a height of about 15-20 cm a light earthing up should be provided from both side of the row.
- When the plant will be a 5-6 leaf stage the second earthing up should be done.

Staking:

- At 5-6 leaf stage, the plant should be stake with the help of a bamboo stick.
- During staking care should be taken to avoid any damage to the underground corm and cormels.

Diseases and Their management-

Fusarium rot and yellow:-

- **Control Measures:** 1.Treat the corms by dipping in carbendazim (1 g/L water) or captan (2 g/L water) for 60minutes after harvesting and before storage.
- Use disease free corm stock.

Grey mould (Botrytis chinerea) :-

- **Control Measures:** Remove old flowers spikes and destroy.
- Hot water treatment (52 ^{o}C) of corms with carbendazim (1 g/L water) added to the water is effective in eradicating the pathogen from planting stock.

Leaf spot-

Spray Carbendazim or Mancozeb 2 g/lit to control leaf spot.

Wilt-

Drenching of Bavistin (0.2%) at fornight intervals controls the wilt disease.

Blight disease-

Blight disease can be controlled by spraying Mancozeb @ 0.2 %

Insects Pest and Their management-

1. **Thrips :** This insect can be controlled with malathion 0.1% spray
2. **Aphids:** Aphid suck the sap from tender leaves and emerging spikes as well as florets. This can be controlled by spraying with monocrotophos at 0.05% can effectively controlled.
3. **Mites-** Mites can be controlled by application of kathane 0.5%.
4. **Semi looper and Helicovarpa -** Methyl Demeton 25 EC or Monocrotophos @ 2ml/l or Dimethoate 30 EC @ 2ml/l

Harvesting and Yield-

A- Harvesting of flower spikes:

- For local market gladiolus is harvested when the lower most pair of floret is fully opened.
- For distant market harvesting is usually done when the lower most pair of floret has just shown the colour.
- For local market harvesting is usually done in morning hours.
- Immediately after harvesting the spike should be kept in a bucket of a plain water.
- For local market it is advisable to sent the flower in the bucket of water itself.
- However for distant market these are packed gently in some suitable card board boxes wrapping with a loose papers.
- It is advisable to provide some cotton ball soaked in water at the base of the spikes.

Yield of flowers:

- The flower spike yield in gladiolus is very according to the cultivar, corm size , planting density and management practices etc.
- Approximate yield of flower spike would be around 2,00,000 per hectare.

B- Harvesting of the corms and cormels-

- Generally, the corms and cormels required 30-35 more days after harvest to get properly matured.
- After harvesting of the spikes water should be withheld and allow the plants to remain in the field itself.
- When the lower leaves starts turning yellow the corm should be harvested.
- With the help of a hoe the entire plant along with corm and cormels should be turned upside down.
- Then with the help of secateurs the plant should be detach from the corms.
- These materials are dried under shed.
- After that they are completely cleaned, graded at the size and packed in marketing bags after mixed with bavistin powder.

Yield of corm and cormals:

- The yield of gladiolus corm and cormals is influenced by cultivars, corm size and other factors.
- Approximately 41.3 t/ha.

Storage of corm-

- Proper storage of corm and cormels are very important , as otherwise storage rot of corm may occur due to fungal infection.
- Corms are stored in single layers in wooden trays having a wire bottom.
- The scales over the corms are not removed during storage.
- Before storage corm/cormals should be treated with fungicides, than air dried and stored.
- For gladiolus 4-10 ^{o}C cold temperature are required.

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ORGANIC FARMING: A SUSTAINABLE AGRICULTURE

Suman Chaudhary
UIAS, Chandigarh university (Mohali), Punjab
Corresponding author- choudharysuman5088@gmail.com
ARTICLE ID: 021

ABSTRACT

Organic farming is the farming in which only organic products is used for the cultivation of crop. This farming promotes the sustainable agriculture which means to conserve the natural resources that is degraded day by day by the use of chemical or synthetic fertilizers. The most important challenge in India has been to produce enough food for the growing population. Hence high yielding varieties are being used with infusion of irrigation water, fertilizers or pesticides. This combination of high yielding production technology has helped the country develop a food surplus as well as contributing to soil health, environmental pollution, pesticide toxicity and sustainability of agricultural production. Certified organic products including all varieties of food products including basmati rice, pulses, honey, tea, spices, coffee, herbal medicines are used in India this products is very helpful also conserve natural resources.

INTRODUCTION

Organic agriculture has been differently but the description offered by Lampkin (1990) appears to be the most the comprehensive one covering all essential features. To the maximum extent feasible, organic farming system relies on crop rotation, crop residues, animal manures, Legumes, green manures, off-farming, organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and also control insects, weeds and other pests.

The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystem and organisms from the smallest in the soil to human beings. In modern age, increasing pollution levels in every sphere of life is the key challenge in sustainable development of our environment.

Organic farming evolves thousand years ago. Ancient farmer's starts crop cultivation along the river belts by using natural resources. Indian scriptures Ramayana, Rigveda, Mahabharat etc. briefly mention the organic agricultural inputs by the farmers at that time. Sustainable agriculture is the agriculture that meets the needs of the present without compromising the ability of future generation to meet their own needs.

Organic agriculture is intended to produce high quality, nutritious, food that contributes to prevention health care. Organic farming promotes the sustainable agriculture which means help to stop exploiting natural resources. It conserves the fertility of soil, productivity of soil, soil texture is also maintained the organic farming.

International federation of organic agriculture movements (IFOAM): An international organisation established in (1972) for organic farming organisations defines goal of organic farming as: "Organic agriculture is a production system that sustains the health of soils, ecosystem and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.

US department of agriculture: A system that is designed and mailed to produce products by the use of methods, and substances that maintain the integrity of organic agricultural products until they reach the consumer.

FAO: Organic agriculture is a unique production management system which promotes and enhances agro ecosystem health, including biodiversity activity, and this is accomplished by using on farm agronomic, biological and mechanical methods in exclusion of all synthetic off farm inputs.

NEED OF ORGANIC FARMING:

- With the increase in population our compulsion would not only to balance out agricultural production but to build it further in sustainable manner. The researchers have understood that the 'Green revolution' with high input use has reached a level and is presently sustained with lessening return of falling profits.

- Run off nitrate compounds during rains contaminates water resources
- Loss of soil richness due to excessive utilization of chemicals fertilizers and absence of crop rotation.
- Deep ploughing and heavy rains lead to the soil erosion.
- Destruction of the native species of animals and plants due to the introduction of exotic species and hybrids.

OPTIONS IN ORGANIC FARMING

1. **Pure organic farming**: Complete exclusion of inorganic fertilizers and pesticides., but advocates the use of organic manures and biological pest control methods.
2. **Integrated green revolution farming:** Basic trends of the green revolution such as intensive use of external inputs with limited damage to the environment and human health. Some organic techniques are developed and combined with the high input technology in order to create integrated systems such as Integrated Nutrient Management (INM). Integrated pest management (IPM) and biological control methods which reduce the need for chemicals.
3. **Integrated farming system:** low input organic farming in which farmers have to depend on local resources and ecological processes, recycling of agricultural wastes and crop residues.

CERTIFICATION OF ORGANIC PRODUCTS

Organic farming certification in India is governed by The National Programme for organic Production (NPOP) under the ministry of commerce and industry. This programme provides standards for organic production, systems, criteria and procedure for accreditation of certification bodies, the national logo and the regulation governing its use. Farms that have obtained organic farming certification and adhering to the norms specified by the National Programme for organic production will be allowed to use the following India organic logo in the produce.

Government scheme that promote organic farming

1. National mission for sustainable agriculture (NMSA)

2. Mission for integrated development and horticulture (MIDH)
3. Rastriya Krishi Vikas Yojana (RKVY)
4. National project on organic farming (NPOF)
5. National programme on organic production (NPOP)
6. National horticulture mission (NHM)
7. Horticulture mission for north east and Himalayan states (HMNEH)
8. Macro -Management of Agriculture (MMA)

SUSTAINABILITY ASSESSMENT OF FOOD AND AGRICULTURE SYSTEMS (SAFA)

In the absence of an assessment tool including all the sustainability pillars along the food and agriculture value chain, food and agricultural organisation developed a global holistic framework called SAFA. The framework built on already existing sustainability reference documents, standards, indicators and tools with the objectives to create a standardized system and a common understanding of sustainability, suitable for all contexts and sizes of operations. SAFA consists of four sustainability dimensions: good governance, environment integrity, and economics.

FUTURE PROSPECTS

India is bestowed with lot of potential to produce all varieties of organic products due to its various agroclimatic regions. In several parts of the country, the inherited tradition of organic farming is an added advantage. India has a strong traditional farming system with innovative farmers, vast dry lands and least use of chemicals. In a country like India where the agriculture is highly influenced by the vagaries of various biotic and organic farming is capable enough to provide economic security to the mediocre farmers as well. However , with the policies implemented by the government of India to encourage organic farming and the marketing of organic food products as well as the increasing demand of the organic products in the domestic as well as international market, there is ample scope for organic food industries to expand and generate revenue to strength the Indian economy.

CONCLUSION

India with diverse agroclimatic conditions has great potential for organic farming and many products are produced organically in India. For sustainable agriculture production, farmers must use organic fertilizers in place of synthetic fertilizer. This will not only be helpful in achieving ecosystem viability. Organic products give parents a healthy choice when it comes to their baby's nutrition. Organic products are the best from nature and the best for nature.

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THE FUTURE OF AGRI INNOVATION

Drip in Aerobic Rice

Koduru Surya Chandra Reddy
B.Sc.Agriculture
Suresh Gyan Vihar University, Jaipur
Email: - suryachandra067@gmail.com

ARTICLE ID: 022

Introduction

Aerobic rice is one new innovation in paddy (rice) with efficient water usage and can be grown in almost all soils like other crops. As aerobic rice can even bare little amount of water, as for irrigation drip in aerobic rice is much more efficient.

Four varieties viz., CR Dhan 200 / Priya (suitable for Odisha), CR Dhan 201 (suitable for Chhattisgarh and Bihar), CR Dhan 202 (suitable for Jharkhand and Odisha), CR Dhan 204 (suitable for Jharkhand and Tamil Nadu), are suitable for aerobic rice cultivation, released from Central Rice Research Institute, Cuttack.

Content

As the farmers in Rayalaseema (Andhra’s), Rajasthan, and some parts of Telangana, Jharkhand were facing severe irrigation problem. The concept “Aerobic Rice” is of utmost importance in these areas.

As the crop can grow aerobically in upland soils that is not puddled, non-flooded or saturated along with oxygen through the growing season. By this 70% of water is saved, this method does not require transplantation like usual plants, row to row and plant to plant spacing is high, so there will be proper sunlight and air which increases the tillerings and the grain size per plant also increases. Inputs applied such as fertilizers, pesticides, herbicides usage reduces, because they can be done through fertigation. Therefore the cost of cultivation decreases.

There will be no water logging conditions. Due to over usage of water, there is increase in greenhouse gas methane (CH_4) in environment. By switching to drip, the drop in emission will be equivalent to taking 10 million cars off the road. It also increases the cost of production by increasing the yield by up to 50% reaching up to 12 tons/ha.

Conclusion

This is concluded that reduced the cost of cultivation to a greater extent and brought about massive (huge) gain in yield, profits. So, I hereby suggest every individual paddy farmer to adapt this method.

“Farmer’s Wealth is a Nation’s Health”

Vol.1 Issue-1, September,2020

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Various causes of Fruit Drop in Kinnow (*Citrus reticulata* blanco) and its Control with Growth Regulators - A Review

Rajesh Kumar
Assistant Professor, Department of Agriculture Sciences,
Sant Baba Bhag Singh University, Jalandhar, Punjab
ARTICLE ID:023

Fruit Drop

In citrus, fruit drop is the major causes of yield loss. Fruit drop can be defined as **s**hedding of unripe fruit from plant either due to physiological disorder or pathological condition. The phenomenon of fruit drop can be attributed to physiological, pathological and environment factors. Aforementioned factors can act alone or in combination to induce the fruit drop **(Figure 1.1)**.

Causes of Fruit Drop

Pre-harvest fruit drop is serious problem not only in citrus but also in other fruits like mango, peach, plum and litchi. Literature suggested that depending upon the reason, fruit drop can be of three types namely

a) Climatic factor induced fruit drop,
b) Pathological factor induced fruit drop,
c) Physiological factor induced fruit drop,

All above mentioned causes may work together to induce fruit drop **(Figure 1.1)**.

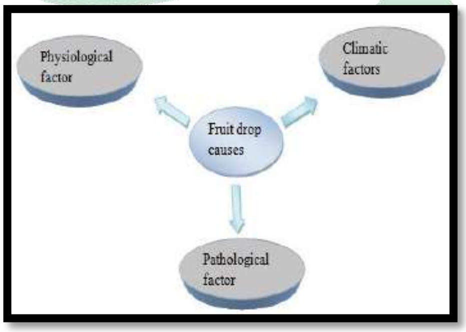

Figure 1.1 Diagrammatical representations of various causes of fruit drop.

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Climatic Factors Induced Fruit Drop

Fruit drop due to adverse climatic factors are universal problem. Climatic factors namely temperature, relative humidity, wind and rainfall are considered to have profound influence on citrus fruit drop. Extreme weather condition can trigger unfavourable physiological pathways resulting in excessive pre-harvest fruit drop. High temperature and low humidity has been recorded as major cause of immature orange drop. Fruit drop is more common during the dry and cool weather.

Pathological Factors Induced Fruit Drop

Pathological condition can be induced by any microorganisms capable infecting the plant. Bacteria, fungi, virus as well as pest are known to induce pathological condition in fruit crops. Most profound symptom of diseased plant is development of brown discoloration near stem-end of fruits. As the disease progress, this discoloration covers whole of the fruit and causes rotting. Sometimes discoloration remains limited to stem end only and cause dropping of the fruit without rotting. In case of late infection, the diseased fruits shrink, become black, light in weight and become mummified. Mummified fruit may remain hanging to the stalks for a long time. The twigs of the infected trees show die-back symptoms. Fawcett reported the stem-end rot of citrus fruits in Florida for the first time.

Physiological Factors Induced Fruit Drop

Physiological states of plant decide organic product yield just as natural product quality. Plant physiological condition is impacted by both biotic and abiotic factors. Abiotic factors like climate condition, supplement accessibility has critical effect on physiological condition of plant. Biotic elements like pathogenic microorganism, helpful microorganism and irritation can change physiological status of plant. Mineral component like N, P, K, Zn B, Mn and Fe have been found to control natural product drop in citrus by modifying the physiological condition of plant. The basal and foliar application of Zn and B significantly affect the growth, yield and quality parameters in kinnow. Different cultivar may have different physiological state under given condition. Fruit drop in nagpuri local oranges was the maximum in April. Physiological (40-63%) and pathological (5-25%) drop in kinnow is a great matter of concern as the pre-harvest fruit drop results in direct economic losses to the growers. Fully grown fruits have already drawn the metabolites from the tree and exhausted its nutrients. Climatic and pathological factor has ultimate effect on the physiology of plant. Thus it would not be an exaggeration to say that by modulating physiological state of plant by growth regulator researcher can control pre-harvest fruit drop as well as increase quality parameters of fruit.

Controlling Fruit Drop By Plant Growth Regulators

Plant growth regulators (PGRs) comprise of natural atoms created artificially and used to change the development of plant. The American Science Society for Horticultural additionally isolates the plant development controllers into six classes including gibberellins, auxins, cytokinins, ethylene, development inhibitors and development retardants. For modifying physiological factors in citrus plant 2,4-dichlorophenoxyacetic corrosive, Gibberellic corrosive and Naphthalene acidic corrosive are generally utilized in pre reap application. Auxin (2,4-D and NAA) has better job in decreasing pre collect organic product drop than gibberllins. Application of 2,4-D and NAA dramatically increases total number of fruit buds per plant, total soluble solids, acidity, vitamin C, reducing sugar. Fruit drop in citrus may occurs due to imbalance in combination of nutrient and pest attack. Therefore treatment with formulation of 2,4-D, salicyclic acid, K and Zn amend the yield and quality of kinnow in Punjab. Application K and Zn increases the fruit weight, juice content and control pre harvest fruit drop. Exogenous application of GA_3, 2,4-D in different concentration were improved Juice quantity, TSS, total sugars and reducing sugars in blood red. Various growth regulators have been reported to control fruit drop but 2,4-D has been reported to controlling be more effecting in controlling pre harvest fruit drop under various agro climatic regions when used as foliar spray and application of 2,4-D has improves quality of kinnow mandarin. At Pea and Gravel stages of kinnow application of 20ppm NAA increases 45% fruit retention and similarly 2% spray of urea increases weight of 100 fruit upto 16.70 KG. 2,4-D and salicyclic acid effective against fruit drop in citrus and other included 2,4-5 trichlorophenoxypropionic acid NAA & GA_3 helps in synthesis of protein, opening of stomata & activation of enzyme. Deficiencies of micronutrients like Zn, Cu, Fe and Mn in citrus orchards of Pakistan and among them Zn is more acute and is beneficial against the fruit yield and quality. So the perfect combination of macro-, micronutrients and growth

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regulators mask the effect of fruit drop and improve the citrus fruit yield and its quality. Growth regulators treatments 2,4-D, GA_3, NAA at 15 and 20ppm concentrations respectively reduced fruit drop in kinnow mandarin. The highest fruit drop control was exhibited by 2,4-D resulting in high yield and quality. Exogenous application of gibberellins had no effect on abscission in citrus. Application of different growth regulators (GA_3, 2,4-D and NAA alone and in combination) on 'Pera' orange had no influence on the development of the fruit such as length; diameter and fresh fruit mass.

Conclusion

Pre- harvest fruit product drop was basically because of physiological issue and neurotic condition. Blend of synthetic growth regulator and wide range fungicide was utilized in the current investigation to beat physiological confusion and obsessive condition. Aside from lessening pre-reap organic product drop, splash detailing was additionally assessed for upgrading the natural product nature of foods grown from the ground. Engineered development controllers in particular 2,4-Dichlorophenoxy acidic acid and Naphthaleneacetic acid (NAA)was utilized to modify physiological condition. 2,4-Dichlorophenoxy acidic corrosive and Naphthaleneacetic corrosive are notable engineered auxin. Auxin are phyto-hormones answered to assume basic job in plant development.

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Engaging Farmers in Climate Change Through Assessing Intercropping

Arvind Kumar[1] and Vikas Sharma[2]
[1]Barkatullah University, Bhopal (M.P.)- India
[2]Director and Chief Executive, Centre for strategies and leadership
ARTICLE ID: 024

Summary

Agriculture is one of the most vulnerable and adaptation-prone sources of livelihood facing climate change. Joint adaptation planning by farmers and researchers can help develop practically feasible and environmentally farm adaptive capacity. Here, the perceptions of farmers regarding intercropping, the cultivation of two or more crop genotypes together in time and space, as a means to prepare for climate change. The main challenges associated with intercropping were related to the lack of information on crop variety performance and optimal yielding in mixtures, more complicated crop management and harvesting, and the economic risks associated with experimenting with novel mixtures. Therefore, this paper is aim to raise awareness on the potential of intercropping for addressing climate change-induced cropping challenges in northern agriculture.

Keywords: climate change; ecological intensification;intercropping; legumes; yield security.

Introduction

Agriculture is a major land use, using approximately 38% of the global land area. Climate change impacts agriculture by the need to develop existing practices, including field cropping, to minimize greenhouse gas emissions and thus meet the mitigation targets for climate change. Farmers must adapt to the impacts of climate change to secure sufficient food production for the growing world population. Sustainable intensification, i.e., increasing productivity from existing agricultural lands while minimizing the negative environmental effects and ensuring the future needs of food production, has been proposed as a central means to restrict further land clearing for agriculture and transform agriculture and food systems to operate in a more sustainable way. Both climate change mitigation and adaptation relate to the main resources used in agriculture: land, carbon and nitrogen, water and energy, which provide good potential for synergism in the solutions (Smith and Olesen, 2010).

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Developing 'climate-smart' solutions for agriculture refers to adopting practices that benefit both mitigation and adaptation, while ensuring the productivity and resilience of farming, including the economic aspects (FAO, 2016).

Intercropping represents a within-field diversification strategy that is based on ecological intensification. It refers to the cultivation of two or more crops together in time and space, and it is an ancient practice of cropping that aims to maximize productivity per land area using only few external inputs. The method allows for designing local genotype combinations and intercropping types (mixed, relay, strip or row) to target various goals, which makes the method interesting to be developed and employed more as a means of sustainable agriculture. Overyielding per land area is one of the often-reported benefits of intercropping, and it is potentiated by the enhanced utilization of growth resources: growing space, water, nutrients and light (Vandermeer, 1992). Diverse crop genotypes compete less with each other than identical genotypes. Leveraging ecosystem services such as the biological fixation of nitrogen and facilitative interactions such as the associational resistance to pests and pathogens reduces the use of agrochemicals in intercropping. Mixing genotypes may also stabilize yields and thus contribute to food and feed security.

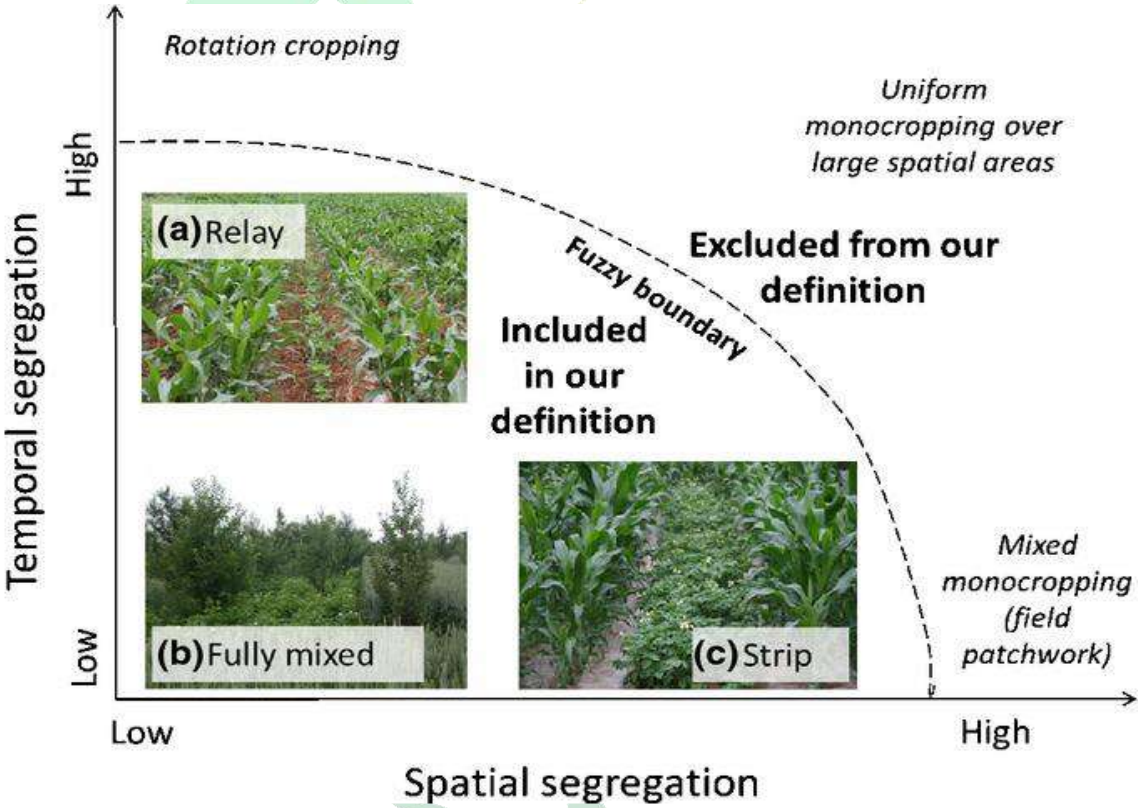
Potentials and Challenges of Intercropping

Perceived potentials of using intercropping related mostly to crop production and farm economy, with additional social and environmental aspects. Intercropping was regarded as supporting self-sufficiency for protein and nutrients, improving soil quality and water regulation, advancing novel genotypes and allowing the reduced use of external inputs. The potential to reduce workload was identified for certain types of intercropping, e.g., cover cropping. The recognized potentials of intercropping, albeit acknowledged to depend on the intercrops and the type of intercropping used, including enhanced yield security, soil conservation, regulation of water dynamics, buffering from pathogens, increased nutrient and protein self-sufficiency, and the reduced use of fossil energy-based external inputs, relate to addressing many climate change-related challenges for northern field cropping. Thus, intercropping can be regarded as both a targeted adaptive strategy of a farm, a potential climate-smart practice to be developed locally and context-specifically, and a means for enhancing farm adaptive capacity.

Maintaining and improving soil quality and fertility via intercropping was regarded as an important potential of intercropping in our workshop. Soil is a central resource of farms, and it relates to both climate change mitigation and adaptation actions. Earlier studies have reported how diverse and prolonged soil cover and shade can protect soil from weather extremes such as heavy rain or prolonged drought. Evaporation (water escaping into the air from bare soil) can be lower, and water use efficiency (water uptaken and transpired by the more dense canopy) can be higher with intercropping (Ray *et al*., 2015). Field water dynamics, including water use efficiency, runoff and excess water, are increasingly important when considering water budgets and yield under climate change. In intercropping, plants with differing root structures can take up water from varying depths, and adding deep-rooted or drought-resistant crop genotypes can reduce the between-crop competition for scarce water. Intercropping can induce root growth into deeper soil layers, as reported for, e.g., faba bean intercropped with wheat. Increasing species diversity (a 16-species mixture) was also found to increase the deep-root (roots below 30 cm) biomass seven-fold compared with monoculture plots. The extensive root biomass sequesters more carbon in the soil in carbon-depleted soils, especially in the deeper layers. The increased vegetation cover and reduced tillage, as potentiated by relay intercropping, can also impact greenhouse gas emissions during winter-time melting and freezing cycles.

Designing Optimal Intercropping

For the most promising intercrops to use in Finland, the participants listed crop species with the ability to biologically fix nitrogen (legumes), especially pea (*Pisum sativum* L.), faba bean (*Vicia faba* L.) and clovers (*Trifolium* sp.). Clovers were emphasized as possessing the additional benefit of improving soil structure. Green manure mixtures including legumes and deep-rooted species were also rated important. Cereal farms, in particular, were perceived to benefit from having green manure mixtures and undersown crops to diversify their crop rotations. Designing intercropping is a knowledge-intensive process that combines scientific and practical expertise. As a first step, the knowledge on the potential of the method among farmers, advisers and the whole food production chain needs to be improved. Arbuckle *et al.* (2015) found that the adoption of cover cropping by farmers in Iowa was related to the gained experience of their benefits, the presence of facilitative educational and technological infrastructure, and the development of risk abatement strategies for intercrop trials. More farm-scale research, as suggested also by our workshop, should be conducted to assess the pros and cons of the method in practice and provide more detailed instructions on how to employ, leverage and develop the method. Many possibilities exist for practicing intercropping such that guidelines and better knowledge on how to select the best type of intercropping (row, strip, mixed intercropping), the species or variety genotypes to combine, adjusting the timing of sowing/planting and management and considering local and production-specific goals are obviously needed. Accessibility, i.e., the availability of the method to farmers is good because relatively little additional economic investments are typically needed, and in contrast, economic costs can be reduced via reduced input use (Vandermeer, 1992). As revealed by the challenges recognized for adoption of the method more broadly, the usability of the different spatiotemporal types of intercropping depends on the technological and educational resources of the farm, agricultural policies, the germplasm available by breeding and markets.



Advancing the Uptake of Intercropping

Intercropping was perceived to demand courage from farmers to consider sowing multi crops instead of traditional monocultures and to allow more agro ecosystem diversity, especially for the most common monocultures: cereal cropping. Forage mixtures and green manures are easy to adopt, and it was discussed that farmers have a high interest in experimenting with novel genotypes and mixture combinations. The selection of an available germplasm, breeding for good intercrop performance and the availability of seeds were found

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to be important in allowing experimentation with more diverse mixtures in mixed intercropping at farms. Under sown crops and green manure are easy to add to the crop rotations of specialized cereal farms, and their benefits for the soil structure and environment further supports their use. In addition, using intercropping to diversify might offer novel forms of collaboration between plant production and livestock farms and provide novel opportunities to produce feedstock for bioenergy use. The key traits mentioned as important in intercropping were biological nitrogen fixation, improvement of the soil structure by deep root systems, pathogen resistance and the crop properties related to health benefits in feed use. Both the quantity and quality (palatability) are imperative for producing feed, and optimally selected mixtures could improve both (Walker and Ogindo, 2003).

Breeding for optimal performance in mixtures, “adapting the crops to grow well together”, was an innovative suggestion made at the workshop. To our knowledge, intercropping performance has not been a central criterion for breeding to date. However, especially concerning the traits that are scarcely addressed in traditional breeding, breeding for optimal mixtures might provide alternative ways for advancement. Seed suppliers likely have an interest in the experimental mixing of the existing genotypes and the search for novel markets by diversifying their supply via more tailored products in a faster pace this way. However, for northern latitudes, the selection of crop genotypes to use is more restricted than for more southern regions, which partly reduces the combinations to be tested. The available germplasm obviously determines much of the potential to be gained by intercropping.

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PANCHGAVYA AS AN ORGANIC PREPARATION

Tanmay Chaudhary
UIAS , Chandigarh University, Punjab
Corresponding author – 17mab5068@cuchd.in

ARTICLE ID: 025

ABSTRACT

Panchgavya is a term used to describe organic product produced by using five different by-products of cow like cow dung, cow urine, cow milk, cow ghee, cow curd. It has the potential to play the role of promoting growth and providing immunity in plant system thereby it provides resistance against pest and diseases. Panchagavya contains several nutrients i.e. macronutrients like **N, P, K** and micronutrients which are required for the growth and development of plants and also contains various amino acids, vitamins, growth regulators like Auxins, Gibberellins and also beneficial microorganisms like pseudomonas, azotobacter and phospho bacteria .

COMPONENTS OF PANCHGAVYA PREPARATION

Panchagavya consists of five products viz. cow dung, cow urine, milk, curd, ghee and **three fortified products** viz. jaggery, , banana, Tender coconut water. When suitably mixed and used, these have beneficial effects.

Cow dung - 7 kg
Cow ghee - 1 kg
Cow milk - 3 liters
Cow curd - 2 liters
Fortified Additions for Panchgavya preparation
Tender coconut water - 3 liters
Jaggery - 3 kg
Well ripened poovan banana – 12 nos.
Jaggery and coconut water are used to accelerate the process of fermentation which also help in minimizing the bad odour.

⇩

Mix the above two ingredients thoroughly both in morning and evening and keep it undisturbed for 3 days

⇩

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Cow Urine - 10 liters
Water - 10 liters
After 3 days mix cow urine with water and keep it undisturbed for 15 days with regular mixing both in morning and evening.
⇩
Panchagavya will be prepared after 30 days.

MICROBIAL LOAD IN PANCHGAVYA

Physio-chemical properties of Panchagavya reveal that they possess almost all the major nutrients, micro nutrients and growth hormones (IAA & GA) required for crop growth. Presence of fermentative microorganisms like yeast and lactobacillus in more numbers might be due to the combined effect of low pH, milk products and the addition of jaggery/sugarcane juice as substrate for their growth.

The low pH of the medium was due to the production of organic acids by the fermentative microbes as proved by the population dynamics and organic detection by GC analysis. Lactobacillus helps in production various beneficial metabolites such as organic acids(OA), hydrogen peroxide(H_2O_2) and antibiotics, which are effective against other pathogenic microorganisms besides its growth. GC-MS analysis resulted in following compounds of fatty acids, alkanes, alconol, alcohol.

PHYSICO CHEMICAL AND BIOLOGICAL PROPERTIES OF PANCHAGAVYA

pH	**5.45**
EC dSm2	**10.22**
Total N (ppm)	**229**
Total P (ppm)	**209**
Total K(ppm)	**232**
Sodium	**90**
Calcium	**25**
GA	**3.5**
IAA (ppm)	**8.5**

CHEMICAL COMPOSITION OF PANCHGAVYA

Fungi	38800/ml
Bacteria	1880000/ml
Lactobacillus	2260000/ml
Total anaerobes	10000/ml
Acid formers	360/ml

BENEFICIAL EFFECTS OF PANCHAGAVYA ON COMMERCIAL CROPS

Mango

1. Induces dense flowering with increased number of female flowers.
2. Irregular or alternate bearing habit is not experienced and regular fruiting is observed.
3. Enhancement of the shelf life by 12 days in room temperature.
4. Flavour and aroma are extraordinarily improved.

Guava

1. TSS content is higher.
2. Shelf life is extended by 5 days.

Turmeric

1. Enhancement by 22% in the yields.
2. Extra long fingers.
3. Drainage losses are less.
4. The ratio of mother to finger rhizomes is narrowed.
5. Helps in the survival of dragon fly, spider etc, which helps reduce pest and disease load.
6. Sold for premium price as mother/seed rhizome.
7. Curcumin content was enriched greatly in Turmeric.

Banana:

In addition to addition with irrigation water and spraying, 3% solution (100 ml) was tied up at the naval end of the bunch after the male bud is removed.

1. The size of the bunch becomes uniform.
2. Harvest was witnessed 1 month earlier in comparision to others.
3. The size of the top and bottom hands was uniformly big.

Paddy

1. Tillering was increased.
2. Chaffy grains were absent.
3. Increase in Grain weight by 20%.
4. Cooking quality of grain is improved.
5. Harvest was done 15 days prior to other paddy crops.
6. Percentage of broken rice during milling was reduced.

Maize, Sorghum, Barley

1. Plant growth is increased.
2. Palatability is increased.
3. Increases nutrients in plants.
4. Crop is ready to be harvested in advance by 10 days.

Brinjal

1. Greeny and healthy plants are produced.
2. Fruits appear to be more attractive to eyes.
3. Resistance against *Leucinodes arbonalis* (Shoot and Fruit Borer) and sucking pests.
4. Increased fruit size and keeping quality.

Other vegetables

1. Increase in yield.
2. Extended shelf life.
3. Shiny outer skin.

General Advantages of Panchagavya

1. It improves soil health and fertility greatly.
2. It is used for protection against pest and diseases.
3. Yield and quality of produce is increased.
4. Chemicals aren’t used in preparing Panchgavya.
5. It is an Environment-friendly approach.

6. Cost required for preparation of Panchgavya formulation is less.
7. No special techniques is required.
8. It have multiple uses.
9. Reduces cost of cultivation by reducing chemicals like fertilizers, pesticides, fungicides, growth regulators etc.
10. Farmer friendly method.

PROBLEMS, CONSTRAINTS, BARRIERS AND DIFFICULTIES IN ADOPTING PANCHAGAVYA

1. Lack of awareness about its uses amongst farmers.
2. Contamination occurs sometimes, during the process of fermentation which spoils the Organic Prepration.
3. The action of Panchgavya on Plants is not fast, it takes it's time and is therefore, slow.
4. Panchgavya products in markets is limited so, it's status of availability is not known to farmers.
5. It is non-selective in nature so, it encourages weed growth.
6. Utilization by farmers is also very less.
7. Poorly prepared Panchgavya formulation reduces the quality of produce sometimes.

