

## Organic Cultivation of Medicinal and Aromatic Plants: a Review

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Medicinal and aromatic plants are the source of various bioactive components which are source of basic material for various pharmaceuticals, food additives, flavours, and industrially important bio-chemicals. These bioactive components have been used by mankind for treating various diseases since long time. Many of these bioactive components have very complex structure which makes it hard to economically synthesize them in laboratory and so plants became only source for their production. Growing environment plays an important role in the production of these plant secondary metabolites. Among these environmental factors physical and chemical properties of soil are of great importance for the growth and development of plants. It had been studies that chemical compounds present in soil had great impact on secondary metabolite production. Chemical fertilizers not only deteriorate the quality of soil but also impact the productivity and quality of plant secondary metabolites. So, under good agricultural practices followed for the cultivation of the medicinal and aromatic plants, organic cultivation is of utmost importance. Organic manures not only helps in improving soil health but also helps in better growth of plants and does not have any residual effect on the plant produce.

*Key words: Medicinal and aromatic plants plants, Plant secondary metabolites, Organic cultivation*

There has been increase in the consumers demand for organic products over past few years due to increasing concern over quality of produce, contamination due to the excessive use of chemical fertilizer, insecticides and pesticides which are serious hazard to human health as well as for environment (Abdelaziz *et al.*, 2007). As increase in the world's population put stress on agriculture and to meet the demands there had been excessive use of chemical fertilizer to increase the productivity but in return it leads to the deterioration of soil quality and quality of raw material. This increase in demand and concern to the human health and environment makes people move toward natural method of cultivation which improves the quality and productivity of raw material without affecting environment is known as organic farming (Meena and Sharma, 2015). Organic farming is the method of cultivation focuses on use of biological origin based products to increase the productivity and quality of produce. It includes use of on farm and off farm bio waste and various cultural practices to minimize the use of chemical fertilizer, insecticides and pesticides.

### **MEDICINAL AND AROMATIC PLANTS**

Over centuries ago, the father of medicine, Hippocrates advocated, "Let food be your medicine and let medicine be your food." The plants, in addition to food, clothing and shelter have provided all the medicaments and health care needs to human beings and domestic animals ever since the beginning of civilization (Malik *et al.*, 2011). Medicinal plants are the plants which contain bio-molecules which are used for pharmaceutical preparation or have potential to be one where as aromatic plants contain essential oil which are used as food adjacent, flavouring food products, cosmetics and also have one or more medicinal properties (Mahmoodabad *et al.*, 2014). Since long time, humans were totally dependent on forests and had been collecting these plant products from natural habitats. With the increasing market demand and change in environmental conditions over the period of time there is threat on many of the plant species of great medicinal importance (Das *et al.*, 2016). The attempts had been

made to synthesize these bio-compounds but due to their complex structure it is difficult to synthesize. So the plant is only source of these chemical compounds and decreasing natural population fails to meet the demand. Therefore the cultivation of these plants is only way to produce these economically important compounds (Malik *et al.*, 2011). Cultivation of these plants not only helps in meeting the market demand for these plant secondary metabolites but, also help in empowering the farmers and conservation of these threatened plant species (Kala 2015; Chandra *et al.*, 2016). India is well known for its diverse climatic condition rich natural habitat *i.e.* 15 agro-climatic zone and consists of about 17000-18000 flowering plant species out of which 7000-8000 plant species are being used in different systems of medicines. It will offer farmers to cultivate wide variety of medicinal and aromatic plant species according to their growing habitat and market demand (Ganesan *et al.*, 2016).

### **ORGANIC CULTIVATION OF MEDICINAL AND AROMATIC PLANTS**

Among the various aspects contributing to the growth and development of the plant nutrition is one of the important factors. Plants absorbs nutrients from soil in ionic form there are various factors which are responsible for the nutrient availability in soil which includes physical and chemical properties of soil. Due to the excessive use of chemical fertilizers, pesticides and insecticides lead to the hazardous impact on soil health and environment. This results in the shifting toward the reduced chemical or non chemical farming methods (Nene, 2017). Organic farming or non chemical farming methods prohibits the use of chemicals in agriculture and encourages the use of bio origin supplements for the plant nutrition and plant protection. Organic farming includes the use of animal and plant waste as nutrient supplement it includes compost, farm yard manure, vermicompost, bio-fertilizers, bijamrita, jivamrita, panchagavya and many bio-dynamic preparations. The use of these non chemical methods not only increases the yield and quality of the raw material but also enhances the soil health (Kumar *et al.*, 2015; Nene 2017). It had been also reported that these natural

substances as fertilizer not only helps in maintaining soil health but also conserve the soil micro-fauna by providing them organic matter and micronutrients which in turns aids plants in absorption of nutrient and also converts the nutrients in soil to available form (Naguib 2011)

