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Green Technology for Organic Spices Cultivation

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SUMMARY

Organic farming systems come in a number of ways like Permaculture, biodynamic farming, do-nothing farming, no-till farming, and other varieties of organic farming are widespread. Nutrient management plans for spices have been standardised for organic farming systems and organic packages have been developed for black pepper, ginger and turmeric integrating composts, oil cakes, biofertilizers/ PGPRs and biocontrol agents. In addition, an entomopathogenic fungus, *Lecanicilliumpsalliotae*, effective in controlling the cardamom thrips was potentially identified and evaluated for agro-climatic conditions in Kerala and Karnataka. The technology is ideal for adoption in organic horticulture. A new species of group I multiple Nucleopolyhedrovirus (NPV) infecting *Spilarctiaobliqua*, a polyphagous pest of ginger, turmeric and other crops was also identified as potential bio-agent.

INTRODUCTION

India is known as the Land of Spices. The country produces more than 65 spices out of the 109 varieties of spices identified by the International Organization for Standardization (ISO), which are mostly traditional. Even though organic farming is not recent, in snail's room, science and coordinated development of organic spices is blooming. In this domain, very minimal data is available. Among India's overall transfers of organic goods to the world export basket, the contribution of spices has so far been just around 1%. In large areas of spice fields or orchards, the indiscriminate usage of industrial fertilisers, plant defence products, manufacturing inputs etc. are major disadvantages of the early implementation of the organic conversion of these current lands under cultivation. In addition to the flavouring and seasoning of nutrition, seed spices are used for various cosmetic, perfumery and medicinal purposes. Globally, rising awareness of health has led to the need for organically grown seed spices because they are free of chemical contaminants and health threats. India has exported seed spices and their value-added goods to 70 countries worldwide and earns more than Rs. 362 crores each year in foreign exchange (Malhotra,2010).

The production of organic seed spices in India is still in its infancy and the main credit for organic spice export goes to the main group of spices producedespecially in Kerala and its environs. Seed spice production is largely concentrated in the arid and semi-arid regions of Rajasthan, Gujarat, and Madhya Pradesh. Organic farming has been initiated by a small group of farmers in these states, but no official data on production, location, or export is available. Owing to a lack of technical knowledge on suitable cultivation technology, plant protection steps, and unique varieties for organic processing, organic seed spice crops have not gained much traction. People all over the world are becoming more mindful of the health threats involved with the use of pesticide-contaminated agricultural produce and the harmful impacts of climate change. Organic cultivation is a feasible solution to these pressing concerns. Organic production has a range of benefits, including the fact that organic spices are extremely lucrative due to export demand, and organic produce is of high quality, healthy, nutritive, and environmentally friendly. The long-term fertility of soils is maintained because it is founded on the concept of organic cultivation, and insoluble nutrient supplies can be used by the action of microorganisms.

Green technology adopted in major spice crops.

Black Pepper

Depending on the age of the vineadd 5-10 kg of farmyard manure per vine along with 5-10 kg of vermicompost/leaf compost per vine. growers can also use neem cake (1 kg/vine) and composted coir pith (2.5 kg/vine). Depending on the findings of a soil test, rock phosphate/bone meal, wood ash, or potassium sulphate (mineral potassium) can be used to complement the necessary amount of phosphorus and potassium. Application of lime @ 500g/vine during April-May in alternate years is also recommended.

Microbial consortium: For increased growth and yield in black pepper nurseries and plantations, a talc-based formulation (IISR Biomix) comprising a consortium of plant growth stimulating rhizobacteria [*Micrococcus luteus* (BRB3)] + [*Enterobacter aerogenes* (BRB 13)] + *[Micrococcus sp*. (BRB23)] is suggested. In the region, 20 g of talc formulation is combined with one litre of water and added at a rate of 250 ml per vine and in the nurseryat a rate of 100 ml per bag. Alternatively, 1 kg of talc formulation can be combined with 100 kg of farmyard manure spread in the basin, i.e., around the root region, at a rate of 1 kg per plant. It can be applied twice a year (during May-June and September-October).

Vertical column method for quality black pepper

The continuous demand for quality planting material created a novel idea of producing ortho-trope on vertical 2m columns filled with composted coir pith and vermicompost fortified with bio-control agent *Trichoderma harzianum* in poly house. The advantage of vertical column method is one can get three types of cuttings viz., normal single node cutting, laterals and top shoots. (Peter *et al.*, 2018)

***Trichoderma harzianum*, a biocontrol agent against Phytophthora**

The production of black pepper is hampered by Phytophthora foot rot caused by *Phytophthora capsici*. The talc based bioformulation based on *Trichoderma harzianum* can be used successfully to manage Phytophthora. It can be used in Integrated Pest Management as well as under Organic Farming System in crops like black pepper, ginger, cardamom and turmeric. There is a great demand for the product and IISR has already issued several licences for its commercial production

Cardamom

It is estimated that average of 5-8t of dry leaves fall from shade tree manually in a hectare of land. Application of organic manures such as FYM Cow dung or compost @ 5 kg/plant or neem cake 2 kg/plant and 100g bone meal per plant may be applied during June – July and during September /October. Application of azospirillum and phosphate solubilizing bacteria @ 50g/plant or PGPR mix 1 along with 5kg of FYM was found to be effective in enhancing the yield.

Ginger

At 45-day intervals add 25-30 t/ha of farmyard manure, 4 t/ha of vermicompostand 12-15 t/ha of green leaves mulching. Incorporation of oil cakes, such as neem cake, at a rate of 2 t/ha and composted coir pith at a rate of 5 t/ha. *Azospirillum* 2.5 kg /ha. and phosphate-solubilizing bacteria microbial cultures can increase fertility and yield. For growth promotion and disease prevention, the Bacillus at liquifaciens PGPR strain mix 1 as basal (GRB 35) is also recommended.

Depending on the findings of a soil test, rock phosphate and wood ash can be used to augment the appropriate amount of phosphorus and potassium. (Chinthana *et al*., 2016)

Turmeric

Farmyard manure can be spread at a rate of 40 t/ha, at the time of land preparation and 3 t/ha each at 30 and 60 days after planting. Apply 250 kg ash /ha half at 30 DAP and another half at 60 days after planting. and vermi compost at a rate of 5-10 t/ha. Mulching with green leaves at 45-day intervals @ 12- 15 t/ha

Until planting, the soil can be solarized by coating it with a thin polythene film for 45-50 days. The use of *T. harzianum* in conjunction with 1 kg of neem cake per bed tends to minimise the disease's occurrence. Infested rhizomes can be handled with hot water (50°C) for 10 minutes, nematode-free seed rhizomes can be used, and ginger beds can be solarized for 40 days to control nematodes. At the time of sowing, *P. chlamydosporia*, a nematode biocontrol agent may be introduced into ginger beds.

Improved soil-less method (Pro-tray) of healthy planting material production

Ginger & turmeric

The major diseases in ginger and turmeric are soft rot caused by Pythium sp. and bacterial wilt caused by Ralstonia solanacearum. These pathogens are both seed and soil borne. Infection by these pathogens can be reduced by at least 50% through the use of disease-free planting materials. A transplanting technique in ginger by using single bud sprouts (about 5 g) has been standardised to produce good quality planting material with reduced cost. The advantages of this technology are production of healthy planting materials and reduction in seed rhizome quantity and eventually reduced cost on seeds. (Peter *et al.,* 2018)

CONCLUSION

Organic farming allows farmers to mix conventional farming methods with cutting-edge technologies.The current improvements in organic cultivation in recent years has been improved by adopting the new innovative technologies. The organic forming technology can protect the environment, minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health.

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