

Role of Non-Conventional Fertilizer Sources for Boosting Flower Production

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Introduction

Organic farming pertains to a food production system in which traditional wisdom and ancient agriculture knowledge, such as crop rotations, mixed cropping, mixed farming, organic manuring, residue recycling, and agro-forestry systems, are coupled with improved agricultural cultivation and livestock management practices to enhance profitability while reducing dependence on off-farm resources. The potential non-conventional fertilizers sources of plant nutrients are green manure crops, crop rotation, crop residues, organic manures, FYM, sludges, oilcakes, blood meal, compost, phospho-compost, vermi-compost, biogas slurry, agricultural wastes, press mud, Biodynamic preparations, bio-fertilizers, bio-enhancers etc (Sharma, 2004).

Organic sources improve soil structure, soil aeration, water holding capacity and reduce soil losses due to erosion. They supply nutrients in a balanced ratio and stimulate soil flora and fauna. In floriculture, organics are used as substrate media, as a component in plug plant production, in preparation of nursery for flower seeds, as a component for pot mixture for foliage plants, as important media for greenhouse crops to improve the soil physical properties, as a soil drench of bulb soaking or foliar spray, in propagation of ornamental crops, in the hardening of tissue cultured plants and as a plant protection. In ancient literature, such as Rig-Veda, the use of animal dung as manure was reported. Atharvaveda indicated the importance of green manures which was practiced before 1000 B.C. Kautilya's

Arthashastra recorded manures like oilcakes, excreta of animals etc.

The concept of organic farming means ‘A food production system where traditional wisdom and ancient knowledge of Indian Farming such as crop rotations, mixed cropping, mixed farming, organic manuring, residue recycling, agro-forestry systems are amalgamated with modern practices of crop cultivation and livestock management to enhance profitability without dependence on off-farm resources’. India is blessed with various types of naturally available organic form of nutrients but quality of these inputs needs to be improved through Integrated Nutrient Management (INM), Integrated Pest Management (IPM) and Integrated Weed Management (IWM).

Advantages of non-conventional fertilizer

- a. It improves soil structure, soil aeration, and water holding capacity.
- b. They supply nutrients in a balanced ratio and stimulate soil flora and fauna
- c. Eliminating the use of synthetic fertilizers and pesticides.
- d. Minimizing soil erosion by up to 50% and increasing crop yields up to five-fold within 5 years.
- e. Non-conventional fertilizer provides all the nutrients that are required by plants but in limited quantities.
- f. It helps in maintaining C:N ratio in the soil and also increases the fertility and productivity of the soil.
- g. It improves the physical, chemical and biological properties of the soil..
- h. Due to increase in the biological activity, the nutrients that are in the lower depths are made available to the plants

Present Status of non-conventional farming

Organic agriculture is gaining importance in European countries, USA, Canada, Australia, Japan, China, India and others. India accounted for 1,72 MMT of certified organic produce. Karnataka the first state to introduce policy on organic farming on 24-03-2004 and organic movement in India. In India, Uttarakhand, North-East States, Chhattisgarh have taken initiatives for promoting organic farming. North East States are selected because the land is almost virgin and the crops are virtually organic. The use of inorganic fertilizers and chemicals is meager in the region. All the households are maintaining livestock's producing sufficient quantities of on-farm manures. The region is receiving very high rainfall leads to

production of biomass including weeds, shrubs, and herb which could be efficiently used in organic production. The region has the potential of about 47 mt of organic manure including 37mt from animal excreta and 9 million tons from crop residues. Extent of chemical consumption in farming is less than the national average. Besides, eighteen lakh ha of land in NER can be classified as 'Organic by Default'. In January, 2016, Sikkim has been declared as "First Organic State of India".