CONCLUSION

The concern for environmental safety and global demand for pesticide residue free food is increasing and, this increase has evoked keen interest in crop production using eco-friendly products which are easily biodegradable and do not leave any harmful toxic residues besides conserving nature. So it is necessary to use natural products like Panchagavya to produce chemical residue free food crops and hence Panchagavya can play a major role in organic farming. There is a need to increase awareness amongst farmers about uses and advantages of Panchgavya.

Government should provide incentives for youth entrepreneurs involved with Organic Farming also a farmer to farmer interactions should be done by State Agriculture

Departments and State Agriculture Universities from time to time to increase the awareness and popularity of Organic Farming amongst the masses.

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Vol.1 Issue-1, September,2020

Farmer Producer Organisations (FPO)

Kharidu Baby Jigeesha
Suresh Gyan Vihar University,Jaipur
Corresponding author- babyjigeesha@gmail.com
ARTICLE ID:026

Introduction:

What is a "Farmers Producer Organisation" (FPO)?

It is one type of PO where the members are farmers. Small Farmers' Agribusiness Consortium (SFAC) is providing support for promotion of FPOs. PO is a generic name for an organization of producers of any produce, e.g., agricultural, non-farm products, artisan products, etc.

Farmer Producer Organisation :

Collectivization of producers, especially small and marginal farmers, into producer organisations has emerged as one of the most effective pathways to address the many challenges of agriculture but most importantly, improved access to investments, technology, inputs and markets. Recognizing the centrality of FPOs to meet national agricultural goals, Department of Agriculture and Cooperation, Government of India, had issued detailed Policy and Process Guidelines for Farmer Producer Organization during 2013. SFAC was nominated as a Single Window Agency by Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India, to support the State Governments in the formation of Farmer Producer Organizations (FPOs). SFAC has promoted FPOs across the length and breadth of country and at present FPOs are operating in 29 States covering wide array of crops. Sitting through thousands of awareness building and training meetings, exposure visits, sharing experiences, contributing savings towards share capital, organizing technology demonstrations, leveraging their collective buying power to source inputs in bulk and carrying pooled produce to distant markets, over a quarter million farmers have helped to anchor the success of the project.

Current Regional Scenario:

- Growing scarcity of labour in agri-food systems, and increasing labour costs.
- Small holders are under continuous pressure to increase production and overall returns from their production output – crops, fishery, Livestock, etc.
- New technologies, while available are out of reach of small holders,
- who cannot afford to purchase of these items of machinery.

To overcome these types of problems CHC's are helpful for farmers. These CHC's are a part of FPO's.

Custom Hiring Centre:

CHCs are basically a unit comprising a set of farm machinery ,implements and equipment meant for custom hiring by farmers. Though certain implements and equipment are crop specific, the traction units like tractors, power tillers etc., and self-propelled machinery like combine harvesters etc., are used in common. So it enables farmers to rent the appropriate equipment, often along with someone to operate it for a defined period of time only, Thus

only paying for

Custom Hire Services : Custom hire services enhance technical and economic efficiency across agri-food value chains. Above fig indicating the types of Custom Hire Services Used to Support Agri-Food value chain activities:

About CHC Farm Machinery App :

This mobile app helps the farmers to connect with Custom Hiring service centres in there nearby places. Through this app the farmers can select and order the required machinery at rates feasible for them from custom hiring centres (CHC) at a radius of 50kms from their place. Thus farmers primarily small and marginal farmers, will have easy access to high value and technical agricultural equipments and this will help to use all the types of inputs using

these farming machines.

Advantages of Custom Hiring Centers:

- Provide access to small and marginal farmers to costly farm machinery
- Facilitates timeliness in farm operations and efficient use of inputs.
- Promotes adoption of climate resilient practices and technologies by farmers because of availability of appropriate machines at reasonable hiring chargers.

Conclusion:

These CHC'S play's very important role in every farmers life not every small and marginal farmers can effort for large equipments. so that as per requirement of farmers they can hire equipments according to their needs and crop based requirements.

Goat Rearing and Commercialization: Makes Life Better

Dharmendra Kumar[1], Harsh Wardhan Dhakad[2] and Durgesh Nandan[3]**
[1]Ph.D. Research Scholar, Sangam University, Bhilwara,Raj.
[2] Asst. Prof., Dr. APJ Abdul Kalam University, Indore (M.P)
[3]Ph.D. Research Scholar, C P University, Kota, Raj.
Email-harshwardhan134@gmail.com

ARTICLE ID: 027

Abstract-

Animal husbandry has been in place for centuries along with agriculture as a subsidiary business, but its importance is being used commercially today, apart from purely domestic use. At present honey bee keeping, cow, buffalo, sheep, camel, chicken, fishery, goat rearing etc. are the main ones. This has a direct impact on the income of the farmer and its dual use is in crop production. In this view, the importance of goat farming becomes more important, because we do not have to do any special care to maintain them and separate their feeding and living. There is no need to spend a lot in arranging. Therefore, this small size animal can be reared very easily, marginal and landless farmers mainly rear it for milk and meat, also their hair and skin have commercial importance which gives good income and Fertility of fields can also be increased by making use of their excreta as a fertilizer. At present, there is also a provision for grant of 60% by the central government and 30% by the state government to open goat farming as a business. Goat farming can be made the best business through proper training.

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Introduction

Along with agriculture, animal husbandry has been happening since time immemorial, goat rearing is done easily in various areas of the country, whether it is a desert or a hill or whether it is a plain part. The main purpose of rearing goats is to obtain milk and meat from them and to earn income by selling them, and at the same time it is helpful in the development of agriculture, it is linked to the livelihood or employment of crores of people in the country and it is available in every climate of the country. Can be reared in every part and it can be reared easily only through the care of family at home. Due to the ease and rearing of goats, its popularity has increased so much today that it is not only reared by marginal farmers but also businessmen and today, goat rearing is being done in big farm houses. At present, small size animals like goat are contributing a lot in increasing the economy of the country and the income of the farmer. Many breeds of goats have the ability to produce more than one kid, it is ready for reproduction soon after kidding. Goat meat is ubiquitous compared to other animals, so people of all religions eat its meat, due to which its demand increases.

The biggest feature of goats is the ability to convert non-useful substances for humans and animals into very useful products such as milk and meat, by-product fibre, hair, skins, manure etc. Their milk has medicinal properties because it eats various types of grass chaff and leaves of trees and their green-dried legumes. To make goat rearing economically beneficial, it is necessary to raise 95 goats and 5 male goats. On average, a goat requires an area of 1 sqm.

To make any type of animal husbandry successful, the cycle of birth is very important, The number of children of that animal and the quantity of milk obtained is determined through the correct reproduction cycle. At about 1.5 years of age the goat is able to give kid in 5 to 6 months. Normally a goat gives birth to two to three months. The most suitable period of their breeding is from the second week of May to July. These goats produce kidss from the second week of October to the first week of December. Similarly, the season of November and December is favourable for breeding. The goat that conceives in this season gives birth to the kids by March-April. If the whole generation is treated as a circle, then the processes related to it can be divided mainly into four phases.

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Reproduction

It is considered as the first phase of the birth cycle, ensuring the success of breeding business in animal husbandry, it would not be wrong to call it the key of success because everything from milk to the birth of new progeny depends on it. Which is necessary to take the business forward. Goats have a good lifespan of 2 to 5 years of age, and after 7 years the fertility starts to decline, till about 10 years of age, goats are capable of producing kids. Male goats remain able to conceive from the age of 2 to 6 years.

Heat Cycle

Healthy goats keep coming in a regular cycle at an interval of 17 to 21 days if not pregnant. In goat rearing, breeding should be given importance when there is suitable climate and climate for kids and proper arrangement of food. Goats have a heat cycle for 24 to 28 hours. During this limited period, it gives goat an opportunity for intercourse and we can also resort to artificial insemination. To detect the goats in the heat cycle, a teaser goat is rotated an hour in the morning and evening in a group of 50 to 60 goats.

Care during pregnancy

Pregnancy is the third stage of kidding. The time of pregnancy is when the goat has to nurture the fetus that grows in the womb along with her. It is very important to give proper feed to the pregnant goat in the last 45 days of pregnancy. Goat milk should not be milked during this period. Each pregnant goat has to be provided with a mix 150-250 grams of granule mixture and pigeon straw daily. If green fodder is not available, vitamin K should be given. Some preparations should be done before a fortnight of prospecting. Let the enclosure (4' x 4') which is used for them to be cleaned, dried and whitewashed with lime on it and after a week laying the straw. Keep a box of 21’ x 21' x 21' size of grill partition for every goat that nearing to kidding. Put dry grass and straw in it too. Goat handler needs to observe the goat in the early morning to know the estimated time of kidding.

Parturition/Kidding

Labor pain initially mild and later intense. This symptom is a sign that the goat is going to give birth soon. Goat gives birth to kid within 3 to 4 hours of normal labor. The kid should be right side up with the front feet first, with legs extended and the head lying between the knees and pasterns in a “diving” position. After the water sac breaks, the doe should start to give birth within 30 minutes to one hour. If the doe is pushing very hard for longer than 30 minutes and a water sac or kid does not appear, it may be necessary to assist the doe yourself or contact a veterinarian for further assistance. Generally, if the doe is still in active labor and is pushing after having a kid and does not pass placenta or another kid within 30 minutes to one hour, assistance may be needed. Some does may take longer between kids without problems. If they are up cleaning a kid and appear comfortable, longer than one hour may be acceptable. Goats may have three, or rarely, more kids. The process will repeat with each kid.

Disease, Treatment and other Precautions

It is necessary for goat rearing to be healthy and disease free. The common diseases of goat in the country are- Khurpaka-Muhpaka (FMD), stomach worms, itching etc. Normally, these diseases occur in the rainy season, so as soon as the rain comes, appropriate measures should be taken to prevent these diseases. Indigenous treatment is also effective in these diseases, but treatment should be done only after consulting the veterinarian. It is also necessary to have other precautions to protect the goats from predatory animals, to keep the kids away from the dogs and also from the green fields, because they are rushing to graze which creates controversy.

Hybridization in Tropical Fruit Crops

Pradyot Kumar Nayak
Research Scholar
Dept. Of Fruit Science & Hort. Technology, OUAT, Orissa
Corresponding author- pradyot7@gmail.com
ARTICLE ID:0028

HYBRIDIZATION TECHNIQUES IN TROPICAL FRUIT CROPS

Then individual produced as a result of cross between two genetically different parent is known as hybrid. The procedure of developing hybrids is called as hybridization. It is an important method of combining desirable characters. The objective is to artificially create a variable population for the selection of types with desired combination of characters, combine the desired characters into a single individual, exploit and utilize the hybrid varieties.

STEPS:-

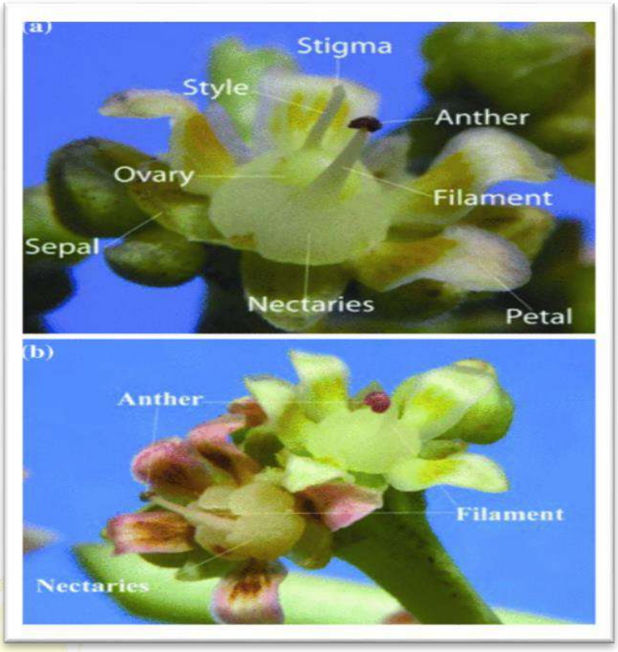
It involves the following steps:-

- Selection of parents
- Evaluation of parents
- Emasculation
- Bagging
- Tagging
- Pollination
- Harvesting and storage of F1 seeds

Approach to combine the characters by sexual crossing is far the most popular method for obtaining plants that have a more favorable combination of desirable traits. In fruit trees hybridization requires several decades.

MANGO (*Mangifera indica*):-

Since a large number of male and perfect flowers are borne on a mango panicle, it requires a special crossing technique.



- The panicle should be bagged with a muslin bag (60 cm x 30 cm) fully stretched and fixed with two rings and a rod made of spliced bamboo. A piece of thick iron wire can also be made into a good frame for stretching the muslin bag over the panicle.
- Staminate flowers of the selected panicle to be used as female parent should be removed daily before dehiscence.
- Panicles of the variety selected as male parent should also be bagged before their flowers begin to open.
- Freshly dehisced male flowers should be carried in a small petridish lined with a filter paper and covered with another petridish to protect the flower from contamination with foreign pollen carried by insects.
- Perfect flowers should be emasculated early in the morning before dehisced.
- Freshly dehisced anther of the male parent should gently be brushed against the stigma which should then be examined under lens to see if pollen grains have adhered to it.
- As the pollination of flowers in any one panicle is carried over a number of days, only the pollinated flowers should be allowed to remain on the panicle. It has been found advantageous to keep the panicles enclosed in bags till the fruits set and develop slightly.
- The conventional method of pollination is time consuming, cost intensive and inefficient because of tallness and difficult to handle trees and poor fruit set. ' Caging technique' for crossing, developed at IARI following the discovery of self incompatibility in Dashehari, Langra, Chausa and Bombay Green, involves planting of grafted plants of the self incompatible varieties along with those of male parents

enclosed in an insect proof cage and allowing pollination by freshly reared house flies and thus doing away with the tedious hand pollination.

ACHIEVEMENT

Hybrid	Parentage	Remarks	Institute
Arka Aruna	Banganpalli x Alphonso	Dwarf tree, precocious, free from spongy tissue, fibreless	IIHR
Arka Puneet	Alphonso x Banganpalli	Vigorous, regular bearing, free from spongy tissue, good keeping quality	IIHR
Arka Anmol	Alphonso x Janardhan Pasand	Semi-vigorous tree, regular, high keeping quality	IIHR
Arka Neelkiran	Alphonso x Neelum	Semi-vigorous, regular, fruit with red blush, pulp deep yellow	IIHR
Arka Udaya	Amrapali x Arka Anmol	Regular bearing, late season variety, sweet, high yeilding with long shelf life,	IIHR
Mallika	Neelum x Dasehari	Semi-vigorous, regular bearer, high TSS	IARI
Pusa Lalima	Dashehari x Sensation	Regular bearer, semi-vigorous suitable for closer planting. Fruits attractive in shape red peel and orange pulp, high β-carotene content	IARI
Pusa Shreshth	Amrapali x Sensation	Regularity in bearing, attractive elongated shape, red peel and orange pulp. Plants are semi-vigorous and suitable for closer planting , higher pulp content	IARI
Pusa Peetamber	Amrapali x Lal Sundari	Moderately resistant to mango malformation and major insect pests of mango	IARI
Prabha Shankar	Bombai x Kalapadi	Regular bearer, medium in height	-do-
Jawahar	Gulab Khas x Mahmood Bahar	Semi-vigorous, precocious, regular bearing, high pulp content	-do-
Neeludin	Neelum x Himayuddin	Regular bearing, small fruit, pulpy, fibreless and aromatic	FRS, Kodur, AP
Neelgoa	Neelum x Yerra Mulgoa	Fibrelesss, juicy fruit	-do-
Neeleshan	Neelum x Baneshan	Fibreless, fragrant fruit, regular bearing, suitable for canning	-do-
Ratna	Neelum x Alphonso	Moderately vigorous, precocious, free from spongy tissue	KKV, Dapoli
Sindhu	Ratna x Alphonso	Regular bearing, parthenocarpic fruits borne in cluster, free from spongy tissue, non-viable seeds	-do-
Ruchi	Neelum x Alphonso	Good for pickling, regular bearer	-do-

BANANA

Interdiploid hybridization (2X2)

Diploids are the main source of genetic variability in breeding new commercial hybrids. Initially, breeding was started with the objective to incorporate the resistance against wilt in Gros Michel (as female parent) by using wild *M.acuminata* diploid as male parent. The tetraploid progeny was very tall but resistant to wilt.

Pollination is carried out between 7 to 10 AM, undehisced anthers of male flowers are collected and twisted gently to force them to dehisce. Using a soft hairbrush, the pollen grains are taken out and smeared gently over the stigmatic surface of the female flowers, which opened on the day of pollination. The pollinated flowers are to be covered with soft cloth bag.

Triploid breeding

The crossing of diploid and tetraploid results in triploid. As tetraploids tends to produce a higher proportion of abortive gametes than diploids it is better to use them as male parents. Natural AAA triploid arose from the AA cultivars by chromosomes restitution at meiosis as an evolutionary course (Simmonds, 1962). Several synthetic AAA triploids have been bred out by using Highgate/Valery as female parents and wild /edible/ or improved *acuminate* diploids as the male.

Tetraploid breeding

Tetraploids are bred by crossing a triploid female with improved diploid male (AA or AB). Seed fertile tetraploids are analyzed for potential usefulness in (4x) X (2x) crosses for synthesizing triploid hybrids

A number of good AAAA clones exist but remain unexploited. They were bred while breeding better export quality AAA clones. Similarly, AABB tetraploids is useful to breed AAB/ABB types. Important tetraploids for commercial adoption are e.g. Gold Finger (FHIA-01 AAAB), FHIA-02 (AAAA), FHIA-17, FHIA-21, BITA-1, BITA-2

ACHIEVEMENT

- CO 1- (Kallar Laden x *Musa balbisiana* cv. Sawai) x Kadali – with pome flavour at lower altitude
- H110- Matti x Tongat – Dwarf
- H201- Barelli China x Pisang Lilin – Dwarf
- H21, H59, H89, H65 and H201- Leaf spot and burrowing nematode resistant
- FHIA hybrids- FHIA- 01, 02, 23, 17 etc. – wilt resistant

GUAVA

ACHIVEMENT

Hybrid	Parentage	Remarks	Institute
Safed Jam	Allahabad Safeda x Kohir	Soft seeded large fruits with good quality	Sangareddy, Andhra Pradesh
Kohir Safed	Kohir x Allahabad Safeda	High yielding vigorous, fruits large, soft seeded and white fleshed	-do-
Arka Amulya	Allahabad Safeda x Seedless	Semi- vigorous, heavy yielder, fruits white fleshed, soft seeded with good keeping quality	IIHR
Hybrid 16-1	Apple colour x Allahabad Safeda	Bright red fruit skin, soft seeded with good keeping quality	IIHR
Arka Kiran	Kamsari x Purple Local	firm pulp and deep pink in colour with good keeping quality	IIHR
Hisar Safeda	Allahabad Safeda x Seedless	Upright tree growth, compact crown, round fruits with smooth surface, creamy white flesh, soft seeded	HAU, Hisar
Hisar Surkha	Apple Colour x Banarasi Surkha	Tree crown broad to compact, pink colour flesh	HAU, Hisar

PROBLEMS IN FRUIT HYBRIDIZATION

- High heterozygosity
- Long juvenile phase
- Complex taxonomy
- Lack of information related to inheritance pattern of traits
- Chromosomal aberrations
- Nucellar embryony
- Cross and self incompatibility
- Requirement of large area for seedling evaluation

FUTURE THURST

- Breeding for improved quality, increased productivity, annual bearing, pest and disease resistance
- Crop-trait specific breeding

  Banana: varieties with better fruit quality, resistance to fusarium race-4

  Mango- coloured cultivars with resistance against wilt and malformation
- Use of biotechnological tools like markers for identifying diverse parents for hybrid development
- Using marker assisted breeding to reduce the breeding cycle
- Use of techniques like embryo rescue to overcome post zygotic barriers in distant hybridization
- Use of morphological and molecular markers as pre selection criteria to select desirable hybrids

Impact of Climate Change on Indian Agriculture

Abhishek kumar [1], Princi thakur [2] and Priyanka kunjam [3]
[1]M.Sc. Scholar, College of Agriculture, RVSKVV, Gwalior, MP
[2]M.Sc. Scholar, School of Agriculture, ITM, Gwalior, MP
[3] B.Sc (Ag). .BTCCARS,Bilaspur, IGKV, Raipur, CG
ARTICLE ID: 029

Introduction

Climate change is the historical change in the pattern of average seasonal conditions. These changes are generally studied by dividing the history of the Earth over long periods. This change in climate conditions can also be natural and also the result of human activities. Greenhouse effect and global warming are believed to be the result of human actions after the industrial revolution, the result of the increase in the amount of gases released by humans from the industries like carbon dioxide etc. in the atmosphere.

The potential impact of climate change is visible in the agricultural sector. Climate change will not only affect the production of crops but will also negatively impact their quality. Lack of nutrients and protein will be found in the grains, due to which the health of humans will be affected even after taking a balanced diet. Due to the increase in temperature in the maximum regions, production of most crops will decrease. Wheat and paddy are the main food crops of our country. Wheat production will suffer many losses due to climate change. If the temperature rises to about 2 ° C so in most places wheat production will be reduced. This will have less effect where the productivity of wheat is high. However, climate change will have a greater impact in areas where there is low production.

Global climate change

- Identifiable change in climate of Earth as a whale that lasts for an extend period of time (Decades or Longer).
- When due to natural process. It is usually referred to as Global climate variability.
- Usually refers to changes forced by human activities that change the atmosphere.

Climate is affected by many factors

- **Abiotic factors**

- Ocean currents
- Solar radiation
- Evaporation
- Volcanic activity

Biotic factors

- Transportation
- Respiration
- Photosynthesis
- Decomposition

Some effects of climate change

- Melting of polar ice-polar bears and others animal and drowning.
- Migrating birds are forced to change their time and place of migration.
- Melting of glaciers will lead to higher sea low which will cause flood and put many low elevation regions at risk of disappearing under water.
- Longer summer can disrupt animal habitat.
- New and wild spread disease because of warm climate.
- Average precipitation increase around the world.
- Droughts heat waves, extreme winter and Storms hurricanes typhoons.
- More wildfires.

Agriculture and climate change 3 fair relationship

- Agriculture as a contributor of climate change.
- Impact of Climate Change on agriculture.
- Agriculture as a potential moderators of climate change.

Current issue of in agriculture

- Over production in short term, yet food security for a larger production.
- Decline in yields.
- Diversification
- Quality and quantity of water resources.

Impact of Climate Change on agriculture

- Greater Loss expected in Ravi every 1^{o}C increase in temperature reduces wheat production by 4 to 5 million tones. Loss only 1 to 2 million tons if farmers could plant in time.
- Reduce frequency of frost damage less damage: Less damage to potato, Peas, mustard.
- Increase increased drought and floods are likely to increase production variability.
- Cereal productivity to decrease by 10 to 40% by 2100.

How hot is too hot?

- **Rising CO2 and Temp:**

- CO2 emitted by human is main cause (IPCC).
- Global surface temperature risen - in 0.8^{o}C since 1880 (IPCC).
- Australian temperature risen 0.9^{o}C since 1910 (CSIRO).

Heat stress in rice production system

All Rice production system will be exposed to heat stress but Rain fed uplands are particularly vurnerable.

- Heat stress leads to high sterility, Standing and accelerate development.
- About 33^{o}C sterility of rice drastically increase.
- Given yield reduction.
- Grain quality (chalkiness) increase with high temperature.

Climate variability and climate change and another driver in agriculture

- Increase in CO2
- Increase in temperature
- Sea level rise
- Variability and extreme events such as flood and drought.

Agriculture as part of the solution?

- Increasing carbon sequestration through Land management.
- Rotation with cover crops, green manure Agro forestry.
- Conversation tillage.
- Could reduce global CO2 emission by 5 to 15%.
- Organic farming (but limited benefits)
- Enhance carbon storage in soil.

Projected beneficial impact of Climate Change on Indian agriculture

- Reduce frequency of Frost damage: Less damage to Potato, Peas, Mustard.
- New “flooded” areas may become available for fisheries in costal a regions.
- Other potential benefits, If any need to be characterized.

Adaptation to climate change

- New varieties: Draught\heat resistant.
- New farm management practices.
- Change in land use
- Watershed management
- Agri-insurance.

What can be done

First we must admit that climate change is everyone’s problems. No agency government or scientist can “Fix it” for us. we are all in this together. We get here because of our Lifestyle so our lifestyle has to be change.

Steps taken by the government so far.

- **National mission for sustainable agriculture** (NMSA):- To make agriculture productive, sustainable and climate resilient. It also developed capacity of farmers and stakeholders in the domain of Climate Change adoption and mitigation measures.
- **Soil health card**:- SHC scheme in 2015 carry crop wise Recommendations of nutrition and fertilizers required for the individual farms to help farmers to improve productivity throught use of inputs.
- **Climate change knowledge network in Indian agriculture**: To established ICT enabled approaches for knowledge exchange on climate change adaptation in Indian agriculture. The eAric project war initiated in North east to disseminate climate smart agriculture practices.
- **Pradhanmantri fasal Bima Yojana**: In the direction of government saving farmers from the Worth of frequently changing climate pattern. A part from all this, Government of India started **National innovations in climate resilient agriculture** (NICRA). To make the farmers but reliant by use of climate resilient agriculture Technologies.

Conclusion

Climate change is a reality. Indian agriculture is likely to suffer losses due to heat, erratic, weather and decreased irrigation availability. Adoption strategies can help minimize negative impacts. These need research funding and policy support. Costs of adoption and mitigation are unknown but likely to be high cost of in action could be even higher. Reduce emissions of greenhouse gases. Attempt to develop alternative energies. Allow emissions to continue but prepare for global climate change. Allow emissions to continue as Normal and leave preparations up to individual countries. Combine any of these ideas. Come up with your own unique plan.

Vol.1 Issue-1, September,2020

A REVIEW ON EFFECT OF ORGANIC FARMING ON SOIL PROPERTIES

Tammana[1] and Rohit Kumar[2]
[1]Research Scholar, [2]Assistant Professor University Institute of Agriculture Science (UIAS), Chandigarh University, Mohali, Chandigarh

ARTICLE ID: 030

Abstract

Common agricultural practices like excessive use of agro-chemicals, deep tillage and luxury irrigation have degraded soils, impure water resources and contaminated the atmosphere. There's increasing concern regarding reticulate environmental issues like soil degradation, geological process, erosion, and accelerated greenhouse effects and global climate change. The decline in organic matter content of the many soils is turning into a significant method of soil degradation. Soil organic matter the merchandise of on-site biological decomposition affects the chemical and physical properties of the soil and its overall health. Its composition and breakdown rate affect: the soil structure and porosity; the water infiltration rate and wetness holding capability of soils; the variety and biological activity of soil organisms; and plant nutrient handiness. several common agricultural practices, particularly tilling, disc-tillage and vegetation burning, accelerate the decomposition of soil organic matter and leave the soil prone to wind and water erosion.

Introduction

Soil Organic Matter Soil organic matter is arguably the foremost vital soil part, influencing soil structure, water-holding capability, soil stability, nutrient storage and turnover, and oxygen-holding capability, properties that are elementary in maintaining and up soil quality. A decline in organic matter content will increase the condition to eroding. Organic matter is especially vital because the prime surroundings for large numbers and sort of soil fauna and microflora, that play a essential role within the health and productivity of soils. It's extremely prone to changes in land use and management and to changes in soil temperature and wetness. Within the last decades of the 20 the century, changes in land use and management, notably conversion of forest and piece of land to agriculture, have diode to a big decline in organic matter levels in some components of the globe.

Soil Organic Matter Formation

Soil organic matter consists of living plant, animal, and microbic biomass, dead roots and alternative plant residues in varied stages of decay, and soil humus. it's assumed that soil humus forms as a results of microbic activity however very little is thought regarding the precise mechanisms of humus formation.

Impact of Organic Farming on Soil texture

Soil organic matter tends to extend because the clay content will increase. This increase depends on two mechanisms. First, bonds between the surface of clay particles and organic matter retard the decomposition method. Second, soils with higher clay content increase the potential for combination formation. As an example, once angleworm casts and also the massive soil particles they contain are split by the joint action of many factors (climate, plant growth and alternative organisms), nutrients are discharged and created obtainable to alternative parts of soil micro-organisms.

Effect of Organic Farming on Soil Acidity and Salinity

Toxicity and extremes in soil pH scale (acid or alkaline) end in poor biomass production and, so in reduced additions of organic bear on the soil. as an example, pH scale affects humus formation in 2 ways: decomposition, and biomass production. Soil acidity conjointly influences the provision of plant nutrients and so regulates indirectly biomass production and also the obtainable food for soil collection. Fungi are less sensitive than bacterium to acid soil conditions. Impact on Soil wetness and Saturation Soil organic matter levels normally increase as mean annual precipitation will increase. Conditions of elevated levels of soil wetness end in larger biomass production, that provides a lot of residues, and so a lot of potential food for soil collection. Soil biological activity needs air and wetness.

Soil properties

Higher application rates of organic amendments resulted in lower bulk density compared with mineral plant food check and lower rates of organic amendments. Physical, chemical and biological properties of soil settle by the application of the organic amendments. Application of Farmyard manure ends up in higher pH scale. Lower convenience of plant nutrients in plots applied with organic amendments is predicted thanks to slower unhitch rates of organic materials, notably throughout initial years of transition to organic production. Organism activity utterly affected by applying organic amendments as a results of organism population decrease with higher application of harmful chemicals among the kind of fertilizers , pesticides and herbicides. Application of FYM, hyperbolic SOC, offered P and K in soil as facet for the reduction of bulk density. There was vital improvement in soil biological properties associated with nutrient sport moreover as soil dehydrogenase activity, that's associate indicator of soil biological health. An organic amendment helps to up C: N magnitude relation in soil thanks to higher organic carbon.

Long Term Effects of Soil Organic Matter on Soil Properties

Many effects, e.g. carbon sequestration within the soil and attainable build-up of venomous components, evolve slowly, thus it's necessary to visit long-run trials. Continual, application of exogenous organic touch cropland crystal rectifier to AN improvement in soil biological functions. as an example, microbic biomass carbon accumulated by up to 100 percent victimization high-rate compost treatments, and catalyst activity accumulated by half-hour with sludge addition. Durable application of organic amendments accumulated organic carbon by up to ninetieth versus unfertilized soil, and up to 100 percent versus chemical treatments. Regular addition of organic residues, notably the composted ones, accumulated soil physical fertility, chiefly by up combination stability and decreasing soil bulk density. The most effective agronomical performance of compost is commonly obtained with the best rates and frequency of applications. Moreover, applying these ways, there have been extra helpful effects like the slow unharnessed of gas chemical. Crop yield accumulated by up to 250% by long-run applications of high rates of municipal solid waste compost. Stabilized organic amendments don't scale back the crop yield quality, however improve it Organic amendments play a positive role in temperature change mitigation by soil carbon sequestration, the dimensions of that relies on their kind, the rates and also the frequency of application. There's no tangible proof demonstrating negative impacts of significant metals applied to soil, notably once high-quality compost was used for long periods. continual application of composted materials enhances soil organic gas content by up to ninetieth, storing it for mineralization in future cropping seasons, typically while not causation nitrate activity to groundwater.

Organic Farming and microbic Population

Organic management considerably improved soil nutrient levels and accumulated microbic abundance and variety, particularly within the plastic tunnel, in comparison to standard farming. Differential microbic taxa analysis prompt that organic plastic tunnel cultivation-enriched various microorganism linkages associated with plant growth promotion and organic material turnover were completely correlative to a variety of soil nutrient parameters. Moreover, the microbic community composition was considerably correlative to the soil atmosphere, such as pH, EC, and nutrient-related properties (i.e., on the market N, on the market P, CEC, NO3 −-N).

Conclusion

Organic farming enhance soil physical, chemical and biological properties and additionally increase the merchandise quality .This embody property agriculture suggests that use of naturally on the market resources concernedly to future use. Deterioration of soil, water and atmosphere because of non considered use of harmful chemicals for accumulated yield impact human humanity directly or indirectly. In modern world, we centered on quality production to not increase amount and maintaining the ecological balance for property agriculture

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Kerala floods, impact and mitigation

Vivek S Kumar
Dolphin (PG) College of Science and Agriculture, Fatehgarh Sahib
Corresponding author- viveksk26@gmail.com
ARTICLE ID: 031

Abstract-

Kerala has been facing devastative floods consecutively for the past 2 years. Heavy rainfall, cause filling of the dams to its brims, resulting in the opening of barriers which intensifies the flood as it increases the water level in the already flooded regions. The impact of flood greatly affected the farmers and the agriculture industry of Kerala. Major reasons for the flood are excessive deforestation, mining, illegal encroachment and so on. Major reasons for the floods and the consequences of the new policies can be seen. Proper policies should be enacted by the Central Government, Ministry of Environment, Forest and Climate change, along with the Government -of Kerala, so to prevent such catastrophes in future.

Keywords: Ecological Hotspots, Flood, Gadgil Committee Report, , Soil piping,Western Ghats,

Introduction

Kerala is a state which is situated in the south western side of the Indian peninsula. It is the twelth largest economy in India with 11.3% GDP contribution in agriculture (Centre for Development Studies.2017). The state is blessed with 44 rainfed rivers, 34 lake, innumerable small streams and innumerable water bodies. Coastal line runs about 580 kms in length and the state is geographically divided into 3 zones namely; Eastern highlands, Central midlands and Western lowlands. Kerala's climate is wet and maritime tropical influenced by heavy monsoon resulting in an average of 3107mm rainfall per year. The Western ghats are situated in the western region of Kerala sharing the topography with Tamil Nadu. The ghats form a wall of mountains penetrated near the district Palakkad, has a natural mountain pass which makes the entry into Tamil Nadu. The area is extremely susceptible to frequent torrential rainfall.

On the day **16th of August 2018**, the state was devastated by heavy floods, which was the after effect of unusual heavy downpour. It was indeed the worst flood which was faced by Kerala in the century. The people were extremely affected by this catastrophe. The heavy downpour resulted in about 80 landslides in the Eastern hilly areas of Kerala during a time span of 48 hours. Out of the 54 dams located at various locations in the state,35 of them was opened as emergency measures. Around 483 people were dead, 153 went missing and the total damage caused by the flood in the year was approximately equal to ₹40 thousand crores (US$ 5.8 billion).

Similary on **8th of August 2019**, Kerala was affected by flood for the second time in the century, consecutively after the one in 2018. Flood was followed by frequent landslides. Many people were buried beneath the sand and clay. Large scale loss of houses and agriculture produce occurred. Livestock got drowned and drifted away. The total estimation of the losses have not been properly calculated yet. Loss of life was around 121and many went missing. The subsequent floods which occurred in the state drasctically affected the development of the state. Bridges, roads, waterways everything got destroyed beyond repairable condition. The main reasons for this kind off hazard is the overexploitation, overutilization and improper usage practices of the forest and the natural ecosystem. These issues resulted in large scale depletion of forest land, which eventually made the land more flood prone.

