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JUST AGRICULTURE®

THE FUTURE OF AGRI INNOVATION

THE FUTURE OF FARMING

AUTONOMOUS ELECTRIC TRACTORS

FEBRUARY 2021

CONTENT

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-magazine which provides platform to bound all the agriculture students, scholars and research oriented people. We are glad to introduce the Sixth issue of JUST AGRICULTURE e-Magazine, 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. Our magazine features about agri innovations, farm ventures and agribusiness, success stories of progressive farmers in India are innovating conventional practices to become successful farm entrepreneurs. 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 magazine will be a voyage of discovery.

Keep Reading....

D.P.S. BADWAL
Founder Editor,
JUST AGRICULTURE magazine

FROM THE DESK OF CHIEF EDITOR

It is the great pleasure moment for me to introduce all of you with the agriculture magazine "Just Agriculture". In my concern this magazine just agriculture will provide you innovative research and recent trends of various field of agriculture.

In this magazine we will consider all the concern article related to agronomy, plant genetics & breeding, plant pathology, agriculture chemistry and soil, agriculture biotechnology and biochemistry, veterinary and Animal husbandry and other related fields of agriculture. As the chief editor I insure that you will get all the recent trends, development and innovative idea's in this magazine.

Finally, I would like to thank the editorial and reviewer's team, authors as well as publishers and team members for contributing to this fifth issue. Editors will welcome all constructive criticisms as well as new suggestions to improve the quality of the magazine.

Mohit Bharadwaj
Editor-in-Chief
Just Agriculture-the Magazine

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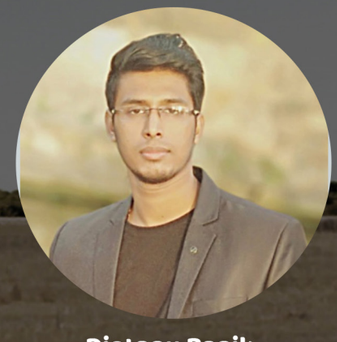

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FUTURE OF FARMING
– AUTONOMUS ELECTRIC TRACTORS

D.P.S. Badwal and Mohit Bharadwaj

John Deere, probably the largest manufacturer of agricultural machinery in the world, has been showcasing a new autonomous tractor and other new technology at the ongoing Agritechnica event. In a new exhibition concept at this year's Agritechnica, Deere is demonstrating its leading position in precision agriculture in the Future Technology Zone. Nine different product developments and research projects in the fields of electrification, autonomy through automation and artificial intelligence show how agriculture could work even more sustainably and productively in the future.

ELECTRIFICATION–

Zero emission compact utility tractor: This electric compact tractor is based on the John Deere 1 Series. A key feature of this machine is its high PTO power, allowing more than 10,000 m^2 of lawn to be mowed with one battery charge lasting four-and-a-half hours.

The John Deere stand at Agritechnica In addition to high performance, customers benefit from very low maintenance costs. Potential applications are mainly where low noise levels and emission-free operation are required.

eAutoPower TRANSMISSION:

eAutoPower is the first continuously variable transmission with an electro-mechanical power split. Compared to conventional CVTs, the drive is more efficient and wear-free. Another special feature is the provision of up to 100kW of electrical power for external consumption.

To demonstrate this, John Deere and Joskin have developed a slurry tanker with two electric drive axles. Thanks to this eight-wheel drive system, much more efficient transmission of tractive power is possible. This can also reduce slurry incorporation costs by up to 25 per cent.

AUTONOMY THROUGH AUTOMATION–

Autonomous electric tractor:

John Deere's new autonomous tractor concept is a very compact electric drive unit with integrated attachment. The tractor has a total output of 500 kW and can be equipped with either wheels or tracks. Flexible ballasting from five to 15 tonnes is possible, depending on the application, to help reduce soil compaction. Because of its electric drive, there are no operating emissions and noise levels are extremely low. Further advantages include low wear and maintenance costs.

Semi-autonomous tractor:

This tractor drives semi-autonomously and is equipped with an integrated crop sprayer. Using a built-in camera, it is possible to work in row crops – for example, applying plant protection products to fruit tree plantations. Filling the sprayer tank takes place fully automatically at a filling station, so the user is not exposed to pesticides. This is designed to reduce costs and increase productivity by over 30 per cent.

Autonomous drone sprayer:

This drone is equipped with a weed scanner and crop sprayer, allowing weeds to be scanned from the air and then specifically controlled. The 10.6-litre tank is filled fully automatically at a field boundary station, where the automatic battery charge also takes place. Flight time with a fully charged battery is 30 minutes. The main advantage of this drone is the precise application of pesticides, which significantly reduces the amounts used. Spraying from the air is also possible regardless of ground conditions.

Autonomous sprayer:

This novel autonomous sprayer has a 560-litre spray tank. The high ground clearance of 1.9m and four-wheel steering make it extremely versatile, while the tracks minimise ground pressure and greatly extend the operating window.

ARTIFICIAL INTELLIGENCE

Blue River Technology:

With See & Spray technology, high-resolution cameras capture 20 images per second. Based on the images and artificial intelligence, the system recognises the difference between cultivated plants and weeds so that individual plants can be specifically treated. With this new generation of weed control, the use of pesticides can be greatly reduced.

Command Cab:

The future vision of a driver's cab reveals new possibilities for artificial intelligence. With its joystick control, touchscreen display and networking of all machine components, John Deere presents a completely new operating concept. By integrating real-time weather data, individual pre-settings and job management procedures, the cab becomes the command centre for agricultural operations.

Large spraying drone – VoloDrone:

The large drone developed jointly by John Deere and Volocopter has a diameter of 9.2 m and is powered by 18 rotors. It has a fully electric drive with replaceable lithium-ion batteries. One battery charge allows a flight time of up to 30 minutes, and the VoloDrone can be operated both remotely and automatically, on a pre-programmed route. The drone frame is equipped with a flexible standardised payload attachment system. This means that different devices can be mounted on the frame, depending on the application. For crop protection, the large drone is equipped with two liquid tanks, a pump and a spray bar.

Mumbai-based AutoNxt claims the 30hp Hulk is the world's first autonomous electric tractor. The Level 2 autonomous farm equipment has a range of 150km per charge and can perform a variety of farming functions.

It took a year for the 'Hulk' to go from proof of concept through to prototype stage.

The AutoNxt team at the Mumbai office, which also doubles up as their technical and research centre. **This became the inspiration for AutoNxt, which has developed India's first electric autonomous tractor, called 'The Hulk'.**

It may be recollected that in September 2017, Mahindra & Mahindra revealed its first-ever driverless, non-electric tractor, developed at the Mahindra Research Valley. AutoNxt was set up in January 2016 by Kaustubh Dhonde, a 24-year-old electronics engineer. The idea to automate the tractor came to Dhonde when he visited a relative, who is a farmer. He says that when his uncle decided to sell his one-year-old tractor, he was shocked to know the stark reality of the farming community. He explains: "Owning a tractor involves a lot of expenses and health issues; one of the major operational costs is hiring a skilled driver."

HOW THE 'HULK' TOOK SHAPE

What started as a concern turned out to be a solution in disguise for the young engineer. Dhonde says he started discussing the idea with his peers in 2015 during his college days and eventually was convinced that the underlying issue needed to have a much more holistic and realistic approach. By December 2015, he had developed a concept idea on how to translate his learning into a product solution.

In January 2016, he undertook a survey covering 212 farmers in four states – Maharashtra, Punjab, Gujarat and Karnataka. Following this, the company started experimenting with GPS technology on small robotics that would help them in product development.

Then, a gritty Dhonde, along with his founding team, started providing GPS tracking services to various clients to raise investments for their core project – an autonomous-electric tractor. In January 2017, the company successfully showcased its first proof of concept of its autonomous driving capability to a bunch of potential investors at a mere expense of Rs 50,000. Dhonde explains, "When we developed the first prototype technology, we realised the cost of buying a second-hand tractor or even renting it would be quite high. Fortunately, one farmer was quite curious and helped us by giving his tractor on rent for free."

The prototype Hulk, which is a 30hp, Level 2 autonomous electric tractor, is capable of delivering a range of around 150km per charge. It can perform various functions like ploughing, tilling, disking, insecticide spraying and others, just like a conventional tractor. The Hulk uses a proprietary battery technology which is lithium-based and claimed to have one of the highest life-spans. Dhonde, however, was tight-lipped as to the details of the technology. The company has incorporated electronically controlled hydraulics that can be adjusted for different functions. The rechargeable battery, which comes with an inbuilt charging socket, can be charged using any conventional charging point. AutoNxt claims the battery life is around 10 years, and compared to fuelling up a conventional 30hp tractor which costs around Rs 1,500, the charging cost will be around a third of that for 0-100 percent charge.

ALT. CONTROL. AUTONOMOUS.

According to Dhonde, initially setting up the autonomous function requires the farmer to manually drive the tractor around the borders of his farm to feed-in the data to the autonomous tractor. Once the data is fed in, the farmer using his cellphone or tablet can define the path, function and let the tractor do its work.

From the safety perspective, the tractor has a kill-switch which can be activated either by pressing the button on the tractor or the app in the phone/tablet, which will halt the tractor in its tracks. To make sure that the autonomous driving capability cannot be misused, controlling the tractor remotely can be done in a specified range only and authentication for remote controlling has several safety features. The company states that in India where tractors are also used by households as a passenger transport vehicle, they have made sure that the vehicle's autonomous driving capability cannot be employed on roads.

Kaustubh Dhonde, Founder and CEO, AutoNxt

According to Dhonde, the survey highlighted that in India where a huge section of farmers have small or medium landholding, the 30hp tractor is the best fit for their needs. "As per our findings, the 30hp tractor is well suited for our initial offering. Later on, we can expand our range depending on the needs and findings we come across," explains Dhonde.

THE ROAD AHEAD

According to Dhonde, the company is already in advanced talks with leading tractor manufacturers in India, for collaboration. He states that while AutoNxt will act as the technology provider, the established OEMs will produce and use its distribution network that will act as a win-win situation for the partners.

When asked if the company would look at producing the tractor itself, Dhonde says, "We are more of a technology company, we would like to focus there. But in case there is a disagreement for this kind of collaboration, we would explore taking a contract manufacturing route."

He is also planning to get the first prototype ready and get the necessary approval/certification done to begin the commercial rollout by 2022. He is also optimistic about the government's support for electric vehicles to play a key role in the adoption of the e-tractor in India.

CARDAMOM

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ABSTRACT

Cardamom is a strong antioxidant plant, so it is called the queen of spices. *Elettaria cardamomum*, a highly priced spice, is native to the Western Ghats of South India. Wild populations still occur in isolated patches in their natural habitats; however, much of today's commercial product comes from cultivated sources. Cardamom is a seed pod mostly known for its culinary and medicinal properties. It is grown in India, Sri Lanka, Tanzania, and Guatemala. Each green pod on the plant contains about 15 to 20 seeds. Their seeds have a unique taste and smell.

INTRODUCTION

Common Name: **Cardamom**

Botinical Name: ***Elettaria cardamomum***

Cardamom is a spice with an intense, slightly sweet flavor that some people compare to mint. It originated in India but is available worldwide today and used in both sweet and savory recipes. The seeds, oils and extracts of cardamom are thought to have impressive medicinal properties and have been used in traditional medicine for centuries.

