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Organic farming and role of Trichoderma in organic farming: An environmental friendly approach

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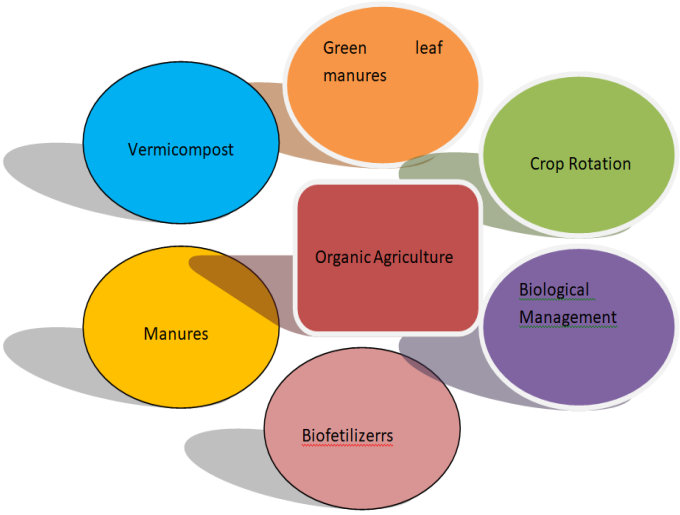
Organic farming is not new for India. In India Organic farming is being used from the ancient times. The word organic farming means use of organic wastes(Crop, animal and farm wastes) and biological materials along with biofertilizers for crop production.USDA (United States of Agriculture) has defined organic farming " It is a system which avoids or largely excludes the use of synthetic fertilizers, pesticides, hormones, feed additives etc.and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection"

FAO defined organic farming as "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs"

Features of organic farming

* Maintains the soil fertility by maintaining organic matter levels, biological activity and mechanical innervations.
* Providing crop nutrients by the action of microbes
* Pest and disease control is primarily relied on the crop rotation, natural predators,use resistant varieties and manuring.



Components of organic farming

Seeds-The seeds used in organic farming are not treated with any synthetic fertilizer or if treated they are treated with cow urine, animal dung, biofertilizer and biofungicides.

Biomanure- FYM containing urine, straw and farm wastes, concentrated organic manures, oil cake, fish bones,

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poultry etc are rich source of nutrients and organic matter. Green manuring with plants such as dhaincha, barseem, sunhemp, cowpea, green gram or sesbania increase plant mass and also improves the physical and chemical properties of soil and fertility.
Compost-composed is prepared from decomposed products of organic wastes left in the fields such as plant debris, crop and fodder residues etcwhere as vermicompost is a metabolic product of earthworms. When Trichoderma or Panchagavya is added in the organic matter its nutritive value increased.

Crop diversification-Yearly crop rotation, intermix cropping and cover crops are followed yearly. Trap crops attract and trap insect pests. These crop patterns reduce the incidence of pests and disease and maintain soil fertility and optimize the balance of plant nutrients.

Soil solarization-Mulching during the period of intense solar radiation and spreading of dried weeds or crop residues around plant base decreases the water evaporation and results in soil moisture retention.

Biofertilizers and microbial inoculants-Nitrogen fixing organisms (Azolla, Azotobacter,Rhizobium, Azospirillum, BGA, mycorrhizae) and other microorganisms help to reduce the use of fertilizers.

Microbial pesticides-Pesticides containing microorganisms such as bacteria (Bacillus subtilis, Bacillus thuriengiensis, Pseudomonas fluorescenes) and other fungi (Trichoderma viride, Trichoderma harzianum) are commonly used as pesticides.

Botanical pesticides-Application of naturally available plants and their products such as seed kernel extract, water extract of neem leaves, nirgnum bulb of garlic and onion, chillies, medicinal plants etc. use of botanical pesticides is environmental friendly and is very effective for the control of pests (Predators,parasitioids, nematodes, disease causing pathogens).
Naturally occurring salts-Gypsum and lime are mixed in soils for maintaining correct pH.

Barriers of organic farming

There are many obstacles in organic farming like lack of information and knowledge of existing policies, weak infrastructure, economic issues and many other cultural issues. Moreover research of organic agriculture is very less developed. Farmers face infrastructure and economic barriers. There is a need to develop knowledge base infrastructure which create environment for agriculture innovation.