Causes for the catastrophe

The catastrophic flood was caused by the reduced capacity the state to deal with such extreme floods, mainly due to the processes which include illegal quarrying, large scale - destruction of forests, grassland and excessive manipulation of the river beds by the process of sand mining. Installation of quarries in large scale is the root cause behind the landslides and landslips,as commented by Madhav Gadgil, founder of Centre for Ecological Sciences, IISc Bengaluru.

Ecologically sensitive areas were extensively used for the commercial purposes. When the **Gadgil Committee- Report** came in 2011, the Central Government and the Western Ghat states, including Kerala refused to accept the committee report.

The **Western Ghats** region have thick intense vegetation, spreading over 6 states; Kerala, Tamil Nadu, Karnataka, Maharashtra, Goa and western coastal area along Gujarat, covering about 160 thousand sq kms.

It is one among the world's 10 biological hotspots, habitat for around 7,402 flowering plants, 1814 non flowering plants, 139 mammal species, 508 species of birds, 279 species of amphibians, around 6000 species of insects and 290 species of fresh water fishes.

The ghat have intense vegetation cover which basically performs the function of a super sponge, soaking up all the excess precipitation. The **Gadgil Committee Report** suggested a classification of the Ghats into 3 zones namely **EZ1**; highest ecologically sensitive zone, followed by **EZ2**; moderately sensitive, where small scale development can be carried out and **EZ3**; where energy related projects and infrastructures can be allowed under strict regulations for the environment . But the report was not accepted by the Government due to various reasons. The large scale stone quarrying and riverbed sand mining continued with full might.

As time went on, the capacity of the land to withhold the soil and resist floods drastically got deteriorated. Loss in vegetation caused increased soil erosion and thus causing the rainwater to flow and flood without any restrictions. A particular phenomenon which is rare in the area, called **Soil piping** emerged. It is commonly known as **soil contact erosion,** as water seeps along the interface in the junction of coarse soil and fine soil, eroding the particles from the finer layer into coarser counterparts. Torrential rain and strong current in of the water sources beneath the soil contribute to this phenomenon. It begins as erosion caused by underground water, later on creating an underground tunnel known as the soil pipe. As the time passes, the continuous flow of water along the soil pipes deteriorate or erode the surface earth causing the collapse of the land above. This study was conducted upon in response to the investigation of the flood by scientists from National Centre for Earth Sciences Studies (NCESS)

Also drastic change in climate also plays a a key role in causing such intense level of precipitation. Extreme rains were triggered by a depression or low pressure are in the Bay of Bengal near the Odisha coast . This depression strengthened the monsoon currents across the Arabian sea causing an intense convention over the state of Kerala. Heavy siltation of the rivers also promote overflowing causing rapid floods. The failure of the Government to restrict rampant quarrying resulted in overexploitation of the wetlands. Also the lack of flood warning from **Central Water Commission**, the only Central Government agency aggravated the issue.

The Way Forward

The time has come for everyone to make appropriate decisions in order to prevent these things in the future. Recently **MoEF & CC** under the Central Government, drafted **Environment Assessment Impact 2020**, which solely monitors the impacts and the effects caused by development and commercial processes which is about to be carried out in these ecological zones. EIA consists of 4 steps which are Screening, Scoping, Public hearing and Appraisal. It has decentralized the environment clearance projects.

Even though it is said that EIA is drafted keeping the environmental conservation in mind, it has been found that it may cause more harm that good, causing problems like floods even more. Major criticism include lack of experts in the commission, using same protocol to study about different types of regions, lack of transparency in the policy and the data collectors did not respect the knowledge if the indigenous people inhabited in these areas.

Also the State Government should also give much more importance to protect these sensitive zones, rather than permitting the companies to mine in these areas.

Awareness should be created widely among the public so that they would force the government to open up their blind eyes to these illegal operators. Quarrying should be banned in ecologically sensitive areas. The wetlands and mangroves should be protected with at most care and locals should be made aware about the importance of mangroves in resisting flood and soil erosion. The reservoir regulations should be properly planned and amended regularly to avoid mishaps in future. The most important action is that the government should reconsider about the **Gadgil Committee Report** and make appropriate changes in the policy with respect to the report.

It is the need of the hour for the public to put more emphasis on climate related matters as our forests are under constant threat. Environmentalists and Scientists should be given due respect as they work for the conservation of nature. Their works should be appreciated and given emphasis in the most respectable manner. Political parties must strive for bringing excellence in conservation programmes rather than merely striving for political power. Everyone should give emphasis to conservation and protection of the nature as it's a matter on survival.

"For the true nature of things, if we rightly consider, every green tree is far more glorious than if it were made of gold and silver" as quoted by **Martin Luther King Jr**, every tree is more worth than itself made in gold or silver. Trees have to be treated with full respect and we humans should rather limit ourselves from exploiting these treasures, as if we are entitled to do so. Only through change in mentality and collective approach such natural calamities can be prevented as humans play a major role in the creation of such hazards by various selfish activities. Let us all dream for a future without any natural disasters and development backed by the most sustainable methods.

Vol.1 Issue-1, September,2020

An Introduction to Plant tissue culture

Amanpreet Saini[1] and Jasmine[2,*]
Department of Agriculture, G.K.S.M Government College, Tanda Urmar, Hoshiarpur,
[*]Corresponding Author: jasmine.nannu@gmail.com
ARTICLE ID: 032

Introduction

Plant tissue culture was a new addition to the methods of plant breeding that developed around the 1950s. It has a great significance in plant biotechnology especially in the crop improvement programmes. It is gaining attraction as an effective propagation method that embraces cell technology to propagate new plants in artificial environments using tissue fragments from plant media. It is becoming as an alternative means to vegetative propagation of plants. In vitro growing plants are usually free from bacterial and fungal diseases. Plant Tissue culture is the in vitro aseptic culture of cells, tissues, organs or whole plant under controlled nutritional and environmental conditions often to produce the clones of plants. The resultant clones are true-to-type of the selected genotype.Plant Tissue Culture is a collection of techniques used to maintain or grow plant cells, tissues or organs under sterile conditions on a nutrient culture medium of known composition. It is widely used to produce clones of a plant in a method known as micropropagation. Plant Tissue Culture is widely used in –

- Obtaining disease free plants
- Rapid propagation of plants those are difficult to propagate
- Somatic hybridization
- Genetics improvement of commercial plants
- Obtaining androgenic and gynogenic haploid plants for breedingprogrammes

Importance of Plant Tissue Culture in Agriculture

As an emerging technology, the plant tissue culture has a great impact on both agriculture and industry, through providing plants needed to meet the ever increasing world demand. It has made significant contributions to the advancement of agricultural sciences in recent times and today they constitute an indispensable tool in modern agriculture.

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Biotechnology has been introduced into agricultural practice at a rate without precedent. Tissue culture allows the production and propagation of genetically homogeneous, disease-free plant material. Cell and tissue in vitro culture is a useful tool for the induction of somaclonal variation. Genetic variability induced by tissue culture could be used as a source of variability to obtain new stable genotypes. Interventions of biotechnological approaches for in vitro regeneration, mass micropropagation techniques and gene transfer studies in tree species have been encouraging. Genetic engineering can make possible a number of improved crop varieties with high yield potential and resistance against pests. Genetic transformation technology relies on the technical aspects of plant tissue culture and molecular biology for:

- Production of improved crop varieties
- Production of disease-free plants
- Genetic transformation
- Production of secondary metabolites
- Production of varieties tolerant to salinity, drought and heat stresses

Basic Requirements of Plant Tissue Culture

The main requirements of plant tissue culture are:

- Laboratory Organisation
- Culture Media
- Aseptic Conditions

General Technique of Plant Tissue Culture:

General technique of plant cell, tissue and organ culture is almost the same with a little variation for different plant materials. There are certain basic steps for the regeneration of a complete plant from an explant cultured on the nutrient medium.

- Selection and Sterilization of Explant: Suitable explant is selected and is then excised from the donor plant. Explant is then sterilized using disinfectants.
- Preparation and Sterilization of Culture Medium:A suitable culture medium is prepared with special attention towards the objectives of culture and type of explant to be cultured. Prepared culture medium is transferred into sterilized vessels and then sterilized in autoclave.

- Inoculation: Sterilized explant is inoculated on the culture medium under aseptic conditions.
- Incubation: Cultures are then incubated in the culture room where appropriate conditions of light, temperature and humidity are provided for successful culturing.
- Sub culturing: Cultured cells are transferred to a fresh nutrient medium to obtain the plantlets.
- Transfer of Plantlets: After the hardening process (i.e., acclimatization of plantlet to the environment), the plantlets are transferred to green house or in pots.

Types of Plant Tissue Culture

On the basis of explant used, there are different types of plant tissue culture techniques which are as following;

- Single cell culture: Single cell culture is a method of growing isolatedsingle cell aseptically on nutrient medium under controlled condition.
- Embryo culture: Embryo culture may be defined as aseptic isolation of embryo from the bulk of maternal tissue of mature seed or capsule and in vitro culture under aseptic and controlled physical condition in glass vials containing nutrient semisolid or liquid medium to grow directly into plantlet.
- Antherculture: Androgenesis is the in vitro development of haploid plants originating from potent pollen grains through a series of cell division and differentiation.
- Pollen culture: Pollen culture is the in vitro technique by which the pollengrains are squeezed from the intact anther and then cultured on nutrient medium where the microspores without producing male gametes.
- Somatic Embryogenesis: Somatic embryogenesis is the process of a single or group of cells initiating the development pathway that leads to reproducible regeneration of non zygotic embryos capable of germinating to form complete plants.
- Protoplast Culture: It is the culture of isolated protoplasts which are naked plant cells surrounded by plasma membrane which is potentially capable of cell wall regeneration, cell division, growth and plant regeneration on suitable medium under aseptic condition
- Shoot tip and Meristem culture: The tips of shoots can be cultured in vitro producing clumps of shoots from either axillary or adventitious buds. This method can, be used for clonal propagation.

- Explant Culture: There are variety of forms of seed plants *viz.* trees, herbs, grasses, which exhibit the basic morphological units i.e. root, stem and leaves. Parenchyma is the most versatile of all types of tissues. They are capable of division and growth.

Plant in vitro culture techniques

- Micropropagation –Micropropagation is used to develop high-quality clonal plants (Smith 1990). The main advantages are attributed to the potential of rapid, large scale propagation of new genotypes, the use of small amount of original germplasm.
- Somatic cell genetics- Contribution of in vitro methods to plant breeding i.e. somatic cell genetics is most significant, mostly in terms of haploid production and somatic hybridization.
- Transgenic plants- Expression of mammalian genes or other plant gene is becoming routine for several plant species. It has proved beneficial for the engineering of species that are resistant against insects, virus and other pathogens as well as herbicide.

Conclusion

Plant tissue culture represents the most promising areas of application at present time and giving an out look into the future. The areas ranges from micropropagation of ornamental and forest trees, production of pharmaceutically interesting compounds, and plant breeding for improved nutritional value of staple crop plants. The rapid production of high quality, disease free and uniform planting stock is only possible through micro-propagation. New opportunities has been created for producers, farmers and nursery owners for high quality planting materials of fruits, ornamentals, forest tree species and vegetables. Plant production can be carried out throughout the year irrespective of season and weather. The in vitro culture has a unique role in sustainable and competitive agriculture and forestry and has been successfully applied in plant breeding for rapid introduction of improved plants. Plant tissue culture has become an integral part of plant breeding. It can also be used for the production of plants as a source of edible vaccines. There are many useful plant-derived substances which can be produced in tissue cultures.Plant cell culture has made great advances. Perhaps the most significant role that plant cell culture has to play in the future will be in its association with transgenic plants. It has a great role to play in agricultural development and productivity.

Post Harvest Loss Minimization In Fruits And Vegetables

Subha laxmi Mishra[1]* and Gargi Gautami Padhiary[2]
[1&2] Research Scholar, Department of Vegetable Science, Orissa University of Agriculture and Technology, Bhubaneswar, 751003
*Email: subhalaxmimishra02@gmail.com
ARTICLE ID: 033

Introduction

The presence of wide range of agro climatic conditions in India favours the production of various fruits and vegetables. Globally India ranks second in fruit and vegetable production after China. Although the production is high but it fails to meet the consumption of the country. Generally 30 to 40 percentage loss occurs in post harvest stages. Sometimes the loss is as high as 50%. Post harvest loss refers to detoriation in quality and quantity of commodities during harvesting, post harvest handling, and storage till it reaches to the consumer. Fruits and vegetables are more diverse in their morphology and physiology. High water content makes them more perishable and prone to damage. So strategic steps should be taken at several stages to minimize the loss for feeding the population.

Causes of post-harvest loss

- **Harvest**

Fruit and vegetables should be harvested at proper edible maturity stage. Sometimes due to early or late maturity the quality of the produce is affected. Mechanical injury, scars on fruit during harvesting creates losses. Over ripe fruits and vegetables are more prone to disease and pest attack, which spreads to other later on. Adverse climatic conditions like drought, hail storm and rain damage the fruits. Faulty methods of harvesting of the produce cause damage.

- **Packaging**

Improper packaging of the produce affects the losses. Bruising of fruits and vegetable at the time of storage and transportation increases the chances of infection and ultimately the loss of the product. Use of poor quality materials do not protect the produce properly sometimes favors spoilage. Rough and harsh packaging of the delicate produce like leafy vegetables causes severe damage and loss. Produce directly placed in crates or wooden boxes without packaging increases the amount of loss.

- **Storage**

The rate of transpiration and respiration increases with increase in temperature. High temperature during the storage leads to more ethylene production which affects the quality. High moisture and relative humidity in storage atmosphere favours the microbial growth leads to bacterial rot of fruits and vegetables.

- **Transportation**

Transportation connects the chain between production and consumption. Faulty transportation is one of the main causes of losses, especially for fresh products. Many fruits and vegetables require optimum temperature maintenance during the transportation beyond which the damage occurs. Broken cold chain management causes losses. The way of transport like poor roads facility favors the damage. In rainy season severe rain create barriers in open transportation facility or in truck. Improper loading and unloading of the material by unskilled and uneducated laborers causes mechanical damage of the produce.

- **Consumer Waste**

Consumption is the final stage of any produce. Considerable losses for fruit and vegetable occur at consumption stage in the food supply chain. Fresh fruit and vegetables contribute to almost 50% of food wasted by households. The main causes of the consumers' waste are due to over-purchasing, improper planning, poor home-storage facility, etc. The consumer waste is highly affected by factors such as gender, lifestyle, income and home storage facilities. Sometimes rodent infestation in houses causes severe loss of fruits and vegetables.

- **Cultural practices and variety**

Appropriate and feasible agricultural practices should be adopted for extending shelf-life of perishable fruits and vegetables to minimize the losses. Variety with good shelf-life and adapted to long distance transportation should be grown where the market facility is far. Cultural operations such as proper spacing, weeding, fertilizing and pesticide application could be conducted with great care. Optimum harvesting age and harvesting time has to be knowledge for each crop as in fruits and vegetable the edible maturity differs from the physiological maturity. This can be done by using a maturity index standard and pre-sorting loss greatly reduced. So all these factors are very much important for reducing the post-harvest losses.

- **Harvesting method**

Proper harvesting should be carried out to reduce the losses. Techniques of harvesting such as physical, mechanical, manual should be chosen wisely to minimize injury such as scratches, cuts, punctures and bruises to the crop. Harvesting should be carried out during the cool part of the day, which is early morning and late evening harvest crop at turgid stage. Immediately after harvesting, damaged produce should be removed from the bulk.

- **Storage and transportation facility**

The transportation of perishable commodities like fruits and vegetables require multiple stages from farm to plate of the consumer. Produce should be kept at optimum conditions during the transport. Adequate temperature control systems and air circulation systems are the most important means to ensure quality preservation of the produce. Cold chain is the logistics system provides ideal condition to the perishable goods from the point of source to the point of consumption. Provision for proper loading and unloading, maintenance of moisture and humidity should be taken care of during transportation. Storage is an important operation during post harvest stages. Adoption storage technique like Controlled Atmosphere Storage (CAS), Modified Atmosphere Storage (MAS) and Zero Energy Cool Chambers (ZECC) should be used to maintain the temperature and relative humidity of fruits and vegetables is necessary. This will increase the shelf-life and maintain the quality during storage.

- **Packaging**

Physiological and biochemical activities of fruits and vegetables continue even after harvest. Packaging restricts the rate of transpiration and respiration, protects against the microbial contamination and physical injury so minimizes the water and quality loss. It also controls the ethylene concentration. Therefore, appropriate packaging systems should be designed to reduce food losses. The packaging solutions for minimizing food waste during post-harvest vary from crop to crop and that should be taken care while going for packaging.

- **Sanitation**

From the harvesting till the produce reach in the hand of consumer sanitation is an important measure during all pre and post-harvest operations in fruit and vegetable crops to eliminate sources of infection and reduce level of crops contamination. Good hygiene practices are throughout the produce handling practices. Producers, wholesalers, retailers and consumers should aware of the impact of sanitation. All the equipments used in the post harvest practices at each stage should be sanitized at regular interval to avoid contamination by pathogen.

Conclusion

In developing country like India minimization of post harvest loss is beneficial to combat the growing hungry population in coming days. Proper storage infrastructure, transport facility, involvement of educated and skilled labor is mandatory in loss reduction. Market strategy and consumer awareness regarding the loss should be acknowledged. All together the loss reduction in perishable commodities like fruits and vegetables will boost the economy in sustainable way.

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ORGANIC FARMING - REQUIREMENTS AND CHALLENGES

Narendra singh
UIAS, Chandigarh University (Mohali), Punjab
Corresponding author:- singhnarendra6977@gmail.com
ARTICLE ID:034

Introduction

Organic farming is a method of crop and livestock production that involves much more than choosing not to use pesticides, fertilizers, genetically modified organisms, antibiotics and growth hormones. Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. The principal goal of organic production is to develop enterprises that are sustainable and harmonious with the environment. The general principles of organic production, from the Canadian Organic Standards (2006), include the following: protect the environment, minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health maintain long-term soil fertility by optimizing conditions for biological activity within the soil maintain biological diversity within the system recycle materials and resources to the greatest extent possible within the enterprise provide attentive care that promotes the health and meets the needs of livestock prepare organic products, emphasizing careful processing, and handling methods in order to maintain the organic integrity and vital qualities of the products at all stages of production rely on renewable resources in locally organized agricultural systems

Organic farming promotes the use of crop rotations and cover crops, and encourages balanced host/predator relationships. Organic residues and nutrients produced on the farm are recycled back to the soil. Cover crops and composted manure are used to maintain soil organic matter and fertility. Preventative insect and disease control methods are practiced, including crop rotation, improved genetics and resistant varieties. Integrated pest and weed management, and soil conservation systems are valuable tools on an organic farm.

Organically approved pesticides include "natural" or other pest management products included in the Permitted Substances List (PSL) of the organic standards.

Organic farming - Requirements

The requirements are studied under following heads:-

1. **Protecting soil quality using organic material and encouraging biological activity** - the soil has its own inherent qualities which is received from the parent material of the particular soil eg, rocks and minerals which needs to be protected for the sustainable agriculture by the use of various organic materials.use of organic materials in soil helps the soil in many ways.

    - Improves soil structure
    - Improve water holding capacity
    - Hold nutrients for more time and reduces leaching loss
    - Reduces soil acidity
    - Enhances soil organic matter

2. **Indirect supply of crop nutrients using soil microorganisms** - providing crop nutrients indirectly using relatively insoluble nutrient sources which are made available to the plants by the action of soil microbes. This promotes the natural biological cycles within the soil which helps in plant growth.

3. **Nitrogen fixation in soil using legumes-** Nitrogen self sufficiency through the use of legumes and biological nitrogen fixation as well as effective recycling of organic materials including crop residues and livestock materials.

4. **Weed, disease and pest, control using various methods**- there are following few ways to control weeds and pest using organic approach.
    - Crop rotation - crop rotation refers to the breaking of the existing cropping pattern within an area for a certain time (2-4) years with a new crop which results in weed control and very low infestation of pests.

1. Breaks life cycle of pests by providing unfavorable conditions
2. Lack of host plant after resting period of diseases

- Existing resistant varieties- the naturally existing resistant varieties of old time to drought and frost which ultimately makes plant strong to fight against diseases
- Natural predators - some of the natural predators of vegetable cropping systems are spiders, mites, beetals etc. This promotes the natural cycle of various biotic agents on the farm.

5. **Rearing of livestock -** Livestock rearing is a way to provide an integrated approach in organic farming and ultimately the better management and utilization of wastes in an integrated manner.
    - Nitrogen cycling- the cattle feed on grass and green fodder with good nitrogen content and the same amount of nitrogen is present in cow dung which is again used in the field and again the plants are grown and the cycle goes on
    - Source of organic fertilizers for various preparations
    - Extra source of income for farmers
    - Promotes sustainable agriculture

6. **Care for larger environment and conservation of natural resources, habitats and wildlife-**carefull attention should be there on the impact of farming system on the wider environment and the conservation of natural habitats and wildlife. Keeps a balance in food chain

Organic Farming - Challenges

According to a research paper published in the research journal of agricultural sciences on 31 Jan 2020 a study was conducted in way district of Kerala on the challenges faced by the farmers who are engaged in organic farming. The study found a number of challenges that were common with most of the farmers from seed to market are given below along the few other challenges frequently faced by the farmers in organic farming.

1. **Lack of knowledge** - lack of strong action taken by the government to promote organic agriculture
    - Low access to modern media and technical support.

Solutions - free vocational training to the farmers

- Farmer to farmer interaction
- Connecting more and more farmers with digital media and kisan apps.

2. **Marketing problem**s
   - Low access to markets for marginal farmers
   - No smooth marketing channels available
   - Low shelf life of various fruits and vegetable crops hence farmer has very less time to reach the market.
   - Poor infrastructure and cold storage units
   - Farmers do not have proper transport trucks
   - Marginal farmers has to travell hundreds of kilometers to sell the produce
   - Distress sale - it is the situation when when the farmers are offered a less amount by the market dealers according to the quality of product and he has to sell it to the market dealers in a low price to avoid more interest on the loans he has taken before.
   - Lack of market knowledge - many farmers do not even know that where they could find a better market for their product.

Solutions

- Developing a bridge between the farmer and market
- Encouraging the young entrepreneurs in marketing of organic products
- Government should induce private investments in organic farming to facilitate the farmers
- Enhancing the number of regulated markets
- Government should encourage the cooperative marketing societies
- Subsidized transport

3. Microbial biomass

- Total population of active microbes in soil at the time of sampling
- Influenced by soil properties
- Measured by amount of c:n ratio

- Responds quickly to soil management

Solutions

- Use of organic waste decomposer
- Jeevamrut to enhance microbial population within soil.

4. Lack of suitable seeds and varieties

- Organic farming needs the seed from an organic farm
- It is difficult for farmer to get the seed from an organic source due to less number of farmers engaged in organic farming in villages

5. High labour requirement

- Due to various manual operations like weeding, mulching and other intercultural operations more labour is required.
- Weed management requires a lot of man power
- Labour is also required for the various on farm preparations of organic materials eg- jeevamrut, panchgavya, ghanjivamrit etc

6. Expensive organic produce discourages consumer 's interest and affects sale

- According to a study of ASSOCHAM that in india there will be an increase in expenditure of rs 1200-1500 per month if a person switches to organic food consumption
- Farmers says that the reason for high cost of organic product is high labour requirement and comparatively low yield

7. Lack of extension service on organic farming

- Lack of available data and less success stories on organic farming due to less work done in this field
- But the situation is improving in many states like uttarakhand and himachal pradesh
- Includes lack of package of practices

8. Yield

- Initial yield is low in some areas depends on how heavily the soil is treated with synthetic chemicals before shifting to organic agriculture
- Transition period is relatively longer in these areas like punjab and haryana
- Yield problems are not so serious in some areas like himachal and uttrakhand where there has been a limited use of chemicals before.

9. Complicated certification

- The certification cost is the big problem for small and marginal farmers
- This can be better understood by a report on PMKVY (pradhan mantri krishi vikas yojna)-2018
- Under this there was an initiative by government of india for free certification
- The report shows that all states except odisha, tripura and karnataka was unable to utilize even 50percent of their funds under scheme
- The states will have to take the responsibility and contribute towards organic india.

Conclusion

As the demand in foreign countries for organic products is increasing with a faster rate, india can become among the top countries exporting the organic goods, but for that the demand needs to be increased in india as well to convince the farmers on an initial level on the other hand both secondary and tertiary sectors has to be developed in organic agriculture to strengthen the value of organic products. The basic structure of the market has to be improved to facilitate the farmers.organic farming has a potential to bring prosperity in indian farming scenario however the above requirements and challenges has to be addressed and the improvement in organic agriculture must go on.

Impact of Lockdown on Subsidiary Occupations

Palwinder Singh*, A P S Dhaliwal & G S Dhillon
Krishi Vigyan Kendra, Bathinda
*Corresponding author: psbkvk@gmail.com
ARTICLE ID: 035

The outbreak of Covid-19 is being seen all over the world. The epidemic began in Chinese city Wohan, but in a short time it has affected the entire world. Its arrival in India took place in the month of January in Kerala and gradually spread in whole India. This epidemic in Punjab was reported on March 19th, 2020 in Nawanshahar. Subsequently, the Punjab Government imposed lockdown from March 21, 2020 which results direct effect on economic conditions of state. Today we talk about the agriculture and allied occupations. During lockdown farmers had to face a lot of difficulties and in this regard a very effective strategy was formulated by Krishi Vigyan Kendra Bathinda, which is as follows:-

- Seed of kharif crops, vegetable kits, fruit plants etc. were provided to the farmers so that the people would not face any difficulty due to lockdown.
- The curfew pass was made available to dairy farmers for marketing of milk & milk products.
- Poultry farmers were helped in smooth marketing of eggs & meat.
- Additional produce was utilized by making pickle, marmalade & sauces.
- Assisted in cold storage & marketing of fruits, mushroom, & vegetables.

Best Practices against Lockdown in Animal Husbandry

After reviewing the various occupations mentioned above, the farmers are requested to follow the following suggestions for better and smooth livestock production to avoid economic downturn.

1. All the farmers of the group are advised to download and register Arogya Setu app in their mobiles.
2. All the farmers are advised to strictly follow Government directives on Social Distancing in all activities.
3. All farmers are advised not to allow any outsider near their animals.

4. Clean milk production practices should be followed.
5. Wash hands with soap/sanitizer and use of mask is must before and after doing daily management of animals.
6. All the utensils used for production and management should be clean/sanitized with 1% hypochlorite.
7. To maintain animal's healthy proper amount of clean water, forage and good housing especially protection from heat should be done.

Economical Impact of Lockdown on Animal Husbandry

During lockdown period our farmer faced following problems as follows:-

1. Dairy Farming:

- Non availability of migration passes for movement to city for dairy medicines, feed supplements etc.
- Carriage problem of liquid nitrogen for frozen semen at farm level and quality semen of high yielder bulls, which results breeding problem during lockdown.
- Loss in sale of raw milk up to Rs 5-6/litter by to organised sector.
- Animal husbandry services available telephonically as well as on door step.
- Private supply of quality semen disturbed in lockdown.
- Breeding problem in some remote areas also reported due to non availability of inseminator.
- No occurrence of disease outbreak improves animal health due to restriction of visitor.
- Sale purchase of animal stopped.
- Requirement of milk in market decreased due to closer of local dairies, cantonment areas, sweets shops, hotels, restaurants as well as marriages which has resulted in loss of Rs. 10 per litre.
- Door step Sale of milk not effected, only excess milk not utilized.
- Rural areas near city shows less effect than remote corners,
- Supply of feed, medicine also affected in remote areas.
- Procurement of milk by Verka increased upto 20-25% while rate decreased upto 12-13%.Sale of milk products of Verka increased due to door step supply.

2. **Poultry Farming**:

- Covid-19, during early phases effect the sale of egg & meat due to misconception of presence of viruses in non-veg. items.
- Sale of egg in local market stable now but decrease in rate upto 40-50%.
- Major problem faced by broiler farmer due to no purchase in market.
- To avoid losses, Egg laying birds are moulted i.e. kept without feed for 7-8 days, then started feeding from 10 gram/bird/day and increased daily by 10 grams to normal in 22 days. Hence Egg lying is restored to normal in 28 days and even feed cost is saved.
- Local ingredients are being used for feed formulation like khani, nakku etc
- Feed and medicine supply was hindered earlier but normal nowadays.
- Shopkeepers are supplying old stock of medicines due to lack of production and supply.

3. **Pig farming:**

- Pig farmers are facing high losses upto 40%.
- Due to lack of sale the price of pork has reduced to 50%.
- Due to lack of purchasers in Punjab farmers are forced to sell the animals at low rates to other states like Assam at lower prices.
- Non availability of waste from hotels, restaurants increased the feed cost.
- Breeding has been stopped at farm level by opting for castration of boars.

Future Planning:

According to the facts mentioned above, we are all well aware that there is unbearable loss during lockdown even after using common sense. In the **Dairy farming**, it is very important to pay attention to these points in future: Formulation of balanced & economical diet, regular checkup of animals, de-worm, vaccination and clean milk production. In **Poultry farming**: Bookings of a quality chicks from reputed hatchery, Sorting of non laying hens, Protecting birds from the swear heat stress, Vaccination, proper marketing of egg & meat is the key to future success. Similarly, in **Pig farming** collecting waste for pig feeding to reduce cost, breeding and breed improvement, Vaccination and better marketing are important points for the future success. Hope all the facts will prove as a light house to the farmers. New comers advised to take skill development trainings before the start of any live business in future.

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Organic Theatre: Redefining Agriculture as "AGRI-CULTURE"

Sowparnika S. B
College of Co-Operation, Banking and Management, Kerala Agricultural University
ARTICLE ID: 035

Introduction

Organic farming is a modern and sustainable form of agriculture that provides consumers fresh natural farm products. Organic farming works in synchronization with nature rather than against it. Organic theatre is a concept that aims to revive the natural bond between agriculture and art. It aims to show the new generation the natural bond that exists between the fertility of the soil and fecund imagination that goes with the tilling of land. It is a combination of both organic produce and theatrical performances which coexisted even from the medieval times. The focus is on traditional farmers and organic farming and organic theatre is a stepping stone. The theatre will carry messages and impart information on agrarian culture. Organic theatre agriculture is redefined as "AGRI-CULTURE". This initiative aims to educate people on the dangerous side effects of pesticides and the need to promote organic farming and to create a new work culture and food culture which is closely linked with Mother Nature and the climate.

Organic theatre is a heart warming idea where farming and folk theatre flourished alongside each other. The concept not only takes agriculture as a science but also an art bringing in the true spirit of the word agri-culture. It speaks about the importance of linking agriculture with tradition and culture. Organic theatre revolves around the idea of organic farming where farmers adopt eco-friendly practices for cultivation alongside with folk theatre. The farmers work in their fields during the day time and in the night they practice music, dance and drama in the stages constructed near the field. The final performance of the art is made on the day of harvest, usually 3-4 months after the sowing.

Organic Theatre and Rural Development

1. Women Empowerment

The concept of organic theatre has helped in empowering women and thereby helps in rural development. Most of the workers in farms were women and it helped them in earning a good source of living. Participation in cultural performances will also help them in developing their talents and social interactions. With the coming of women into main stream it would help in empowering them.

2. Employment Opportunities

Organic theatre provides employment opportunity to all spheres of life. In this initiative, not only farmers but students, IT professionals, teachers, doctors and people from different walks of life join hands right from sowing the seed till the final stage.

3. Better Crop And Pest Control

Better weed and pest control is obtained through adopting techniques like crop rotation, biological diversity, natural predators, and organic manures, suitable chemical, thermal and biological intervention. The farmers usually use endangered seeds for cultivation which would help in protecting various endogenous germ-plasms.

4. Higher Market Prices

Since the concept of organic theatre uses complete organic method of cultivation, the crops produced through this method would fetch higher prices. This would further help in increasing the farmer's income, improve their standard of living and thereby help in rural development.

5. Social And Political Aspect

Food is an emotional topic. Food often has a strong cultural, religious or even political meaning attached to it. Organic food is no different in that respect. Organic theatre is a concept which is in close relationship with the society. The various performances of dance, music and drama also take up relevant social and political issues.

A time where more and more conventional farmers are opting out of farming, But the mouths to feed are increasing exponentially day by day, it is crucial that more and more individuals and government bodies should take up farming to maintain the balance. Similarly, art and theatre should not be confined to auditoriums alone; instead they should go to the fields where they can make the change. Agriculture depicts the relation which humans have with art and soil. We should adopt this culture of cultivation to promote organic farming. The message of this concept is to recall our nature, culture and the equilibrium.

Vol.1 Issue-1, September,2020

Precision Farming: The Future

Ankarapu Roshni
Suresh Gyan Vihar University, Jaipur, Rajasthan
Email: - ankarapuroshni729@gmail.com
ARTICLE ID: 037

Introduction

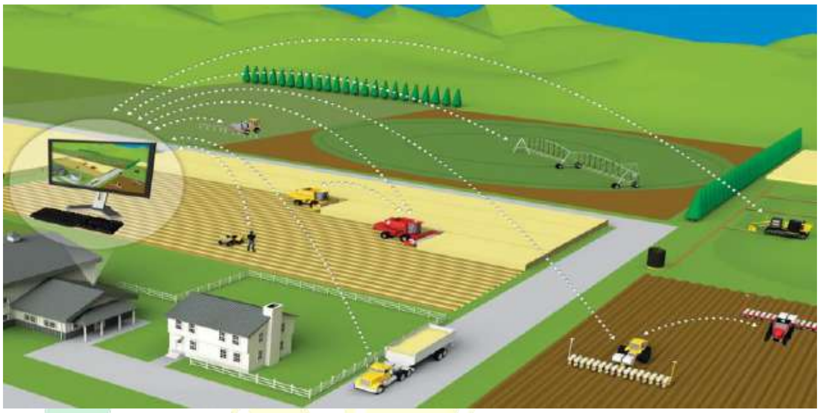
The Indian farmers were facing the problem of shortage of labour now-a-days. And this is going to be the severe one in the future. Here comes the solution is "Precision Agriculture" called as "Site Specific Farming" (or) Future of Agriculture".

Precision agriculture is an art and science of utilizing innovative, site-specific techniques for management of spatial and temporal variability using affordable technologies…for enhancing output, efficiency, and profitability of agriculture production in an environmentally responsible manner.

Precision farming

Precision farming is nothing but the use of "Hi-fi" technology in the agriculture, For example: - GPS trackers, drones (or) robots, tiny sensors and cameras, automatic robotic pickers, software are that analyse drone-captured images.