Important non conventional sources for ornamental plants

- **Coco peat:** Coco peat is a multipurpose growing medium made out of coconut husk. The fibrous coconut husk is pre washed, machine dried, sieved and made free from sand and other contaminations such as animal and plant residue. It has air filled porosity and high water holding capacity and is an ideal growing medium for the plant crops. It is 100% organic and eco- friendly, free from soil borne pathogen, weed and ideal for plant growth.
- **Vermiculite:** This is a micacious mineral produced by heating to 745°C. Vermiculite is hydrated aluminum iron magnesium silicate material with accordion like structure. It has a very low bulk density, a neutral pH, a high CEC and small amounts of potassium and magnesium. It is well suited for propagation media.
- **Perlite:** This is a siliceous mineral of volcanic origin. Perlite is rigid, sterile and essentially infertile with minimum CEC and neutral pH. Perlite may be included in the mix to increase aeration and to lower bulk density. It is generally recommended for use in a propagation media.
- **Vermi-Compost:** It is prepared from the organic wastes upon the action of earthworms. It contains 2.5-3.0% Nitrogen, 1.0-1.5% Phosphorus and 1.5-2.0% Potash.
- **Vermiwash:** It is washings from the earthworms collected during the preparation of vermin- compost, used as spray in raising of nursery, lawn and orchids. Vermiwash is rich in growth promoting substances.
- **FYM/ Compost:** It is prepared from the decomposition of organic wastes through anaerobic organisms. It contains fair amount of macro and micro-nutrients and most commonly used organic. Supplement given to the flower crop cultivation.

FYM contains 0.5-1.5% N, 0.4-0.8% P₂O₅ and 0.5-0.9% K₂O whereas Garden compost contains 0.5% N, 0.3% P₂O₅ and 0.8% K₂O.

- **Panchgavya:** It was prepared using the ingredients viz cow dung (5 kg), cow urine (3lit), cow milk (2lit), curd made from cow milk (2lit), ghee made from cow milk (1lit), sugarcane juice (3lit), tender coconut water (3lit) and ripened banana (12 Nos). All these substrates were added to a wide mouthed mud pot and kept open under shade. The contents were stirred twice a day for about 20 minutes both in the morning and evening to facilitate aerobic microbial activity. After fifteen days of incubation, the fermented product Panchagavya is ready for use.
- **Beejamrutha:** It was prepared using the ingredients cow dung, cow urine, water and lime. Cow dung (5 kg) tied in a cloth was dipped in a bucket containing 50 liters of water overnight. Next day morning, the tied dung was frequently squeezed and dipped in the water. Five liters of cow urine, a handful of soil and 50 g of calcium chloride was added to this extract.
- **Jeevamrutha :** It was prepared by mixing 10 kg cow dung, 10 lit cow urine, 2 kg jiggery, 2 kg. pulse flour with 200 l water and kept for one week incubation.
- **Green manures:** Green manures include beans, peas, alfalfa, red clover, or cowpeas. they store nitrogen in nodules on the roots plant fix nitrogen gas from the air and combines it with hydrogen this process creates ammonia, which is converted by bacteria into nitrates, a usable form of nitrogen once the plants are tilled into the soil, they release the nitrogen into the earth this improves the soil and provides supplemental nitrogen that was removed by other plant's growth they also help prevent soil erosion as they are used as cover crops.
- **Oil cakes:** Many oil cakes such as the castor, neem, madhuca, karanja, linseed, rape seed and cotton seed which are non-edible oil cakes may serve as useful organic manure as these contain high amounts of plant nutrients.
- **Bone meal:** Bone meal is finely ground bone, a by-product from animal slaughterhouses it is a great source of calcium and contains up to 15% phosphate bone meal promotes strong root systems and flowering it is often used when growing flowers.

- **Blood meal:** Blood meal is dried, powdered blood collected from cattle slaughterhouses it's such a rich source of nitrogen that gardeners have to be careful not to over-apply and burn the roots of their plants apply blood meal just before planting to stimulate green leafy growth.
- **Fish emulsion:** Fish emulsion is an organic garden fertilizer that is made from whole fish or parts of fish it provides an NPK ratio of 4-1-1 and is most often used as foliar feed to provide a quick nitrogen boost.
- **Poultry manure:** Poultry manure is the feces of chickens used as an organic fertilizer, especially for soil low in nitrogen of all animal manures, it has the highest amount of nitrogen, phosphorus, and potassium one chicken produces approximately 8-11 pounds of manure monthly.
- **Press mud:** Press mud is an industrial waste available from the sugar mills for every 100 tons of sugarcane crushed about 3 tones of press mud is left behind as by-product.
- **Bio-fertilizers:** They are living organisms or preparations containing bio inoculants of efficient strains of microorganisms that help in uptake of nutrients by converting unavailable forms of nutrients to available forms for plants use. Bio-fertilizer is a low cost input for crop production through which more yields and good quality produce maybe taken. It accelerates certain microbial processes in rhizospheric soil where applied through seed treatment, seedlings treatments, root dipping and soil application by broadcast. These microorganisms are *Rhizobium*, *Azotobacter*, *Azospirillum*, Phosphorus Solubilizing Bacteria (PSB) and Vesicular Arbuscular Mycorrhiza which are generally supplied in the form of bio-fertilizers. Broadly they can be grouped in different categories based on their nature and function.
- **Nitrogen Fixation:** Nitrogen fixing microorganism called diazotrophs are aerobes; facultative anaerobes derived their energy from organic substances, inorganic compounds. or solar energy directly. Diazotrophic bacteria rarely dominant population in terrestrial ecosystems. High population densities of biological nitrogen fixers are generally localized and transient and it is assumed that N-fixing