HEALTH BENEFITS OF CARDAMOM

- The therapeutic properties of cardamom oil have been found application in many traditional medicines as antiseptic, antispasmodic, carminative, digestive, diuretic, expectorant, stimulant, stomachic and tonic.
- Cardamom is a good source of minerals like potassium, calcium, and magnesium. 100 g pods contain 1119 mg of this electrolyte. Potassium is an important component of cell and body fluids that helps control heart rate and blood pressure. The human body uses copper for the production of red blood cells.
- This exotic spice contains many plants derived chemical compounds that are known to have been anti-oxidant, disease preventing and health promoting properties.
- Cardamom is known to regulate high blood pressure with daily intake due to its diuretic effect. Rich in antioxidants, it helps detoxify the blood and expel water collected around important organs by promoting frequent urination.
- Cardamom kills the unhealthy bacteria present on the palate and tongue, thus fighting bad breath.
- Cardamom and its essential oils combined with ginger, lemon and lavender help to clear your head, beat nausea and feel relaxed while you are awake.
- Asthma and wheezing can be reduced by using Cardamom in addition to regular medicine. It helps to clear the nasal passage and chest of phlegm to promote easier breathing. It also improves your oxygen intake by helping your lungs to relax in order to breathe long and deep.
- Cardamom has meat protection properties as it acts as a natural preservative.
- Cardamom has analgesic properties so it eases joint and muscle pains and inflamed nerves.
- It works as an antidote to scorpion and snake bites.

CARDAMOM CROP CULTIVATION

Production of green cardamom has fallen from 25,000 tonnes to 10,000 to 12,000 tonnes in the past few years. The average price of cardamom reached Rs 4,000 this season and it presently commands a price of Rs 2,900 to Rs 3,000 per kg.

HARVESTING AND CULTIVATION PROCESS

Cardamom plants normally start bearing two years after planting. In most of the areas the peak period of harvest is during October-November. Picking is carried out at an interval of 15-25 days. Ripe capsules are harvested in order to get maximum green colour during curing. After harvest, capsules are dried either in fuel kiln or electrical drier or in the sun. It has been found that soaking the freshly harvested green cardamom capsules in 2% washing soda solution for 10 minutes prior to drying helps to retain the green colour during drying. When drier is used, it should be dried at 45-50° C for 14-18 hours, while for kiln, over night drying at 50-60° C is required. The capsules kept for drying are spread thinly and stirred frequently to ensure uniform drying. The dried capsules are rubbed with hands or coir mat or wire mesh and winnowed to remove any foreign matter. They are then sorted out according to size and colour, and stored in black polythene lined gunny bags to retain the green colour during storage.

MEDICINAL USE

The therapeutic properties of cardamom oil have found application in many traditional medicines as an antiseptic and local anesthetic, and antioxidant, besides playing health promoting and disease preventing roles.

NUTRITIONAL VALUE OF CARDAMOM

- 100 grams of cardamom contains:
- Protein: 11 g
- Cholesterol: 0 mg
- Carbs: 68 g
- Total Fat: 7 g
- Calorific Value: 311 kcal

SOME NATURAL REMEDIES WITH CARDAMOM

- To relieve hiccups, make an infusion by boiling 5 mint leaves and 2 pounded cardamom pods in a cup of water and drink.
- To treat gonorrhoea, cystitis, nephritis and burning sensation while passing urine add some powdered cardamom seeds to 1 tsp banana leaf powder and 1 tsp amla juice and take 3 times a day.
- For instant relief in headache apply cardamom paste on the forehead.
- For aphrodisiac benefits, add a pinch of cardamom seeds to a glass of milk. Add a tsp of honey and drink daily.
- For protection against heat stroke, chew a cardamom pod before going out in the sun.
- In stomach-ache, crush 2 cardamoms and mix in a tsp honey and consume.
- In kidney failure grind cardamom and mix in milk and drink. It brings on urine and also stops burning sensation on urination.
- For blood in bile, on an empty stomach chew and eat 2 cardamom pods every day and then drink milk after this. It benefits.

CONCLUSION

Although many of its health benefits need further study, cardamom is safe for most people to take in moderate amounts. Cardamom's natural photochemical have antioxidant and anti-inflammatory abilities that could improve health. However, it is too early to say whether this spice can treat any health conditions.

BEETROOT FOR HEALTHY LIVING

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INTRODUCTION:

Beetroot (*Beta vulgaris*) is the taproot portion of beet plant and commonly known as beets in Canada and USA while as per British English is referred to as table beet, garden beet, red beet, dinner beet or golden beet. Beta is the ancient Latin name for beets and one of several cultivated varieties. It is a popular root crop grown for its fleshy roots which are used as cooked vegetable, salads, for pickling and canning. Young plants along with tender leaves are also used as pot herbs.



MAIN COMPONENTS OF BEETROOTS:

Betanins:

They are also called beetroot red, the most common pigment in beetroots, responsible for their strong red color. They are water-soluble nitrogen-containing pigments that are divided into red-violet betacyanins and yellow-orange betaxanthins. Betanin (Betanidin-5-O-β-glucoside) is the most common betacyanin in the plant kingdom. Betanin is a scavenger of reactive oxygen species exhibiting gene-regulatory activity. It may induce phase II enzymes and antioxidant defense mechanisms with possibly preventing LDL oxidation and DNA damage.

The treatment with betalains and betalain-rich diets is not only nontoxic and can be a promising alternative to supplement therapies in oxidative stress, inflammation and dyslipidemia-related diseases such as stenosis of the arteries, atherosclerosis, hypertension and cancers to a certain extent.

Inorganic nitrate:

The inorganic nitrates include nitrates, nitrites and nitric oxide. It is found in generous amounts in green leafy vegetables, beetroots and its juice extract. The inorganic nitrate turns into nitric oxide in the body with many important body functions specially the potential blood pressure lowering effect.

Vulgaxanthin:

A yellow or orange pigment found in beetroots and yellow beets.

BRIEF HISTORY OF BEETROOT:

Beet root originated from *Beta vulgaris* L. ssp. maritima by hybridization with *Beta patula*. The crop has site of origin probably in Europe with earlier varieties being long rooted like carrot. Beet root, sugar beet and palak belong to species *B. vulgaris* and are cross compatible.

Beets were domesticated in the ancient Middle East primarily for its greens followed by the Ancient Egyptians, Greeks and Romans. But the Roman era saw the use of roots along with the leaves. Besides being used as a food, beets have been as a food colourant and medicinal plant. From the Middle Ages, beetroot was used to treat illnesses relating to digestion and blood. During the middle of the 19th century, wine was often coloured with beetroot juice to get the desired redness.

BEETROOT CULTIVATION:

The period of 55 to 65 days is needed from germination to harvest of this root. The optimum temperatures for growth and development are 15 to 18°C with minimum of 5°C and maximum of 24°C. Although beetroot is a cool-season crop, it is fairly tolerant to high temperatures when soil moisture is adequate. The plant can withstand moderate frosts, but growth will be affected due to excess frosting. The beet root is sown in cold areas (heavy frosts) from August to March, warm areas (light frosts) although the year and hot areas (frost-free) from February to September.

The root colours vary between red to dark red with different degrees of zoning when sliced. Usually, the deep purple beet roots are eaten boiled, roasted, raw alone or combined with any other salad vegetables. The yellow-coloured beetroots are grown on a very small scale for home consumption.

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deep purple beet roots are eaten boiled, roasted, raw alone or combined with any other salad vegetables. The yellow-coloured beetroots are grown on a very small scale for home consumption.

PROCESSING OF BEETROOT:

A large proportion of the commercial production include boiled and sterilized beets as well as used for pickling. In Eastern Europe, beet soup like borscht is a commonly consumed delicacy. In Indian cuisine, chopped, cooked and spiced beet is a common side dish. The green, leafy portion of the beet is also edible with the young raw leaves use in salads whereas matured leaves are commonly served boiled or steamed due to its similarity with spinach.

Beetroot can be boiled or steamed, peeled and then eaten warm with or without butter as a delicacy, can be cooked, pickled and eaten cold as a condiment, peeled, shredded or sliced raw and eaten as a salad. Pickled beets are a traditional food in many countries round the world.

NUTRITIONAL VALUE OF BEETROOT:

Beetroot is a rich source of protein with 1.70 g in 100 g followed by carbohydrates with 9.56 g, fat of 0.17 g, sugars of 6.76 g, dietary fiber of 2.80 g and energy of 43.0 Kcal. They are low in calories due to water content of 88.0% along with high amount of valuable vitamins and minerals like calcium of 200 mg, phosphorus 55 mg and vitamin C 88 mg in 100g beetroot. Its leaves are rich in iron with 3.1 mg, vitamin A of 2100 IU, thiamine of 110 µ g and ascorbic acid of 50mg/100g sample.

The consumption of 100g of beetroot can meet RDI of 6.0% for vitamin C, 20.0% of folate, 3.0% of magnesium, 9.0% of potassium, 4.0% of phosphorous, 16.0% of manganese and 4.0% of iron. Beetroot can be boiled or steamed, peeled and then eaten warm with or without butter as a delicacy, can be cooked, pickled and eaten cold as a condiment, peeled, shredded or sliced raw and eaten as a salad. Pickled beets are a traditional food in many countries round the world.

HEALTH BENEFITS OF BEETROOT:

Beets contain inorganic plant compounds like nitrates and pigments with a number of health benefits.

Checks body blood pressure:

Beets contain a high concentration of nitrates which have a lowering effect on blood pressure leading to reduced risk of heart attacks, heart failure and stroke. The nitrates in them also may help increase blood flow to the brain, improve cognitive function and possibly reduce the risk of dementia.

Enhance athletic performance:

Eating beets may enhance athletic performance by improving oxygen use and reduce the exhaustion time. For maximum benefit, beets should be consumed 2 – 3 hours prior to training or competing. They contain pigments called betalains which may possess a number of anti-inflammatory properties.

Promote digestive health:

The fiber in beets may promote weight loss by reducing appetite, promote feelings of fullness and reduce gastric emptying time thereby reducing overall calorie intake. Fiber resists digestion upon entering the colon, where it either feeds the friendly gut bacteria or adds bulk to stool. This can promote digestive health and prevent digestive conditions like constipation, piles, inflammatory bowel disease and diverticulitis. Moreover, fiber has been linked to a reduced risk of chronic diseases including colon cancer, heart disease and type 2 diabetes.

Reduce muscle soreness:

Muscle soreness caused by exercise, sprinting or jumping can be reduced by drinking beetroot juice a few times a day for about 48 hours.

INDUSTRIAL USES:

Betanin obtained from the roots is used industrially as red food colorant to improve the colour and flavour of tomato paste, sauces, desserts, jams, jellies, ice cream, candies, and breakfast cereals. When beet juice is used, it is most stable in foods with a low water content like frozen novelties and fruit fillings. According to the regulation on food additives betanin is permitted *quantum satis* (amount which is enough) as a natural red food colorant (E162) in different foods. It is also used as colorant in cosmetics and pharmaceuticals world over.