This farming involves sophisticated machinery which collects soil humidity, salinity and nutrient content of the soil. We can also use the economic sensors and cameras to monitor the presence of pests, level of greenness of leaves, presence of weeds, inputs applied, weather forecasting and yield. These machines are often connected to the internal, and send the information automatically to the "Agriculture based big data firms", that analyse the information and send the agronomical instructions back to the software machinery, Use of automatic pickers gathers crops twice as fast as humans, Robots or drones. That can precisely remove weeds and pests (or) shoot them with targeted herbicides and pesticides, reduces the use of chemicals 90% less than that of usual.



We Indians with large area are lagging behind the other countries with small area in production is due to lack of awareness in technology Eg: - USA, Israel with higher technology.

Conclusion

It is concluded that precision agriculture, there may be an higher initial cost of cultivation in earlier years but this will reduce the inputs usage and cost of cultivation in later years and reduces the labours. Allowing only the farmers and his wife to carry out the whole farm enterprise.

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Panchagavya as Biofertilizer in Organic Farming

Madhav Sharma
UIAS, Chandigarh University (Mohali), Punjab
Email- madhavsharma4068@gmail.com

ARTICLE ID: 038

Abstract -

Panchagavya is an organic product produced by using the use of five specific through-products of cow like cow dung, cow urine, cow milk, cow ghee, cow curd and other substances. It has the capability to play the function of promoting boom and supplying immunity in plant machine thereby confers resistance against pest and sicknesses. Panchagavya includes several vitamins i.e. macronutrients like N, P, okay and micronutrients which might be required for the growth and development of vegetation. The components like cow dung and cow urine enhances the insecticidal activity of panchagavya which can reduce the number of application hazardous chemicals on crops.

Keyword: panchagavya, cow dung, cow urine, cow milk

Introduction:

Panchagavya is an organic formulation, which in Sanskrit means the blend of five products obtained from cow i.e. milk, ghee, curd, dung and urine (all these products are individually called as “Gavya” and collectively named as panchagavya). Panchagavya has got reference in the scripts of Vedas (devine scripts of Indian wisdom) and Vrikshayurveda (Natarajan, 2002). In India, use of panchagavya in organic farming is gaining popularity in recent years especially in states like Tamil Nadu and Kerala. Panchagavya requires mainly five products of cow along with certain other ingredients as listed below (Natarajan, 2002; Pathak, 2002);(1) Fresh cow dung - 7 kg; (2) Cow urine - 3 l; (3) Cow milk - 2 l; (4) Cow curd - 1 kg(5) Cow ghee - 1 kg; (6) Sugarcane juice - 3 l or 500 g jaggary; (7) Tender coconut water – 3 l; (8) Riped banana – 12 Nos.; (9) 100 g yeast + 100 g jaggary dissolved in 2 l of warm water.

Beneficial Effects of Panchagavya- Panchagavya is a component of crop production and it plays a crucial role in each and every component of crop management like integrated soil fertility management, integrated pest management, and integrated disease management.

Use of Cattle dung and Panchagavya in diseases control

1. It increases immunity power in plants thereby confers resistance against pest and diseases

2. Various beneficial metabolites produced by microorganisms such as organic acids, hydrogen peroxide and antibiotics, which are effective against various pathogenic microorganisms

Effect of panchagavya on soil fertility and productivity

1. Panchagavya improves fertility status in soils by increasing macronutrients, micronutrients and beneficial microorganisms thus increase soil health.

2. It improves water holding capacity of soils because it acts as organic manure.

3. It encourages growth and reproduction of beneficial soil microorganisms

4. Increases nutrient uptake in plants and enhances plant growth.

Effect of panchagavya in different commercial crops-

- **Paddy**
- Increases tillering
- Absence of chaffy grains
- Grain weight is increases by 20%
- Improved cooking quality
- Harvest is advanced by 15 day

Mango

- Induces dense flowering with more female flowers
- Irregular or alternate bearing habit is not experienced and continues to fruit regularly
- Enhances keeping quality by 12 days in room temperature
- Flavour and aroma are extraordinary

Guava

- Higher TSS
- Shelf life is extended by 5 days

Banana

- In addition to adding with irrigation water and spraying, 3% solution (100 ml) was tied up at the naval end of the bunch after the male bud is removed. The bunch size becomes uniform. One month earlier harvest was witnessed. The size of the top and bottom hands was uniformly big.

Turmeric

- Enhances the yield by 22%
- Extra long fingers
- Ensure low drainage loss
- Narrows the ratio of mother and finger rhizomes
- Helps survival of dragon fly, spider etc which in turn reduce pest and disease load
- Sold for premium price as mother/seed rhizome
- Enriches the curcumin content

Effect of Panchagavya on plants

- **Leaf**

Plants sprayed with Panchagavya invariably produce bigger leaves and develop denser canopy. The photosynthetic system is activated for enhanced biological efficiency, enabling synthesis of maximum metabolites and photosynthetic.

- **Stem**

The trunk produces side shoots, which are sturdy and capable of carrying maximum fruits to maturity. Branching is comparatively high.

- **Roots**

The rooting is profuse and dense. Further they remain fresh for a long time. The roots spread and grow into deeper layers were also observed. All such roots help maximum intake of nutrients and water.

- **Yield**

There will be yield depression under normal circumstances, when the land is converted to organic farming from inorganic systems of culture. The key feature of Panchagavya is its efficacy to restore the yield level of all crops when the land is converted from inorganic cultural system to organic culture from the very first year. The harvest is advanced by 15 days in all the crops.It not only enhances the shelf life of vegetables, fruits and grains, but also improves the taste. By reducing or replacing costly chemical inputs, Panchagavya ensures higher profit and liberates the organic farmers from loan.

Dosage of Panchagavya recommended for field application

- **Spray system**

3% solution was found to be most effective compared to the higher and lower concentrations investigated. Three litres of Panchagavya to every 100 litres of water is ideal for all crops. The power sprayers of 10 litres capacity may need 300 ml/tank. When sprayed with power sprayer, sediments are to be filtered and when sprayed with hand operated sprayers, the nozzle with higher pore size has to be used.

- **Flow system**

The solution of Panchagavya can be mixed with irrigation water at 50 litres per hectare either through drip irrigation or flow irrigation

- **Seed/seedling treatment**

3% solution of Panchagavya can be used to soak the seeds or dip the seedlings before planting. Soaking for 20 minutes is sufficient. Rhizomes of Turmeric, Ginger and sets of Sugarcane can be soaked for 30 minutes before planting.

- **Seed storage**

3% of Panchagavya solution can be used to dip the seeds before drying and storing them.

Advantages of Panchagavya

- It improves soil health and fertility
- It is used against pest and diseases
- It increases yield and quality of produce
- No chemicals are used
- Eco-friendly approach
- Cost required for preparation is less
- No special techniques is required
- It gives multiple uses
- Reduces cost of cultivation by reducing chemicals like fertilizers,, pesticides,
- Fungicides, growth regulators etc
- Farmer friendly method

Conclusion-

The increasing concern for environmental safety and global demand for pesticide residue free food has evoked keen interest in crop production using eco-friendly products which are easily biodegradable and do not leave any harmful toxic residues besides conserving nature. So it is necessary to use natural products like Panchagavya to produce chemical residue free food crops and hence Panchagavya can play a major role in organic farming.

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Vol.1 Issue-1, September,2020

Diseases and insect pest management in *kharif* maize

Pallavi Priya and Raman Kumar*
BFIT, Dehradun
*Corresponding author: ramankumar927@gmail.com
ARTICLE ID: 039

Maize is one of the most important cereal crop after wheat and rice in India as well as in Punjab also. It is grown in almost all states of India. It covers an area of about 116 thousand hectares in production and its productivity is nearly about 38.5 q/ha during 2016-17 in punjab. Maize is mainly a short duration crop. In India, Maize is traditionally grown during *Kharif* season, but now days the farmers are growing Maize throughout the year especially in North Indian states Punjab, Haryana. Out of total Maize production 50-60% is used in poultry and dairy, 15-20 in processing industry , 8% in human consumption and rest in seed purposes etc. Being as an important cereal crop it is also an important fodder crop in different regions of India, as it conveniently fits into various crop rotations. Maize crop is profitable crop for farmers, but 30-78% loss of Maize yield is due to effect on insects, pest and diseases in various agro climatic regions of India. Major diseases attacking Maize crop are leaf blight and bacterial stalk rot. So, to prevent losses from these insects pests and diseases, integrated disease management and integrated pest management should be followed.

DISEASES

Seed Rot and Seedling Blight

General symptons of these diseases are poor emergence or patchy growth, rotting of seed in the collar region of mescotyle, presence of redbrown lesion on radicles or mesocotyle and wilting of seeding. To control them treat the 3g of Bavistin or Thiram per kg of seed.

Maydis Leaf Blight

This disease starts appearing from the first week of July, throughout the state. Symptons appear as spindle shaped water soaked chlorotic lessions on the leaves, which later coalesce to give blighted appearance to the leaf. In extreme cases, the symptons also appear on leaf sheaths, cob husk and ears. Though the hybrids recommended cultivation in the state as it posseses resistance to maydis leaf blight , yet it has due significance in inbred lines, breeders seed plots and hybrid seed production plots. The diseases is caused by fungus Drechslera maydis, The secondary inoculum is transmitted by air. It is mainly found in waterlogged conditions as well as in late sown conditions.

It can be controlled by two to four Mancozeb 75 WP (2.5 kg in 1000 litres of water per hectare)

Bacterial Stalk Rot

This bacterial disease occurs at pre-flowering stage of the crop and becomes severe in heavy soils under high temperature and humidity conditions. It is caused by bacterium *Erwiniacarotovora* var Zea. Frequent rains and waterlogged conditions in the month of August and September aggravate this problem. The basal internodes develop soft rots and emit characteristic fermenting odour. The rind loses its natural green colour and becomes pale straw coloured as if boiled in water. Basal internodes become soft , discoloured and give a abad fermenting smell. Ear shoots and cobs occasionally get infected directly, but these droop down and hang limply on the infected plant. Ultimately, the stalk breaks and the plant collapse.

To minimize the yield losses, farmers are advised to keep their fields well drained and must not allow water to stagnate. Dense planting should be avoided. Ridge sowing should be preferred than flat sowing in disease prone areas of Punjab. Use of improved varieties along with destruction of diseased debris in affected fields helps to reduce the incidence of this disease.

Control Measures:

1. Select well drained field or arrange proper drainage to avoid water logging.

2. Bleaching powder should be applied along the rows at the rate of 20-25 kg per hectare.

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Black Bundle Disease

Blackening of vascular bundles appears as black dots on the cut ends of the stalk. In severe cases, leaves dry and plants wilt. Ears may rot or may not form at all. To control this disease treat the seed with systematic fungicides like Bavistin or Benlate at the rate of 3g per kg seed.

Post-flowering Stalk Rot

Post flowering stalk rot is a complex caused by number of fungi, out of which, charcoal rot caused by *Macrophomina phaseolina* and Fusarium stalk rot caused by *Fusarium moniliforme* cause economic damage to maize crop under Punjab conditions. The symptoms of the disease become more conspicuous, when plants show premature drying. The pathogen commonly attacks the roots, collar region and lower internodes. The affected internodes become pale, pith become soft and spongy, resulting in deterioration of the vascular system. The disease includes rapid wilting and premature drying at or after flowering. The infected stalk show reddish browning of parenchymatous tissues.

The most economical and efficient method of disease control is the cultivation of resistant hybrid-PMH 1. Its 'stay green' character imparts resistance to stalk rot pathogens. Water stress at flowering predisposes the plant to infection. Crop sanitation, adequate balanced fertilizers and recommended plant density are required to reduce the incidence of disease. Healthy and vigorous plants are more tolerant to post flowering stalk rot disease and thus, able to produce comparatively higher yields.

Banded Leaf and sheath blight

Apart from the above mentioned diseases, yield losses due to banded leaf and sheath blight have increased in the past with cultivation of susceptible cultivation of susceptible cultivars of maize. This disease starts appearing after 35-40 days old plant. The infected leaves show blotched or blighted appearance with alternating light and dark bands. The pathogen is generally identified by characteristics of mycelium and sclerotia as it lacks spore formation. Maximum damage is caused when ears are infected. Severe infection produces blotching on sheaths and cob husks, and later sclerotia develop on sheaths, husk leaves, silks and kernel rows. Crop rotation and removal of lower leaves touching the soil is very effective in reducing the disease spread.

Insect Pests

Maize Stem Borer

Maize stem borer is active from March to September in Punjab. It is more serious at the end of May to mid-June sown crop, afterwards the incidence reduces with the onset of rains. The moths lay egg clusters (25-50eggs) on the under surface of leaves of 10 to 15 days old maize plants. Thus, that control measures should be started at early crop growth stages. Moreover, the young larvae scraping on leaf surface are easily exposed to the spray chemicals, while, the grown up larvae enter deep into the stem and are difficult to control. A single female lays upto 300 oval, light yellow eggs.

The newly hatched larvae of maize stem borer feed by scrapping and cause pinhole injury and grown up larvae tunnel down into the stem. In younger plants, due to boring by larvae, the central shoot dries up to from ‘dead heart’. The larvae per plant may vary from 1 to 15 or even more under severe infestation and migrate to neighbouring plants by wind with the help of silken thread. So, damage in field is sometimes observed in patches. In advanced stages of plant growth (>45 days), the infestation of borer rarely causes complete loss of plant i.e. dead formation.

Management

- The management of any pest should be based on environment friendly pest management approaches. In maize, two releases of *Trichogramma chilonis* parasitized Corcyra cephalonica eggs @ 40,000 per acre recommended at 10 and 17 days old crop. The trichocards with these eggs are available at PAU, Ludhiana. Cut them into 40 strips, each having approximately 1,000 parasitized eggs. These strips should be stapled on the underside of the central whorl leaves (as the eggs are laid on underside) during evening hours.
- Also follow the cultural practices like:

(1.) Since borer hibernates in plant remnants like stubbles, stalks, left over cobs, to reduce them, plough up the fields after harvesting, collect and destroy the stubbles.

(2.) Use maize stalks, cobs and cores kept for fuel purpose by the end of Feb. Chop the remaining stalks, if any, for subsequent use. These practices will reduce the carryover of the hibernating borer larvae.

(3.) To reduce further spread of borer in the standing crop, minimize larval dispersal by removal and destroying of the plants showing severe borer injury.

- Alternatively, spray on the crop should be done 2-3 weeks after sowing on the appearance of first leaf injury using 60 litres of water with Decis 2.8 EC (deltamethrin) @ 80 ml or Coragen 18.5 SC (chlorantraniliprole) @ 30 ml per acre.

Maize Leaf Roller

Damage is caused by the caterpillar which is glossy green in color and becomes pink when fully grown up. The larvae after emergence wander on the tender leaves. They fold the leaves by silkng threads and hide themselves inside the rolled leaves. The surface becomes white and paperu in appearance.

Control Measures:

Spray Endosulphan (0.1%) or 0.2% Carbaryl (4g of Savin 50 WP in one litre of water) at the rate of 500-700 litres per hectare.

Kharif Grass Hopper

Kharif Grass Hopper generally does not cause much damage to maize crop. However, in a favourable season, it may prove very harmful and leaves nothing on the plant except stem and midribs of leaves. Both adult and nymph stages of this pest are responsible for the damage. Adults are green or dry grass coloured.

Control Measures: Grass hopper can be controlled by dusting 2% Methyl parathion dust at the rate of 20 kg per hectare. For well grown nymphs and adults, spraying with 0.04% Carbaryl (Sevin) at the rate of 500-800 litres of water per ha is effective.

Armyworm:

Its attack is relatively more on the border rows. It feeds on the leaves of the central whorl but it does not make pinholes/shot holes like maize borer. It feeds from the outer margins of the leaves towards midrib. The damage of this pest can be detected from its faecal pellets on the leaves or in the whorl. The insecticides used against the maize borer are effective in controlling this pest also.

Silk Cutter

A number of lepidopteran insect pests like hairy caterpillars, armyworm and semi loopers feed on the silk of green cobs but American bollworm is more damaging as it occurs in large number sporadically. The young larvae feed silks and may tunnel in ears damaging the grains in the milky stage. However, only a few grains are damaged in the mature cobs but the presence of masses of excreta on the attacked ears lowers its market value of green cobs. The insecticides used against the maize borer are effective in controlling this pest also.

Vol.1 Issue-1, September,2020

Recent Advances in Rose Cultivation

Raj Kumar Chaurasiya
Assistant Professor
Department of Horticulture, ITM University, Gwalior, MP
ARTICLE ID: 040

Introduction-

- Botanical Name- *Rosa centifolia* L, *Rosa damascena* Mill. *Rosa alba* L. Etc
- Family: Rosaceae
- Kingdom: Plantae
- Class: Magnoliopsida
- Genus: Rosa
- The stem is prickly.
- The leaves are alternate and pinnately compound.
- The oval leaflets are sharply toothed.
- The fleshly berry like fruit is known as hip.
- Roses have a determinant inflorescence that may assume corymbs, paniculate or solitary form.



Uses

Roses are best known as ornamental plants.

- Some are used as landscape plants, for hedging.
- Roses are a popular crop for both domestic and commercial cut flowers.
- Rose perfumes are made from attar of roses or rose oil.
- Rose water, made as a byproduct of rose oil production.
- Rose hips are occasionally made into jam, jelly, and marmalade.

- Roses are also used in herbal and folk medicine.

Environmental factors:

- Temperature (Day: 18-28 and night: 15-18o C)
- Light (Photoperiod over 12 hours and intensity: 6000-8000 foot candles)
- Relative humidity (50-60 %)
- Aeration (Good in air and soil)

Soil requirement and preparation

- Preparation of soil is the key to success in roses.
- Although any soil is good for rose cultivation provided it has proper drainage.
- The ideal soil should be medium loam having sufficient organic matter, with a pH of 6.0 and 7.5.
- The soil should have a fine tilth up to a depth of 50 cm and should have a good drainage facility.
- The soil should be free from gravel, stones, brick pieces and other foreign material and exposed to sun for at least a week.
- If the soil is deficit of organic matter then 10-12 per cent of additional organic matter may be added to it.
- Upon land preparation, beds/ plots of 1- 1.5m wide and 30-40m long should be prepared.

Planting and spacing

- Before planting, the top 30 cm soil from the pits should be removed.
- The plant along with the earth ball may be gently lowered into the pit, keeping the main stem in the centre of the pit
- The bud union point where the scion joins the stock is kept just above the ground level.
- Generally, in temperate countries the bud union point is kept below the ground level.
- While planting it is necessary to spread out the roots evenly.
- The soil is returned to the pit and firmed towards the center.

- The plant must be watered copiously immediately after planting.

Spacing -

- Cut flower production – 60 x 30 cm
- Oil extraction – 2.5 x 0.5 m
- Vigorously growing cultivars- 60 x 75 cm / 75 x 75 cm
- Polyanthas – 45 cm
- Miniatures – 30 cm
- Climbing types – 3 m

Different classes of roses and Varieties-

There are different classes of roses according to the type of flowers they bear:

(A) Hybrid Tea

- This is the most important class of roses.
- The flower buds of this class are longer and look beautiful.
- The flower spikes are also longer.
- Red: First Red, Happiness.
- Yellow: Aalsmeer Gold, Gold Medal.
- Orange: Super Star, Summer Holiday.
- Bi-colour: Anvil Spark, Mudhosh.
- Scented: Avon, Granda.

(B) Floribunda

- There is profuse flowering in this class of roses but the flowers shed soon.
- That's why this class of roses is largely used for decoration and bedding purpose.
- The important varieties under this class are as follows:
- White: Iceberg, Summer Snow,
- Pink: Prema, Sadabahar,
- Yellow: Arthur Bell,
- Mauve: Neelambari,

- Orange: Doris Norman, Suryakiran,
- Bi-colour: Charisma, Mask Red.
- Scented: Angel Face, Delhi Princess

(**C) Polyantha-**

- The rose plants of this class are small and the flowers come in cluster.
- The main varieties of this class are Anjani, Rashmi, Nartaki, Priti, Swati, etc.

(D) Miniature –

The roses of this class are dwarf in stature and the twigs and the leaves are also small.

- The flowers of this class are used in flower arrangement:
- Red: Beauty Secret, Dark Beauty.
- White: Green Ice, Z-Trail.
- Pink: Windy City, Sweet Fairy.
- Yellow: Baby Gold Star, Kale Gold.
- Orange: Angel Ripyance.

(E) Climber

The branches of these roses are soft and spread like climber.

They flower at the end of the branches in small clusters.

They are used for raising over the pergolas and the walls.

The important varieties are as follows:

Red: Climbing Crimson Glory, Blaze.

White: Delhi White Pearl, Shelderer White.

Pink: Climbing Show Girl, Lady Water Loo.

Lemon: Miracle Neel, All Gold.

Manure and Fertilizer-

Manuring-

After pruning in October and again in July the plants are manured with FYM 10 kg and 6:12:12 g of NPK per plant.

Micronutrients -

Foliar application of 0.2% micronutrient mixture containing 20 g $MnSO_4$ + 15 g $MgSO_4$ + 10 g $FeSO_4$ + 5 g B (2g of the mixture is dissolved in one litre of water) can produce bright coloured flowers.

Biofertilizers -

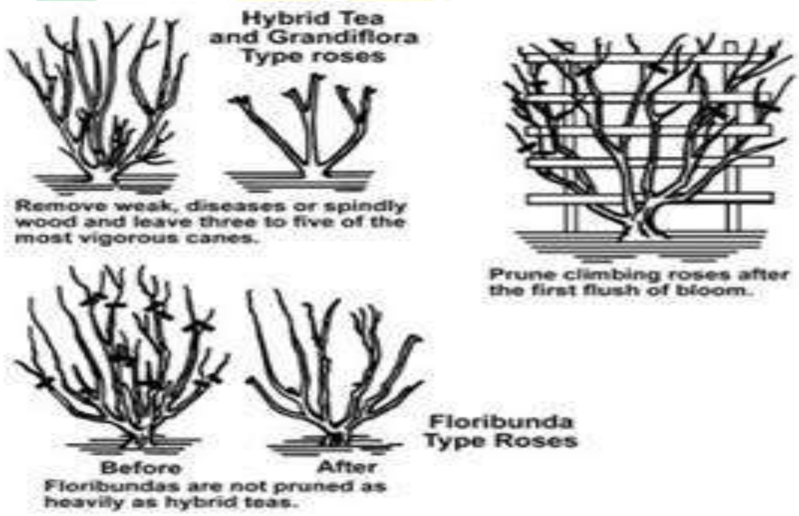
Soil application of 2 kg each of Azospirillum and Phosphobacteria per ha at the time of planting and also mixed with 100kg of FYM and applied in pits.

Pruning and Time of pruning-

Pruning is the removal of unwanted and unproductive portions of the plant and makes the plant more vigorous and productive.

Time of pruning –

Exactly 45 days prior to the date of requirement of flowers during October-December. Pruning is necessary when the yield and quality declines



Diseases and their Management-

1- Dieback (Diplodia rosarum)

Control - For its effective control, the infected portion should be dehisced and burnt and the cut ends should be painted with Bordeaux paste, application of optimum dose of fertilizer and by facilitating proper drainage or spray of 3g/ litter of Copper oxychloride (50%).

2- **Black spot (Diplocarpon rosae)**

It can be easily controlled by spraying Carbendazim (1g/litre of water) or Captan (0.2%) fungicide at fortnightly intervals.

3- Powdery mildew

Spray Carbendazim 1 g/lit or Wettable sulphur at 2 g/lit for controlling powdery mildew

4-Botrytis Blight

Cut and destroy all infected blossoms as soon as they droop or die. Spray carbendazim @ 1 g or Chlorothalonil 2 g or Mancozeb 2 g or Azoxystrobin 0.5 g or Thiophanate methyl 0.5 g/ litre of water.

5-Crown gall

Protect plants from injury on stems during cultivation.

Maintain vigor with fertilization and watering.

Remove and destroy badly infected plants and do not replant in that area for at least five years.

Insects Pest and their management-

- **Aphids (Macrosiphum rosae)**

  This can be effectively controlled by spraying 0.1% Malathion or Metasystox (0.1-0.2%) or Rogor (0.1-0.2%).

- **Red scale (Lindigapsis rosae)**

  These pests can be controlled by spraying Malathion (0.1%) or Parathion (0.25%) in April and again in October.

- **Rose chaffer beetle**

  Hand pick Cetonid beetles and destroy during day time. Spray Quinalphos 25 EC @ 2 ml/lit.Setup light trap to attract *Holotrichia* and *Anomala* spp to have check on the pest.

- **White grub**

  White grub can be controlled Set up light to attract Holotrichia and Anomala spp. and Spray phosalone 35 EC @ 2 ml/lit.

- **Mealy bug**

  Mealy bugs can be controlled by spraying Monocrotophos 2 ml/lit or Methyl parathion 2 ml/lit.

- **Bud worm**

  Bud worms can be controlled by spraying Monocrotophos 36 WSC 2 ml/lit at fortnightly interval during flowering.

Physiological disorders-

Bull heads or malformed flowers-

The center petals of the bud remain only partly developed and the bud appears flat.

- They are common on very vigorous shoots, particularly bottom breaks, and it is possible that there is a lack of carbohydrates to develop the petals.
- The cause of bull heading is yet unknown, however, thrips infestation will also cause malformed flowers.
- Also at low temperature, some varieties will form bull heads.

Blind wood

- The normal flowering shoot on a greenhouse rose possesses fully expanded sepals, petals, and reproductive parts.
- The failure to develop a flower on the apical end of the stem is a common occurrence.
- Such shoots are termed as blind wood.
- The sepals and petals are present, but the reproductive parts are absent or aborted.
- Blind wood is generally short and thin, but it may attain considerable length and thickness when it develops at the top of the plant.
- This may be caused by low temperature, insufficient light, chemical residues, insect, pests, fungal diseases and other factors

Limp necks

- The area of the stem just below the flower "wilts" and will not support the head.
- This may be due to insufficient water absorption; cutting off the lower 1 to 2 inches of stem and placing the cut stem in water at 37°C will revive the flower.

Colour fading

- The off- coloured flowers are seem to be a problem with some yellow varieties.
- In these varieties the petals may be green or a dirty white instead of a clear yellow.
- Raising the night temperature several degrees will reduce the number of off-coloured flowers.
- Occasionally the pink or red varieties develop bluish-coloured flowers.
- This is very often associated with use of organic phosphate and various other kinds of insecticides.

Yield-

- Loose flowers: 7.5 t/ha
- Cut flowers: 1st year: 100-120 Flowers/m2

  2nd year: 200-240 flowers/m2

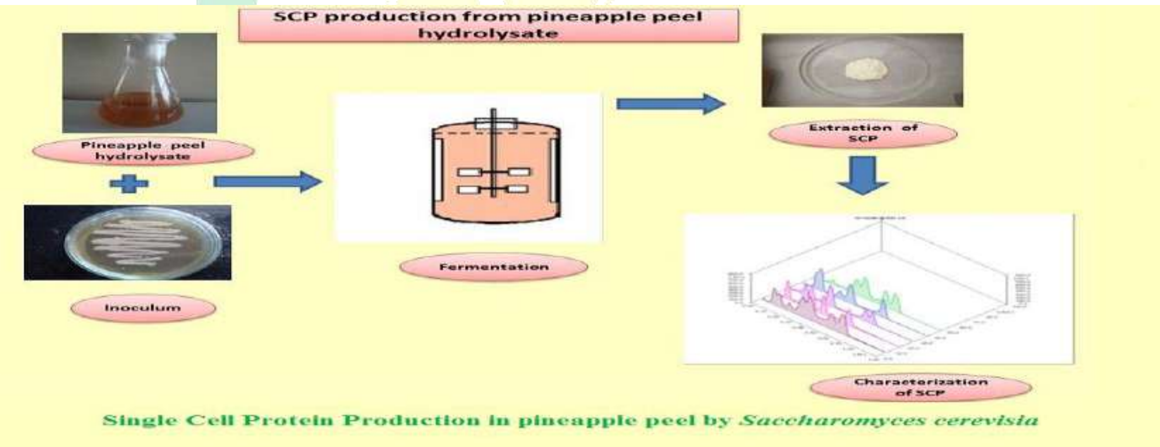
  3rd year: 300-360 flowers/m2

Single Cell Protein:- A Review

Anuradha Kumari
Senior Lecturer,
Ganga Memorial College of Polytechnic, Harnaut, Nalanda.
Email ID - anurakhi08@gmail.com
ARTICLE ID: 041

Introduction

Single-cell protein (SCP) refers to the microbial cells or total protein extracted from pure microbial cell culture (monoculture) which can be used as protein supplement for humans or animals. The word SCP is considered to be appropriate, since most of the microorganisms grow as single or filamentous individuals. This is in contrast to complete multicellular plants and animals.



If the SCP is suitable for human consumption, it is considered as food grade. SCP is regarded as feed grade, when it is used as animal feed supplement, but not suitable for human consumption. Single-cell protein broadly refers to the microbial biomass or protein extract used as food or feed additive. Besides high protein content (about 60-80% of dry cell weight), SCP also contains fats, carbohydrates, nucleic acids, vitamins and minerals. Another advantage with SCP is that it is rich in certain essential amino acids (lysine, methionine) which are usually limiting in most plant and animal foods. Thus, SCP is of high nutritional value for human or animal consumption.

It is estimated that about 25% of the world's population currently suffers from hunger and malnutrition. Most of these people live in developing countries. Therefore, SCP deserves a serious consideration for its use as food or feed supplement. In addition to its utility as a nutritional supplement, SCP can also be used for the isolation of several compounds e.g. carbohydrates, fats, vitamins, minerals.

Advantages

- The SCP is rich in high quality protein and is rather poor in fats, which is rather desirable.
- They can be produced all the year round and are not dependent of the climate (except the algal processes).
- Some SCPs are good sources of vitamins, particularly B-group of vitamins, as well, e.g.. yeasts and mushrooms.
- Mushrooms are considered as delicacy in the human diet.
- At present, SCP appears to be the only feasible approach to bridge the gap between requirement and supply of proteins.
- They use low cost substrates and, in some cases, such substrates which are being wasted and causing pollution to the environment.
- The microbes are very fast growing and produce large quantities of SCP from relatively very small area of land.
- They use low cost substrates and, in some cases, such substrates which are being wasted and causing pollution to the environment.

As compared with traditional methods of producing proteins for feed or human foods, large scale production of the microbial biomass includes the following advantages:

1. Microorganisms have high rate of multiplication.
2. Microbes possess high protein content.
3. They can utilize large number of carbon sources.
4. Strains with high yield and good composition are produced easily.
5. Microbial biomass does not depend on seasonal and climatic variation.

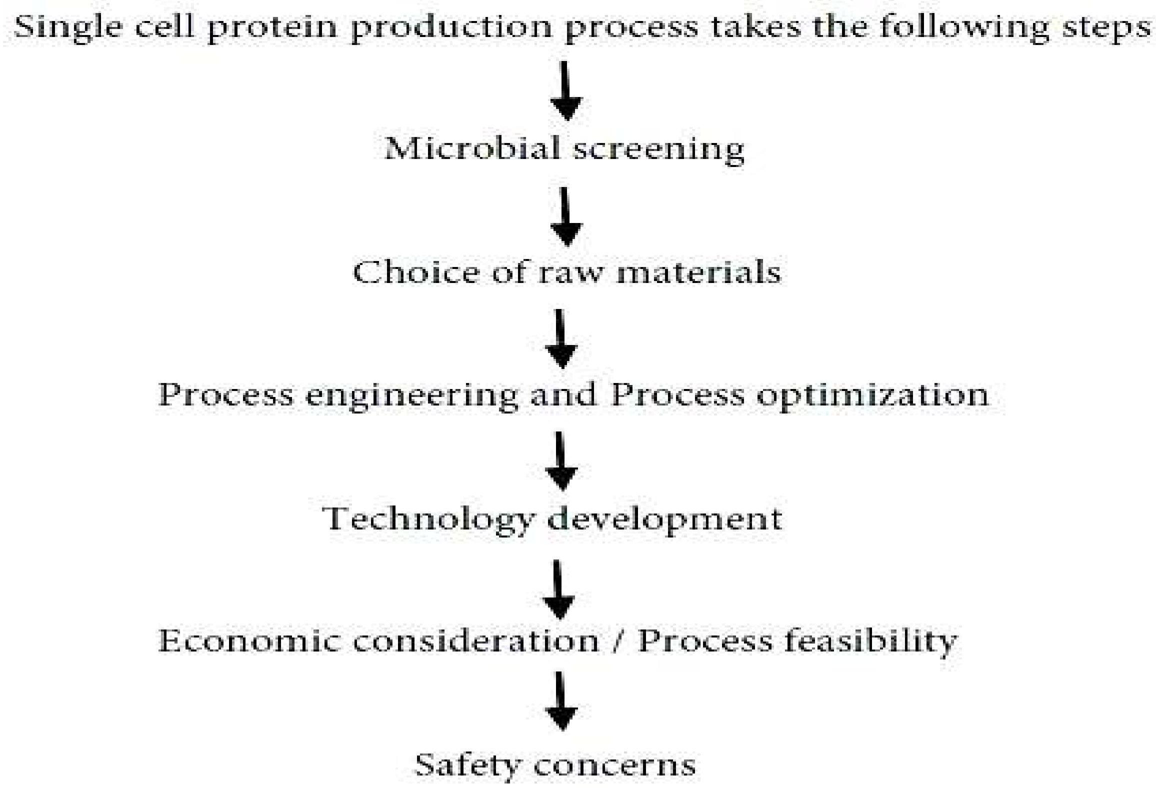
Economic Aspects

Development of SCP processes has always been driven by a need for protein, and this continues to be an important driver in the development of both old and new processes. The valorization of readily available substrate and waste streams has also been a strong driver and continues to be so. SCP is frequently seen as a potential co-product that could strengthen the economic potential of an otherwise unprofitable bio refinery process, as well as a means of reducing the downstream processing costs required to dispose of process waste. Selling residual biomass as feed is preferable to selling as fertilizer. This is seen in the numerous publications and patents (not addressed in this review) in which specific waste products are converted to SCP and are assessed as food for specific animals. However, environmental concerns also now play a strong role in driving the development of novel SCP products. This is seen particularly in the processes which utilize greenhouse gases: algal SCP from CO2 and bacterial SCP from methane. Such processes are unlikely to be economically viable in the short term, since there are still many problems to overcome in large scale cultivation, but may survive where they are able to benefit from a green premium. In addition, environmental concerns, as well as economic concerns, are helping to drive the development of products from waste streams.

Apart from the environmental benefits, the key elements in estimating the economic viability of a SCP production process are total product cost, capital investment and profitability. Ugalde and Castrillo (2002) estimated that in fungal SCP production 62% of the total product cost would come from the raw material and 19% from the production process. According to Aggelopoulos et al. (2014), raw material costs vary from 35 to 55% of the manufacturing costs, whereas the operation costs, including labour, energy, and consumables take 45–55%. Utilizing side-streams and waste biomass is sometimes viewed as a means to reduce the substrate costs, in cases when the substrate does not compromise the usability of the final product.