The studies had showed that during seed germination organic fertigation with bijamrita per cent germination and seedling growth is significantly increases by the higher concentration of bijamrita in various leguminous crops under study (Vyankatrao 2019). It not only effects the seed germination but also enhances the biochemical content in seedlings such as, amylase and amino acid content (Karuppaswamy and Perumal 2013). Cow dung slurry was found to be the second best pretreatment for the seed germination and seedling growth after GA<sub>3</sub> in *Santalum album* L. (Sutheesh *et al.*, 2016). In sesame seed organic seed treatments like neem leaf powder and dry pepper powder had significantly enhances the seed viability, germination and seedling vigour in comparison to other treatment and control after storage (Oyekale *et al.*, 2012).

Vegetative growth and development is greatly affected by the source and availability of nutrient in soil. Studies carried out on various medicinal and aromatic plants show that organic fertigation had significantly positive effect on growth and yield. In *aloe vera* of vermicompost significantly increases the leaf weight, gel weight and dry weight of gel (Yavari *et al.*, 2013). Vermicompost and neem cake increases the herbage yield and oil content in rosemary, sweet basil (Singh Hadi 2010; Wasnik 2014 and Sarrou *et al.*, 2016). It also increases the NPK content and carbohydrate content in rosemary (Abdelaziz *et al.*, 2007). Flower head growth (fresh and dry weight) and essential oil content in chamomile was enhanced by using compost and liquid compost fertigation (Hendawy and Khalid 2011).

Medicinal and aromatic plant are basically cultivated for the bioactive content present in them so it is important to assess the impact of organic cultivation technique on the yield and quality of the raw product. It had been studied that the organic cultivation technique

had not only affect the herbage yield but also have significant positive effect on primary and secondary metabolite production in plant. In many medicinal and aromatic plants such as, *Centella asiatica*, *Sideritis perfoliata*, *Cymbopogon citrates*, Sweet Marjoram, Pepper mint, Lemon balm and Patchouli bioactive contents were found in highest concentration in organically grown plants in comparison with non organically grown plants (Gharib *et al.*, 2008; Kazmierczak *et al.*, 2014; Singh *et al.*, 2015; Bhattacharya *et al.*, 2017; Itankar *et al.*, 2017; Chrysargyris *et al.*, 2019).

Beside these organic compost biofertilizers can be the best alternative for reducing the use of chemical fertilizers. Biofertilizer is the utilization of micro-organisms for enhancing crop productivity. It had been seen that bacteria and fungi such as Phosphorous Solubarizing bacteria, *Azospirillum*, *Azotobacter*, *Pseudomonas*, Bacillus and Arbuscular mycorrhizal fungi not only increases the yield and secondary metabolite content in *Ocimum basilicum*, *Withania somnifera* and *Stevia rebaudiana* but also enhances the soil health (Patil 2010; Rajasekar and Elango 2011; Saburi *et al.*, 2018).

## CONCLUSION

Medicinal and aromatic plants have great demand in national and international market. This will help in strengthening the economy of country and marginal farmers. As conventional method of farming uses the chemical based fertilizers which are not useful in case of medicinal plants as use of chemical fertilizers had adverse effect on nature of secondary metabolites. Organic method of cultivation is found to effectively enhancing the production quantitatively and qualitatively over chemical fertilizers. Beside their effectiveness these are easily available material in low cost and also helps in reduction in farm waste. These methods will not only helps in increasing quality production but also help in reclamation of soil which lost its fertility due to excessive use of fertilizers. Being organic in nature and economically low cost these methods will reduces the dependency of farmers over chemical fertilizers which in turns reduced input cost and will result in gaining

maximum profit out of the production.

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