CONCLUSION:

Beets contain chemicals that might reduce swelling and cholesterol. Also, they can increase levels of nitric oxide in the body which is a vasodilator that helps to relax the inner muscles of blood vessels causing them to widen for increased blood flow and possibly reducing blood pressure and making it easier to exercise. The consumption of beetroots may improve running and cycling performance, increase stamina, boost oxygen use and lead to better exercise performance overall.

Thus, consumption of beetroot benefits digestive health with antioxidant content and anti-inflammatory nature of beets can be of interest to researcher for combating life style diseases.

BLENDED OIL:
A HEALTHY NUTRITIONAL APPROACH

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INTRODUCTION:

Edible vegetable oils are the main sources of macronutrients, essential fatty acids and essential dietary components in our diet play an important role in maintaining human health. For consumption vegetable oils are the source of essential fatty acids. Essential Fatty acids are those fatty acids which the body cannot synthesize and need to be supplied through diet. Vegetable oils are one of the important component of the daily diet and major source of fat in the diet. Presently there are different types of vegetable oils, but no single edible oil available in the market which has desired fatty acid profile, oxidative stability and desired functional properties. Therefore, fats /oils needed to be altered according to their specific use for consumption and fatty acid composition. It was found that blending of vegetable oils balances fatty acid composition with good functional and nutritional value which confers health benefits.

Oils and fats are used for cooking and frying as well as in food formulations. Most vegetable oils have limited technological application in their original forms because of their specific chemical and physical properties. To enhance their commercial application, vegetable oils are often modified using four different methods; hydrogenation, interesterification, fractionation and blending

Fats and oils provide calories, enhances the flavor of food, induce satiety and improve palatability. Beside that they are required for many physiological functions, transportation of fat soluble vitamins, membrane structure and many other functions. Dietary fats are essential to provide desirable physical, nutritional, organoleptic properties to the food and is mainly used as the cooking medium in different food preparations. Vegetable oils, in general distinguish in their fatty acid composition and No single oil in nature provides all essential fatty acid in optimum amounts as per dietary requirements. Recently, due to increasing awareness about health and food habits the nutritional quality of fats and oils has gained more importance due to their connection with health and coronary diseases.

Edible vegetable oils can be obtained from many sources. Some of the commonly used oils are groundnut oil, mustard oil, sunflower oil, safflower oil, palm oil, olive oil, soybean oil, coconut oil and cotton seed oil and also rice bran oil derived from cereals bran of rice. The nutritional profile of edible vegetable oils depends on the fatty acid composition, degree of unsaturation, arrangement of fatty acid in triglyceride structure. Therefore, healthy and stable oil with a high functional value have gained significance because of changing lifestyle and dietary pattern. In order to improve the nutritional profile, stability, utility of dietary fats and oils could be possible by modification by blending different oils. The Blending of two or more different oils having different composition and functional properties is an economic way to modify fatty acid profile and physicochemical properties.

WHY BLENDING OF OIL?

The blending of edible vegetable oil can provide desired fatty acids in recommended levels. Since the blends have right mix saturated fatty acids (SAFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) including the ω-3 and ω-6 polyunsaturated fatty acids with improved oxidative stability of oil. Natural antioxidants present in oil may reduce the rate of oxidative changes during food frying and storage which ultimately prevent food becoming rancid and improve its shelf life.

No single oil is perfect in respect of nutritional profile. The imbalance in fatty acid profile is due to deficiency in one or more essential fatty acid which are very beneficial for the regulation of lipid metabolism and also help in prevention of cardiovascular diseases (CVDs). Therefore, the ratio of essential fatty acids, i.e. omega-6 (n-6): omega -3 (n-3) is very crucial to meet dietary requirements and in maintaining good health.

According to ICMR-National Institute of Nutrition (NIN), Hyderabad the 'Recommended Dietary Allowance (RDA)' of fat intake for Indians is 30g per day for individual. The fat in the diet must contain all the three types of fatty acids namely, saturated fatty acids (SAFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) including the Omega-3 and Omega-6 polyunsaturated fatty acids. The linoleic (LA ω-6) and alpha linolenic acid (ALA ω-3) are the essential fatty acids. These essential fatty acids are the precursors of several biologically active molecules which are involved in various physiological functions. Oil from a particular source has its own unique composition of different types of fatty acids. The fatty acids in oil may be short chain, medium chain or long chain, and saturated or unsaturated.

The nutritional value of edible oils depends upon the fatty acid profile, degree of unsaturation, arrangement of fatty acid in triglyceride structure. According to World Health Organization (WHO), the healthy oil should have following three characteristics: The ratio of saturated, mono and polyunsaturated should be 1:1.5:1. The ratio of essential fatty acid, linoleic acid (ω-6): linolenic acid (ω-3) should be 5- 10:1 and presence of natural antioxidants.

BENEFITS OF BLENDED VEGETABLE OIL:

- Lowers the Cholesterol Level
- Reduces the risk of coronary heart diseases (CVDs)
- Improve calcium absorption to prevent osteoporosis
- High in natural antioxidant
- Helps to prevent cancer
- Maintain blood pressure level
- Helps to develop good immune system
- Provide essential dietary components

CONCLUSIONS

Blending of vegetable oil is a promising healthy nutritional approach which combines the potency of two or more edible oils and which offers a optimum balance of essential fatty acids. Fats and oil can be designed to provide health promoting properties through blending with balanced fatty acid profile, greater stability and improved natural antioxidant and bioactive compounds. Blended edible vegetable oils may provide a good balance of both MUFAs, PUFAs, SFAs and Omega-3 and Omega-6 essential fatty acids in right proportion to fulfill dietary requirements. It could be recommended that blending of oil help to improve stability and functional properties of oil for food preparation and prevent the oxidative damage of unsaturated fatty acid, maintains a health to prevent various chronic diseases.

CHIA SEED: A SUPER FOOD

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INTRODUCTION:

Chia (*Salvia hispanica* L.) was originated from Mexico and Guatemala; it has been the part of human food for about 5500 years. The word chia is derived from a Spanish word chian which means oily, it is oilseed, with a power house of omega-3 fatty acids, high quality protein, abundant source of dietary fibre, vitamins, minerals and wide range of polyphenolic antioxidants which act as antioxidant and safeguard the seeds from chemical and microbial breakdown. The massive nutritional and therapeutic potential of chia is little known, chia offers a great future perspective for feed, food, medical, pharmaceutical and neutraceutical sectors.

NUTRITIONAL PROFILE OF CHIA SEED:

Chai seed is potential source of different essential nutrient that includes protein, fat, carbohydrate, dietary fibre, ash and dry matter contents ranged from 15 to 25 %, 30–33 %, 41 %, 18–30 %, 4–5 % and 90–93 % with a wide range of polyphenols. Currently chia seed is widely used for the extraction of bio-active compounds for the development of functional foods. The high fibre content of chia seed as health perspective, fibre increases stool volume, prevent from diverticulosis and cancer.

The presence of higher concentration of polyunsaturated fatty acids in chia oil has increased its popularity many folds. Omega-3 fatty acids are comprised of three essential fatty acids; alpha-linolenic acid, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) whereas omega-6 is comprised of linoleic acid and arachidonic acid. Chia seed with appreciable amounts of ω-3 alpha-linolenic acid (ALA) and ω-6 linoleic acid. On an average it contains about 64 % ω-3 and 19 % ω-6 fatty acids.

PHYTOCHEMICALS IN CHIA SEED

The total phenolic content in chia seed extract was 8.8 % on dry matter basis. The presence of caffeic acid, chlorogenic acid and quercetin can be correlated with higher extents of phenolics in chia. Chia seed is potentially a great source of antioxidants, the massive antioxidant potential can be utilized for better health and preservation of food lipid systems.

HEATH BENEFIT OF CHIA SEED

CHIA SEED IN PREVENTING HEART DISEASES

Alpha-linolenic acid, eicosapentaenoic acids play a vital role in the formation of vital biochemical compounds such as prostaglandins, leukotrienes, and thromboxanes which are encountered in numerous physiological functions. mega-3 fatty has the capability of blocking calcium and sodium channel dysfunctions, which otherwise can consequences in hypertension (Leaf and Kang 1998). Omega-3 fatty acids improve the parasympathetic tone, heart rate variability and protect ventricular arrhythmia. Alpha-linolenic acid content of the seed greatly

CHIA SEED CONTROL DIABETES

Chia seeds have the ability to convert glucose into a slow-release carbohydrate. This could have a positive effect on people with type 2 diabetes. High-fiber content of chia seed are associated with a lower risk of developing diabetes, and eating high-fiber meals helps to keep blood sugar stable.

APPLICATION OF CHIA SEEDS IN FOOD INDUSTRY

- Chia seeds are used whole, ground and in the form of gel and oil in food system to provide food with texture and consistency.
- Gel of chia seeds may be used as a substitute of oil or eggs in baked products.
- Gel of chia seeds can be used as stabilizer and fat replacer in ice cream
- Chia seeds also be used to produce bakery product as a substitute of wheat flour.
- Chia mucilage incorporation can improve technological quality of breads and pound cakes with a reduced fat content.

CONCLUSION:

Chia seeds potential source of dietary fifibre and proteins, rich in many essential amino acids. Also, chia seeds have high contents of polyunsaturated fatty acids, mainly belonging to the group of omega-3 fatty acids. These seeds are also a good source of many minerals and vitamins, as well as bioactive compounds of high antioxidant activity, particularly polyphenols and tocopherols. Hence it could be concluded that chia seeds are a valuable raw material whose Nutritional and health-promoting properties make it more convenient for value addition in food food product.

MICROGREENS: A NUTRIENT BOOST

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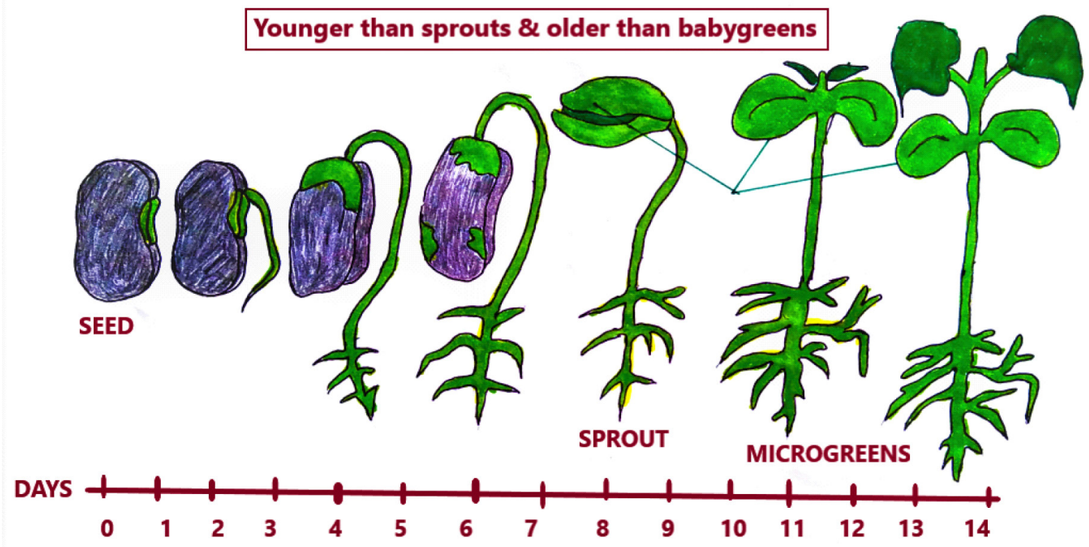
The lifestyle changes associated with improved standard of living in terms of social, economic and cultural standards lead to major lifestyle associated problems including lifestyle and malnutrition disorders. The non-availability of fresh pesticide residues free vegetables for consumption is a big problem in the present-day scenario. Urban population is mainly dependent on long food chains, which begin from distant rural areas, limiting the availability of produce that has short shelf life and poor shipping ability. As a result, a large urban population resides in areas classified as food deserts, where people do not have ready access to fresh agricultural produce like fruits and vegetables, thus, they are suffering from disorders caused due to the deficiency of essential nutrients. Increased health consciousness associated with lifestyle changes has created globally a vast demand for functional food. Microgreens, also known as neogreens, young greens, or vegetable confetti, are an emerging special class of fresh produce with distinctive health benefits since these food articles are additionally a decent source of ready to available forms of amino acids, minerals and vitamins, thus, have gained popularity with chefs and consumers in recent past. Owing to their nutrient-dense properties, microgreens have recently attracted considerable attention of nutritionists, health professionals, educators and health-conscious individuals. In past decade, their culinary value has risen too high because of their high nutrients content, versatility, flavour profile and crisp texture imparted to the dish.