Scale is also important to the economic viability of SCP production. An empirical relationship exists between cost and scale of production. operations have been proven to be the most profitable ones and the majority of the SCP processes which have been implemented at industrial scale have been adjusted to continuous design (Ugalde and Castrillo, 2002). On the other hand, small scale, household production of some products may become feasible, in much the way that home yoghurt production or mushroom production has, and as has been suggested for plant cell nutrition without plants (Poutanen et al., 2017).

Flow chart of single cell protein.



Single Cell Protein (SCP) offers an unconventional but plausible solution to this problem of protein deficiency being faced by the entire humanity A list of the microorganisms used for the production of Single Cell Protein is as follows:

Fungi

- *Aspergillus fumigatus*
- *Aspergillus niger*
- *Rhizopus cyclopean*

Yeast

- *Saccharomyces cerevisiae*
- *Candida tropicalis*
- *Candida utilis*

Algae

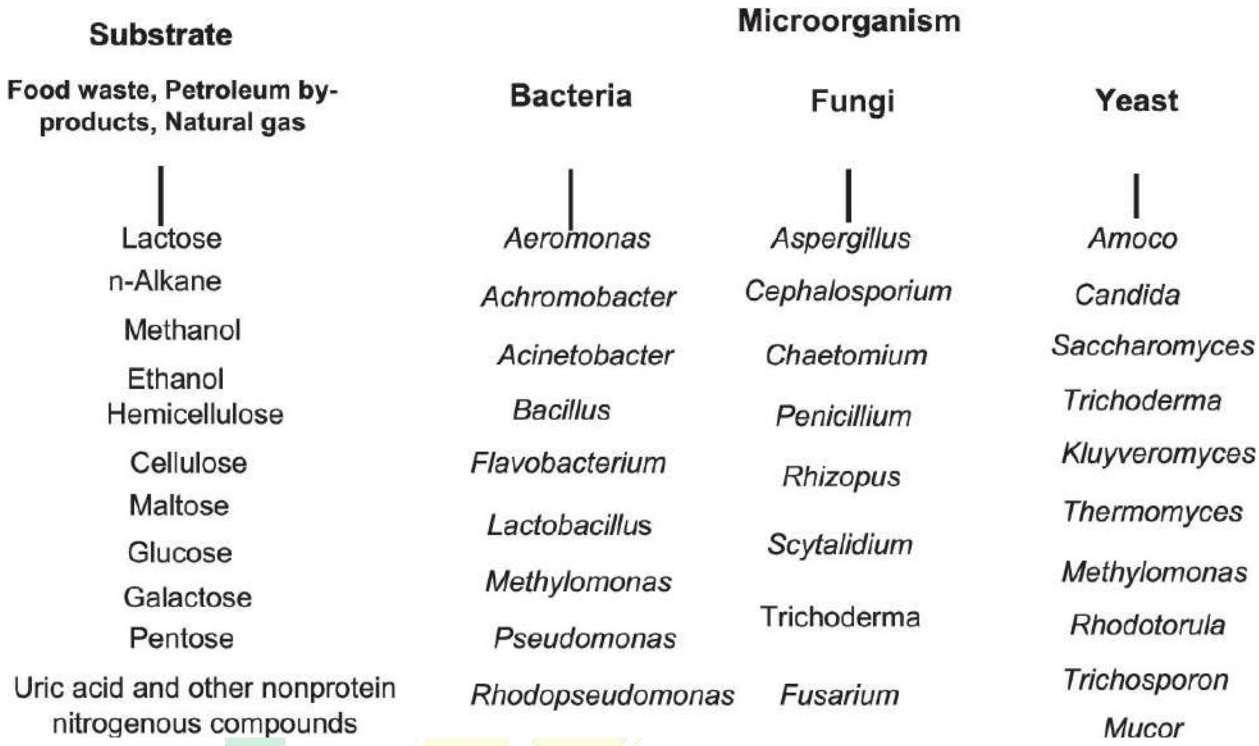
- *Spirulina (spa)*
- *Chlorella pyrenoidosa*
- *Chondrus crispus*

Bacteria

- *Pseudomonas fluorescens*
- *Lactobacillus*
- *Bacillus megaterium*

Here are the average compositions of the different microorganisms present in the % dry weight of Single-cell protein.

Composition	Fungi	Algae	Yeast	Bacteria
Protein	30-45	40-60	45-55	50-65
Fat	2-8	7-20	2-6	1-3
Ash	9-14	8-10	5-10	3-7
Nucleic Acid	7-10	3-8	6-12	8-12



Disadvantages of Single-Cell Protein

In spite of many advantages, there are few drawbacks. Single-Cell Protein has not been widely accepted for human consumption owing to certain problems as follows:

- High level of nucleic acid in biomass makes it difficult for consumption as it may lead to gastrointestinal problems.
- The biomass may trigger an allergic reaction if the digestive system recognizes it as a foreign product.
- The presence of nucleic acids in high content leads to elevated levels of uric acid.
- In certain cases, the development of kidney stone and gout if consumed in high quality.
- Possibility of the presence of secondary toxic metabolites which results in Hypersensitivity and other skin reactions.
- The capital cost of production is high as sophisticated machinery is required.

Conclusion

Single cell protein (SCPs) with rich protein (60-70%) with a high concentration of vitamins B complex and low-fat values are suitable for human and animal consumption. The use of SCP as food ingredient is still in stages of development. There are a lot of prospects concerning improvement of using SCP in various means. Genetic engineering could enhance the synthesis of SCP with huge yield with no toxic by-products produced with the SCP. The application of agro-industrial waste in bio-processes such as cultivation of SCP provides a solution to the pollution problems. Further research and development will facilitate the usage of SCP as a supplement in diet in developing and underdeveloped countries to fight against malnutrition.

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Rodents: Existence Based on Human Behaviour

Priyanka Rana[1], Antul kumar[2]
[1] Research Scholar, *Department of Zoology, Punjab Agricultural University, Ludhiana*
[2]Research Scholar, *Department of Botany, Punjab Agricultural University, Ludhiana*
ARTICLE ID: 042

Introduction

Rodents have become the major problems for researchers, farmers, businessmen, organizations and home owners. Modern culture has given the title to rat's as 'bed rep' and it is quite understandable because in 1960s the rat's swarms in north eastern India uprising the political issue by devour the 80 tons of seed from bamboo forest and devastate the local agriculture. These little crafty creatures not only create problems to farmers, but also affected the urban communities. Expect Antarctica, rodents become the most successful populating mammals with about 2227 species diversity belonging to order Rodentia with traits like small size, short breeding cycle and ability to eat anything on the earth after *Homo sapiens*. Two urbanities species, *Rattus rattus* and *Rattus norvegicus* are pretty much live where human do i.e., New York city estimates about 2 million rats reported in 2014.Amoung, all rodents are considered pests and many of species are important part of the food chains and play important carrier for spreading of spores and seeds ecologically.

The impact of COVID-19 on rodents

The rats can take advantage of human failure and survive very cleverly i.e., Trains, planes, automobiles, sewer lines, electrical lines, any crack or crevice (½ in height and width) are usually utilized by rodents for shelter and food. 'To gnaw' is the real mean of rodents and it creates the major problem by gnawing the wire or an airplane or a wire on a subway or the wire of home. Rats survival in human dwelling areas is totally depend on human behaviour i.e., the amount of solid waste human generates every year steadily rising for decades. During the shutdown period there is decrease in food available to rodent's s leading to their unusual behaviour due to COVID-19. Dr. Bobby Corrigan says that rats have lost a central source of food after corona virus outbreak led to the closure of restaurants across the country and now the wild rodents may become unusually violent as they fight for survival. He further added that there is going to war with each other and struggling within their community for the meal they can discover. But probably there is no difference found in the rats that live and eat in residential blocks during this COVID-19. Facing starvation; some rats have been turned to eating their own young. According to centre for disease control and prevention, as these rats move to new areas in search of food, they also can bring with them fleas and rodent borne disease. Their urine can also worsen allergies and asthma, particularly in children.

Can we get permanent rid of rodent's population?

Rats have thrived for centauries as a major pest because of human behaviour. Human in response often blamed the rodents and spend lots of money in developing different techniques to control rat's population, for example, the use of rodenticides, repellents, reproductive inhibitors, hunting and biological control. Human usually failed by using theses common approaches to managing rats. The researchers from worldwide realized that rats behaviour contribute less to infestation than do humans. To address the problem of rodents effectively, we must know firstly the wild rodent's ecology. With the availability of better sources of food, they successfully adopted in human area and reproduce remarkably i.e., *Rattus norvegicus* can give the birth up to 12 pups in a litter and each pup contribute in population rise within 6 weeks. Rodentologist always point the people need to change their behaviour for rat control. However, roots of rats are deep in our society, the researchers and people together need to examine and understand how human daily habits can helpful in balancing the rodent population ecologically. We need to aware the society about this toughest issue and find out the best favorable ways to manage rodent problems effectively and humanely.

Should the whole world needs to adopt Alberta model to solve the rodent problems?

Less than 10 % rodent species act as pest worldwide and causes annual harvest losses as 17%. The governments of affected countries are spending average cost for rodent control is $331-1200billion each year. New York decided to spend $32 m to battle against rats in 2017 and Mumbai the busiest city of India faces the most vehicle fire issue by rats. While the whole world suffering with rodent's problem there is well known country that with the help of their citizens got the success in the outbreak of rodent's population. But for the world it is remain a question. How did they achieve a feat unparalleled anywhere in the world? Was it Alberta's good luck or was the result of strategic genius? Or by keeping rats out what the Albertans gained? Rats were declared as a pest in Alberta during 1950's. By making rat control mandatory, rodenticides were used to kill rats and sanitized the buildings that might shelter them in along with the eastern border. There was establishment of rat control zones by government of Alberta and PCOs (Pest control officers) teams were appointed. Not only this, the government also decided to begin public education to encourage their contribution towards their nation. Many of the Albertans had never seen the Norway rats so government started a campaign and thousands of posters were released to distinguish them from native rodents. Many slogans were used like 'Kill Rats at Sight' and 'He's A Menace to Health, Home, Industry' cast the rats as invaders and leaned heavily on war-time rhetoric and good farmer, who kept a tidy homestead, versus bad farmer, who was sloppy and endangered his neighbors. With began of year 1950s, there were 500 reported rat's infestation in each control zone but with the efforts of government and people, the Alberta had successfully got dropped the number significantly within a decade. There were reported about 50 rats every year and in 1990s there were only 10-20 rats left in selected zonal area and reached to zero infestation in 2003. \ With this the governments solve the problems and what he gained from keeping out the rats, it is well answered by Alberta to the world by utilize save currency from rodent control program to their people's development.

Conclusion

Any organism becomes pest because of human activities. So firstly we should change our behaviour. We should utilize the COVID-19 period for the management of rodents said by Famous rodentologist Dr Bobby Corrigan in the 85th annual Purdue Pest Management Conference, 2020 held at Indiana, US. As rats considered the biggest issue, they are also exhibit contrition and empathy like characters. We don't need to get rid them from earth permanently and they can live with human being happily without expensive loss.

Vol.1 Issue-1, September,2020

SCOPE, PROGRESS AND CONSTRAINTS OF FARM MECHNAIZATION IN INDIA

Tanubala
UISH, Chandigarh University (Mohali)
Corresponding author:tanuwala123@gmail.com

ARTICLE ID: 043

ABSTRACT

In the context of increasing commercialization of agriculture, mechanization is very important. There has been increase in the use of farm machinery in Indian Agriculture as it contributed to the increase in output due to timeliness of operations and increasing precision in input application. Most of the mechanical inputs have displaced human and bullock lab our, which is socially unjustified. Some states like Punjab, Haryana excelled in farm mechanization, but have experienced it as over- investment. There cannot be going back from mechanization but we frame suitable policies such as liberalizing land lease market, encouraging cooperative management and custom hiring of machinery,

INTRODUCTION-

The technological improvements in Indian agriculture since mid sixties have brought about revolutionary increase in agricultural production. Interestingly, the growth rate of food grain production particularly in case of wheat and rice was much higher than the growth rate of population. The country was facing acute food shortages till eighties has now become not only self sufficient but also a net exporter of food grains. This has been made possible due to evolution of high yielding crop varieties, increased use of chemical fertilizers, development of irrigation facilities and plant protection measures accompanied by effective price support programs of farm products.

SCOPE OF MECHANIZATION –

Farm mechanization has been helpful to bring about a significant improvement in a agricultural productivity. Thus, there is strong need for mechanization of agricultural operations. T he factors that justify the strengthening of farm mechanization in the country can be numerous. The timeliness of operations has assumed greater significant in obtaining optimal yields from different crops, which has been possible by way mechanization. For instance, the sowing of wheat in Punjabi was done up to the first fortnight of November. A delay beyond this period by every one week leads to about 1.50 quintals per acre decrease in the yield. This is also correct in the case of other crops and for other farm operations like hoeing, irrigation, harvesting, threshing and marketing which need to be performed at appropriate time otherwise the yield and farm income is affected adversely

CONSTRAINTS IN MECHANIZATION

It is true that farm mechanization has shown good results as of raising the agricultural production and improving the standard of living of cultivators within very short period. But a number of arguments have been advanced against farm mechanization such as:

1. Smallsizeandscatteredholdingsofthefarmersstandinthewayofmechanization. As a result of this, farm machinery generally remains under-utilized.
2. Majority of small cultivators are poor who are not in a position to purchase the costly machinery like tractors, combine harvesters etc.
3. The use of tractor operated machinery may render some of the draft cattle population surplus. Studies under AICRP on Energy Requirement indicate that tractor owning farms do use draft animals for certain jobs. Like-wise farms using animate sources of farm power, use tractor on custom service for certain jobs.
4. The farm machinery have large turn ingredient and thus require comparatively larger farm for economical use. Mechanization may lead to structural change in agriculture in respect of the occupational distribution in the rural economy. There is great shortage of diesel in the country as a whole. Thus, to use so extensive oil based farm machinery is not desirable

PROGRESS OF FARM MECHANIZATION

The traditional farm tools and implement mainly relied on use of animate power. Improved farm tools, implements and machinery, which use both animate and mechanical power were devised from time to time. The average size of farm holding being small, animate power is widely used in many parts of the country. Mechanical power is making its impact in Indian agriculture with steady increase in land and labor productivity. The traditional animal operated country plough although give low output and require higher number of field operations are still being used by majority of the farmers. Animal Drawn cultivator and puddler have gained popularity showing an annual growth rate of 3.11% and 7.93% respectively due to higher output and better quality of work.

FARM MECHANIZATION AND EMPLOYMENT

The use of different machines in agriculture has different types of impacts on employment of human and bullock labor. On the basis of data collected under the cost of cultivation scheme, the use of bullock labor has gone down significantly on the three major crops in Punjab as a result of fast mechanization. Although the cost of human labor has gone up but there is considerable decline in the quantity of labor use. For example, in case of wheat, paddy and cotton, the use per hectare was 558.72, 961.44 and 810.65 hours in 1974-75 which declined to 301.15, 450.54 and 605.73 hours in 1998-99 respectively. On the other hand, the cost of farm machinery use has gone up manifolds. Here, it is worth mentioning that it is wrong to say that all sorts of mechanization are unjustifiable. For example, the use of pump sets has established the fact that labor displacement by them is more than compensated by the increased demand for labor in the field of irrigation and other operations.

ECONOMICS OF FARM MECHANIZATION

It is of utmost importance to examine whether the use of machines has been economical or not. On the basis of a study covering 203 farmers having 218 tractors in different districts of Punjab (Singh & Jindal, 1983) it was brought out that the total use of the tractor, which on an average came out 397 hours per annum is much less than the possible extent of 1000 hours. The cost per hour turned out to be very high due to high fixed cost, which can be reduced by increasing the hours of working of the tractor. If it finds work for 600 or more hours per annum, the cost per hour can be lowered significantly. The overall average cost/hour, which was Rs.103.04 by its existing quantum of work i.e. 397 hours declines to Rs.91.77, Rs.86.26 and Rs.82.97 by working per 600, 800 and 1000 hrs. Per annum. The machine becomes economical only if it is gainfully employed for rather than accounting for its unproductive use. Custom servicing increases annual use of farm machinery. The committee set up by the Planning Commission (1975) observed that harvester combines were generally demanded by big cultivators and it displaced a large number of agricultural labours in the harvesting season when the opportunities of employment in agriculture were higher for them.

INTER-REGIONAL VARIATION

Singh (1979) studied the growth of tractorization in different districts of Punjab during the years 1960-61 to 1976-77. The author reported that the annual growth of tractors was24.57% in the period 1961-66 which increased to 45.75% during 1966-72 and again declined to 16.49% during the period 1972-77. Ropar district witnessed the highest annual growth rate of 87.69%viz. Punjab, Haryana, Gujarat, Uttar Pradesh and Rajasthan states had high intensity of tractors. A simultaneous view of percentage of farms having more than 4 hectare holdings indicated that Punjab, Haryana, Rajasthan and Gujarat states have high tractor density, perhaps due to higher percentage of large farms. Even though the Punjab state excelled the other states in terms of tractor intensity, yet within the Punjab state district-wise intensity of tractorization as presented in is highly variable. The number of tractors in the state registered fast growth but still there are some districts which have low intensity. For example in Mukatsar district it was as low as 10.65 tractors per thousand of cultivated hectares. Conversely, intensity of tractors in Faridkot was as high as 397.5 tractors per thousand of cultivated hectares, Bathinda (180.54), Ludhiana (147.68) and Patiala (138.81).

DEMAND PROJECTIONS

A number of studies were carried out to project the demand for tractors in the country and in some specific states. National Council of Applied Economic Research (1974) studied the demand for wheeled tractors in the country during the fifth plan period. A single equation model was used to estimate the stock demand of tractors for1973-74 and1978-79. The variables tried in the model were relative price of the tractor, irrigated area, agricultural production and gross cultivated area. The study projected the stock demand level between 2.42 and 2.44 lakh tractors. Further, the annual demand for 1973-74 as 38 to 40 thousand units was estimatedrisingtoabout79thousandby1978-79. Sharma (1998) projected that the demand for tractors in India to be 2258 thousand in 2024-25. The study concluded that the saturation point of the demand for tractors would be reached sometime during the period2010-11and afterwards only there placement demand would continue which worked out to be around 25 to 32 thousand tractors annually. Singh (1992) brought out that the total annual demand for tractors in Punjab would vary from 15,000 to 17,000 during the period 1988-89 to 1994-95 and it would be between 19,200 and 25,500 during the period 1994-95 to 2000-01. It was also observed that the adjustments to tractor density in the region of study had almost reached a saturation point and the demand for tractors in such a case would be mainly for replacement of tractors.

FACTORS AFFECTING USE OF TRACTOR-

Naidu and Rao (1977) studied the trend in farm mechanization in India and the variables associated with it. It was observed that there was dramatic rise in the number of tractors during the period of mid-sixties due to Green Revolution. Tractorization was found to be positively correlated with variables such as percent of double cropped area to percentage of net area sown, percentage area irrigated to the net area sown, percentage area under high-yielding varieties to the net area sown, percentage area of holding with more than twenty hectares to net area sown, wages of agricultural labour and annual growth rate of agricultural output. However, there was negative correlation of tractors with agricultural labour per 100 acres of net area sown and working animals per hundred acres of net area sown. Singh and Jain (1981) estimated the utilization of tractor in Punjab and observed that the utilization of tractor was positively correlated with irrigation facilities and it was estimated that the increase in irrigation facilities by 25% could lead to an increase in the tractor use by about 6% and when irrigation facilities were doubled, the tractor use increased to about 9%. The study concluded that the tractor density was higher in those areas where relatively more irrigation facilities were available. Kumar et al. (1995) observed that growth in tractors during 1967-72 was attributed to up rise of wheat high yielding variety seeds in Punjab; however, the latest increase in tractors was due to the steady adoption of mechanized supply of tractors.

POLICY MEASURES

Mechanization in Indian agriculture is the need of the time but its use has to be viewed from angles of unemployment problems of human and animal force and vast majority of small and uneconomical farms. To rationalize the existing farm machinery is important as seen from the high variability in inter-regional distribution, it is imperative to suggest some policy issues such as;

1. The total use of the farm machinery, which on an average is much less than the prescribed norms. Therefore, there is need to enhance its productive use as a result of which, the fixed cost can be reduced significantly. The use of the machinery for social purposes, which is otherwise unproductive and thus needs to be minimized to the possible extent.
2. The use of the tractor for custom hiring should be encouraged through legislative measures. The various problems faced by the farmers in this process such as uneven distribution of tractors, uniform cropping pattern in the area, social symbol attached to the ownership of tractors and the payment problems should be further probed into for their minimization.
3. The distribution of tractors from area to area should be normalized so that the custom hiring is increased. Further, the small farmers having operational holding of less than four hectares need to be discourageed to own the tractors unless they have substantial grounds to make economical use of it. However, to solve the problems of mechanization of smaller holdings, the possibilities can be:
   A. Cooperative management of farm machinery;
   B. Financing of second hand tractors for small farmers;
   C. Extension services to advise the suitability of various makes, models and horse powers for different size of operational holdings;
   D. Devising smaller machinery suitable for small farms which constitute the vast majority of farmers but the machinery has to be effective and less costly.

CONCLUSION-

The agricultural sector is of vital important for region. It is undergoing a process of transition to a market economy, with substantial changes in the social, legal, structural, productive and supply set-ups, as is the case with all other sector of the economy.

Vol.1 Issue-1, September,2020

Sustainability for maize production under organic farming system.

Harshit Tripathi[1]*, U.C. Tripathi[2], Pawan Kumar[1] and Shivom[1]
[1,2]Ph.D. Scholar, Deptt. of G P B, C S Azad Uni. of Ag.&Tech., Kanpur,U.P.-208002
[2]Asst. Prof., Deptt. of (Ag.) Economics, B. N. P. G. College, Rath, Hamirpur, U.P.-210431
[*]**Corresponding author:** trip1496harshit@gmail.com
ARTICLE ID: 044

Introduction-

Maize (*Zea mays* L.) is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. It is cultivated on nearly 190 m ha in about 165 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 39 % in the global grain production. The United States of America (USA) is the largest producer of maize contributes nearly 36% of the total production in the world and maize is the driver of the US economy. In India, Maize is grown throughout the year. It is predominantly a Kharif crop with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for around 10 per cent of total food grain production in the country. In addition to staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, textile, gum, package and paper industries etc.

Achieving grain supply security with limited arable land is a major challenge in the twenty-first century, owing to the changing climate and increasing global population. Maize plays an increasingly vital role in global grain production. As a C4 plant, maize has a high yield potential. Maize is predicted to become the number one cereal in the world by 2030. However, maize production has reached at plateau in many countries, and hybrid and production technologies have been fully exploited. Thus, there is an urgent need to shape maize traits and architectures for increased stress tolerance and higher yield in a changing climate for sustainable production. Organic farming for maize production can help to achieve this target of sustainable production.

Organic farming is not a new concept to Indian farmers, because they have practiced it since ancient times. Organic farming system relies on crop rotation, crop residues, animal manures, legumes, green manures, off- farm wastes and biological pest control. Yields in organic farming are lower than chemical farming during initial years of practice and it takes a few years to stabilize the yields .However, in the long run, if properly followed ,yield with organic farming would be a greater than those obtained with chemical farming . The gravity of environmental degradation has drawn the attention of the scientists and planners towards finding out ecologically sound, viable and sustainable farm technologies, keeping in view of the needs of the future generations. Most of the Indian soils contain less than 0.5 per cent organic carbon. Unless it is raised to 0.9 – 1 per cent level, productivity of the soil cannot be optimized. In view of the resurgence of interest in alternative agriculture in recent years, organic farming has been considered to be sound and viable option in most of the countries.

The term agriculture derived from a *Latin* word that means both crop plants and domestic animals and their products to benefit the human kind. The production and productivity were increased during the time of green revolution due to the use of high yielding seed, fertilizer, irrigation facilities and chemicals for control of diseases and pests. But due the continuous use of high dose of fertilizers and chemicals for getting much higher yield, crop may remain the residual effect that may cause the different issues in animals as well as human beings. Now the era is shifting from chemical or fertilizers based agriculture to organic agriculture. In India the Sikkim state declared as organic farming state, they are not using single chemicals in their crops. Even though the crop yield under organic condition is low but that will be compensate by getting higher price of organic crops compared to traditional crops. In this context, breeders planned to do some breeding activities for organic condition or to develop the varieties for organic condition to get higher yield i.e. organic plant breeding. Organic plant breeding is important for farmers and human health because it do not affect the environment and human health. In which, control of inorganic and synthetic chemicals such as pesticide and insecticide, synthetic soluble fertilizers and veterinary medicines, organic farmers rely heavily on preventive and system-oriented practices. Varieties developed through organic plant breeding and multiplication of seed production through use of organic plant breeding.

The worldwide umbrella organization International Federation of Organic Agriculture Movements (IFOAM) defined to organic agriculture, organic agriculture is a production system in which scientists and plant breeder consider high yield, without losing effect of soil health, people and ecosystem, biodiversity and their components and without using of in-organic chemicals, synthetic chemicals and pesticide etc. Organic farming produce lower yield than conventional breeding but it is more eco-friendly, profitable for human health and provides good nutritional value to human diet.

Sustainable

Modern Concept of Organic Farming-

The modern concept of organic farming combines the tradition, innovation and science. Although, history states that the movement for organic way of life recognized in 1905, it could gain ground after realizing the ill effects of modern agriculture in the late 1990's. In 1905, the British botanist Sir Albert Howard, often referred to as the father of modern organic agriculture, documented traditional Indian farming practices, and came to regard them as superior to conventional agriculture science. During 1940, In Japan, Masanobu Fukuoka, a microbiologist working in soil science and plant pathology, quit job as a research scientist, returned to his family's farm, and devoted the next 30 years to develop a radical no-till organic method for growing grain, now known as "*Fukuoka farming*". Many other practices such as Rishi krishi, Natueco farming, homa farming, panchagavya krishi and bio dynamic farming are associated with organic agriculture. The reports indicates organic farming can minimize energy consumption by 30.7 % per unit of land by eliminating the energy required to manufacture synthetic fertilizers and pesticides and by using internal farm inputs, thus reducing fuel used for transportation. India can emerge as global leader due to the presence of large number of organic producers (almost 7 lakh producers) and they needs to be supported with technical knowledge and inputs besides marketing infrastructure. The research results available for little over a decade confirms the yield advantage in many crops such as basmati rice, maize, cotton, chickpea, soybean, groundnut etc.

However, the major impediment for growth of organic farming in India is yield reduction in the initial years due to swift switch over from inorganic to organic, wide gap between availability of organic source of nutrients and requirement and lack of pest and disease management options. Most of the organic growers have expressed that lack of support price for organically grown crops and marketing infrastructure as the major constraint in promotion of organic agriculture. The certification systems of grower group, participatory guarantee system, know your farm and know your food should be promoted in large scale.

Status of Organic Farming-

Demand for organic products, especially in developed countries, has been increasing since start of this century. Globally, organic agriculture is practiced in 162 countries and 37 m ha of land are managed organically by 1.8 million farm households. The regions with the largest areas of organically managed agricultural land are Oceania (12.1 million hectares of 33 percent of the global organic farmland), Europe (10.6 million hectares or 29 percent of the global organic farmland) and Latin America (6.8 million hectares or 23 percent). On a global level, the organic agricultural land area increased by three percent compared with 2010. The countries with the most organic agricultural land are Australia (12 million hectares), Argentina (3.8 million hectares) and the United States (1.9 million hectares). In Asia, land under organic management reached 3.6 million hectares for 2009 up from just under 3.4 million hectares reported for 2008 and under 2.9 million hectares for 2007. The expansion of over 0.2 million hectares, a growth rate of close to 6 per cent comes on top of a 17 per cent growth from 2007 to 2008. It maintains an upward trend albeit a slower pace of conversion. The main contributor of the expansion of cultivated acreage is India. With the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only addresses the quality and sustainability concerns, but also ensures a profitable livelihood option. Cultivated area under certified organic farming has grown almost 17 fold in last one decade.

Plant breeding for organic farming-

Organic plant breeding is a system that develops the variety which is higher yielder under organic conditions which maintain the soil and human being health due to non application of chemicals. Eventually the yield of organic variety may be low but that can be addressed through the use of plant breeding techniques under organic soil. The varieties developed through organic plant breeding or varieties cultivated under organic conditions may not have any adverse effect on human health and even familiar to environment also. The next decade may be the era of organic breeding activities and organic agriculture without any yield barrier and other challenges that we are facing in present scenario.

The breeding goals for organic agriculture to get high yield as compared with conventional breeding methods. Incorporation of resistance genes and tolerance genes to biotic and abiotic factors and higher resource efficiency for plant (water, nutrients and light etc.) organic plant breeding aims to fit any variety for any environment and for any farming system. The variety affected by the variable environments and specific variety cannot exist in variable environment. So, we will make effort to develop such variety which is adaptable to every environment. In general, crossing methods that do not break the reproductive barriers between species and selection methods based on the evaluation and selection of whole plant performance. There are some breeding techniques to develop high yielding variety through organic plant breeding e.g., 1. Intraspecific crossing (2) backcrossing (3) mass and individual selection (4) hybrid cultivars, without harassment of any gene, transfer of desirable genes from wild germplasm/accession or landraces to modern cultivar. Development of varieties fit for organic farming can be achieved successfully if plant breeding programs combine the selection of the progeny in organic and low-input environments. In organic plant breeding we can use system of shuttle breeding in which segregating materials differentiate in different environment to achieve wide adaptation for insect and disease resistance.

Challenges for organic plant breeding-

Organic plant breeding is not a strategy but it excluded to those techniques which are being hazard for ecological perspective and attention to bring to take about improvement of organic varieties which is suitable for all beneficiary. There are some precious challenges for organic plant breeding which are given below.

1. Main challenge to obtain new variety with organic plant breeding: it is difficult task that any variety developed through organic plant breeding does not adapted to every environment.

2. Low yield in comparison to conventional breeding method: it is demonstrated that organic plant breeding gives low yield compression to conventional breeding method, because in organic plant breeding we cannot use any chemical substances which affect the yield of a variety. But in conventional breeding continuing use of chemical fertilizer which make to get higher yield from any variety.
3. To control insect-pest in organic plant breeding is difficult task, there are many insect pest out of which is being harmful for organic plant breeding because in organic plant breeding, we cannot utilize any synthetic chemicals, organic chemicals, pesticide and insecticide. In organic plant breeding we can use only those products which are synthesized from organic products to control insect, pest such as Neem oil and pyrethrum etc.
4. Organic farming loses yield due to lack of insufficient control system, weed suppression, disease and pest resistance traits in cultivar such as late blight in potato, powdery mildew in pea etc.
5. Organic crop ideotype: although the organic sector is receiving advantage from organic plant breeding through breeding efforts, all varieties which are going under trial, are not fit for all requirements. The organic system approach requires that all varieties which are developed through organic plant breeding must adopt the given organic environment rather than the conventional environment to the variety. The ideotype for organic conditions should have the features e.g., wider adaptation, maintain or improve the soil fertility through application of organic inputs, better root system, to take benefit from soil micro-organisms, suppressing ability of weeds, maintain soil and crop health, good quality product and high yield stability
6. Loss of genetic resources: many farmers continuing use of modern high yielding varieties in place of landraces, transgenic and hybrids. Due to lack of systemic collection of land races small or no of variety/gene pool/ germplasm has been conserved in seed gene bank for organic plant breeding.

Pest, Disease and Weed management-

Use of synthetic/chemical pesticides, fungicides and weedicides is prohibited. Natural enemies shall be encouraged and protected. (for e.g. raising trees in the farm attracts birds which kills pests of the crops, nest construction etc.) Products collected from the local farm, animals, plants and micro organisms and prepared at the farm are allowed for control of pests and diseases. (eg. Neem Seed Kernel Extract, cow urine spray). Use of genetically engineered organisms and products are prohibited for controlling pests and diseases. Similarly, use of synthetic growth regulators is not permitted. Slash weeding is to be done between the plants. Weeds under the base of the plants shall be cleaned and put as mulch around the plant base. The weeded materials should be applied as mulch in the ground itself. The products that are permitted for control of pest & diseases are Neem oil and other neem preparations like Neem Seed Kernel Extract, Chromatic traps, Mechanical traps, Pheromone traps, and Plant based repellents, Soft soap and clay. The following products shall be used when they are absolutely necessary and taking environmental impact into consideration. The certification agency shall be consulted before using these inputs.

- Bordeaux mixture
- Plant & animal preparations e.g. Cow urine spray, Garlic extract, Chilli extract
- Light mineral oils e.g. Kerosene

Certification process for the organic products-

Certification of organic farms is required to satisfy the consumers that the produce is totally organic. Certification agency conducts the inspection that minimum requirements prescribed for organic agriculture is fully met and issues certificate. The producer makes contact with certifying agency. Certification agency provides information on standards, fees, application, inspection, certification and appeal procedures. The producer then submits application along with field history, farm map, record keeping system etc. Then the contract indicating scope, obligation, inspection and certification, sanction and appeals, duration, fee structure is executed. Then the Inspector of agency comes and carries out inspection. The Inspector gives inspection report with his recommendation to the agency, then the agency issues approval or denial of certificate. Certificate is given for current year's harvest only and hence annual certification is required.

In India, there are two accreditation systems for authorizing Certification and Inspection agencies for organic certification. National Programme on organic Production (NPOP) promoted by Ministry of Commerce is the core programme which governs and defines the standards and implementing procedures. National Accreditation Body (NAB) is the apex decision making body. Certification and Inspection agencies accredited by NAB are authorized to undertake certification process. The NPOP notified under FTDR act and controlled by Agricultural Processed Foods Export Development Authority (APEDA) looks after the requirement of export while NPOP notified under APGMC act and controlled by Agriculture Marketing Advisor, Directorate of Marketing and Inspection looks after domestic certification. Currently 20 certification agencies have been authorized to undertake certification process. Details of the system are available at www.apeda.com/npop. In 2006, India's organic certification process under NPOP has been granted equivalence with European Union and Switzerland. It has also been recognized for conformity assessment by USDA's NOP. NPOF is being implemented by National Centre of Organic Farming at Ghaziabad and its eight Regional Centres at Bangalore, Bhubaneshwar, Panchkula, Ghaziabad, Imphal, Jabalpur, Nagpur and Patna. Besides working for realisation of targets under NPOF, NCOF and RCOFs are also performing specific roles in promotion of organic farming.