organisms are found in all types of soils. *Azotobacter* and *Azospirillum* are mainly used as N-fixer micro inoculants.

- **Phosphorus Solubilization** : Phosphorus is an essential mineral nutrient for plants comprising 0.2 per cent of plant dry weight. Application of P fertilizers can be both expensive and ineffective because of high capacity of soils to absorb or fix P in forms unavailable to plants. The microbial phosphorus solubilization (MPS) is the positive impact of P solubilizers on plants. Several heterotrophic and chemoautotrophic bacteria, fungi, actinomycetes and algae have the capacity to solubilize insoluble mineral phosphates. The application of varying quantities of phosphorus depends on the efficiency of microorganism strains. The production of organic acids by the microorganisms has been considered the main cause of MPS activity, while other mechanisms such as production of carbonic acid, hydrogen sulphide and alkalinity production also causes MPS activity. Microorganisms such as bacteria (*Bacillus spp.*, *Pseudomonas spp.*) and fungi (*Aspergillus spp.*) help in P-solubilization process.
- **Phosphorus Mobilization**: Mycorrhizal symbiosis is most prevalent and important mutualistic association in the plant kingdom. Arbuscular Mycorrhizal fungi (AMF) are the most wide spread type of endomycorrhizae and are considered as obligate symbiont to crop plants for better utilization of Phosphorus and other essential elements. The symbiotic mycorrhizal association increases economical use efficiency of super phosphate fertilizer and better exploitation of cheaper but insoluble rock phosphate. Vesicular Arbuscular Mycorrhizae (VAM) generally stimulates plant growth by enhancement of natural uptake and increased cytokinins and chlorophyll contents of plants.
- **Application in floriculture**: Use of bio-fertilizers in flower crop provided good results particularly in enhancing growth and flowering. The positive effects of use of bio-fertilizers on different growth yield and flowering characters in different flower crops as reported by several researchers is reviewed as under:
- Positive effect of inoculation of AM fungi and *Pseudomonas fluorescens* was reported in micro propagated carnation (Anusuya *et al.*, 2002). The combined application of bio-fertilizers and phosphorus increased yield and quality in

chrysanthemum (Kumari *et al.*, 2014). The improved growth response of marigold plants initiated early flowering and maximum flower yield per hectare by application of *Azotobacter* and phosphorus solubilizing bacteria with 75% nitrogen (Chandrikapure *et al.*, 1999). Inoculation of the cuttings of *Jasminum sambac* with *Azospirillum* and phosphobacteria at the time of planting of rooted cuttings increased the plant height, number of branches, dry weight (shoot and root), leaf area, size of flower bud, number of petals, petal length flower yield and saved 25 per cent of N and P fertilizers (Manonmani, 1992).

Conclusion:

Use of non-conventional fertilizers like manures, vermicompost, oilcakes, Bio stimulants, compost, FYM and bio-fertilizers increases flower production. The use of bio fertilizers not completely replace the chemical fertilizers but saves 25-30 % of nitrogenous and Phosphatic fertilizers. Considering the harmful effects of conventional fertilizers, it has become essential to adopt non-conventional fertilizer sources so as to avoid the harmful effects of conventional fertilizers on human health and environment in the future. The past studies conducted on different flower crops suggested that adoption of non-conventional fertilizer sources have improved the overall status of flower crops and also it is highly beneficial to farming community from economic point of view. Thus, use of non-conventional fertilizers sources is efficient tool for boosting the flower production.

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