WHAT ARE MICROGREENS?

The term microgreens has been given to the seedlings based on their stage of harvesting for consumption. Microgreens are very young and tiny seedlings of vegetables and herbs harvested after full expansion of cotyledonary leaves or just after the emergence or partial expansion or just before unfolding of the first pair of true leaves. It is different from sprouts in the sense that sprouts are the germinated seeds that are consumed with embryonic roots and seeds. However, microgreens are different from baby greens in their size and much smaller than baby greens. Their status remains in between sprouts and baby greens. The size of these microgreens varies from 2.5 to 7.6 cm in height, which usually occurs within 7 to 14 days after germination, depending on environmental conditions, crop and its variety. Microgreens include three basic parts, i.e., a central stem, two cotyledonary leaves and typically the first pair of very young true leaves. Microgreens are cut along with the stem and attached cotyledonary leaves using scissors or sharp edge knife. If left for a longer time, they will begin to rapidly elongate and lose their colour and flavour. Any species, seedlings of which have a desirable flavour and colour can be used as microgreens. The plant species commonly used for microgreens are amaranth (*Amaranthus viridis*), beetroot (*Beta vulgaris var. crassa*), broccoli (*Brassica oleracea var. italica*), cabbage (*Brassica oleracea var. capitata*), celery (*Apium graveolens*), corn shoots (*Zea mays*),dill (*Anethum graveolens*), golden pea (*Pisum sativum var. saccharatum*), kale (*Brassica oleracea*), lettuce (*Lactuca sativa*), mustard (*Brassica juncea*), pepper cress (*Lepidium sativum*), radish (*Raphanus sativus*), red cabbage (*Brassica oleracea var. capitata f. rubra*), spinach (*Spinacia oleracea*), Swiss chard (*Beta vulgaris var. cicla*) etc.



NUTRITIONAL COMPOSITION

For good health and wellness, adequate dietary intake of minerals is essentially needed, however, unfortunately, mineral malnutrition is still a worldwide concern and is considered one of the most serious global problems. Microgreens are cheaper and richer source of several micronutrients. They are higher in nutritional content than their mature parts. Their composition differs with the types of crop, growing medium, amount of sunlight, atmospheric temperature and the stage of harvesting. Bright-coloured microgreens are found to be more nutritious than the lighter ones. Microgreens have a higher content of protein, iron, zinc, α-carotene, β-carotene, violaxanthin, lutein and neoxanthin in comparison of sprouts. It is interesting to know that antinutritional factors like nitrate (NO3-) and nitrite (NO2-) are also very low in microgreens. In recent years, edible greens have become a good source of dietary antioxidants, consumption of which is often associated with reduced risks of certain serious disorders. Dietary antioxidants include vitamin C, vitamin E, β-carotene, polyphenols and other non-nutrients bioactive substances. Microgreens contain lutein, a lipid-soluble antioxidant pigment, which neutralizes the adverse effects of photochemical reactions. Polyphenolic compounds in microgreens are associated with reduced risk of several diseases. Chlorophylls, which are another major group of antioxidants in microgreens, have been reported to exhibit chemoprotective activity in carcinogenic conditions.

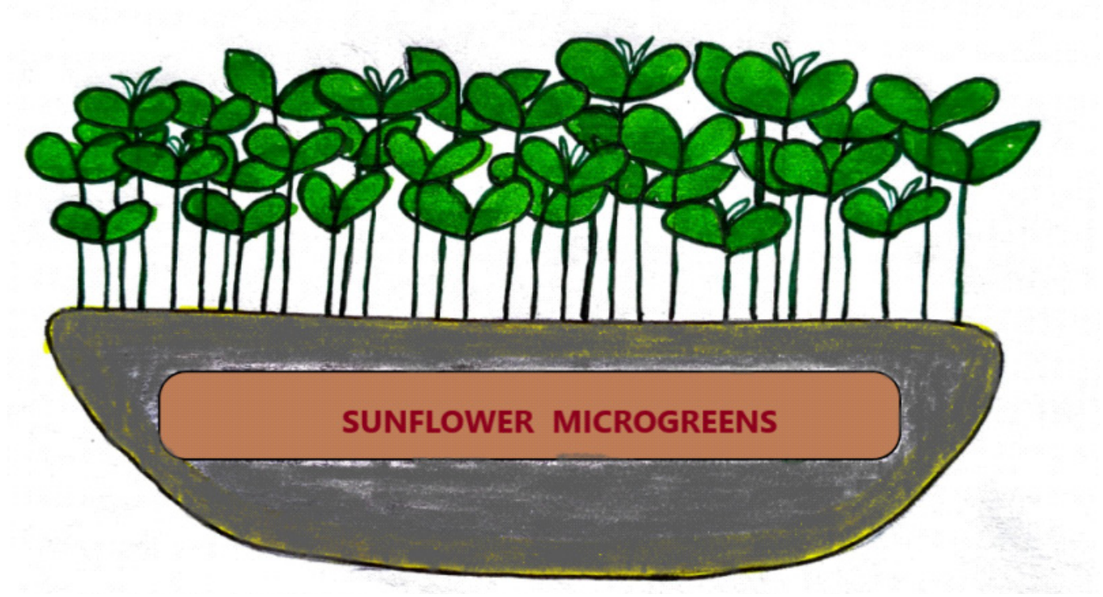
BENEFITS OF GROWING MICROGREENS

The advantages of leafy- and micro-greens in human diet are gradually being understood worldwide, ensuring their demand in the market. Now a day, crop failure of vegetables grown outdoors has become a major problem for the farmers, thus, there is a great scope of starting a enterprise with very

low investment by growing microgreens inside the room successfully. The microgreens may be sold both in vegetable markets and nearby top restaurants once a week to get higher prices and rising production according to customer demand. Microgreens from seed to harvest take very little time, therefore, the farmer does not have to wait for a longer period to earn money for their needs.

GROWING MICROGREENS: INDOORS VS. OUTDOORS

Microgreens can be grown on a wide range of temperature since wide range of plant species are used for the production of microgreens. Usually, 20 to 22°C temperature is most optimum for the growth of microgreens of all summer and winter species. However, the seeds of *Brassica* species can germinate at a bit cooler temperature. Time taken by the seedlings to reach the marketable stage increases with the decrease in temperature. Warmer conditions favour the quick growth of microgreens. The absolute first choice of a farmer for microgreensis to decide whether the outdoor or the indoor conditions are suitable for the production of superior quality microgreens, which can be made possible by creating a perfect and controlled environment. As per the experienced farmers, indoor conditions are far better for the production of superior quality microgreens since the temperature, humidity and light inside can be maintained as per the requirement of microgreens and the fluctuation in atmospheric conditions inside can easily be controlled. Therefore, a farmer can use any room in his home for the production of microgreens, which can be grown under low-light conditions since the seeds can use the stored energy in the form of starch and proteins for germination. However, the yield and quality of microgreens increase with the increase in light intensity. Outdoor conditions have their own prospects and constraints.The most important merit of growing microgreens outdoors is that it does not require any artificial light but environmental conditions outside the house may not be appropriate round the year for growing microgreens. Greenhouse can be a better option for thegrowing of microgreens, however, constructing a greenhouse is very expensive for the farmers under Indian situations. In late fall, winter and early spring when light is limited, supplemental light is needed. If sunlight is not available, artificial light may be used for the harvesting of best quality microgreens.



HOW TO GROW MICROGREENS?

Microgreens can be grown successfully through a variety of production systems. Media like soil, tissue paper, hydroponics, etc. can be used for raising microgreens but a mixture of cocopeat, vermiculite and perlite can be used for growing microgreens in a ratio of 5:2:1, respectively, as this mixture releases nutrients very slowly, hence, the same medium can be reused several times for raising young greens. Neogreens can also be raised in large open packs or flats filled with peat or coconut coir-based substrates. The most important consideration for the sowing of seeds for the production of microgreens is the seeding rate per unit area since the seeding density affects the yield of microgreens. As the seeding rate increases, the weight of individual seedling decreases due to competition among the seedlings but there is an increase in total yield per unit area. Generally, the seeds of microgreens do not require much nutrients for germination though require only ideal environmental conditions (temperature and proper moisture for imbibition) for germination and further growth. However, providing mineral nutrients in solution form will increase the yield of microgreens.Treatment of seeds with any chemical is taboo in microgreens and using hybrid seeds may not be economical.

SOWING TIME

For microgreens, the seeds can be sown round the year as per the consumer's need. Before reusing of previous media, the roots and other remnants of microgreens should completely be removed from the trays. Before filling in trays, the media should be exposed to sunlight for its disinfection. Any room or mini-greenhouse where optimum temperature, humidity and light intensity can be provided may be used for keeping the microgreens trays for better harvest.

HARVESTING AND PACKAGING

Microgreens become ready for harvest 7-14 days after germination under tropical and somewhat longer (14-28 days) under temperate conditions, depending on kinds of crop and other environmental conditions. Microgreens when attain a height of 2.5 to 7.6 cm are cut just above the surface of media using a sharp knife. Microgreens have a short time span of usability, thus, require better strategies for storage and transport. Microgreens are tender and susceptible to bruising, therefore, biodegradable clamshell containers are used for the packaging of microgreens. When microgreens are packed in bags, ample air space is left in top of the bags to protect the fragile shoots. The consistency and quality of cut microgreens can be preserved by packing in modified atmospheric packaging and storing at low temperature. Microgreens of different species are stored at different temperature based on their susceptibility or tolerance to temperature.

SUMMARY

Microgreens are new generation smart food, popularity of which is increasing day by day. These are tiny immature edible form of green leafy vegetables obtained from different kinds of vegetable, herb and plant and popularizing as new culinary ingredients, which are having a higher content of minerals, vitamins and many non-nutrients bioactive compounds and are more nutritious than their mature plant parts. They have an appealing appearance, soft texture and powerful flavour and supply of essential nutrients. Microgreens also have strong market acceptability due to their flavour and texture.