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Vol.1 Issue-1, September,2020

Cultivation Practices and Production Technology of Marigold Crop

Rajmani Singh*[1], Chhote Lal Rawat[2], Shatrunjay Yadav[3] and Prabhat Babu Verma[4]
[1]Research ScholarBabasaheb Bhimrao Ambedkar University, (A Central University) Vidya Vihar,Raebareli Road, Lucknow (Uttar Pradesh)
[2,3] Research Scholar,Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, (Uttar Pradesh)
[4] Cane Supervisor, Department of Sugar Industry and Can Development, Uttar Pradesh
Email-rajmani813926@gmail.com
ARTICLE ID: 045

Introduction:

Flowers are considered as a symbol of love, beauty and a gift of nature. Flowers are used by us to provoke the feelings of love and happiness. Marigold is native to South and Central America especially Mexico and belong to the family Composite. The genus *Tagetes* commonly cultivated species are *Tagetes erecta* (African Marigold), *Tagetes patula* (French Marigold) and *Tagetes minuta*. Amongst these *Tagetes erecta* and *Tagetes patula* are more commonly grown for their ornamental values while the later for its high content of essential oil. Marigold are long upright and quick growing habit. The height of plants ranges from 30 to 90 cm. The flowers of these varieties are deep orange, light orange, golden yellow, bright yellow and lemon yellow in color. The size of flower may vary from 4 to 6cm (diameter). Marigold is good source of carotenoid pigment for poultry feed to intensify yellow color of egg yolks. Marigold also finds industrial application like preparation of natural dyes and essential oils. It is used as mosquito and nematode repellents. The marigold plants are highly useful for suppressing the population of nematodes in the field also. The uses of marigold are many fold, often referred to as, "Versatile crop with golden harvest". Marigolds produce thiopenes, which are toxic to nematodes and used as trap crop in tomato, brinjal, tobacco etc. In India, major flower growing states are West Bengal, Tamil Nadu, Karnataka, Uttar Pradesh etc. About 309-thousand-hectare area under floriculture with production estimated to 1653 thousand MT of loose flower and 593 thousand MT of cut flower. Among these flowers, marigold is the leading loose flower of India. In India, the total area under marigold cultivation is 47.68 thousand hectares with production of 501.87 thousand MT (**Anomous, 2017).**

Climate:

Marigold requires mild climate for luxuriant growth and flower production. The optimum temperature range for its growth is 20 -30°C. Marigold plant survive best in dry and hot condition but very hot climate give adverse effect on flower yield.

Soil:

Marigold can be grown in a varied type of soils except water logged conditions. But it can be grown best on well drained sandy lome fertile soil. Marigold no need more acidic and alkaline soils with pH 7.0 to 7.5 are suitable for higher production of flower.

Land preparation:

Ploughing the field 2 to 3 times by the desi plough or tractor with rotavator bring field to fine tilth. During the last ploughing of the field Farm Yard Manure @ 50 ton/hectare or well decomposed cow dung in soil or compost mix in the field.

Sowing time:

Marigold easily grown three times in a year- **Rainy seasons** (seed sown in middle of Jun and transplanting seeding during middle of July month), **Winter seasons** (seed sown in middle August and seeding successful transplanting in middle of September month) and **Summer seasons** (sowing of seed first week of January and then transfer seedling first week of February) hence flowers of marigold can be grown throughout the year.

Seed rate and transplanting:

For raising seedling, required 1.5 kg seeds/ha. Rising seedling standard size of nursery bed is 3×1 meter. 8 to 10 bed are required for raised seedling for one-hectare transplanting. Seed can be sown by broadcast or line method in nursery. Treat the seeds with *Azospirillum* before sowing. Before sowing of seed DDT and BHC broadcasted outer side of bed to protect from the ants. Seedlings are transplanted after 28 to 32 days when seedling attained 3 to 5 true type leaf. Propagation by cutting commonly followed for maintain the purity of varieties.

Variety: Some specific variety are given below-

(1) African Marigold: Climax, Cracker jack, Golden Age, Crown of Gold, Chrysanthemum Charm, Star Gold, Pusa Narangi Genda, Pusa Basanti Genda, Guinea Gold, Apricot, Sun Giants, Primrose, Fiesta, Golden Yellow, Shaggy, Glitters, Mammoth Mum, Happiness, Spun Gold and Cupid.

(2) French Marigold: Butter Scotch, Valencia, Rusty Red, Flame, Spry, Star of India,

Spacing:

Spacing should be maintaining in African marigold is 40×30 cm and French marigold 20× 20 cm or 20 ×15cm.

Manure and Fertilizer:

Incorporate 40 to 50 tonnes of FYM /hectare during the last ploughing of field. Marigold is one of the commercial flower but research work has not been determining the describe dose of nutrient for growth and flowering. For heights yield of flower N: P: K @100:100:100 kg/ha required at the time of preparation of land and remain 100kg Nitrogen/ha should be applied one month after transplanting of seedling.

Weeding and Hoeing:

Weed problem in marigold found especially in rainy season. In, India weeding is done manually. Total 3 to 4 times weeding are required during entire growth period marigold. Chemical weed control is also recommended.

Irrigation:

Irrigation should be given 7 to 8 days' interval for obtain higher yield of marigold. In summer season frequent irrigation 4 to 5 days' interval required. Water stagnation should be avoided otherwise many diseases are occurred easily and destroyed the entire plant.

Pinching in Marigold:

Removal of apical portion of shoot is known as pinching. Pinching is a form of pruning that encourages branching of the plant. Pinching forcing the plant to grow more new stems from the leaf nodes below the pinch. First time pinching done at 40 days after transplanting enhances flower yield. Due to pinching maximum yield are obtaining easily.

Yield:

Flower yield are depending upon the season of planting and cultural practice adopted by former. In rainy season fresh flower yield are 200 to 250 quantal/hectare, in winter season 150 to 175 quintal/hectare and 100 to 120 q/ha yield obtain in summer season.

Diseases management:

Generally marigold crop is free from diseases and insects' pest. Occasionally some diseases and insect pests observed are given below.

(1) Damping off: Caused by the fungus (Rhizoctonia solani) and major symptoms are brown necrotic spots on young seedlings.

Control:

- ❖ Drenching with copper oxychloride @3g/l or brassicol (0.3%).
- ❖ Proper drainage should be provided in the nursery beds.

(2) Powdery Mildew: Caused by the fungus Odium sp. and Leveillula taurica. Major symptoms are appearing as grey or white powder and in severe condition leaves turn yellow and fall prematurely.

Control:

- ❖ Dusting Kerathane (40 E.C) @ 0.5% or sulphar powder on the plant surface for immediate control.

(3) Alternaria leaf spots and Blight: Caused by Alternaria, Cercospora and Septoria. Small brown spot near the lower leaves.

Control:

- ❖ Spraying Dithane M-45 2 0.2%.

(4) Collar rot: Caused by pythium sp. and phytophthora sp. fungus. Major symptoms of this disease are black lesions on main stem of the plant, rotting at the collar region and destroyed the entire plant.

Control:

- ❖ Carbendazim @ 1g/l diminishes the occurrence of collar rot disease.

(5) Fusarium Wilt: Wilting in marigold caused by the fungus (*Fusarium oxysporum*) and wilting of entire plant.

Control:

- Crop rotation is the best way to control wilting in marigold.
- Carbendazim (0.2%) is effective for wilting.

(6) Cucumber mosaic: This is the Viral disease and caused mottling of leaves and busy appearances of plant.

Control: Use of Dimethoate at 2 ml/l.

Pest management:

(1) Red spider mite (Tetranychus sp.): This pest sucks the sap of the plant and then plant are injured badly.

Control: Spraying of Kelthane (2 ml/l).

(2) Aphid: Attack of aphid on the marigold plant the major symptoms are black or brown spot on the plant appear.

Control: Spraying of malathion at 2 ml/l.

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Mango (Mangifera indica L.) Health benefits

Raghvendra Bajpai
M.Sc Scholar
School of Agriculture, ITM University, Gwalior, Madhya Pradesh
Corresponding author: bajpairaghvendra42@gmail.com
ARTICLE ID: 046

Mango are sweet, creamy fruits that have a range of possible health benefits. They are highly popular around the world.

Basic information:-

1. Botanical name: - *Mangifera indica* L.
2. Common Name: - Bathroom fruit, King of fruits
3. Family: - Anacardiaceae
4. Chromosome No. : - 40
5. Origin: - Indo-Burma region
6. Climatic adaptability: - Tropical
7. Edible part: - Mesocarp

General Introduction:-

The mango is a member of the drupe family. This is a type of plant food with a fleshy outer section that surrounds a shell, or pit. This pit contains a seed. Olives, dates, and coconuts are also part of this family. There are many different kinds of mango. They vary in color, shape, flavor, and seed size. Although mango skin can be green, red, yellow, or orange, its inner flesh is mostly golden yellow. In this article, we explore the many benefits of mangoes, explain their nutritional breakdown.

Nutritional importance:-

Consuming mangoes can help protect and strengthen the body in several ways. The sections below discuss these benefits in more detail.

Cancer:-

A 2014 study from Japan found that carotenoid-containing fruits and vegetables such as mangoes may reduce the risk of colon cancer. Also, the Skin Cancer Foundation suggest that a diet high in beta-carotene content can help protect against skin cancer. Orange fruits and vegetables, such as mangoes, contain beta-carotene. They also suggest that it can boost the action of the immune system against disease.

Diabetes:-

A 2019 mouse study into mango leaves found that some plant compounds had a powerful effect on risk factors for diabetes. These included lower body weight, reduced blood sugar levels, and lower levels of fats in the blood. This study does not clarify whether or not mango flesh provides the same benefits. However, one 2014 study found that eating freeze-dried mangoes reduced blood sugar levels in people with obesity.

Heart disease:-

The fiber, potassium, and vitamin content in mangoes all help keep the arteries working and reduce the risk of heart disease. Increasing potassium and decreasing sodium in the diet are among the most important dietary changes a person can make to reduce their risk of high blood pressure.

Skin and hair:-

Mangoes also support hair health, as they provide a good amount of vitamin A. This nutrient helps the skin provide an oily substance called sebum, which moisturizes the hair. Vitamin A is also necessary for the growth of all bodily tissues, including skin and hair. One cup of sliced mango provides 60.1 milligrams (mg) of vitamin C. This is most of a person’s daily requirement, according to the Dietary Guidelines for Americans. Consuming enough vitamin C supports the development and maintenance of collagen. This provides structure to the skin and hair.

Nutrition:-

One 165-gram (g) cup of sliced, raw mango provides:

- 99 calories
- 1.35 g of protein

- 0.63g of fat
- 24.7 g of carbohydrate
- 22.5 g of sugar
- 2.64 g of fiber

Mangoes are a good source of vitamins and minerals. They can contribute heavily to the daily requirement for several nutrients.

Risks:-

People with an allergy to latex may have a cross-reaction to mangoes

Integrated Pest Management in Indian mustard (*B.juncea L. Czern Coss*)

Mohd Salman[1], Harshit Tripathi[2]
[1,2] Research Scholar, CSAUA&T,Kanpur U.P.
Email-mohdsalman021996@gmail.com
ARTICLE ID: 047

Introduction

Brassica juncea L. Czern. and Coss., alternatively known as Indian, Oriental or Brown mustard, is widely believed to be one of the earliest domesticated plants, with mustard known as a condiment (spice) since early times. It is described in Sanskrit and Sumerian texts from as early as 3000 BC (Hemingway 1995). B. juncea initially spread to Europe in the Middle Ages as a medicinal crop and was later grown as a vegetable for human consumption. Today, B. juncea is used world wide as an oilseed, a condiment and a vegetable. In terms of area and production mustard stands in second place among oilseeds in The average yield of mustard and Toria in India is 7.5 quintal/hectare.

In Indian mustard major losses are due to diseases, insects and pests which restrict the production. To overcome this a scientific approach is must require which is known as Integrated pest management (IPM).

What is IPM?

IPM is such an approach which entails ideal use of the most effective, economically safest, ecologically sustainable and sociologically acceptable combination of physical, chemical and biological methods to limit the harmful effects of crop pests.

Important facts about IPM

- In 1967 term 'IPM' was given by R.F.Smith and R.Vanden Bosch.
- Term 'IPM' was formalized by U.S. national academy of sciences in 1969.
- IPM was adopted as policy by various world governments during the 70's and 80's including the USA(1972).

- In 1985 India declared IPM as official ministerial policy.

Objectives of IPM

Rapeseed and mustard are most important rabi oilseed crops of our country. Major bottleneck in it's production is reduction of yield due to pest attacks. Insects and diseases are appears important limiting factors which restrict the fast expansion of cultivation and productivity of these crops.

One of the major concerns in enhancing and stabilizing the yield of Rapeseed and mustard is the incidence of insects and diseases which are causing the damage to crop at different stages and responsible for huge yield losses to a extend ranging from 10 to 90%. So our main concern is to prevent our crop from these losses by the use of various prevention techniques of IPM.

Application of Ipm

In mustard there are much losses occurred by several diseases, insects and weeds so ultimately production falls down. IPM provides various methods and ways to normalize the condition and in this techniques we used a combination of methods. Now, how it control or manage the problems, let's know-

(1) Insects: Mustard is highly vulnerable to large number of insect pests. About 50 insects are known to damage brassica crops. Among these insects Mustard aphid (*lipaphis erysimi)* is the key pest of brassica crops while saw fly (*Athalia proxima)*, painted bug(*Bagrada cruciferarum)* causing yield losses.

Yield losses due to aphid may be up to 97% and saw fly and painted bug up to 15% and 30% respectively. The period of peak activity for aphids is January- February. The economic thresh hold level (ETL) for aphid in rapeseed-mustard for different states has also been worked out.

Management:- Crops should be sown at optimum time recommended for particular area. The mustard sown before 15th October in North India often escapes aphid damage. Use balanced dose of fertilizers, overuse of fertilizers particularly nitrogen attract more aphids.

Plucking and destruction of infested twigs or plants at initial stage of attack is very useful. Plucking the infested leaves and burry them in soil helps in the reduction of the pest.

(2) Diseases: Expression of full inherent genetic potential of a genotype is governed by inputs that go in to the production system. Production has to be increased vertically taking in to account the exploitable yield reservoir. The losses in oilseed crops due to biotic stresses is about 19.9%, out of which diseases cause severe yield reduction at different growth stages. Various plant pathogens are reported to affect the crop. Among them, 18 are considered to be economically important in different parts of the globe. In India, the following diseases cause considerable yield losses. Disease like Alternaria blight and white rust cause about 10-70% damage.

Management:- Choosing the sowing time is very important as it affects the disease incidence significantly Deep summer ploughing.Use of disease resistant or tolerant or early maturing disease escaping culcultivar. Use of good quality sseed. Seed treatment with biocontrol agents viz., T. viride, G. virens or botanicals like Allium sativum bulb extract (1 % w/v) or carbendazim @ 0.1% a.i. or mixture of carbendazim with Apron 35 SD (6 g/ kg). There is a need for mixture of fungicides for avoiding resistance development in pathogens to fungicides. Use of biocontrol agents is advantageous as they are often effective against a wide range of soil-borne pathogens. Moreover, they are ecofriendly, cost effective and their use avoids the risk of development of resistance in the pathogen towards the control agent.Application of recommended doses of N, P and K fertilizers with split application of N2 Maintaining optimum plant population with recommended spacing. Proper drainage to avoid water stagnation.

(3) Weeds: Weeds in mustard; *Phalaris minor*(28.2%), Avena ludoviciana(25.2%) and *Lolium temulentum*(19.2%). Broad leaves weeds like *Vicia sativa, Coronopus didymus* and *Anagallis arvensis* as a whole constituted 26.7% of total weed Flora.

Yield losses due to crop-weed competition in Rapeseed and mustard have been estimated to the tune of 10-50% (Gill et al.1989, Bhan 1992, Banga and Yadev 2001)

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or even beyond 23-70% depending upon the type, intensity and duration of competition in gobhi sarson(Chopra and Saini 2007).

Competition by weeds at initial stages is a major limiting factor to it’s productivity. Mannual weeding at 3-4 weeks after sowing is the most common practice to control weeds in Indian mustard.

The most common herbicidal weed control measure recommended in Indian mustard is the pre- emergence application of pendamethalin (0.75kg/hectare).

Conclusion

Most of the farmers are unaware about IPM technologies.The knowledge regarding of IPM technologies should be higher than other methods. IPM is to be used at the farmer’s level and therefore it needs to be converted from a scientist-oriented to a farmer- oriented concept. Extension efforts need to be intensified to educate farmers about different methods of IPM technologies, it’s application according to topography and nature of crops.

There is a distorted view of IPM as pest control without chemical or biological control, in fact IPM is based on the optimization not elimination of chemical pesticides. The IPM approach encompasses all available control techniques to contain and combat the pest infestation with the aim of lessening the pesticides load in the environment.

Vol.1 Issue-1, September,2020

Biopesticides

Komal
University Institute of Agricultural Sciences,
Chandigarh University (Mohali),Punjab
Email : rameshkumar565287@gmail.com
ARTICLE ID: 048

Introduction:

Despite the harmful implications involved in the use of synthetic chemicals to control pests, still they are extensively used in all countries all over the world. The increased social pressure to replace them gradually with other alternatives that are safe to humans and non-target organisms has led to increased development of compounds based on the models of naturally occurring active ingredients of biological origin, having various biological activities known as "biopesticides"

Biopesticides are broad array of microbial pesticides, biochemicals derived from micro-organisms, phytochemicals and other natural sources, and processes involves the genetic modification of plants to express genes encoding insecticidal toxins. The use of biopesticides for pest control today is an evolving field in pest management.

Biopesticides is a formulations made from naturally occuring substances that controls pests by non toxic mechanisms and in ecofriendly manner.Such as animals, plants, bacteria, and certain minerals. For example, canola oil and baking soda have pesticidal applications and are considered biopesticides

Concept of Biopesticides

Bio-pesticides are naturally occurring substances from living organisms (natural enemies) or their products (microbial products, phytochemicals) or their by-products (semiochemicals) that can control pest by nontoxic mechanisms .Organization for Economic Co-operation and Devlopment (2009), viewed biopesticides as manufactured mass produced agents derived from natural sources living micro-organisms and sold for use to control pests. According to Suman and Dikshit , biopesticides encompass a abroad array of microbial pesticides, biochemicals obtained from micro-organisms and natural sources. Historically, biopesticides has been associated with the biological control and by implication, the manipulation of living organisms as indicated.

Types of biopesticides :

1. **Microbial pesticides:** These biopesticides are produced by microorganisms, including bacteria, viruses, and certain fungi. Each type of microbial pesticide targets a specific species or small group of species.E.g. **Bacillus thuringiensis*:is a natural occurring, soil-borne bacteria that has been used since the 1950s for natural insect control. It consists of a spore, which gives it persistence, and a protein crystal within the spore, which is toxic.

2. **Plant-Incorporated Protectants (PIPs):** These pesticides are produced from plants as a result of another genetically incorporated material added to that plant.

3. **Botanical pesticides**: These are naturally occuring plant material that crude preparation of the plants parts ground to produce a dust or powder that can be used in full strength or dilite form in a crrier such as clay. Azadirachtin effects the reproductive and digestive process of pest.

4. **Biochemical/herbal pesticides:** These are substances naturally occurring in the environment that control pests. This could include plant extracts that lure and trap insects or insect pheromones that interfere with mating.

5. **Semiochemicals:** A semiochemical by definition is a chemical signal produced by one organism, usually insects which caused a behavioural change in an individual of the same or different species.

Biopseticides formulations: In most cases, the active ingredients of biopesticides are formulated in the same way as the synthetic pesticides and most convenient for farmers to use the same equipment for application . The basis for most of the biopesticides is living organisms and their viability have to be maintained during the formulation process and stored at acceptable levels. The organisms must revive from their dormant state in order to be active at the application time. Final product is maintained by mixing the microbial component with different carriers and adjuvants during formulation process for better protection from environmental factors.

Biopesticides dry formulations:

- **Dustable powders**:Active ingredient concentration for dust formulations is usually 10% and is formulated by sorption of active ingredient on finely ground, solid mineral powder with particle size ranging from 50-100 mm. The inert ingredients for dust formulations are UV protectants, adhesive materials (i.e. stickers) to enhance adsorption and anticaking agent.Granules:Active ingredient concentration for granules ranges from 2-20% and the active ingredients either coat the outside of the granule or are absorbed into the granules.

- **Seed Dressing(SD):** A kind of biopesticide formulation obtained by mixing active ingredient carrier in form of powder and accompanying inert to facilitate end product adherence to seed coats. Powders for seed dressing are applied to seed by tumbling seeds with the product designed to adhere to them and they also contain colouring agents inform of red pigment as a safety maker for treated seed

- **Wettable powders**:These are also dry formulation ground finely and applied after suspension in water. Wettable Powders are obtained by blending active ingredients with melting and dispersing agents, synergist, surfactants, and inert fillers.

Liquid formulations:

- **Emulsions**:Emulsion formulations are designed to be mixed with water and it could be normal emulsion which is oil in water (O/W) or an inert emulsion which is water in oil (W/O).

- **Suspension concentrate**:Formulated by mixing finely ground, solid active ingredient dispersed in liquid phase, usually water. Agitation is always a requisite before application to keep particles evenly distributed because the solid particles are not dissolved in liquid phase.

- **Oil dispersion**:The product of the formulation is produced in the same ways as suspension concentrate. Instability problems could be avoided by proper selection of inert ingredients .

- **capsule suspension:** Active ingredients are formulated in micro-encapsulated stable suspension intended for dilution with water before use. Capsules made from gelation, starch, cellulose and other polymers are used to encapsulate the bioagents.

Ultra Low Volume Liquids (ULV): Formulations not intended to be diluted in water before use and have concentration of active ingredients. It is easy to transport and can be formulated using a suspended biocontrol agent as an active ingredient .

Biopesticides applications:

Effective control of pests can be achieved by good selection of application techniques/methods and an appropriate time and/or frequency of biopesticides application.

- **Seed treatment**: One way to apply biopesticides is by seed treatment and is the most effective method or technique. Powder formulations are applied on seeds by tumbling seed with the product that is designed to adhere to the seed .

- **Foliar application:** Simply means biopesticides application on leaves surface as sprays. For example application of B. subtillis .

- **Seedling dipping:** This involves dipping roots of the seedlings in biopesticides suspension for some minutes or hours prior to transplanting. For example Trichoderma spp.

Biopesticides control:

- **Antibiosis**: This occurs as a result of an interaction with other microbes mediated by specific metabolite of microbial origin, by volatile compounds, lytic enzymes or other toxic substances.

- **Competition**: Another mechanism of control by biopesticides is their ability to compete aggressively, that they grow rapidly.

- **Hyperparasitism**: Hyperparasitism is the lysis of the death by other microorganisms or direct parasitism. For e.g T. lignorum

Advantages of biopesticides:

- More-renewable
- Biodegradable
- Can be more effective in the long-term
- Effective in small quantities and quickly decompose, avoiding pollution, which is a major problem with synthetic pesticides
- Biopesticides are usually inherently less harmful/toxic and cause less environmental load or pollutions.
- Designed to only one specific pest or, in some cases, a few target pests as opposed to chemical that have a broad spectrum activity.
- Cost of developing biopesticides is significantly lower than those of synthetic chemical pesticides.
- Their nature of control is preventive not curative and their effects on flower is less.

Disadvantages-of-biopesticides.

- the very high specificity against the target disease and pathogen that may require multiple microbial pesticides to be used.
- Biopesticides are not suited for a stand-alone treatment rather they have to be with a compartible method for high efficacy.
- Living organisms evolve and increase their resistance to biological, chemical, physical and any other form of control.
- Because of their slow speed of action, biopesticides are often unsuitable if a pest outbreak is an immediate and becames a threat to crops.
- On the other hand predators and chemicals may be danger for other beneficial insects in threatened area.
- Heat, desiccation (drying out), or exposure to ultraviolet radiation reduces the effectiveness of several types of microbial insecticides.

- Special formulation and storage procedures are necessary for some microbial pesticides. Although these procedures may complicate the production and distribution of certain products, storage requirements do not seriously limit the handling of microbial-insecticides. .

Conclusion :

The increasing concern of consumers at one hand, and government on the other hand about the problems associated with synthetic chemicals for pest control, and on food safety has led growers to find new eco-friendly methods to replace the current chemical-based practices.The use of biopesticides as supplement has emerged as promising alternative to chemical pesticides and their demand is rising steadily in all parts of the world.Therefore, this report has provided some information about the potentials of "biopesticides for pest control" and if fully exploited, could serve as a very effective alternative method for pest control.

Vol.1 Issue-1, September,2020

Preservation Technique of Fruits and Vegetables: Modified Atmosphere Packaging (MAP)

Raveena Kargwal[1], Ruby Garg[2]
[1]Research Scholar Department of Processing and Food Engineering, COAE&T, CCS HAU, Hisar
[2]Research Scholar, Department of Entomology, COA, CCS HAU, Hisar
Email-raveenakargwal@gmail.com
ARTICLE ID: 049

India is the second largest producer of fruits and vegetables in the world after China & accounts for about 15% of the world's total production. According to the National Horticultural Board of India, it produced 169.1 million metric tonnes of vegetables and 90.2 million metric tonnes fruits during 2016-2017. The area under cultivation of vegetables stood at 10.1 million hectares while in case of fruits was cultivated in 6.3 million hectares (APEDA, 2018). The differing agro-climatic zones and soil type of the nation make it conceivable to grow almost all of the horticultural crops. However, India accounts for only 2.2% of the total food processing in the world. Cultivation of fruits and vegetables play a significant role in the agricultural economy.

Modified atmosphere packaging (MAP) is a technique used for prolonging the shelf-life of fresh or minimally processed foods. In this preservation technique slows down the metabolic activity of a product and of the microorganisms present, both spoilage and pathogenic, by optimizing the gas composition (O_2 supply, applying an elevated level of CO_2 and balance of N_2).This way the initial fresh state of the product may be prolonged (Kargwal *et al*., 2020). It is the shelf life of perishable products like meat, fish, fruits and vegetables that will be prolonged with MAP since it slows the natural deterioration of the product. MAP is used with various types of products, where the mixture of gases in the package depends on the type of product, packaging materials and storage temperature. Two types of MAP are commonly used such as active packaging and passive packaging. The active packaging is a packaging material that interacts with the atmosphere or gas composition present inside the package by varying the headspace gas composition such as oxygen, carbondioxide and ethylene, or it contain additives which are incorporated into the package to modify the package headspace atmosphere (Mangraj, 2009). In passive MAP the gas composition is altered due to the combined effects of products respiration and permeability of packaging film.

Advantages of MAP

- MAP increases the shelf life of produce/commodity from several days to several weeks as compared to the traditional storage system.
- It extends the ripening process of agricultural commodity.
- MAP delays the softening and compositional changes.
- MAP reduces the fungal growth.
- Reduction of oxygen and elevation of carbon dioxide environment suppresses the rate of respiration of produce, thus slow vital process and prolongs the maintenance of post harvest quality.
- Map is excellent branding option.
- It transfers the quality advantages to the consumer.
- Reduction of handling and distribution of unwanted or low grade produce.
- Quality benefits like color, flavors, moisture and maturity retention occurs.
- Reduction of weight loss, desiccation/water loss and shriveling takes place in MAP.
- Provide clear visibility of product all around the package occurs.
- In MAP little or no chemical preservatives is used.

Disadvantages of MAP

- Additional investment in terms of machinery and labour is required which adds as additional investment in the packaging system.
- Plastic films used in MAP causes environmental degradation unless effective recycling is established.
- Improper packaging or temperature can cause spoilage of produce. Capital cost of gas packaging machinery.
- Cost of gases and packaging materials.
- Requirement of additional investment in machinery and labour in the packaging line.
- Plastic films may be environmentally undesirable unless effective recycling is arranged/ installed.

- There is no particular standard available for MA packaging, because the intrinsic properties of the commodity varies greatly with cultivar, maturity stage, place of cultivation etc. and the permeability of the films varies with the manufacturing company and process, etc.

Table 1. MA Potential benefits for Deciduous, Subtropical and Tropical Tree fruits

Horticultural Products	Temperature (°C)	MA Oxygen	MA Carbon dioxide	Benefits
Deciduous Fruits				
Apple	0-3	1-3	1-5	Excellent
Apricot	0-5	2-3	2-3	Fair
Fig	0-5	5-10	15-20	Good
Grape	0-2	2-5	1-3	Fair
Guava	10-15	2-5	2-5	Good
Kiwifruit	0-5	1-2	3-5	Excellent
Nectarine	0-5	1-2	3-5	Good
Peas	0-5	1-2	3-5	Good
Pear, Asian	0-5	2-4	0-1	Good
Pear, European	0-5	1-3	0-3	Excellent
Persimmon	0-5	3-5	5-8	Good
Plum and prune	0-5	1-2	0-5	Good
Raspberry	0-3	5-10	15-20	Excellent
Strawberry	0-2	5-10	15-20	Excellent
Sweet cherry	0-2	3-10	10-15	Good
nuts and dried fruits	0-25	0-1	0-100	Excellent
Subtropical and Tropical fruits				
Grape fruit	10-15	3-10	5-10	Fair
Lemon	10-15	5-10	0-10	Good
Lime	10-15	5-10	0-10	Good
Litchi	0-2	2-3	2-5	Good
Nectarine	0-5	1-2	3-5	Good
Olive	5-10	2-3	0-1	Fair
Orange	5-10	5-10	0-5	Fair
Mango	10-15	3-5	5-10	Fair
Papaya	10-15	3-5	5-10	Fair

Pineapple	8-13	2-5	5-10	Fair

Source : S. V. Irtwange, 2006, Mangraj, 2009, Kargwal *et al*., 2020

Table 2. MA Potential benefits for vegetables.

Horticultural Products	**Temperature (^{o}C)**	**MA Oxygen (%)**	**MA Carbon dioxide (%)**	**Benefits**
Artichokes	0-5	2-3	2-3	Good
Asparagus	0-5	15-20	5-10	Excellent
Beans	5-10	2-3	4-7	Fair
Beets	0-5	2-5	2-5	Fair
Broccoli	0-3	1-2	5-10	Excellent
Brussels sprouts	0-5	1-2	5-7	Good
Cabbage	0-5	2-3	3-7	Excellent
Cantaloupes	3-7	3-5	10-15	Good
Carrots	0-5	3-5	2-5	Fair
Cauliflower	0-2	2-3	2-5	Fair
Celery	0-5	1-1	0-5	Good
Corn, sweet	0-5	2-4	5-10	Good
Cucumbers	8-12	3-5	0-2	Fair
Honeydews	10-12	3-5	0-2	Fair
Leeks	0-5	1-2	3-5	Good
Lettuce	0-5	1-3	0-3	Good
Mushroom	0-3	Air	10-15	Fair
Okra	8-12	3-5	0-2	Fair
Onions, dry	0-5	1-2	0-5	Good
Onions, green	0-5	1-2	10-20	Fair
Peppers, bell	8-12	3-5	0-2	Fair
Peppers, chili	8-12	3-5	0-3	Fair
Potatoes	4-10	2-3	2-5	Fair
Radish	0-5	1-5	2-3	Fair
Spinach	0-5	18-21	10-20	Good
Tomato	15-20	3-5	0-3	Good

Source : S. V. Irtwange,2006, Mangraj, 2009, Kargwal *et al*., 2020

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Recent Trends of Tomato in Cultivation Aspects

G.pradeep Kumar[1]* ,Noopur Jaisalwal[2], Mukesh Kumar Bishnoi[3]
[1,2]PhD scholars Department of Horticulture, Annamalai university Chidambaram,Tamilnadu.
[3]Assistant Professor, Shri Khushal Das University Hanumangarh Rajasthan
*Corresponding author Email-godasup967@gmail.com
ARTICLE ID: 050

Introduction-

The solanaceous family is evolved from the plant."Night shade ".It is considered that Beauty, like and Death are present in that plant. The toxic ingredients' like Atropine and scopolamine causes paralysis in the Involuntary muscles of the body including the heart and the physical content of leaves also given skin irritation and poisons. This mechanisms is generally act as defensive system and for its survival that why the name "Deadly night shade " is popular .It's also the top 10 deadliest plants in the world. Being evolved from that plant this solannaceous vegetables sprended all around the world and gives income to the millions of formers every year.

TOMATO

B.N.-*Solanum lycopersicum* L.

Family- Solanaceae

Chr.no- 2n:24

Origin – Peru Ecuador region

Tomato is one of the most important vegetable crop grown and consumed throughout the year next to potato in solanaceous fruit vegetables in terms of area and it also rank first as a processing crop about 68% of global tomato production is consumed fresh and remaining 32% is processed. The major leading states in our country are madhyapradesh, Andhrapradesh, Karnataka, Telangana and Gujarath. The total area of cultivation was also increased with 769.87 thousand hectares with production of 20708.44 thousand Mt. and the export from India in 2017-18 was around 48 Thousand metric tons which values about 11,421 lak Rupees .So we need to focus on this crop for welfare of farming community and some of the trends in cultivation are discussed below.

Trends In Cultivation (Tomato):-

Seed is used as a material for propagation in tomato and now days many scientists are focusing on the using of Nano technology in the farming as a components like the Nano fertilizers .using of zinc oxide nano particle for seed germination in tomato 250 mg/L of concentration helps the for better growth of seedling .However the many other studies like phytotoxicity mechanisms for example size distribution of particles in solution has to be studied deeply. The A biotic streets is becoming an challenging factor for both the growth and development of the plant improves seed germination, growth and yield characters applying of salicylic acid of 0.5 mm acts a good by seed pres 800 kg gives better results in India.In case of soil which are having high acid reactions. we use the lime as a remedy which is costly for alternative methods .the Bio-char 4t/ha with Vermi compost 25 t/ha along with 100%RDF given the better results(Sanjay Swami.,2019).and this is very much applicable to the Northeast regions of our country. In case of calcareous soil using of Iron in foliar application of the rate of 500 and 100 mg/l in the early mornings starting at 40 days after transplanting in intervals of 7 days shown the best results. However this experiment was conducted in North America.

Irrigation is the major contribute in case of tomato .canes around 94% of water was found in tomato fruit many farmers are shifted to Drip irrigation and Sprinkler irrigation methods and government of India in schemes like per drop more crop etc. studied different effects of Recommended dose of fertilizers will helps to increase the growth and yield attributing characters .not only that but also the residues of N,P,K are found maximum in soil .so the replacement of irrigation with fertigation helps more effectively in many aspects.

The use of mulching also coming in to progress and farmers are showing more interested about this kind of practices in the cultivation. cause the mulching helps in multiple ways like moisture maintains ,wee control and providing favorable micro climate condition

Fig.1 Tomato cultivation by using Polymulching

Fig. 2 Tomato cultivation by using polymulching.

.Mulching by using poly mulching need based irrigation not only decreased the number of needful irrigation but also increased the yield attributing characters like no of fruit plant ,no of effective branches plan

Conclusion

Along with the mentioned technologies like Nano –fertilizers using mulching . fertigation many other techniques like Vegetable grafting, training systems of tomato mainly cherry type in playhouse ,drip irrigation systems and many more are concentration by various research institutes in KVK are working .so hard to improve the yield and quality of tomato crop in our country. However due to the increasing rate of population and also changing climate conditions. we have concentrate on the new varieties and hybrids which can meet all the needs in view of farmers and consumers.