- Absence of supportive policy
- Loss of crop yield
- Non achievement of expected quality
- Failure of organic pest management
- Shortage of biomass and livestock
- Lack of quality seeds supportive organic agriculture
- Lack of storage, transport and organized marketing system
- Vested interests of chemical and pesticide lobby
- Lack of awareness and guideline for organic farming
- Inbality to meet the export demand
- Complexity and high cost of organic certification system
- Scarcity and high cost for quality analysis

Conventional agriculture vs Organic agriculture

In conventional farming before the seed is sown, farmer treat the field with fumigants, and treat the soil by

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using chemical fertilizers while in organic farming the field is teat with natural fertilizers like manures, crop residues etc. In conventional method seeds are treated with chemical fertilizers and they also incorporate the chemicals in irrigation water. On the other hand in organic farming no chemical is used for seed treatment and irrigation. Organic agriculture is totally depend on natural rain or harvest and stored rainwater to use during dry months.

When it comes to consumption there is no doubt that people consuming consumable agriculture based products are consuming pesticides and weedicides while organic agriculture based products are safe they have no

pesticides and weedicides residues.

Health benefits of organic agriculture

Reduced exposure to pesticides and chemicals
Organic agriculture builds healthy soil
Prevents soil erosion
Minimize the Effects of Global Warming
Organic agriculture helps in water conservation and maintains water health
Organic agriculture helps in maintaining Biodiversity

Certification Agencies

There are two types of certification agencies

1. Indian certification agencies

- Tea Board
- Coffee Board
- Spice Board
- Agricultural and Processed food products Export Development Authority (APEDA)
- Tamil Nadu Organic Certification Department

2. International certification agencies

- Argencert
- California Certified Organic Farmers (Ccof)
- International Federation Of Organic Agriculture Movements (Ifoam)
- The Ecological Farming Association
- Organic Farming Research Foundation (Ofrf)
- Organic Trade Association
- Community Alliance With Family Farmers
- Institute For Marketecology (Imo)
- Skal
- Ecocert International
- Demeter

Trichoderma in organic farming

Trichoderma is a well known biocontrol agent described in 1794, it is present in soil or on decomposing organic matter.It is a well known biocontrol agent and commercially used as replacement of chemical fungicides.They are also known for their ability to enhance plant health and soil productivity, resistance to abiotic and biotic stress and nutrient uptake.They enhance crop productivity without causing any harm to environment and human health.Trichoderma are effectively used for plant disease management (Howell 2003). Trichoderma is a free living asexual spore producing fungi, anamorphic fungi.The characteristic features of Trichodermaare rapid

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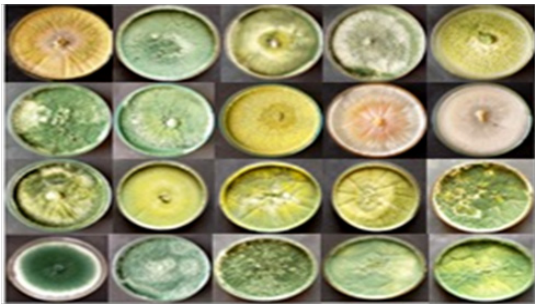
growth and production of bright green coloured spore and branched conidia (Saba et al 2012). Trichoderma plant interaction occurs in soil.It is commonly present in soil or decaying organic matter.200 YEAR AGO

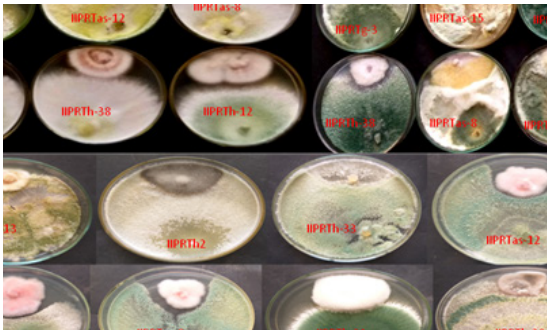


Trichoderma was discovered in the 17 centaury in Germany by Persoon 1794.In Trichoderma genus 89 species are present.Trichoderma colonies have key characteristic such as growth pattern growth rate and colour which are used to identify them (Gams and Bissett, 1998).