RADISH

A UNDERUTILISED VEGETABLE FOR FOOD SECURITY

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INTRODUCTION:

Radish (*Raphanus sativus*) is a root vegetable which is an annual or biennial brassicaceous crop grown and consumed worldwide. It is a root vegetable with light-colored, crunchy flesh, variable skin color and an almost spicy to peppery taste. The hotness varies from mild to very strong. They vary in shape from short and round to long and narrow with the skin color of red, black, white, yellow, pink or purple. It is likely to be native of the southeast or central Asia. The two main categories of radish include winter and spring radishes which usually depend on the time of harvest. Spring radish have short growing season with smaller size and are generally eaten raw. The winter radish has longer growing season with larger round or elongated shaped ones that are eaten cooked. The winter radish can be stored for longer duration compared to spring ones.

HISTORY OF RADISH:

The ancient Greeks and Romans around 2500 years ago used it for food and medicinal purposes. In Unani, Greek-Arab and Indian folk medicine, it is used as a household remedy for treating ailments like jaundice, gallstones, liver diseases, rectal prolapse, indigestion and other gastric pains. It contains carbohydrates, sugars, dietary fiber, protein, water-soluble vitamins like B1, B2, B3, B5, B6, B9 and C) and minerals like calcium, iron, magnesium, manganese, zinc, potassium, and phosphorus.

CULTIVATION OF RADISH:

Radish seed germinates in three to four days in moist conditions and soil temperatures of 18 to 29°C. Best quality roots are obtained under moderate day lengths with air temperatures in the range 10 to 18°C. The crop can mature in 3–4 weeks under optimal conditions but in colder weather, they may require 6–7 weeks. The radish is a diploid species with 18 chromosomes.

Radishes can be a companion plants for many other crops as they emit pungent odour that can deter insects and pests like aphids, cucumber beetles, tomato hornworms, squash bugs, and ants to a certain extent. They can be used as a trap crop luring insect pests away from the main crop to reduce their losses. Cucumbers and radishes can thrive well when grown in close association with each other along with chervil, lettuce, peas and nasturtiums.

NUTRITIONAL VALUE OF RADISH:

Every 100 g radish gives energy of 16 Kcal, carbohydrates 3.4 g, protein 0.7 g, fat 0.1g, sugars 1.9 g and dietary fiber of 1.6 g. They are low in calories due to a water content of 95.0% alongwith valuable vitamins and minerals. The consumption of 100g of radish can meet RDI of 25.0% for vitamin C, 6.0% of folate, 2.5% of calcium, 4.0% of iron, 5.0% of copper, 7.0% of potassium, 5.0% of vitamin B6 and 2.0% of magnesium.

HEALTH BENEFITS OF RADISHES:

These are beneficial in treating common day-to-day ailments like fever, cold, cough, and allergies. The flower, fruit, leaves, and seeds are used widely for their potent medicinal purposes. It contains unique bioactive compounds with recognized potential health benefits like catechin, pyrogallol, vanillic acid, and other phenolic compounds. Although radish is not a much-preferred vegetable can protect the heart to reduce indigestion, cleanse the liver and

stomach by detoxification to make skin healthy due to its antioxidants. The vitamin C present in these root vegetables acts as an antioxidant to protect your cells from damage.

Reduce the risk of diabetes:

They contain chemical compounds like glucosinolates and isothiocyanates that can help regulate blood sugar levels. The coenzyme Q10, an antioxidant present in it, can help reduce the risk of diabetes.

Enhance liver and kidney function:

The indole-3-carbinol and 4-methylthio-3butenyl-isothiocyanate present can help the liver detoxification and heal against damage. These same compounds also help the kidneys flush out toxins. It is a diuretic due to its potassium and magnesium content, which can increase urine production, may help reduce inflammation and relieve the burning sensation during urination.

Helps regulate blood pressure:

Radish also provides your body with potassium that may lower blood pressure and keep blood flow in control.

Guards heart:

The anthocyanins present in it keep the heart functioning correctly, reducing the risk of cardiovascular diseases. The natural nitrates can improve blood flow in the body.

Aids digestion and prevent piles:

Radish is rich in dietary fiber can lower gastric emptying time and improve bowel movement. The indigestible carbohydrates, especially lignins, help decrease water retention, thereby preventing constipation, which otherwise can cause hemorrhoids, commonly called piles. This root is good for the digestive system as it can reduce acidity, obesity, and nausea due to its mineral and water content.

Boost immunity:

The high vitamin C can protect from the common cold and cough and improve the basic immunity system. It also controls the development of harmful free radicals, inflammation, and early aging due to its antioxidant property.

Good for rheumatoid arthritis:

Radish scavenges free radicals from the body, thereby preventing cartilage damage due to its vitamin C content. This also aids in the formation of collagen, which helps in the formation of cartilage. Collagen boosts the blood vessels and decreases the chance of developing atherosclerosis.

Good for skin:

Radish is rich in phosphorus and zinc which help in reducing dryness, acne, and rashes. Its high-water content keeps the body naturally hydrated.

Prevent respiratory disorders:

It has anti-congestive vitamins that prevent irritation of the nose, throat, windpipe, and lungs from colds, infections, and allergies.

Consumption of radish:

From its root to its fruits and leaves, the entire plant is edible and can be used to create a range of delicacies. The most commonly eaten portion is the napiform taproot and tops used as a leaf vegetable. The root of radish can be consumed as raw mostly in salads. Radish is also consumed in chutneys, curries, dals, kadis, sambar, fry, soups, pickling/fermented to being added to stuffed parathas and rotis.

OTHER USES:

The radish seeds can be pressed to extract radish seed oil as wild radish seeds contain around 48.0% oil. Although this oil is not suitable for human consumption, it has potential to be used as biofuel. This root crop has other uses like being used as a cover crop during cooler times to increase soil fertility, scavenge lost soil nutrients, suppress spread of weeds, help alleviate soil compactness and prevent soil erosion during winter.

CONCLUSION:

Though it is not a staple vegetable in the diet, radishes with their plethora of nutrients and antioxidants have umpteen health benefits to combat many life style diseases like diabetes, hypertension augments heart and liver health. Reap the wellness incentive of this humble vegetable by adding it to your regular diet which can help provide food security also.

HYBRID WHEAT:
CAN IT OVERRIDE THE PURELINE VARIETIES.

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Hybrid is an F1 generation obtained by sexual and somatic crossing of two genetically distinct parents. In both cross and self-pollinated crops, hybrid varieties offer increased yield and enhanced vigour, efficiency and quality, but hybrid varieties in cereals belonging to the self-pollinated crop domain have not been proven very good except for hybrid rice. It is possible to clearly explain the process of growing hybrid plant seeds. Two distinct varieties of the same plant are cross bred, each with specific characteristics. One plant has sterile female flowers, the other contains pollen and a new, special offspring is created by the fertilized plant is a hybrid.

HYBRID WHEAT IN INDIA

Earlier after the year, 2005 number of efforts were made by the ICAR to exploit the heterosis in wheat. For this, a hybrid network project was initiated by ICAR in India using the CMS method during 2009-10, but there may be no hybrid varieties evolved. Mahyco (a Maharashtra-based hybrid seed company) launched two wheat hybrids (Pratham 7070 and Pratham 7272) in 2002 using the CMS method for low-input cultivation. However, in 2020 a wheat variety MACS- 6478 doubled the crop yield for farmers in Karanjkhop, a village in Maharashtra founded by scientists from the Agharkar Research Institute (ARI), Pune-an autonomous institute of the Department of Science and Technology (DST). It matures in 110 days and is resistant to most races of leaf and stem rust. This is in contrast to the usual maturation after 140 to 150 days expected for commonly grown wheat varieties in northern India. This medium-sized amber grain contains 14 percent protein, 44.1 ppm (parts per million) zinc and 42.8 ppm iron which is higher than other cultivated varieties. Farmers have a yield of 45-60 quintals per hectare with the new variety compared to an earlier average yield of 25-30 quintals per hectare when cultivating Lok 1, HD 2189 and other old varieties but still there is a long way to go to override pure line varieties because recently, the Indian Agricultural Research Institute (IARI) has released a new pure line variety of wheat named PusaYashasvi which is also known as HD-3226. It has a higher genetic yield potential (at 79.6 quintals) as compared to other varieties of wheat. PusaYashasvi has a higher content of zinc, protein, and gluten (which contributes to the strength and elasticity of the dough). The best feature of this variety of wheat is that it is highly resistant against all major rust fungi viz. yellow/ stripe, brown/leaf, and black/stem.

SYSTEM OF HYBRID SEED PRODUCTION IN WHEAT

For a hybrid seed production program in any crop, male sterility and fertility restoration is needed. The female parents must be male sterile, which is achieved by manual emasculation is carried out until it's cost-effective. This is done primarily through either of the following methods.

(1) Cytoplasmic/genetic male sterility (including YA-type CMS)
(2)Artificial induction through chemical hybridization agent (CHA)
(3) Photoperiod/temperature treatment
(3) Genetic male sterility
(4) chromosomal sterility/XYZ system

FUTURE PERSPECTIVE OF HYBRID WHEAT

1. Heterotic gene pool identification:

The key bottleneck in the gene pool is the absence of ample yield heterosis is the commercialization of hybrid wheat. One should look for a world primary gene pool for this, which has not been used otherwise. The currently available Indian gene pool is largely a descendant of germplasm from CIMMYT. The success story of heterotic gene pools in maize can be taken into account in the identification of heterotic gene pools.

2. Creation of novel genetic variability for yield component traits from secondary and tertiary gene pools and its evaluation:

As evident through CIMMYT wide hybridization program in creating novel gene pool through synthetic hexaploids. This helps in generating new variability altogether different from the variability presently used in various national wheat-breeding programs. The through genetic analysis synthetic hexaploids are essential to identify heterotic groups, floral biology to increase outcrossing potential, resistance source of various stresses.

3. Improving the restoration of fertility through the accumulation of Rf genes:

In China to improve the restoration of fertility through recurrent selection or multiple crosses involving different restorers. In this case, the benefit of CHA facilitated male sterility for recurrent selection or poly cross mating may be taken. Biotechnical methods can also be used for Rf gene pyramiding and MAS recognition.

4. Search for heterosis in diverse gene pools:

Polyploid nature of the Wheat crop has been blamed for lack of heterosis and intergenomic heterosis has already been exploited. But success in rice hybrids would give rise to new hopes. Identification of large compatibility genes in rice has opened up avenues for the use of high heterosis inter-sub-specific hybrids. Due to comparative mapping and synthesis in cereals, heterosis between spring, winter and optional wheat cultivars, as in the case of rice, maybe more commonly used. Further understanding of Photoperiod (Ppd genes) and Vernalisation (Vrn) may aid in the generation of hybrids between spring and winter gene pools.

5.Fixation of heterosis by apomixis:

This can be a challenging goal in the case of cereals where endosperm is the main part in terms of economic significance. It may not be possible to grow proper endosperm by apomixes. However, some solutions could be given to advances in modern biotechnology. The only close relative of wheat with an apomictic gene is Elymus rectisetus, which may be well studied for this reason.

BIO DEGRADABLE

SANITARY PADS FROM BANANA PSEUDO STEM WASTE.