JUST AGRICULTURE
THE FUTURE OF AGRI INNOVATION

Role of Pedotransfer Technology in Soil Properties

Sonam Sharma*
M.Sc. (Scholar),
College of Agriculture, RVSKVV, Gwalior (M.P.)
*Corresponding Email -sonamsharma02official@gmailcom
ARTICLE ID: 051

What Is Pedotransfer Technology

Parameters governing the retention and movement of water and chemicals in soils are notorious for the difficulties and high labor costs involved in measuring them. Often, there is a need to resort to estimating these parameters from other, more readily available data. BRIGGS and SHANTZ (1912), quantified and interpreted relation-ships between soil properties. Such terms as "*prediction of*" or "*predicting*" soil properties, "*estimation of*" or "*estimating*" soil properties, "*correlation of*" or "*cor-relating*" soil properties, were used interchangeably to name the contents, procedures and results of these types of studies .

Relatively recently, equations expressing relationships between soil properties were proposed to be called "*transfer functions*" (BOUMA & VAN LANEN, 1987) and later "*pedotransfer function*"' or PTFs (BOUMA, 1989). Recently the number of PTF applications has increased significantly due to the development of GIS-based regional modeling. According to the SCOPUS database, more than 55% of all pedotransfer papers were published in 2009–2015.

History of Pedotransfer Function

The first PTF came from the study of Lyman Briggs and McLane (1907). They determined the wilting coefficient, which is defined as percentage water content of a soil when the plants growing in that soil are first reduced to a wilted condition from which they cannot recover in an approximately saturated atmosphere without the addition of water to the soil, as a function of particle-size:

$$\textit{Wilting coefficient} = 0.01\,\textit{sand} + 0.12\,\textit{silt} + 0.57\,\textit{clay}$$

With the introduction of the field capacity (FC) and permanent wilting point (PWP) concepts by Frank Veihmeyer and Arthur Hendricksen (1927), research during the period 1950-1980 attempted to correlate particle-size distribution, bulk density and organic matter content with water content at field capacity (FC), permanent wilting point (PWP), and available water capacity (AWC).

In the 1960s various papers dealt with the estimation of FC, PWP, and AWC, notably in a series of papers by Salter and Williams (1965). They explored relationships between texture classes and available water capacity, which are now known as class PTFs. They also developed functions relating the particle-size distribution to AWC, now known as continuous PTFs. They asserted that their functions could predict AWC to a mean accuracy of 16%.

Jurgen Lamp and Kneib (1981) from Germany introduced the term pedofunction, while Bouma and van Lanen (1986) used the term transfer function. To avoid confusion with the term *transfer function* used in soil physics and in many other disciplines, Johan Bouma (1989) later called it *pedotransfer function*. (A personal anecdote hinted that Arnold Bregt from Wageningen University suggested this term).

Since then, the development of hydraulic PTFs has become a boom research topic, first in the US and Europe, South America, Australia and all over the world.

Although most PTFs have been developed to predict soil hydraulic properties, they are not restricted to hydraulic properties. PTFs for estimating soil physical, mechanical, chemical and biological properties have also been developed.

Soil hydraulic properties and Pedotransfer Function:

The aim of soil hydraulic modelling is to provide a simplified and abstract view of the complex hydraulic patterns in a soil sample. Soil hydraulic properties are key aspects in determining soil quality and soil function. Soil hydraulic properties and their associated soil hydraulic models are used in a wide range of applications, including irrigation (Coppola et al., 2004; Grashey-Jansen, 2014), soil leaching losses (Wheeler et al., 2003), soil management (Bodner et al., 2013; Horne and Scotter, 2016), and long-term studies on the effect of climate and land use change (Kellomäki and Vaisanen, 1997; Sulis et al., 2011). Besides this many soil water and solute transport models are currently applied for the investigation and prediction of a wide range of complex environmental processes, which are indicative of soil quality, for example, infiltration capacity. These models require data on soil water retention and hydraulic conductivity characteristics. However, collection of these data is difficult, time consuming and sometimes rather costly, so there is a continued interest in the establishment of pedotransfer functions (PTF), which predict soil hydraulic properties from other - more easily measured - soil properties. Pedotransfer functions can define as predictive functions which relate more easily measurable soil data such as soil texture (sand, silt and clay), bulk density, organic matter (organic carbon) content and/or other data routinely measured or registered in soil surveys with hydraulic parameters such as the soil water retention characteristic.

Bouma (1987) introduced the term pedotransfer function (PTF), which he stated as translating data that we have (soil survey data) into data that we need (soil hydraulic data). The PTFs are multiple regression equations or models, which correlate soil water retention characteristics with easily available soil properties. (Salchow *et al.* 1996) like particle size distribution, organic matter content and bulk density (BD).

Lal (1979) considered sand, silt, clay and organic matter content as predictors in PTFs for estimating the field capacity and wilting point in tropical soils.

There are a variety of methods that can be used to develop PTFs for soil given an adopted property definition, and the choice of which method is used depends on the range of soil characteristics available, the constraints the modeller may wish to apply to take into account the known functional behaviour of soil water dynamics, and the application or model in which the PTFs are likely to be used. For instance, some applications or models may require knowledge of water content over the full range of tensions, while others only require water content for a few specified tension values. During the last decades, most existing and published PTFs have been developed using data from soils of temperate regions (Tomasella *et al*., 2000). Yet, van den Berg *et al.* (1997) argue that physical and chemical differences between "temperate" and "humid tropical" soils might be the causes of the poor performance of "temperate soils" PTFs when applied to highly weathered tropical soils. These differences originate from marked differences in mineralogical properties (Tomasella and Hodnett, 1998, 2004). Based on what is indicated above, we consider that a low quality of the estimation of hydraulic properties may influence the overall quality of the outputs of the whole modelling process.

However, the PTFs derived for estimating soil water retention curves of a specific geographical region cannot be applied to other regions with acceptable levels of accuracy (Cornelis *et al.* 2001; Li *et al.* 2007).

Conclusion:

The pedotransfer functions (PTFs) are defined as predictive functions of certain soil properties derived from other easily measured soil properties. The PTFs are important tool that can be effectively used to estimate the soil water characteristics from limited experimental data points assuming certain functional forms, hence pedotransfer function (PTF) is a translating data that we have (soil survey data) into data that we need (soil hydraulic data). The PTFs are multiple regression equations or models, which correlate soil water retention characteristics with easily available soil properties like particle size distribution, organic matter content and bulk density(BD).

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Weed Management in Organic Agriculture

Sparsh
UIAS,Chandigarh University, Punjab
Email:- sparsh.ranaut612@gmail.com
ARTICLE ID: 052

Abstract

The basic approach of this article is to access the conditions under which formally organized organic farming might become a factor for rural development. organic farming may improve farmers' social and economic conditions as well as the overall development of areas with a significant organic agricultural sector (proportionally to the local scale .Nowadays, as a result of continuous awareness towards a healthy life and environmentally sound products, more and more people tend to consume healthy /Organic Products .Indeed, Organic agriculture is increasingly gaining greater importance and is being recognized by Consumers, Farmers, Environmentalist and Policy Makers, as one of a number of Possible Models for Environmental, Social and Financial Sustainability in agriculture. More recently, it has been argued that organic farming can provide rural development benefits through enhanced employment and through closer connections with the local economy, reconnecting consumers with producers and stimulating positive economic multipliers.

Introduction:

Organic farming can be defined as a system of management and agricultural production that combines a high level of biodiversity with environmental practices that preserve organic farming does not prohibit the use of pesticides and fertilizers and most farms in organic farming use fertilizers and/or pesticides (. some pesticide are allowed For example, copper sulfate is a pesticide used in organic farming in the wine industry. In total, there are several hundred pesticides and fertilizers authorized in organic farming which are listed in annexes I and II of the EC Regulation

- Rural development includes local population, its way of life, employment characteristics, income structure, dwelling conditions, service levels as well as cultural aspects just as traditional handcrafts, dishes, language, clothing and habits. New rural development policy of EU can be featured by Multisectoral and integrated approach. Organic farming is based on the definition of ecology as former naming just as ecological biological represent it. Its basic aim is ensuring sustainable development whereas it uses again, from time to time to locally available reserves.

- It can be stated that market demand for organic products is the strongest in Europe, as much as 46% of the world's organic product output is sold in this continent which possibly can be explained by its economic development level. This overall development reached Hungary, too.
- In December 2002 the estimations showed 105.000 ha and within this 54.497 ha had been registered as approved organic area. In case of organic production quality is more important than quantity, since in farms using environment-friendly ecological methods smaller yield can be obtained.
- The gaining of the rural areas is an accelerating process which on the one hand is in connection with the most complex manifestation of rural functions (economic, ecological, community as well as cultural and social functions), on the other hand it comes from the idea stating that rural areas offer indispensable services for the whole society, therefore accepting and developing rural values is an interest of the society.

All this is connected with fact that in the EU the multifunctional Agricultural model is the main stream and agriculture has to have a two-type performances;

1. It has to produce good quality, whole value and safe foods.
2. It is an economic function which has to be regulated by the market and not financement . Since ,commodity production is not financed in any other branches of economy.
3. It has to offer concrete eco-social services (they are environmental services which serve the maintenance and protection of the rural area, the natural habitat, waters, topsoil helping the people living there).

The intention of the European Union is to assist the accessing countries (among them Hungary) which have employment achievement and environment friendly policy at the same time.

Agricultural Economy in Rural Development:

- ✓ Within national economy sectors it is agricultural economy that has the strongest connection with rural areas mainly because the rural area itself delivers the operation field and labour base of agricultural economy (especially of agriculture and forestry).
- ✓ Agricultural economy ultimately determines the income positions of rural families and communities, therefore it is a settlement forming factor. It has strong and direct connections with living environment, renewable natural resources, so it has an effect on the state of its elements (primarily on soil, surface waters, flora and fauna).
- ✓ Organic farming delivers an ever growing and permanent market background for producers in rural areas.

There are some needs that required for organic farming mentioned below:

1. Organic farming has to be concerned as a complex and integrated system.
2. On one hand that the shift to organic farming should include not only the production of organic raw materials but also the processing, packaging and marketing of them.
3. On the other hand it is important to establish the organizational and interest forms and systems which cover the production itself, the equipment and genetic base supply, small and medium size processing facilities, packaging, advisory and marketing management.

In this way the previously ignored factor of rural development can potentially turn into a dynamizing engine of regional development:-

Depending on the economic situation of organic farms, the development of organic Agriculture will especially depend on the three factors:

1. Technical Progress;

Technical progress in organic and conventional farming will affect the relative future competitiveness of both types of farming. As organic farming is gaining in importance, one can also expect increased technical progress in this sector, which will have positive a impact on it.

2. Price Development ;

Even though prices for organically produced food have mostly remained strong in the last years, despite the strong expansions in organic farming, the risk of prices changing is still to be reckoned with. An EU wide regulation of organic livestock production and similar regulations for plant production can be expected to further strengthen this development.

3. Political Development ;

The direct support given to organic farming via area payment will continue to have a substantial impact on the economic viability of organic agriculture. Any decision regarding how current schemes within EC Reg. 2078/92 will be handled in the future, and what financial support will be available through them, is thus of major importance. CAP reform and an analysis of its impact on organic farming shows that it tends to improve the competitiveness of this type of farming.

Conclusion

Rural environment covers every aspect of natural environment (biodiversity, living spot and resources protection but also landscape protection) as well as of artificial environment (conserving traditional architecture, archaeological sites and other elements historical heritage). Rural development includes local population, its way of life, employment characteristics, income structure, Dwelling conditions, service levels as well as cultural aspects just as traditional handcrafts, dishes, language, clothing and habits. Since agriculture is a historically determining economic activity in rural areas its effects primarily determines the rural ways. And also provide employment for farmers and rural people which satisfy their financial needs and maintain their living standards.

"Do not panic- be organic"
"Do not pay doctors -pay farmers"

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Sustainability in agriculture resources for global food security

Vala Yashraj Batukbhai
M.Sc Scholar
C. P. College of Agriculture,
Sardarkrushinagar Dantiwada Agricultural University, S.D.A.U, Dantiwda, Gujarat.
Email: yashrajsinhvalaagri8877@gmail.com

ARTICLE ID: 053

The global food security is in question today with ever increasing food prices resulting from adverse climatic effects on agricultural production, rise in oil prices, increasing use of grains for biofuels, and almost a 50 per cent reduction in public spending on agricultural sector over the last three decades. The environmental sustainability has also become more elusive due to rapid industrial and population growth, urbanization, and with the lack of public realization about the sheer effects of environmental pollution. Asiatic countries and their economy largely depend upon agriculture. With the technological breakthrough, significant level of food grain production has been achieved and large stocks of food grains have been piled up to meet exigencies. Importantly, this large stock of food grains is being infested with insects' and pests that have increased the cost of storage, besides deterioration in the quality of food grains. Secondly, the use of food grains for manufacturing of bio fuel to meet the energy need of industrial and transportation sector has resulted in diversion of main crop like corn, maize and beans. With this the question of food security of the increasing population has emerged.

In future, the problems of dwindling food security and environmental sustainability will aggravate because the total food production remained constant over the last two decades with growing environmental and socio-economic challenges. Use of bio fuel may encourage a war between food and fuel. Production of bio fuel may lead to decrease in land available for food production creating scarcity of food.

Under the global village, food is becoming the scare and prospectus of agribusiness increases gradually. India is a global agricultural powerhouse. Agri-business are fast realizing the importance of providing quality products and value-adding in the sector by providing modern technology, knowledge and financial assistance to the farmers. Further, post liberalization the sector has witnessed opening of new vistas for the development of the rural economy, and thereby, strengthening the domestic market as well. The need of the hour is to combine entrepreneurial expertise with Government initiatives to help the agri-business sector grow rapidly.

While determining fertility of soil, only NPK ingredients of soil are considered and whereever soils are deficient in NPK, balancing is done by topical soil applications of chemical fertilizers. Indiscriminate use of chemical fertilizers led to establishment of chemical agriculture which resulted in reduction of fertility of soil and thus rendering soil totally alkaline. This led to advent of organic agriculture which is basis of sustainable development. Indian farmers are practicing organic agriculture from ancient times. Soil, a live medium, due to its porosity breathes air and keeps soil organisms thriving. If naturally found ingredients are used to produce organic fertlizers and pesticides for agricultural use, then such practices do not have adverse effect on fertility of soil and once soil regains its fertility then there is no need of any repetitive applications of chemical fertilizers every season.

This is achievement of organic agriculture. It is a cry in wilderness of misguided scientists and a group supporting them that organic agricultural practices are anti-capitalist. If coal is not available on enduring basis, then it is a big cause of concern for producers of electricity but same is not true in case of those units producing electricity from wind and solar energy as these being sustainable natural energy resources and this is an important point to be remembered by practitioners of organic agriculture. Even if end values of crop are same as those of chemical agricultural practices, plus point of organic agriculture is that it is less expensive and is sustainable.

Conclusion

"Sustainable food security" means enough food for everyone at present plus the ability to provide enough in future as well. To cope with such situations, agricultural package of practices and policies should adopt efficient measures for increasing production without degrading environment. Efficient handling, storage, and processing technologies are also needed to reduce postharvest losses of farm produce and increase value addition to processed products. Research and development activities can play a pivotal role in attaining these goals. There is a greater need for our farmers to have an easy access to modern and eco-friendly technologies and quality agricultural inputs to ensure food security and environmental sustainability. Under such conditions, it is imperative for the scholars to ponder over the issue and provide solution to meet the needs of rising population and sustainability of a decent life. The aim of this compilation is to build a roadmap for achieving food security and environmental sustainability.

Vol.1 Issue-1, September,2020

Doubling Farmers' Income through Horticulture Interventions

Dr. Sanjeev Kumar[1] and Dr. V.K. Tripathi[2]
[1] Assistant Director General, UP Council of Agricultural Research, Lucknow
[2] Associate Professor, Department of Horticulture, CSAUAT, Kanpur
Email-drvktripathicsa@gmail.com
ARTICLE ID: 054

Horticulture has emerged as a core sector of agriculture over the past decade, growing steadily in annual area coverage and output. In the year 2016-17, horticulture stood at nearly 25 million ha and production was at a record 299.8 million tonnes of which 269.9 million tonnes was in fruits and vegetables alone. Horticulture is seen as optimal option for crop diversification in agriculture. The per unit earning capacity of farmers is much higher than in case of food grains and it also addresses environmental concerns. Nevertheless, most horticultural output requires specialised market linkages and connectivity, post harvest infrastructure and to make this sector more remunerative, there is a need to address the constraints involved.

The productivity of vegetables and fruits was noticed 17.11 and 14.51 tonnes per hectare, respectively in India during 2017 but this was negligible in case of aromatic crops (1.56 tonnes per hectare) and spices (2.21 tonnes per hectare). Therefore, there is more need to focus on aromatic crops and spices in state programme as compared to other commodities. Productivity growth in fruits and vegetable was meagre (1.57%) over the past decade. This is only due to non-availability of quality planting material, dwindling status of natural resources, abundance of resource poor farmers and low adoption of modern technologies. The challenge is to enhance productivity by increasing the factor productivity of all the horticultural production inputs, and at the same time sustaining it by adoption of good practices and precision farming principles. Hence, situation specific modern technologies should be identified/developed, refined/validated and popularized.

High cost of input in horticulture crops, prevalence of old and senile orchards, unorganized supply chain are the major bottle neck, therefore, adoption of organic agriculture practices and farming system approach should be promoted for decreasing input cost and ultimately increasing the income. Moreover, rejuvenation of old and unproductive orchards and organized marketing are also very important for getting remunerative income. As reported 30% produce of horticultural crops are being spoiled due to their perishability. So their perishable nature should be judiciously targeted based on assessment of production and availability of market to escape unexpected low prices of produce due to high level of production.

Major thrust areas for horticulture development are cluster approach linked with post-harvest management and marketing, market intelligence to promote market led production, quality seeds and planting material, adoption of improved varieties and rejuvenation with improved cultivars, hi-tech horticulture and precision farming, high density plantations, etc.

Interventions for doubling the farmers' income

- Diversification of present farming system with horticulture crops, availability of micro irrigation, resource use efficiency, increase in cropping density, better agronomic practices, incorporation of improved varieties and technologies, area expansion may be taken under consideration as sources of income growth in horticulture sector.
- Popularization of hybrids may be proved as prompt effort for increasing the income. The hybrid technology has capacity to revolutionise the production of vegetable crops and demand for hybrid seeds is continuously increasing. At present, the area under vegetable hybrids accounts for 10 per cent of the total area. High production, earliness, superior quality, uniform produce and resistance to biotic and abiotic stresses are the main advantages of F_1 hybrids. Adoption of hybrid varieties can increase 1.5-3 times more yields which mean more income from increased output from same area.
- Appropriately selected rootstocks have potential to modify the architecture of plants for efficient utilisation of resources. It can ameliorate the soil, enhance nutrient and water use. Therefore, rootstocks have become integrated in the production system of grapes, citrus, apple and many fruit crops for successful production.
- Genetically dwarf cultivars in mango, banana, papaya, sapota and dwarfing rootstocks in mango, guava, citrus, ber suit high density planting system for accommodating more plants, increasing output and income. Rootstock technology has capacity to double the production and even make it possible to grow fruit crops under stress conditions.

- Use of CMS line for hybrid seed production in vegetables and floriculture. Use of good quality seed and planting material is a prerequisite for the production of high yields. High quality seeds and planting material help to increase horticultural productivity; improve food security; lower money spent on food purchases and imports and raise domestic economic activity.

- Various diagnostic methods viz. ELISA, Polymerase Chain Reaction (PCR), multiplex PCR, Real Time PCR are available for different viruses, bacteria and fungi in order to enhance the production with diverse escaping practices.

- Protected cultivation is a good option for producing quality produce and efficient use of land and other resources in some horticultural crops. It is beneficial for nursery raising and cultivation of high value vegetables and flowers.

- Facilitation of micro-irrigation in horticulture sector in rainfed areas. Among various methods tried drip irrigation has proved successful in exhibiting high water productivity by saving irrigation water from 25 to 60 per cent in various orchard crops and vegetables with a 10 to 60 per cent increase in yield as compared to the conventional method of irrigation. It is one of the latest methods of irrigation which is becoming popular in areas with water scarcity and salt problems. The impact of micro-irrigation on resource conservation (saving in input costs to the farmer) is estimated in the range of 20 to 40 per cent in case of horticultural crops.

- The cultivation of horticultural crops is labour intensive and it needs timely operations for maximising the production. The availability of the labours is reducing in the villages. The end to end mechanisation of the horticultural crops is required to be adopted. Several machines and tools have been developed to enhance the efficiency of farm operation in high tech nursery, precision farming, high density plantation, protected cultivation, etc.

- **Bio-fertilizers** are microbial preparations containing living cells of different microorganisms which have the ability to mobilize plant nutrients in soil from unusable to usable form through biological process. Streamlining is required in the use of bio-fertilizers, VAM fungi, biological N fixers and other beneficial microbial agents for effective nutrient use efficiency.

- Nano encapsulated conventional fertilizers, pesticides and herbicides helps in slow and sustained release of nutrients and agrochemicals resulting in precise dosage to the plants.
- Horticulture based cropping system optimises use of the space and time and improves upon productivity from same piece of land. This has an income doubling impact for farmers.
- Promotion of Integrated farming system approach involving synergic blending of crops, horticulture, dairy, fisheries, poultry, etc. seems viable option to provide regular income and at site employment to small land holder, decreasing cultivation cost through multiple use of resources and providing much needed resilience for predicted climate change scenario.
- At present the cropping intensity in agriculture as a whole is 138.9 per cent, and segregated statistic is not available for horticultural crops. Any increase in the intensity would add to the production from farms accordingly. Higher cropping intensity is made possible with various measures, primarily irrigation, use of fertilizers, crop rotation, mixed cropping, relay cropping, etc.
- In perennial horticultural crops, the brown space available in the pre-bearing age of the orchard can be effectively utilised to grow short duration horticultural crops as intercropping or for interspaced planting and cultivation to gain higher income. Mechanical tools, tiller tractors, sowing gadgets, etc. can save critical time between crops thus enabling use of short duration crops or fast maturing varieties.
- There remains a considerable gap between the gross production and net availability of fruits and vegetables due to heavy post-harvest losses in case of horticultural produce. It is estimated that India incurs post-harvest fruits and vegetable losses worth over two lakh cores each year largely owing to the absence of modern cold storage facilities and lack of proper food processing units. More emphasis needs to be given to post-harvest management of fruits and vegetables. Besides storage and processing, the cold-chain is seen as a value adding activity as it allows farmers to capture greater value.
- Commercial floriculture has been steadily increasing with increased use of protected cultivation employing greenhouse, shade nets, polyhouse, etc. Commercial flowers

cultivation in India provides an opportunity for rural development owing to its higher returns per unit area and the new employment opportunities. Nearly 80% of area under floricultural crops is concentrated in seven states comprising Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal, Maharashtra, Haryana, Uttar Pradesh and Delhi. A major part of the area under flower cultivation is devoted to the production of Marigold, Jasmine, Rose, Chrysanthemum, Tuberose, etc., with considerable increase in the area under cut flower cultivation. Share of Uttar Pradesh in floriculture is only 5% which is at near bottom as compared to other states of country even very small states like Karnataka, Tamil Nadu are far ahead (>10%). Therefore, this sector can be identified as grey area which can be directly included in different farming systems as a viable diversification from the traditional field crops because of higher returns.

- Spices sector is one of the most vibrant sectors of the Indian agricultural trade. The share of spices in the total agricultural export works out to about 6 per cent annually. The world demand for organic spices is growing rapidly in developed countries like Europe, USA, Japan and Australia, India has a greater potential to encash this trend by diversifying into high-value-plus crops like saffron, cardamom, turmeric, chillies, ginger and vanilla beans.
- The demand for organic fruits and vegetables is increasing at a rapid pace. Such horticultural produce grown through organic means is nutritionally superior and free from the injurious pesticide residues. The protocol for organic production in many horticultural crops has been worked out which includes a use of resistant varieties, management of soil, use of vermi-compost and bio-fertilizers, and management of disease and pests using biological control as well as bio-pesticides. Recently Sikkim has been announced as hundred per cent organic cultivation state.
- The country has a vast production base which offers growth opportunities for export. Mangoes, Walnuts, Grapes, Bananas, Pomegranates account for larger portion of fruits exported from the country while Onions, Okra, Bitter Gourd, Green Chillies, Mushrooms and Potatoes contribute largely to the vegetable export basket. The major destinations for Indian fruits and vegetables are UAE, Bangladesh, Malaysia, Netherland, Sri Lanka, Nepal, UK, Saudi Arabia, Pakistan and Qatar. Floricultural exports from India comprise of fresh cut flowers (to Europe, Japan, Australia, Middle East and USA), loose flowers

(for expatriate Indians in the Gulf), cut foliage (to Europe), dry flowers (To USA, Europe, Japan, Australia, Far East and Russia), potted plants (limited to Middle East) besides seeds and planting material.

- Among fruits mango, guava, banana, papaya, aonla, bael, vegetables okra, onion, potato, cabbage, watermelon, flowers rose, tuberose, gladiolus, marigold and medicinal and aromatic plants artemisia, mentha, citronella, ashwagandha, palmarosa, brahmi, basil, damask rose, vetiver, lavender, are the potential crops. Standard of these crops may be validated/refined for export parameters in which APEDA and Directorate of Agriculture Marketing and Foreign Trade play a nodal role.
- **Agroforestry** conserves natural resources through various systems under different agro climatic regions. Millions of farmers are dependent on agroforestry farming systems as a way of increasing and sustaining agricultural productivity, as a source of essential food, fuel wood, fodder and building materials and as a supplementary source of income. In Uttar Pradesh enough forest cover is present in various pockets eg. Vindhyan, Tarai and Eastern Plain region where farming system based on agri-silvi pasture, horti-silvi pasture and other agro-forestry modules can be popularised to enhance the farmers' income.
- **Quality seeds** play significant role in the agriculture production. Farmers can enhance their income through participatory hybrid seed production programme for different seed companies. It is a form of contract farming where farmers are supplied with inbred lines for further crossing and production of hybrid seeds of vegetable crops. Hybrid seed production and other open pollinated seed production including planting material of vegetable crops, floriculture and fruit plants is the potential sector for prompt enhancement in farmers' income. Hence, this sector should be promoted in PPP mode. The productivity of horticultural crops like fruits, vegetables, flowers, plantation crops and spice crops can be increased by supply of disease free quality planting material to farmers.
- **Beekeeping** is an agro-based activity which is being undertaken by farmers/landless labours in rural area as an integrated farming practice. In various agricultural and horticultural crops, honey bees' pollination also improves the quality of produce. Honeybees, in addition to enhancing the yield of various crops also convert nectar and

pollen into honey and other beehive products, viz. bees was, royal jelly, propolis, etc. which provides additional income to the farmers/beekeepers.

- **Mushroom** cultivation can also represent a valuable small-scale enterprise option. Surplus crop residues which are being burnt in the country and becoming a threat for ecology should be utilised for casing preparation in mushroom production as example of 10% surplus provided significant gain in mushroom production.
- **Urban and peri-urban horticulture** needs to be promoted as one of the facets that will keep cities clean, as it has highest potential to reutilise recycled water and solid waste (compost) for gainful purposes.
- **Tomato, potato and onion are the most sensitive crops** to price fluctuations form almost 50 per cent of the total fruit and vegetable sales. The prices of tomato, onion and potato fluctuates owing to disparity between demand and supply fuelled by the clash of interests between the consumer, the producer and the middlemen on account of a drop in production because of unfavourable weather, a rise in transport costs, seasonality and supply chain constraints. To reduce price fluctuations, a complementary storage option to be developed to locate buffers of onion and potato close to the markets. These need not be high technology systems but designed to cater to a two week inventory cycle from the buffer into market. All efforts to increase potato production must be balanced with developing external demand and hence export trade needs to be promoted if pursuing future growth in production. A favourable trade policy for potato will favour higher production and productivity and also promote growth in cold-chain.
- Potato seed production at present is being taken up only in a few states like Punjab, Haryana and Uttar Pradesh. The seeds produced in these states are supplied to other producing states of the country. Seed production in states like Karnataka, Madhya Pradesh, Gujarat and Odisha can be promoted, so that the farmers of these states may get quality seed at reasonable prices.
- Protected cultivation of tomato needs to be promoted in different peri-urban areas, to meet the demand during lean period, i.e., from July to October.

- Area expansion programme for kharif and late kharif onion can to be taken up in non-traditional states like Madhya Pradesh, Rajasthan, Haryana, Bihar, Odisha and Gujarat to avoid the pressure on Maharashtra, Karnataka, Andhra Pradesh etc. during lean period i.e., July to March. Onion seed production is presently being undertaken by traders in the states of Maharashtra, Gujarat and some part of Madhya Pradesh, to supply the seed all over the country. Suitable seed producing pockets in other state like Rajasthan, Punjab, Bihar and Odisha can be developed so that there is more availability of seed at reasonable price across the country. Onion storage capacity is required to be enhanced in the states of Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, Bihar, Odisha, etc. to cater the needs of north and north eastern regions of the country.
- The PRAMs **(Primary Rural Agri-Markets**) would serve for direct marketing to local buyers. PRAMs created at village level be modernized and established as aggregation hub to ensure the marketing of produce. These market will work on the line of Horticultural Producers' Co-operative Marketing and Processing Society Ltd. (HOPCOMS) and Mother Dairy Fruit and Vegetable Pvt. Ltd. (SAFAL) programmes. At least one modern state-of-art terminal flower market is required to be developed near each major metropolitan cities.

Quality breeding in bulbous vegetables

Ramavath Ramesh Babu[1], Shubham Singh[2] and Basavaraj T[3]
[1]Ph.D. Research scholar, Division of Vegetable science, University of Horticultural Sciences, Bagalkot, Karnataka.
[2]Ph. D Research scholar, Division of Vegetable science.
ICAR- Indian Agricultural Research Institute, Pusa New Delhi-110012
[3]Ph.D. Research scholar, Division of Vegetable science, University of Horticultural Sciences, Bagalkot, Karnataka.
E-mail: rathod.ramesh89@gmail.com
ARTICLE ID: 055

Introduction

Quality refers to the suitability or fitness of an economic plant product in relation to its end use. Quality is the degree of excellence for a specific use or to serve a specific purpose. A trait that defines some aspect of produce quality is called quality trait (Singh, 2016).

Bulb crops are important vegetables known for their nutritional, therapeutic, medicinal and processing qualities. Quality improvement is an important component in nutritional security; it is of prime importance for the consumers and processing industries. Therefore, improving quality through suitable breeding approach is an important task.

Classification of quality traits:

1. Morphological Quality Traits: It is related to produce appearance. It includes size, shape, surface and colour of produce. It is easily observable. It has main role in determining consumer acceptance of the produce.

2. Organoleptic Quality Traits: It is related to palatability of the produce. It includes taste, aroma, smell, juciness, softness. It is easily detected. It is important in influencing consumer preferences.

3. Nutritional Quality Traits: It determines the value of produce in human nutrition. It includes protein, oil, vitamin and mineral content also the presence of anti-nutritional factors. It is not easily detectable but important in determining the human health.

4. Biological Quality Traits: It is actual usefulness of the produce. It includes protein efficiency ratio, biological value, body weight gain. It is valuable in determining the utility of produce for consumption.

5. Undesirable Traits: Doubles/splitters, sprouting, bolting (Singh, 2016).

Breeding approaches to improve the quality:

Genetic variability is an important prerequisite for improvement of a crop.

- Clonal selection
- Mass selection
- Recurrent selection
- Hybridization
- Biotechnological applications (Ram, 2012)

ONION:

- It is one of the important bulb vegetable.
- Rich source of vitamin C, iron, phosphorous, calcium and fructans
- Pungency-allyl propyl disulphide
- Red colour varieties are more pungent followed by brown, yellow and white.
- It contains different pigments and they are responsible for different colours *viz.*,

  Red-anthocyanin

  Yellow-querectin

Quality parameters:

- Longer bulb storage life
- Single centered bulbs
- Bulb shape, colour and size varies according to consumers preference
- Pungency and TSS
- Firm bulbs
- Free from splitters and bolters
- Dormancy- to extend the storage life
- High antioxidants

Quality parameters for dehydration:

- Pure white globose shaped bulbs (5-7.5 cm diameter)

- Small and tight necked with short root zone
- Thin neck
- Single centered bulbs
- Low ratio of reducing to non-reducing sugars
- High pungency and TSS (15-20%)
- Drying ratio (6:1)
- Wider seasonal adaptability
- Long storage capacity
- Not less than 80% moisture
- Resistant to storage pests and diseases
- Free from greening

Quality parameters for export:

- Bigger sized bulbs (>60 mm diameter)
- Single centered bulbs
- Less pungency
- High TSS
- Uniform in shape, size and colour
- Free from splitters and bolters (Ram, 2012)

Genetics:

Table: 1

Character	**Gene symbol**
Bulb colour	
Red	ii, CC, RR ii, Cc, RR ii, CC, Rr ii, Cc, Rr
Yellow	ii, CC, rr ii, Cc, rr
White	ii, cc, RR ii, cc, rr ii, cc,Rr II,--,-- Ii,--,--
Bulb size (weight, diameter)	Polygenes and additive gene action
Dry matter content	Poly genes, additive gene action
Bulb shape	non additive gene action
TSS	non additive gene action

GARLIC:

- It has higher nutritive value than other bulb vegetables.
- Rich source of carbohydrates, protein, vitamin C, thiamin, riboflavin, calcium and phosphorous.
- Flavour-diallyl disulphide
- It consists of a compound called allicin.

Quality parameters:

- Longer bulb storage life
- Larger bulb size
- White coloured bulbs
- High pungency
- Firm bulbs with compact cloves
- Free from splitters and bolters
- High dry matter and TSS (Ram, 2012)

Conclusion:

Breeding for quality improvement provide more consumer acceptance and satisfaction which in turn enable producer to get good return. Nutritional improvement along with yield is important to combat micronutrient deficiency and malnutrition. There are cultivars developed in bulb vegetables for quality attributes *viz.*, dehydration purpose (Pusa White Flat and Arka Yojith), export purpose (Arka Pitamber and Arka Sona) in onion and Agrifound Parvathi and Yamuna Safed-1 in garlic. In future more emphasis must be given for multi-nutrient rich variety and also to have more quality attributes in one variety along with yield.

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Vol.1 Issue-1, September,2020

Sikkim: The Organic Farming Journey

Manvendra Singh
UIAS, Chandigarh University (Mohali), Punjab
Corresponding author:- singhnarendra6977@gmail.com

ARTICLE ID: 056

INTRODUCTION

Sikkim is known to the fully organic state since 2016, its products are being sold in the organic markets of the Sikkim and as well in the foreign country as the export. The life of people is far better than the past life how they were living while cultivating the conventional farming. Around the 50% increment in the number of tourist who visits the state, it is indirectly improving the life of native people there. Initially farmers were having the fear of adoption of organic farming to due various reasons like low yield, sensitive to plant disease, insect sensitive and crop failure etc.