Fig.Trichoderma isolates

The primary mechanisms for biological control by Trichoderma spp. acting upon the pathogens are (i) recognition and invasion towards plant pathogenic fungal-like species through cell wall disruption and absorption of released nutrients known as mycoparasitism, (ii) induce the resistance of plant towards diseases by root architecture alteration during the interaction with pathogens and (iii) attack the root-knot and cyst nematodes by destroying nematode eggs and second phase juvenile. These indirect and direct mechanisms may respond effectively during the biocontrol event depending on the Trichoderma strain, targeted pathogen, the grown crop, and environmental conditions. Products that are commercially marketed commonly contain one or moreTrichoderma species such as T. viride, T. virens, and T. harzianum. The efficiency of products containing various species or strainsmay act differentlywithin the similar field and climate conditions. Themostwidely Trichoderma spp. products are formulated in awettable

powder or granules. Ninety percent of various Trichoderma strains are applied to crops,with the aimto control plant diseases due to antagonisticcharacteristic expressed by them against phytopathogen. The impact of their usage as a biocontrol agent (BCA) on the field is evaluated on the input cost and in relation to crop productivity. As a result, it was found that the input cost and crop productivity application of BCA are economical and low cost compared to synthetic inputs. For some reasons, farmers may use an excessive amount of synthetic inputs (such as synthetic fertilizers and pesticides) that's favorable for being cheaper, do not bring in any higher profits to farmers. Farmers experienced economic losses if the balance between input costs and crop productivity is not right. Not only to cut down the crop losses, Trichoderma spp. also boost up the yields (productivity), resulting in an increase in revenue. According to, a proper application of this BCA with compost onto crop field can lower or become an alternative for expensive chemical fertilizers. From the perspective of maintaining the soil health, usage of Trichoderma is a great sustainable approach. Researchers have reported that Trichoderma spp. suppress the growth plant pathogenic organisms such as Pythium arrhenomanes, Rhizoctonia solani,Fusarium



oxysporum, Alternaria tenuis and Botrytis cinerea as shown in.T. harzianumiswidely distributed over the globe

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and easily found on all various types of substrates. Perhaps, it is the most frequent nameused in agricultural practices related to Trichoderma spp., involving suppressing plant disease, naturally. .

Fig.2. Efficacy of Trichoderma isolates against wilt pathogens

Fig.3 Efficac of Trichoderma on nodule formation and plant growth

Conclusion

The repeated application of pesticides in the soil will soon bring an alarming situation in the world. Hence, Trichoderma spp. areproven tobe one of the potential biological bioremediation agents in order to reduce the pollution caused by excessive usage of pesticide. Besides, bioremediation by species belongingto the genus. Trichoderma in agriculture industry acts as an excellent and natural way to preserve the fertility.In agriculture, the new and established innovations boost up theyield of agriculture produce. Unfortunately, several of these conventional practices give a destructive impact on the environment. The challengefaced by modern farming is to accomplish a great number of yields in an environment-friendly manner. Hence, quick action on findingeco-friendly solutions need to be done. The success of Trichoderma strains as biocontrol agents against different pathogenic microorganisms is well known worldwide. Not onlythat, current findings revealed that these fungi also enhance plant resistance, plant growth and development, leading to an increase in yield production. Mechanisms that are usually involved are antibiotics, mycoparasitism, competition for nutrients and also stimulation of systemic resistance in plants. Recently, Trichodermaspp. are being used to control plant diseases in the sustainable diseasemanagement system. Besides playing its role in reducing diseases and improving plant growth, Trichoderma spp. can also be used in waste/organic materials decomposition and polluted area detoxification. The increase of nutrient value in compost degraded by Trichoderma strains is discovered in several research papers. Thus, the benefits of Trichoderma spp. when combined in a product are being able to control different crop diseases, stimulates plant growth and development, improves the composting process and promises a clean environment towards achieving sustainable agriculture of the soil. Healthy soil filled with nutrient and microorganisms is needed to enhance the best of plant growth, leading to high yield of production.