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INTRODUCTION

These days everybody is concerned with creating the eco-friendly environment by reducing the environmental problems and natural pollution. Apart from this, health and hygiene is also very much important for human beings. The utmost pollutions are from textile industry, dye industry and healthcare industry. Among these, healthcare wastes are the major pollution that will create deliberate complications to the humans. One major problem is the manufacturing and clearance of sanitary pads.These pads produced by the companies, is not degradable and cause complications to women. India being a developing country has 323.6 million females between the age group of 15-49.They place these pads next to the most delicate and absorbent tissue in their body. They spend at least 20% of their life with these sanitary pads. Further, after each harvest farmers either burn banana pseudo stem discarded stems which causes air pollution or they have to pay additional labour to remove them from their farms. In order to overcome these problems, here we can use sustainable sanitary pads by choosing alternative natural material for the production. Recently, an attempt has been made to produce sanitary pads from banana fiber, a natural absorbent fiber. It is expected that incorporation of banana fibers provides antibacterial property and improve the retentiveness. Other important properties are its absorptivity and bio degradable. It has no negative effect on environment and it is considered as eco-friendly fiber.

MATERIALS:

Sanitary pads contain multilayered structure and each layer should have some specific function. Banana fiber, organic cotton, muslin cloth and canvas cloth were used as a source of material. Banana fiber is naturally occurring material and completely degradable and poses no side effect to humans and environment. Organic Cotton as top layer is one the generally prompted crude material in pad due to its non-aggravation, tissue-friendly and prevalent fluid maintenance properties. Cotton material keeps away moisture and keeps skin dry and make skin comfort .

METHODOLOGY:

Extraction of banana fiber from the pseudo stem of the plant is done manually. After extraction, the fibers are made to cut into fine chops and then it is allowed to boil with 150 mL of distilled water and 5 gram of sodium hydroxide for an hour. The mixture is then cooled for about 1 and half hour to make a thin sheet. The organic cotton was placed on to the thin banana sheet and then it was covered by the muslin cloth. The softened canvas cloth is used to wrap the entire sheets and then the corner of the canvas cloth in the pad is allowed to stick using heat or else stitches can be made in the corner of the pad.

MATERIALS:

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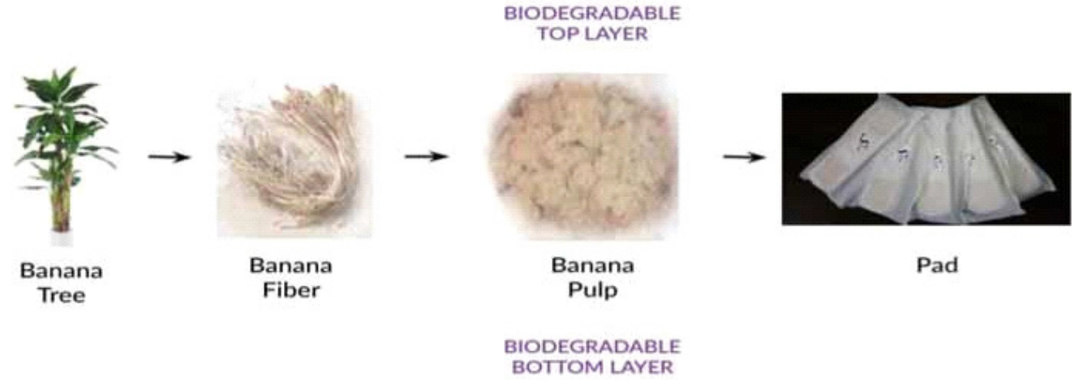

Steps from extracting banana fiber from pseudo stem to make sanitary pad.

CONCLUSION

Recently, natural resources are gaining attention in solving the problems faced by the people around the world. This study proved that the replacement of non-degradable material with the biodegradable material for developing hygienic feminine products is eco-friendly and cost effective. Use of natural material in pads will be cost effective and it can be affordable by the lower income people, we can find a suitable solution to make the world better for future generation.

ASHWAGANDHA (*Withania somnifera* L.) DUNAL– AN ANCIENT MEDICINAL CROP

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INTRODUCTION:

Ashwagandha *Withania somnifera* (L.), is an important ancient medicinal plant, used in the Indian traditional medicinal system i.e. Ayurvedic. The local name of ashwagandha seems to have been derived from the sanskrit language. It is combination of "Ashwa" means horse and "Gandha" means smell which means smelling like horse. Botanically, Ashwagandha belongs to the family Solanaceae, genus *Withania* and species *somnifera*. The genus *Withania* represented by 26 species globally, among Which, India hosts only two species, *Withania somnifera* and the wild *Withania coagulans*. The chromosome number of ashwagandha was found variable as 2n=24, 2n=48 and 2n=75. Among the ayurvedic Rasayana herbs, Ashwagandha holds the most prominent place. It is known as "Sattvic Kapha Rasayana" Herb. The plant has been highly acclaimed for its beneficial effects in a variety of ailments since ancient times. It is native to Indian sub-continent and is the third important prioritized medicinal plant listed by National Medicinal Plant Board (NMPB). The root of Ashwagandha is economic part due to its good medicinal properties. Ashwagandha is commonly available as a churna, a fine sieved powder that can be mixed with water, ghee (clarified butter) or honey. It enhances the function of the brain and nervous system and improves the memory. It improves the function of the reproductive system promoting a healthy sexual and reproductive balance. Being a powerful adaptogen, it enhances the body's resilience to stress.

Common Names:

English: Winter cherry, Poison gooseberry, Indian ginseng

Sanskrit: Ashwagandha and Varahakarni

Hindi: Asgandh and Punir

Gujarati: Asan, Asana, Asoda, Asundha, Aksand, Ghodaakun

Rajasthani: Sarvgandha

Punjabi: Aksan and Asgand

Marathi: Askandha, Kanchuki

Kannada: Hiremaddinagida, Kanchuki, Asvagandhi

Tamil: Amukkira

Telgu: Pulivendram, Panneru-gadda, Panneru

Malayalam: Amukkuram, Pevetti

GEOGRAPHICAL DISTRIBUTION:

Globally, the species is distributed in Africa, Mediterranean to India and Sri Lanka. In India, it is also found throughout the drier parts of subtropical like Rajasthan, Punjab, Haryana, Uttar Pradesh, Gujarat, Maharashtra and Madhya Pradesh.

BOTANICAL DESCRIPTION:

Ashwagandha small, woody, erect perennial shrub that grows usually 30 to 150 cm height with tomentose branches. It is an erect growing dicotyledonous plant with fleshy long tap root system, stem and Branches are covered with minute star shaped hairs. Leaves are simple, dull green and ellip. Flowers are small, inconspicuous, greenish or lurbid yellow and the inflorescence is umbellate cyme. Fruits type is berry and it is globous, spherical yellow/orange-red/red in coloured, enclosed an inflated and membranous calyx. Seeds are small kidney shapes yellow-coloured. The root is straight, unbranched, bear fibers, outer surface buff to gray yellow, bitter and acrid odour. The plants flowers and fruits during November to February. Economic part of plant is dry root having a good medicinal property due to presence of secondary metabolites.

SECONDARY METABOLITES:

- Alkaloids: withanine, somniferine, visamine, withasomnine, choline etc.
- Steroidal compound: ergostane
- Steroidal lactones: withaniferin A, withanolides A-Y, withasomniferin-A, withasomniferols A-C, withanone etc.
- Saponins containing an additional acyl group: sitoindoside VII and VIII
- Withanolides with a glucose at carbon 27: sitoindoside IX and X
- Withanolide glycosides: withanosides I, II, III, IV, V, VI and VII
- Pyrazole derivatives: pseudowithanine and ashwagandhine
- Beside these contents this plant contains starch and amino acids including aspartic acid, proline, tyrosine, glutamic acid, cystine, tryptophan, alanine and elevated amount of iron.

MEDICINAL PROPERTIES:

Root, leaves, fruits and seeds are commercial parts of Ashwagandha for possessing of medicinal properties. This quality herb possesses therapeutic value against a number of alignments such as antioxidants, adaptogen, arthritis, asthma, liver tonic, mental diseases, anti-inflammatory, antitumor, anti-stress, mind-boosting, immune-enhancing, rejuvenating properties, male sexual disorders, ulcers, bacterial infections, venom toxins and senile dementia. Ashwagandha root has also been noted to have sex-enhancing properties. Ashwagandha has the ability to restore sexual health and improve overall vitality while promoting a calm state of mind. Ashwagandha increases haemoglobin (red blood count) and hair melanin. From its ancient use to its modern application, it has been proven to be safe health alternative to millions of patients. It market potential is huge and growing ever since in the field of supplement, extract, capsule, powder.

CONCLUSION:

Ashwagandha is a recognised as potential medicinal plant in Ayurveda. The root powder of Ashwagandha is most economic part due to its multiple medicinal properties. It is a safe health alternative in the era of Ayurveda. Demand of ashwagandha is increase as feed supplement, extract, capsule or powder as commercial product in market.

PERIODIC LOCKDOWN: A MILEAGE TO NATURE

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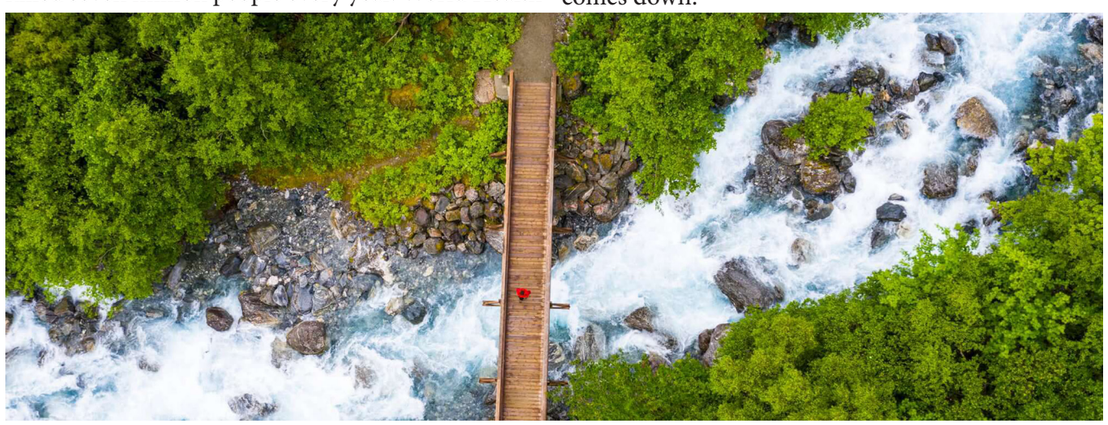
Owing to COVID-19 (Corona virus) pandemic outbreak, lockdown had been imposed almost in every nation to combat its spread. Lockdown had led to a significant improvement in nature. Life under coronavirus brought blue skies along with clean air. As humans stayed indoors, the earths ozone layer showed remarkable improvement, river's water quality improved and looked cleaner as a result of stoppage of industrial pollutants/ waste, residents saw the snow-clad Himalayan ranges with naked eyes lies at a distance of 213 kilometers, a critically endangered mammal (Spotted Malabar Civet) not seen until 1990s resurfaces for the first time in Calicut town indicated, mother earth was rebooting and many more. Other fact is that at present world is facing a bigger challenge of climate change and pollution and each country is spending huge amount to tackle this problem with necessary measures. The increasing pollution is causing human health hazards and even before the COVID-19 outbreak, air pollution killed seven million people every year. World Health Organization (WHO) spending on health continues to rise, it was US$ 7.8 trillion in 2017 compared to US$ 7.6 trillion in 2016. As per Climate Policy Initiative (CPI), climate related financing was $510 billion to $530 billion in 2017, whereas, as per UNs Intergovernmental Panel on Climate Change (IPCC), to limit temperature rise to below 1.5 °C from preindustrial levels, an annual investment of $2.4 trillion is required in energy system alone until 2035. No doubt the world economy dropped sharply due to lockdown, but it is proven as a mileage to the nature. The human activities have bound the nature but, nature needs flexibility, space, silence, calmness and the lockdown has well proven it. The governments of all the countries should think about periodic lockdown after every two or five years. It should be well planned with zero effect on world economy with all necessary pre-measures. It will definitely provide a big gain/reboot to the nature everywhere. The expenditure on climate change related activities and on health issues will definitely comes down.