JOURNEY OF ORGANIC FARMING IN SIKKIM

From the 2003, the revolution had started with target of achieving the fully organic state as soon as possible. So the Government official went to the farmers through the extension workers to spread the organic farming knowledge and target achievement by the state. Farmers were asked to join the training by the scientists and also sent outside the state to adopt the much better skill from that other states and country. In 2010, the Sikkim organic mission started to increase the pace of organic farming in state. In the 2016 the state could achieve the 100% organic state.

ACROSS THE FINISH LINE

- The process of converting Sikkim into a 100 per cent organic state was fast-tracked in 2010 with the launch of the Sikkim Organic Mission
- 2003- Sikkim begins discouraging use of chemical fertilizers, reduces fertilizer subsidy by 10 per cent and the Sikkim Organic Board is constituted.
- 2003-2009 - State adopts 396 villages as bio-villages to test organic inputs.
- 2006-2009 - About 8,000 ha of land is certified as organic.

- Eight units of vermi-culture hatcheries are established in five state farms and three Krishi Vigyan Kendras.
- 2008-09 - Ginger processing unit is established at Birdang Farm, West Sikkim. Ginger is one of the four high-value crops selected by Sikkim for its trade potential
- 2010 - Sikkim Organic Mission is launched to fast-track conversion of Sikkim into a 100 per cent organic state
- 2010-11 - More than 18,234 ha of land is certified. Automated greenhouses are established for production of disease-free quality planting material.
- 2011-12 - 19,216 ha land is certified.
- 2012-13 - 19,188 ha land is certified. `Organic farming' is included in school curriculum
- 2015 - Entire agricultural area in the state is converted to `certified organic'.
- 2016 - Sikkim is formally declared a `100 per cent organic' state.

HOW IT BECAME?

In 2003, Sikkim decided to adopt the resolution to switch the organic farming. At that time people were not ready for this drastic move by state. So, policies phased out the chemical fertilizers and pesticides from the state. Achieved the total ban on the sale of the chemical fertilizer and pesticides and due to this move the farmers of the state bound to adopt the organic farming. The Sikkim Organic Mission in 2010, backed by government funding, supported this initiative by providing seeds and manure, training farmers in organic methods and even sending them outside the state for advanced training. The government initiated further infrastructural measures such as building bio fertilizer units, seed processing units and soil testing labs; enabling the organic cycle to bloom. Farmers have also been facilitated in receiving loans as well as being provided counseling support by the agricultural department. Start-ups like Organic Sikkim have also helped farmers find markets for their produce, eliminating middlemen and resulting in higher profits.

Even India's budget for 2016–17 introduced various measures to increase crop yields and boost organic farming. These include increasing the area of land to be brought under organic farming to half a million acres and launching a scheme to push sales of organic produce in both domestic and export markets. Also the undulating land mass of the state made the farmers to adopt this system uniformly.

WHY IT BECAME?

Organic agriculture is important for our health and the future of our world for many reasons. It's needed to sustainable feed the world. It carries far fewer toxic pesticide residues, and is grown using no GMO s. It doesn't poison farm workers or the micro-organisms living in the soil that produce healthy, drought-resistant crops. Organic farming is also better suited to climate change, protects biodiversity, enhances soil fertility, and, to top it off, organic foods are more nutritious and taste better.

But without pesticides and other tools known for producing high-yield agriculture, would organic food really be able to produce enough food to feed people? Many studies from around the world show that organic farms can produce about as much if not more food than conventional farms. It may take several seasons for farmers to learn the new ways and see success, but as the soil and biodiversity recover, yields go up. And in places where most of the world's hungry live, yield gaps for organic food disappear.

HOW SIKKIM IS BENEFITING FROM BECOMING AN ORGANIC STATE?

Sikkim's transition to an organic state is good for public health and the environment in the area. It's also good for the economy. Tourism to the area is also increasing and bringing in more money. Guests can stay in organic villages, where they are able to enjoy the abundant natural beauty and eat fresh, organic meals. Sikkim organic retail stores offering pulses, rice, mandarin oranges, ginger, cardamom, and turmeric have been set up by the government in New Delhi. More stores are planned for other major cities. Due to the surge in demand for Sikkim's organic produce, farmers are now earning 20%more.

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Vol.1 Issue-1, September,2020

Integrated Pest Management in Brinjal

Mukesh Kumar Bishnoi
Assistant Professor
(Shri Khushal Das University Hanumangarh, Rajasthan)
Email:- bishnoimukesh493@gmail.com
ARTICLE ID: 057

Brinjal or egg plant is a very popular and extensively grown solanaceous vegetable all over the world. One of the major constraints noticed in its production is the increasing incidence of various insect pests which cause a great amount of yield loss estimating about 35-40%. Due to its tender and succulent nature and its cultivation under high moisture and input regime, brinjal is very susceptible to attack of various insect pests at different growth stages. To alleviate the losses caused due to insect pests, a huge amount of pesticides is being used which has led to problems like environmental problem, resistance, resurgence and also create threat for useful flora and fauna. Some vegetables which are harvested at short interval are likely to contain high amount of pesticide residues which is harmful for the consumers. In this context Integrated Pest Management (IPM) approach is gaining motion as it is more reliable and eco-friendly. Here we will discuss about some of important insect pests of brinjal and their management in an integrated way to manage the pests which will help the growers to get maximum returns.

Shoot and fruit borer

Scientific Name - *Leucinodes orbonalis*

Family–Pyralidae

Order - Lepidoptera

Economic Importance: It is one of the most serious pest of brinjal fruits and plants widely distributed all over India and is found associated with a number of host plants. The infestation on brinjal can be as high as 70 per cent.

Marks of Identification: Creamy white eggs, Full grown larva is light pink measuring about 12mm long, Pupa is grayish boat shaped cocoon, the moths are medium sized, wings are whitish with large brown patches all over with wings expanse of 22-26mm.

Life history: A female lays on an average 250 eggs on leaves, shoots or sometimes on fruits. Incubation period is 3-5 days, larva become full grown in 7-13 days. The full grown larva comes out and pupation takes place in boat shaped cocoons on the plant itself. The pupal period lasts about 7-10 days. Adults live for 2-3 days. The pest is active throughout the year.

Nature of damage: Infestation starts after few weeks of transplanting. The caterpillars bore into the growing shoots or petioles and feed on internal tissues. As a result of damage, affected shoots wither and plants exhibit the symptoms of drooping. After fruit formation, larva make their entry under the calyx when they are young. The holes later plugged with excreta leaving no visible sign of infestation. Large holes seen on the fruits are the exit holes.

Host plants: Besides brinjal, the pest is also known to infest potato, bitter gourd, pea pods, cucurbits etc.

Management:

- Removal and destruction of affected shoot and fruits along with larvae
- Avoid continuous cropping of brinjal crop
- Grow the varieties with long and narrow fruits in endemic areas
- Install pheromone trap@12/ha
- Encourage the activity of larval parasitoids: Pristomerustestaceus, Cremastusflavoorbitalis
- Avoid use of synthetic pyrethroids
- Avoid using insecticides at the time of fruit maturation and harvest.

- Neem seed kernel extract (NSKE) 5 %
- Spraying with 0.05% Monocrotophos 36 WSC or 0.2% carbaryl or dusting with 10% Carbaryl 3-4 weeks after transplantation subsequent application 15 days thereafter controls the pest effectively

1. Stem borer

Scientific Name – *Euzopheraperticella*
Family- Crambidae
Order- Lepidoptera

Marks of Identificaion : Eggs cream, scale like,fully grown larva creamy white in colour, adult greyish brown, forewings have transverse line and hind wings are white in colour.

Nature of damage: Top shoots of young plants droop and wither, older plants become stunted, fruit bearing is affected

Management:

- Collect and destroy the damaged and dead plants
- Light trap @1/ha to attract and kill adults
- Spray neem oil 2ml/lit
- Avoid using synthetic pyrethriods causing resurgence

1. Lace wing bug

Scientific Name – *Urentius hystricellus*
Family –Tingidae
Order - Hemiptera

Economic Importance: It is minor pest of brinjal in the State of Maharashtra.

Marks of Identification: White nibble shaped eggs, Nymphs are oval, greenish yellow with few black dots, Adults are oval in shape, straw coloured dorsaly and black on the ventral side measuring about 3mm long. Pronotum and forewings reticulated.

Life history: Eggs are laid on lower surface of the leaves. A single female lays about 35-45 eggs, which hatch within 4-12 days. Nymph moults 5 times in a period of 10-21 days. Adults' longevity is 30-40 days. There are 8 overlapping generations in a year.

Nature of damage: It is specific pest of brinjal. Nymphs and adults suck the cell sap from leaves, affected leaves become yellowish and lower surface are found covered with black insect excreta. The summer crop suffers comparatively more.

Management:

- Spray Dimethoate 30 EC @ 1 lit/ha or Methyl demeton 25 EC @ 1 lit/ha

4. Hadda / Spotted beetle

Scientific Name –*Henosepilachnavigintioctopuntata*

Family- Coccinellidae

Order- Coleoptera

Marks of Identification : Eggs are cigar shaped and yellow in colour, Grubs are yellowish bearing six rows of longitudinal spines, Pupa is yellowish with spines on posterior part and anterior portion being devoid of spines, Adults are deep red in colour having 14 spots on each elytra.

Life history: Eggs are laid on the lower surface of the leaf in a group. Egg stage lasts for 3-4 days and grub stage for 10-35 days. Pupation takes place within the leaf or stem and duration is 7 days. Total life cycle is 17-50 days depending on climate.

Nature of damage: Scrapping of chlorophyll , skeletonization and drying of leaves.

Management:

- Collect damaged leaves with grubs and egg masses and destroy them
- Shake plants to dislodge grubs, pupae and adults and destroy
- Conserve natural enemies in brinjal ecosystem
- Spray Carbaryl 50 WP @ 3g/lit

5. Jassids

Scientific Name:- *Amrasca bigutulla bigutulla*

Family- Cicadellidae

Order-Hemiptera

Marks of Identification: Adults are green colour slender insect and nymphs are different in colour having wedge shaped body. They walk diagonally. Front wings having a black spot on each, at the apical margin and two black spots on the vertex of the head.

Life history: Whitish eggs are laid along leaf veins, which hatch within a week. Nymph moults 5 times and become adults within weeks. A generation is completed in a period of one month.

Nature of damage : Polyphagous pest cause serious damage by sucking leaf sap.The nymphs and adults suck the sap from under surface of the leaf and the infested leaves curl upward in margin. It injects the saliva while feeding and the damaged leaves are crinckled with stunted growth. Reddish brown colour at the leaf margin called as 'Hopper burn' symptom.

Management:

- Spraying with 0.05% endosulfan, 0.03% Dimethoate or thiometon and 0.02% phosphamidon control the pest effectively
- Avoid use of nitrogenous fertilizer and follow recommended spacing
- Use of yellow sticky trap

- Grow resistant varieties like Punjab Chamkila, GB-1 and GB-6

Root Knot Nematode: *Meloidogyne incognita*

Nature of Damage: More detrimental to seedlings. Affected plants show stunted growth along with chlorotic symptoms on leaf and fruit setting is drastically affected. When the plant is uprooted, numerous galls can be observed on the roots.

Management:

- Treat the nursery beds with Carbofuran 2g a.i. /m^2
- Trap cropping with Marigold (TagetesSpp)
- Crop rotation with non solanaceous crops.

Besides these White fly (*Bamisiatabaci*), Aphid (*Aphis gossypii*) Ash weevil (*Myllocerussubfasciatus*) , Brown leaf hopper (*Cestiusphycitis*) etc also cause severe damage to brinjal crop.

Leaf Eating Beetle (*Epilachana vigintioctopunctata*): The yellowish coloured grubs and adults feed voraciously on the leaves and tender parts of the plant and often cause serious damage when they appear in numbers. As a result, the leaves are completely skeletonized leaving only a network of veins.

Control: Collection and destruction of infested leaves along with the grubs, adult and eggs reduces the pest incidence. Spraying the crop with Malathion (2ml/litre of water) or Carbaryl (2-4 g/litre of water) effectively controls the pest.

Jassids (*Amrasca biguttula biguttula, Cestius (Hishimonus) phycitis*)**:** Both nymphs and adults suck the sap from the lower surface of the leaves. The infested leaf curl upward along the margins, which may turn yellowish and show, burnt up patches. They also transit mycoplasma disease like little leaf and virus disease like mosaic. Fruit setting is adversely affected by the infestation.

Control: Jassids are controlled by spraying Malathion (0.1%) or Dichlorvos (0.05%) 20 days after transplanting.

Leaf Roller (*Eublemma olivacea*): Caterpillars roll leaves and feed on chlorophyll while remaining inside the folds. The folded leaves wither and dry up.

Control: Collection and destruction of infested leaves along with insects in the initial stage help to minimize the infestation. Spraying of Carbaryl (0.1%) or Malathion (0.05%) controls the pest effectively.

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KINNOW: PUNJAB'S KING OF FRUIT- A REVIEW

Rajesh Kumar*
Assistant Professor, Department of Agriculture Sciences , Sant Baba Bhag Singh University, Jalandhar, Punjab
*Coressponding author: rajesh.shinji@gmail.com

ARTICLE ID: 058

INTRODUCTION

Kinnow is a high yield mandarin hybrid (Citrus nobilis × Citrus deliciosa), scientifically known as Citrus reticulata blanco. Botanically kinnow belongs to family Rutaceae. Kinnow is renowned citrus fruit favored for its pleasant flavor, appearance, color, taste, good yield, high processing value, therapeutic applications, delicious juice, smoothing character, vitamin C source, wider adaptability to various agro-climatic condition and high nutritive value **[1]**.

Kinnow is a hybrid of two citrus cultivars 'king' (*Citrus nobilis*) and 'willow leaf' (*Citrus deliciosa*). It was developed by H.B Frost in 1915 at University of California Citrus Experimentation Station, USA **[2]**. The hybrid was released for commercial cultivation in 1935 **[2]**. Kinnow was introduced in India by Dr. J.C Bakshi in 1954 at Punjab Agriculture University Regional Research Station, Abohar **[3]**. Since its introduction, Kinnow has gained popularity among farmers and common people making it one of the most desirable citrus fruit in Punjab. Farmer's love for kinnow in Punjab region has made it King of Fruits in punjab.

DESCRIPTION OF KINNOW PLANT

Kinnow is a hot climate plant with very high productivity. Tree exhibits vigorous growth and can reach height of 35 feet. Kinnow plant has broad shallow roots reaching up to depth of 7 to 12 feet depending upon soil condition. Shoot system has columnar trunk bearing numerous long, slender, ascending, and virtually thorn less branches. Branchlets bear dense foliage consisting of medium to large and broadly lanceolate leaves **.**

Leaves are alternate, petiolate, simple, with entire margin, and unicostate reticulate venation. Leaves have smooth essentials oils glands in the lamina giving aromatic smell. Kinnow bears off-white hermaphrodite solitaire pentaerous flower. The anthers are yellow color.

Fruit is hesperidium containing 0 to 9 seeds. Kinnow fruit is globular to oblate in shape. Base of fruit is flattened. Fruit peel also known as rind has smooth surface and are easily peeled. Fleshy interior of fruits contains 9 to12 sections called Carpels. Each carpels have greenish to yellow color seed. Unripe fruits are green in color with off white inner flesh. Ripened fruits are orange in color with orange color flesh and juicy. Each mature plant can produces up to 1000 or more fruits in a season.

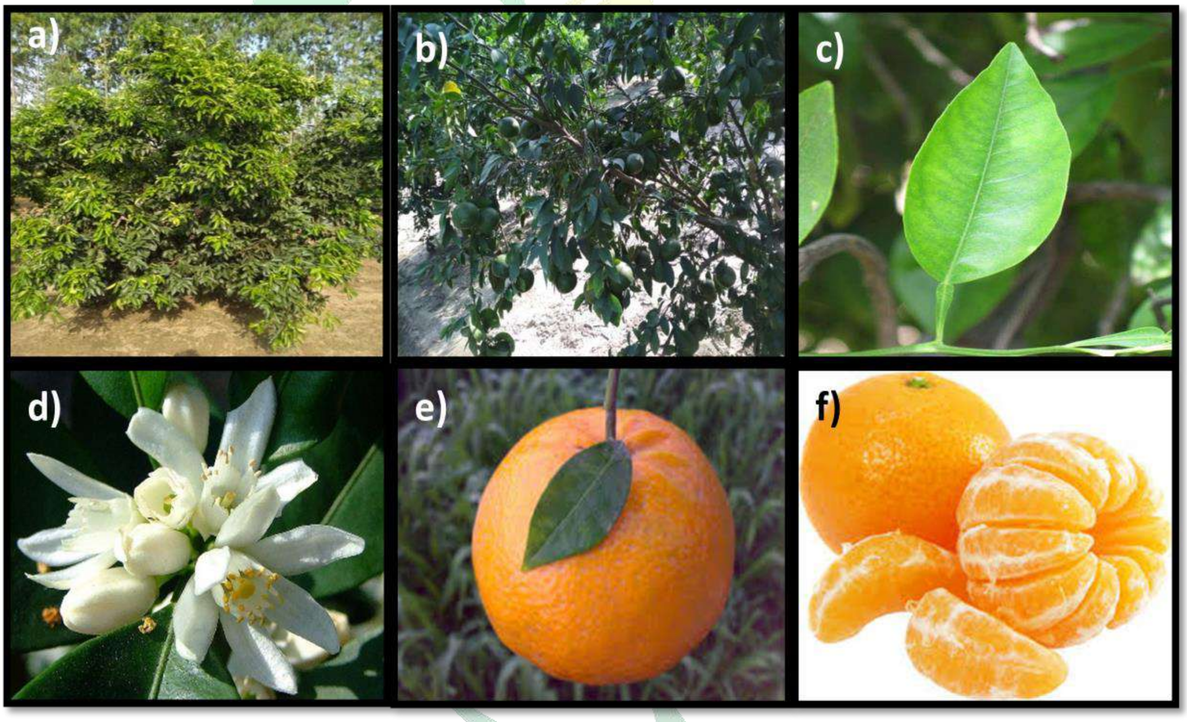

Figure 1.1 Description of kinnow plant **(a)** Kinnow plant **(b)** Kinnow branch **(c)** Kinnow leaf **(d)** Kinnow flower **(e)** Kinnow fruit **(f)** Kinnow without peel.

KINNOW ECONOMIC PRODUCTION

Citrus fruits have a major role in the economy of world. These fruits are among top three fruits of world with respect to area and production. Brazil is the leading citrus fruit producer followed by USA, China and Mexico. Commercially, kinnow is one of the most successful citrus fruit. In India kinnow contributes good percentage to citrus fruit income. The major kinnow producing states are Punjab, Maharashtra, West Bengal, Maharashtra, Haryana, Madhya Pradesh, Himachal Pradesh and Karnataka. Table 1.1 show kinnow production and area under cultivation for three consecutive years. Government initiative to transfer traditional farming into modern and scientific farming practices has helped increased area under kinnow cultivation and total production.

Table 1.1: State wise kinnow production and area under cultivation

States/UTs	2014-15		2015-16		2016-17	
	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)
Madhya Pradesh	60150	1030000	94490	1126270	115830	1437970
Punjab	48180	1108620	49360	1140310	51060	1182100
Maharashtra	105470	716070	106900	768990	107500	985190
Rajasthan	8680	300670	12480	267340	15150	297000
Assam	15760	202380	15650	210140	17550	236010
Arunachal Pradesh	-	-	42640	217040	43500	221410
Karnataka	2860	64250	3960	92050	4090	98810
Nagaland	6100	54800	6120	51690	6480	54430
Meghalaya	8780	42230	8750	42840	9150	45320
Manipur	5350	43060	4910	43340	4890	43180
Mizoram	14200	41200	14370	41340	15970	41340
West Bengal	4010	39100	4020	39210	4070	39550
Tripura	6700	36520	7680	31400	7600	31090
Sikkim	10	20	12380	16800	12820	18480
Himachal Pradesh	8710	10960	8720	13030	8640	14660
Tamil Nadu	1830	4930	2030	6260	2040	4770

J&K	2310	4010	2350	4210	2370	4250
Telangana			30	440	160	2270
Kerala	10	60	0	30		
Others	90	110	90	60	90	70
TOTAL	**299200**	**3698990**	**396930**	**4112800**	**429290**	**4753870**

National Horticulture Database (2016-17)

National Horticulture Board database (2016-17) shows that in India 4,29,290 hectare area was under kinnow plantation with total yield of 47,53,830 MT. According to horticulture statistics (2016-17) Madhya Pradesh was highest producer of kinnow followed by Punjab (Table 1.1). In Madhya Pradesh kinnow plantation covered 1,15,835 hactare area and produced 14,37,976 MT of fruit. Punjab produced 11,82,109 MT of Kinnow annually and nearly 51,063 hactare of land was under kinnow plantation. As evident from table 1.2 Hoshiarpur, Muktsar and Fazilka are main citrus growing belt of Punjab.

Table 1.2: District wise kinnow production and area under cultivation in punjab

District	2014-15		2015-16	
	Area (ha)	Prod. (MT)	Area (ha)	Production (MT)
Fazilka	28490	648910	29500	613160
Hoshiarpur	6510	153230	6250	140200
Muktsar	5910	187880	5930	130180

National horticulture database (2016-17).

CONCLUSION

As evident from table 1.1 and 1.3, in previous decade there has been tremendous increase in kinnow production in north-west region of India owing to high production and increase in area under cultivation. Progressive farmers prefer to grow kinnow because of its high yielding characteristics and its attractive quality that possesses them potential to give the lucrative return in form of profit .

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Water Conservation: Boon for Coming Generation

Dr. Nisha Meena[1] and Vikas Kumar[2]
[1]Assistant Professor, Jagannath University, Jaipur
[2] Ph.D. Research Scholar, SKN Agriculture University, Jobner

ARTICLE ID: 059

Our ancient religious texts and epics give a good insight into the water storage and conservation systems that prevailed in those days. Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water. Efforts have been made to collect water by building dams and reservoirs and digging wells; some countries have also tried to recycle and desalinate (remove salts) water. Water conservation has become the need of the day. The idea of ground water recharging by harvesting rainwater is gaining importance in many cities. In the forests, water seeps gently into the ground as vegetation breaks the fall. This groundwater in turn feeds wells, lakes, and rivers. Protecting forests means protecting water 'catchments'. In ancient India, people believed that forests were the 'mothers' of rivers and worshipped the sources of these water bodies. Water conservation includes all the policies, strategies and activities made to sustainably manage the natural resource fresh water, to protect the water environment, and to meet the current and future human demand. Population, household size, and growth and affluence all affect how much water is used. Factors such as climate change have increased pressures on natural water resources especially in manufacturing and agricultural irrigation.

The goals of water conservation:

- Ensuring availability of water for future generations where the withdrawal of fresh water from an ecosystem does not exceed its natural replacement rate.
- Energy conservation as water pumping, delivery and wastewater treatment facilities consume a significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management.

Some ancient Indian methods of water conservation

- The Indus Valley Civilization, that flourished along the banks of the river Indus and other parts of western and northern India about 5,000 years ago, had one of the most sophisticated urban water supply and sewage systems in the world.
- The fact that the people were well acquainted with hygiene can be seen from the covered drains running beneath the streets of the ruins at both Mohenjodaro and Harappa.
- Another very good example is the well-planned city of Dholavira, on Khadir Bet, a low plateau in the Rann in Gujarat. One of the oldest water harvesting systems is found about 130 km from Pune along Naneghat in the Western Ghats.
- A large number of forts like Raigad had tanks that supplied water. In ancient times, houses in parts of western Rajasthan were built so that each had a rooftop water harvesting system.
- Rainwater from these rooftops was directed into underground tanks. This system can be seen even today in all the forts, palaces and houses of the region.
- Underground baked earthen pipes and tunnels to maintain the flow of water and to transport it to distant places, are still functional at Burhanpur in Madhya Pradesh, Golkunda and Bijapur in Karnataka, and Aurangabad in Maharashtra.

Rainwater harvesting

- In urban areas, the construction of houses, footpaths and roads has left little exposed earth for water to soak in. In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.
- This has become a very popular method of conserving water especially in the urban areas. Rainwater harvesting essentially means collecting rainwater on the roofs of building and storing it underground for later use. Not only does this recharging arrest groundwater depletion, it also raises the declining water table and can help augment water supply. Rainwater harvesting and artificial recharging are becoming very important issues. It is essential to stop the decline in groundwater levels, arrest sea-

water ingress, i.e. prevent sea-water from moving landward, and conserve surface water run-off during the rainy season.

- Realizing the importance of recharging groundwater, the CGWB (Central Ground Water Board) is taking steps to encourage it through rainwater harvesting in the capital and elsewhere.
- A number of government buildings have been asked to go in for water harvesting in Delhi and other cities of India.
- All you need for a water harvesting system is rain, and a place to collect it typically, rain is collected on rooftops and other surfaces, and the water is carried down to where it can be used immediately or stored. You can direct water run-off from this surface to plants, trees or lawns or even to the aquifer.
- Its Improves the quality of groundwater through the dilution of fluoride, nitrate, and salinity Prevents soil erosion and flooding especially in urban areas

Agriculture

Conservation of water in the agricultural sector is essential since water is necessary for the growth of plants and crops.

- A depleting water table and a rise in salinity due to overuse of chemical fertilizers and pesticides has made matters serious. Various methods of water harvesting and recharging have been and are being applied all over the world to tackle the problem.
- Tanks are constructed either by bunding or by excavating the ground and collecting rainwater.

  Rajasthan, located in the Great Indian Desert, receives hardly any rainfall, but people have adapted to the harsh conditions by collecting whatever rain falls.
- Large bunds to create reservoirs known as khadin, dams called johads, tanks, and other methods were applied to check water flow and accumulate run-off. At the end of the monsoon season, water from these structures was used to cultivate crops. Similar systems were developed in other parts of the country.
- These are known by various local names ¾ jaltalais in Uttar Pradesh, the haveli system in Madhya Pradesh, ahar in Bihar.

Water conservation

- Conserve water because it is the right thing to do. We can follow some of the simple things that have been listed below and contribute to water conservation. Try to do one thing each day that will result in saving water.
- Don't worry if the savings are minimal¾every drop counts. You can make a difference.
- Remember to use only the amount you actually need. Promote water conservation in community newsletters and on bulletin boards.
- Encourage your friends, neighbours and co-workers to also contribute. Encourage your family to keep looking for new ways to conserve water in and around your home.

Zero Budget Natural Farming

Komal Chaudhary
UIAS, Chandigarh University, (Mohali), Punjab
E-mail: choudharykomal947@gmail.com
ARTICLE ID: 060

Introduction:

Zero budget natural farming is the farming system in which we do farming without use of synthesised fertilzers or without spending money on purchasing fertilizers , pesticides and seeds. Crops are grown by natural methods. All inputs are to be locally resourced from in and around the village. ZBNF is purposed by Indian agricultural scientist Mr.Subash Palekar.

A popular incident is his interaction with farmers (women self-help group members) almost 10 to 15years earlier (circa 2005) as part of Velugu initiative under Society for Elimination of Rural Poverty. The two sides did not understand each other's language (Mr Palekar spoke Marathi, Hindi or English) and the women SHG members understood only Telegu), but a common medium for them was agriculture that they both understood and the event was was appreciated. One of the participants went back home and had a discussion (rather, argument) with her husband of trying this method of agriculture without use of pesticides and fertilizers. The husband was furious, but finally they agreed that the wife can try the alternative method in half a plot while in the other half the husband would continue with his application of fertilizer and pesticides. The outcome was that the yield was not much different between the two approaches, but the wife's approach had a much lower cost. In the next season the couple used this zero budget natural farming approach in all their plots and now the whole village was watching and they all shifted to this approach in the third season (Mishra and Reddy, 2011). This is a classic case of a real life application of the case-control method.

Four pillars of ZBNF:

- Jivamrut
- Bijamrit
- Acchadana/Mulching

- Whapasa/Moisture

Jivamrita:

Jeevamrit is a organic manure .This is fermented microbial culture which is prepared by natural resources. Jeevamrit helps to increase the microbial activity in the soil . The 48hrs. fermentation process multiplies aerobic and anerobic bacteria present in the cow dung and urine , as they eat organic integredients and a handful of undistributed soil acts as inoculate of native species of microbes and organisms. It can be applied through irrigation water or foliar spray. While transiting from conventional input-intensive agriculture, the application of Jeevamrutha to the soils and plants is required only for the first three years because after that the system becomes self-sustaining.

Bijamrita:

This is a organic manure which is prepared from locally available natural resources for the propose of treatment for seeds, seedlings or any planting material. It reduces the possibility of seed infestation by pests and protects young roots from fungus, soil-borne diseases, and seed-borne diseases that generally affect the plants after monsoon. In the ingredients, the dung and urine from the indigenous breed cow act as a powerful fungicide, and anti-bacterial agent, respectively.

Acchadana/Mulching:

There are three types of mulching.

- Soil mulching: It protects topsoil by avoiding tilling. It facilitates aeration, and promotes water retention.
- Straw/Biomass mulching: Application of dry organic matter (dead material of any living being) along with Jeevamrutha will lead to decomposition and humus formation that will improve soil fertility.
- Live mulching: This suggests inter-cropping or mixed-cropping by combining monocots (those seedlings with one seed leaf like rice and wheat) with dicots (those seedlings with two seed leaves like legumes) in the same plot of land. This

will create a symbiotic relationship because monocots will supply elements like potash, phosphate, and sulphur, while dicots will work towards nitrogen-fixation .

Whapasa/Moisture:

It is the condition where there are both air molecules and water molecules present in the soil. Thereby helping in reducing irrigation requirement.

Other important principles of ZBNF :

- **Intercropping –** Because of this, ZBNF gets its "Zero Budget" name. small costs incurred in cropping is compensated by the additional income, making farming a close to zero budget activity. Crop and tree associations work well for the south Asian context.
- **Contour bunds –**contours bunds promote maximum efficiency for different crops.
- **Local species of earthworms:** Revival of local deep soil earthworms through increased organic matter is most recommended than vermicompost (the Eisinea feotida worm, exotic to India should be avoided), and to use the indigenous humped cow (Bos Indicus) for their dung and urine because they have a greater concentration of micro-organisms.
- **Cow dung-** Dung from the Bos indicus (humped cow) is most beneficial and has the highest concentrations of micro-organisms as compared to European cow breeds such as Holstein. The entire ZBNF method is centred on the Indian cow.

The Karnataka Experience:

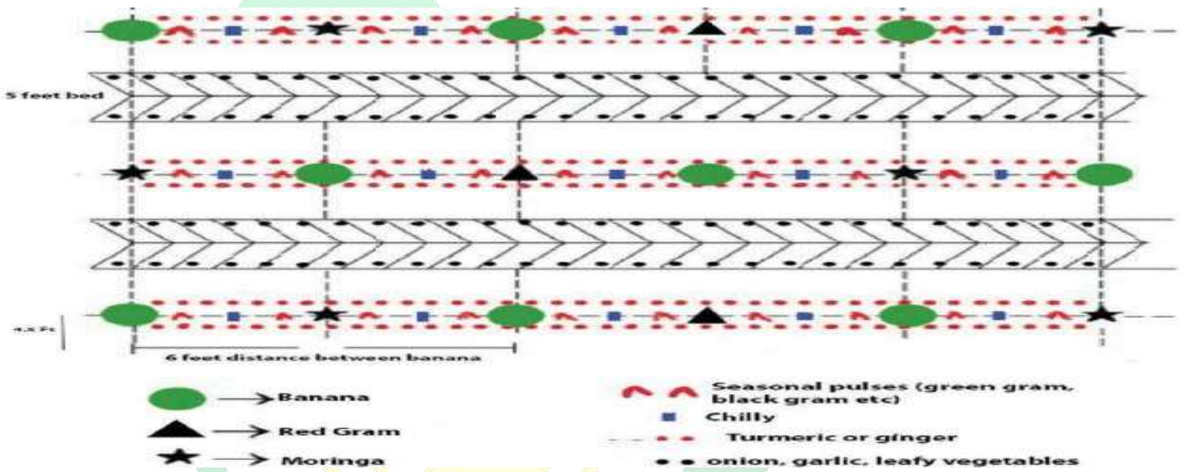
It was in 2002 that a senior leader of Karnatka Rajya Raith Sangha (KRRS) invited Mr Subhash Palekar for an interaction leading to a series of workshops and training camps in the method of ZBNF. It is said that about a lakh of farmer households may be practising it in Karnataka and all of them need not be necessarily linked to KRRS. The spread of this initiative has been discussed in La Via Campesina (2016) and Khadse et al (2017). Further, Khadse et al (2017) survey 97 farmer households who are practising ZBNF and the reasons (not mutually exclusive) that the farmers ascribe to adoption of ZBNF are family health (54 per cent), food self-sufficiency (46 per cent), environmental reasons (42 per cent), reduce cost of production (38 per cent), reduce dependency on corporations (33 per cent), reduce debt (30 per cent), and spiritual reasons (30 per cent) among others. The study of Khadse et al (2017) points the positive impact on various agroecological indicators from among the farmer households they surveyed. Health has increased for all households; soil conservation, seed autonomy, and quality of produce has increased for more than 90 per cent of the households; household food autonomy, and income has increased for more than 85 per cent of the households; yield, and seed diversity has increased for more than 75 per cent of households; and selling price has increased for 58 per cent of households. At the same time pest attack has decreased for 84 per cent of households, production costs decreased for 91 per cent of the households, and need for credit has decreased for 93 per cent of the households. The impact has been positive and affirms the claims that the method can reduce risk. There is ,however, an independent need to evaluate the adverse experiences, even if they are few in number, so as to help us understand the reasons and if possible to address them so that the efficacy of the method can be further improved. There are criticism against ZBNF because to follow that one has to adhere to strict guidelines of do's and don'ts. But, its application in the field points to the existence of different layers of adherence, which implies a process involving diálogo de saberes.

Efficancy of some Agroecological Indicators among Farmers Surveyed, Karnataka, 2012 :

Indicators	Increased	Not change	Decreased
Health	100.0	0.0	0.0
Soil conversation	93.6	4.3	2.1
Seed autonomy	92.7	4.9	2.4
Quality of produce	91.1	4.4	4.4
Household food autonomy	87.7	7.3	4.9
Income	85.5	9.5	4.8
Yield	78.7	8.5	12.8
Seed diversity	76.9	10.3	12.8
Selling price	57.9	34.2	7.9
Pest attack	11.4	4.5	84.1
Production cost	6.8	2.3	90.9
Need for credit	3.8	3.8	92.7
Source : Khadse et al (2017)			

A version of the five-layer Subash Palekar model:

Subash Palekar's most popular model is the five-layer model . It is a type of agroforestry model which integrates trees with various levels of plant canopies, each layer at an optimum level to harvest the sunlight. It includes various crop and tree combinations, including living fences on the edges, and trenches for water harvesting. Farmers have further adapted this model according to their needs and in many states and many local versions have been found.



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