ROLE OF INTERACTIVE ICTS IN PLANT HEALTH CLINIC MUSEUM FOR EFFECTIVE COMMUNICATION

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The plant health clinic museums are aimed at giving advice and recommendations to the farmers on various aspects of modern agrotechniques1. The traditional plant health clinic museums rely on samples preserved in formalin, herbariums, insectariums to aid farmers in the diagnosis of different field problems and considered as one of the extension strategies to solve field problems. With the increased use of the information and communication technologies (ICTs) in agricultural extension, the facets of plant health clinics have also revolutionised. A modern plant health clinic museum with interactive ICTs have been set up for cashew at the ICAR-Directorate of Cashew Research, Puttur.

It depicts the relevant information on cashew cultivation, pest and disease management, nutrient and water management, post-harvest and value addition in an appealing manner. For a perennial crop with seasonal production, it is difficult to provide practical field exposure on various aspects of scientific management and agro techniques for the visitors. The incorporation of information with the help of information and communication technologies made it possible to provide a holistic overview of crop and related activities at a single place. The museum provides information about cashew right from the journey to India from its centre of origin in North East Brazil during the 1500s through Portuguese. It is depicted in the form of murals in 2D representation. Three-dimensional depiction through models on softwood grafting and other aspects of cashew processing shall help the visitors in imbibing the information in a faster manner. Kiosks and touch screen with custom made software let the farmers, students, researchers and other visitors to explore areas of their interest. Farmers can compare the symptoms of various diseases, disorders, pest damages, nutrient deficiencies and find out the remedial measures on their own. Storytelling boards and press button boards in the museum facilitates interactive learning involving three senses which will have long persistence of information. Scrolling translates provided in the museum increases the linguistic capacity of the museum to cater to the requirements of visitors from different states. Models and specimens made available are intended to cover all the possible spectrum of knowledge on cashew.

The use of information and communication technologies in modern museums shall make it an ideal one-stop point for providing information on various aspects of modern agro techniques for the benefit of farmers, students, researchers and other visitors.

EDIBLE FOOD PACKAGING TECHNOLOGY: A GREEN MARKETING STRATEGY

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INTRODUCTION:

It is typically used as a kind of package. Packaging is necessary for food quality maintenance so that it can stay in good condition. The utilization of plastic as a fabric of food packaging gave rise to a range of issues to the surroundings or environment, after its utility it becomes plastic waste and most of this waste ends up in landfills, rivers and oceans and solely tiny percentage of this plastic waste is recycled because of the undeniable fact that plastic can never degrade and can remain on the landscape for many year and later onraises environmental problems. Keeping in view all issues, the use of edible film for packaging material over the plastic packaging is an effective alternative to resolve these kind of environmental problems. Edible films and coatings are made up of edible parts and could lead to the reduction of environmental pollution. Edible food packaging technology or eco-friendly packaging plays vital role in green marketing for sustainable environment.

ECO-FRIENDLY EDIBLE FOOD PACKAGING (HAVE YOUR FOOD AND EAT THE WRAPPER TOO)

Edible films and coating is a thin layer of eco-friendly edible material made from natural polymer like lipids and proteins. Mainly the edible films are made from milk protein casein which act as an oxygen blocker and prevents food spoilage. There are variety of edible packaging available in the market, starch based edible packaging is the other one but it allows oxygen to enter through the micro-holes.

EDIBLE FOOD PACKAGING INDUSTRY

In today's world consumers and several food companies have started to show concern about the environmental impact of products and are becoming more environment conscious. The reason for the concern could be perceivable climatic change, increasing air and water pollution and global warming. By identifying the changing consumer behavior and competition in market, most of the food companies were shifting their focus from normal plastic packaging to green or ecofriendly edible packaging.

WikiCells, is the edible skin or a food wrapper that takes the place of plastic packaging and acts as a protective peel of an orange, which protects ice cream (Magnum bar), yogurt, cheese, food from spoilage and are totally biodegradable.

MonoSol Inc. is a Water Soluble Film Technology whichhas developed water soluble (hot or cold water) sachets or wrappers.

GREEN MARKETING

The idea of green marketing or inexperienced marketing has been widely practiced in vehicles, batteries, refrigerators, microwave ovens, air-conditioners, soaps and detergents, paints, energy-saving lights and in many agricultural inputs like fertilizer and pesticides.Green Marketing is the marketing of product and services supported by environmental factors. According to the American Marketing Association, green marketing is the marketing of products that are presumed to be environmentally safe. Green marketing is also known as environmental, ecological and Sustainable marketing. Green Marketing includes several activities like modifying the merchandise, making changes within the production method and packaging, furthermore as modifying advertising or eliminating activities that impact the surrounding in negative manner.

Green Marketing is a holistic Marketing concept where the production, promotion, consumption, disposal of merchandise and services happen in a manner that are less damaging to the atmosphere.

WHY GREEN MARKETING FOR SUSTAINABLE GROWTH?

Green marketing is a buzz word and it is very necessary to implement as humans are getting over dependent on the natural resources for their wants. It is important for all the manufacturers to use all the required resources efficiently without wasting the resources as to achieve the organizational objectives. Growing interest among shoppers and their changing buying behavior everywhere regarding protection of environment hasmade companies to switch over green products or marketing and has emerged that speaks for growing marketplace for property and socially accountable merchandise and services.

SUSTAINABLE DEVELOPMENT

Physically better environment

Conservation of natural resources
Environment friendly

Consumer benefits

Health and safety

More fulfilled life

Performance Improved Organization

Better quality products
Competitive advantage
Improved profitability

SWOT ANALYSIS

STRENGTHS

- **Edible films are eco-friendly in nature as it can be fully consumed and is biodegradable.**
- **Nutritional value of food can be enhanced by supplementation.**
- **It is helpful in reduction of solid waste disposal problems.**
- **Lower processing cost makes it more efficient.**

WEAKNESS

- **Lack of awareness among people about edible food packaging.**
- **Poor mechanic.**
- **The packaging can develop off flavour.**
- **People may lack confidence by the idea of eating a package.**

OPPORTUNITY

- **Due to rising environmental threats, consumers are now inclined towards green products and technology.**
- **Edible films can tolerate high temperature and thus can also be used as oven bags.**
- **The fruit and vegetable films can also be consumed as snacks.**

THREATS

- **Being a new technology it may be difficult to establish market.**
- **Competitors may pose threat by imitating the same technology.**
- **Consumption habits and consumer believes.**

Green Segmentation

It is done by dissevering the consumers on the basis of their level of concerns about environmental issues. There are three categories on which the consumers are divided:

Dark green lifestyle,

which represents the consumers who are well educated and are aware about ecological threats caused by synthetic products. Such individuals are more inclined towards green environment.

Light green lifestyle,

involves people who have knowledge about green environment and ecological threats but do not spend money on green products due to the belief of such products being inferior in quality.

The Uncommitted green,

involves people who do not show much concern towards the environment. They are believed to harm the environment by their purchasing behaviour.

Target Market

Target market would have those consumers who are more aware about green products and are more concerned about environmental threats that synthetic packaging material can cause. Moreover, consumers of such group are more inclined towards the use of eco-friendly products.

Positioning

Green products already have a positive image in consumer's mind, so, mentioning the green properties of packaging material would enable consumers to distinguish it from synthetic packaging and would also increase its value in consumer's mind.

GREENMARKETING MIX

It is necessary to gauge the green marketing in order to grasp the position of green product. There are four element- Product, Price, Promotion and place.

Product

The green technology has the ability to produce better quality product and is ecofriendly too. These products carry higher value than typical products. For instance, upon opening an outsized packet of 20 individual sachets of coffee, one can simply place a sachet in a cup of hot or cold water without peeling off the seal. The edible layer that holds the coffee powder can dissolve upon contact with water.

Price

Environmental goods are supposed to be expensive but instead they are affordable compared to normal goods.

Place

The mode of distribution holds great importance. This eco-friendly packaging would be more comfortable for local and seasonal products in comparison to imported products. Grocery stores can provide the products wrapped in edible packaging, fruits and vegetables can also be provided wrapped in same.

Promotion

The promotion of edible food packaging should stress on its eco-friendly properties and also on the fact that it can be consumed. Consumers should be made aware about its contribution towards the environment and also towards the food industry. With rising environmental issues, this technology can easily make its place in the market.

CONCLUSION

Edible food packaging is a new and innovative packaging technology and can also be a great medium in promotion of green marketing. The adoption of this technology will also reduce the use of plastic, which is one of the main causes of environmental deterioration and will help in achieving ecological balance and improving human health.

NATURAL FARMING:
STAR PROMOTER OF ZERO BUDGET NATURAL FARMING (ZBNF) JAGADEESH REDDY

B. SRI SAI SIDDARTHA NAIK

ICAR – SRF, Ph.D (Ag) in Agronomy, MPUAT, RCA, Udaipur, Rajasthan

"Natural farming is a type of farming that is closest to nature." His strongest desire to save the soil from chemicals and pesticides made Mr. Jagadeesh Reddy a natural farmer. Jagadeesh Reddy is an Indian agriculturist who practices Zero Budget Natural Farming. Jagadeesh was born to Mr. Krishna Moorthy Reddy.& Mrs.Suguna in Chittoor district of Andhra Pradesh in India. He has an agricultural background and practices natural farming without using pesticides to cultivate. He conducted many workshops, seminars, webinars and conferences all over India and was awarded Futuristic farmer award, Innovative farmer award in 2019 by Central Government, and various other awards from Delhi and across India.

Farming was always his major interest since childhood. He joined the family farm with his father, a chemical farmer. Having learned of pesticides and artificial fertilizers, Jagadeesh started reading about natural farming methods, interventions and protocols of Subhash Palekar. Books have introduced him to the legendary farmer Mr. Subhash Palekar, Padma shri awardee in 2016. Jagadeesh once attended his workshop conducted in Tirupathi and practically understood natural farming techniques at his level of . He started applying ZBNF methods in his farm and this unique approach to farming involves manures and agroecology. His transformation from chemical to natural has attracted the attention of various social media platforms and his fellow farmers. IAS officers, Doctors, IT employees and people from various professions come to visit his natural farms to buy some quality naturally grown chemical free food. Now, many farmers around his village are practicing natural farming under his guidance and he stands as an inspiration to many farmers' co-operative groups.

Natural farming is an ecological farming approach with the avoidance of manufactured inputs and equipment. It is related to fertility farming and sustainable agriculture. Essentially, natural farming is to grow crops without fertilisers, pesticides or herbicides. Observing the conditions of the local ecosystem, and mimic nature rather than heavily relying on outside nutrients and artificial chemicals does the trick. When done properly, natural farming saves upto 90 percent of water, electricity and expenditure. It also avoids water pollution, prevents loss of biodiversity and halts soil erosion and all of this, without sacrificing the output of yield. Jagadeesh can demonstrate step-by-step on how to turn your farm into a completely natural, chemical-free farm that produces highly nutrional food. Understanding the healthier and beneficial alternatives to using chemical fertilizer and other invasive substances on crops is important. It can affect consumers health and cause illnesses as a result of digesting hazardous chemicals used in farming.

To our surprise, there are key differences between natural and organic farming. Natural and organic both are chemical or poison free farming methods. Both systems discourage farmers from using any chemical fertilizers, pesticides on plants and in all agricultural practices. Organic and natural farming methods promote nonchemical and homemade pest control methods. In organic farming, organic fertilizers and manures like compost, vermicompost, desi cow dung manure, etc. are used and added to farmlands from external sources. In natural farming, neither chemical nor organic fertilizers are added to the soil. In fact, no external fertilizers are added to soil or given to plants. In natural farming, decomposition of organic matter by microbes and earthworms is encouraged right on the soil surface itself, which gradually adds nutrition in the soil over the period. Organic farming still requires basic agro practices like plowing, mixing of manures, weeding, etc. to be performed. In natural farming there is no plowing, no fertilizers, and weed removal is manually done. Organic farming is still expensive due to the requirement of specific manures, and it has an ecological impact on surrounding environments; whereas, natural agriculture is an extremely low-cost farming method, completely based on local biodiversity. There are many working models of natural farming all over the world, the zero budget natural farming (ZBNF) is the most popular model in India.

The cost of cultivation in natural farming is considered to be very cheap comparatively. One desi (native) cow is sufficient to maintain land up-to thirty acres. Fertilizer they commonly use is jeevamrutam which provides all macro and micro nutrient requirements to the crop. Requirements to prepare this natural fertilizer are desi cow dung, desi cow urine, jaggary, green or black gram flour and forest soil. 200 litres liquid fertilizer is sufficient to serve one acre. It can be applied through irrigation, flooding, drip etc. Natural pesticide prepared and used namely Neemastram (prepared with neem extract, cow urine, cow dung and water).

Farmers following such practices need not spend more money for crop protection. According to stage of the crop these naturally prepared are applied to avoid occurrence of the pests and diseases on the crop. Other farmers are requested to visit such type of farms following natural farming methods and try this cow based natural farming. Farmers who got converted to natural method farming are only practising by their adaptive trials. Adaptability is a key component during the land conversion from

chemical to natural form. It may not always be possible for an agroecosystem to regain it's previous properties and function the way it was before. It is a slow process to be followed with patience and determination as initial yields will be marginally very low. Once the land regains it's properties, it will start giving good yield and continue to increase there on. Finally, sustainable agriculture is not a single, well-defined end goal. It is continuously evolving and is influenced by contemporary issues, perspectives, and values. For example, agriculture's ability to adapt to climate change was not considered a critical issue before, but is now receiving increasing attention. When the production of food and fiber degrades the natural resource base, the ability of future generations to produce good food and flourish decreases. A sustainable agriculture approach seeks to utilize natural resources in such a way that they can regenerate their productive capacity, and also minimize harmful impacts on ecosystems beyond a field's edge. One way that farmers try to reach these goals is by considering how to capitalize on existing natural processes. Hope this type of farming will spread in India to make marginal profits to small and poor farmers.

ZBNF has so far been adopted most prominently in the states of Karnataka and Andhra Pradesh. Evolution of ZBNF, beginning as a grassroots social movement and evolving into a major policy initiative in some states of India. Some of the first available findings on the impacts of ZBNF amongst early-adopters in Andhra Pradesh, focusing on crop yields, costs of cultivation, farmer income and observed impacts on farm ecosystems and within households. Efficiency is additive and incremental, though can involve step changes within existing agricultural regimes. Natural farming involves reducing waste and making the best use of easily available resources. Techniques of sustainable farming started coming to light and various training workshops are being organized in the state with the help of some experienced natural farmers like Mr. Subash Palekar and Mr. Jagadeesh. Farmers transitioning to ZBNF are thus embedded within a supportive network of peers, practitioners and formally trained agronomists, together forming a dense learning ecosystem. Farmers are encouraged to experiment with ZBNF, progressively deepening their practice. Naturally grown crops health and climate resilience to shocks are proving to be the best compared to chemically grown crops.

Naturally grown foods are in increasing demand because of the hazardous highly contaminated food being sold in the markets. Food contamination occurs if the food has come into contact with harmful chemicals. Exposures to such contaminated food at large creates adverse health effects. Once a person is exposed to a chemical, it may enter the blood stream, and eventually reach the liver. The liver attempts to detoxify harmful chemicals in the body by converting them to less toxic ones or ones that could be used by the body. The body naturally attempts to eliminate substances that are harmful. The kidneys filter substances out of the blood and excrete them in urine. Also, chemicals are removed from the body in feces, sweat and exhalation. However, the body may not be able to remove all the chemicals. The amount, type, and length of time the human body gets exposed to harmful substances associated with food will determine adverse health effects. Substances that are added to food to maintain or improve the safety, freshness, taste, texture, or appearance of food are known as food additives. Many different food additives have been developed over time to meet the needs of food production, as making food on a large scale is very different from making them on a small scale.

According to the World Health Organization (WHO), the two objectives in relation to pesticides are to ban pesticides that are most toxic to humans, as well as the pesticides that remain for the longest time in the environment. WHO intends to protect public health by setting maximum limits for pesticide residues in food and water. The most at risk population are people who are directly exposed to pesticides. This includes agricultural workers who apply pesticides, and other people in the immediate area during and right after pesticides are spread. Consumers can further limit their intake of pesticide residues by peeling or washing fruit and vegetables, which also reduces other foodborne hazards, such as harmful bacteria. In children, accidental exposures to high levels of pesticides are associated with childhood cancers, attention deficit hyperactivity disorder (ADHD).

Eating locally grown foods might be considered a safer option, but it depends on the practices of the individual farm. Hence, it is highly recommended for everyone to have a genuine farmer who can suggest and grow good food for you and your family. Eating chemical free or poison less food automatically develops immunity power which can combat any kind of viruses or diseases. Even chronic diseases like diabetes, arthritis, etc can be kept at bay with the consumption of naturally grown foods. Having a specific food producer contact benefits mutually to both you and the farmer. What Jagadeesh always says is "Every family must have a family farmer like a family doctor" which is a well said factual statement. Path to good health and well-being is not so easy. What a noble service by heroes like Jagadeesh who are striving hard to create health awareness among public. It is evident that knowing what you eat has become crucial to lead a healthy lifestyle.

Messages from Mr. Jagadeesh Reddy to readers, farmers and scientists

"Farmers should take step towards poison less farming because this is the only way to sustain a better life and they should also make earth a habitable place for the future generation. Today farmer should understand the current need and look for more meaningful and sustainable ways of pursuing agriculture instead of fulfilling their monetary needs."

"Today cancer like Disease is spreading among the people is because of chemicals being used by the farmers. I'm not saying that farmers shouldn't use fertilizer and pesticide, but they should reduce its use and switch to organic farming. In this way they can stop the soil and water pollution and can also prevent cancer like deadly diseases.

"Every farmer must do natural farming, if not possible to a larger extent then at least try it in a smaller area for home purpose. In this way, they can create a difference in their own lives and make it better."

HEENG CULTIVATION IN INDIA:
A STEP FORWARD TOWARDS ATAM NIRBHAR BHARAT

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INTRODUCTION

Heeng or Asafoetida (*Ferula asafoetida*) is an essential spice in many Indian dishes. It is a perennial plant and it produces oleo-gum resin from the roots after five years of plantation. It can be grown in unutilized sloppy land of cold desert regions. The spice is extracted from the stem and tap root of the plant. It has pungent smell and named as 'devil's dung' or 'food of the devils' in the West. India, though, has more prosaic names, such as hing in Hindi and perungayam in Tamil. This plant is native to the deserts of Iran and mountains of Afghanistan where it is grown in a substantial amount. India consumes around 50% of the total production in the world. Despite this, the spice was not being grown in India, and the entire demand was met from imports, around 90% from Afghanistan. Currently, around 1200 tons of raw heeng worth around Rs 600 crore is imported annually from Afghanistan, Iran and Uzbekistan to India. Although there is no cultivation in the country, it is processed in India using imported raw heeng.

SPICE PROFILE OF ASAFOETIDA

Asafoetida is bitter in taste and hot in effect, and can also be used to enhance flavours in roasted meat dishes. Asafoetida gives a comforting onion-garlic flavour in curries. It has a lingering taste that adds a special umami flavour to your dish. Commercially sold asafoetida is mixed with wheat flour and gum Arabic to temper the acrid taste of the resin. The additives help to adjust the concentration of the asafoetida according to its usage. Hing kabuli sufaid (milky white asafoetida) and hing lal (red asafoetida) are the two types of resin available in the market. The white or pale variety is water soluble, whereas the dark or black variety is oil soluble.

OTHER PROPERTIES OF ASAFOETIDA

Asafoetida is often used as an instant remedy for heartburn, indigestion, constipation and reflux. According to Ayurveda, it has the ability to balance all the three doshas.

FIRST EVER PLANTATION OF ASAFOETIDA IN INDIA

Asafoetida was planted for the first time in India on October 2020. Its cultivation was started in India by its first plantation at Kwaring village in Lahaul and Spiti district of Himachal Pradesh, at an altitude of about 11,000 feet above mean sea level. Farmers of the Lahaul Valley have started taking up cultivation of asafoetida (heeng), mainly due to the efforts of the CSIR Institute of Himalayan Bioresource Technology, using the vast wasteland in the cold desert conditions of the region. Dr. Sanjay Kumar, Director CSIR-IHBT, planted the first saplings of heeng. With the domestic production of heeng starting in India, import of asafoetida is expected to come down in the coming years.

CSIR-IHBT has introduced six accessions of heeng from Iran through the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, and standardized its production protocols under Indian conditions. By bringing asafoetida seeds from abroad, the institute has developed a technique to grow the plant from it. Cold desert areas of India such as Lahaul and Spiti, Ladakh, parts of Uttarakhand and Arunachal Pradesh are suitable for its cultivation. In adverse weather conditions, it goes under dormancy. The Institute raised the plants at the Centre for High Altitude Biology (CeHAB - a research centre of CSIR-IHBT) in Ribling, Lahaul and Spiti as a trial. As part of the trial, asafoetida plants have been provided to only 7 farmers in the valley at present for cultivation.

FARMER

PRODUCER

COMPANY

DIGITAL KISSAN FARMING & ORGANIC PRODUCER COMPANY LIMITED

Digital Kissan Farming & Organic Producer Company Limited

CIN No. - U01100HR2020PTC087504

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