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Trichoderma- An Incredible Challenger for Plant Diseases

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Introduction:

Bio-control of plant diseases can be referred as the method of controlling any condition or practices, which limits the survival of the pathogen through the agency of another living organism other than man itself. It can be accomplished either naturally or through the manipulation of the environment, host or addition of antagonists. Theses antagonists belong to various groups of bacteria and fungi. *Trichoderma* attacks many plant pathogenic fungi and promotes overall plant growth i.e. shoot to root development such as lettuce, tomato, cotton, cauliflower, sugarcane, soyabean, pulses, cardamom, pepper, etc. It is an effective biological control for many plant pathogenic fungi as well as bacteria and viruses especially soil borne diseases. It is a free-living fungus which uses different mechanisms for pathogen control such as antibiosis, competition, mycoparasitism, hyper parasitism, lysis, induced systemic resistance etc. Some species of *Trichoderma* have penetrated the roots epidermis and formed colonies in root surfaces. Some species of *Trichoderma* used as bio-control for plant diseases control are *T. asperllum, T. viride, T. harzianum, T. atroviridae* etc. they can be applying as seed treatment (4g/kg) as well as in soil application (2.5kg/ha) by mixing in well decomposed farm yard manure (FYM).

Aids of Trichoderma

1. Disease Control: Trichoderma is being widely used as bio-control for many soils borne disease. They control the pathogen belonging to the genus *Fusarium, Phytophthora, Pythium, Streptomyces, Verticillium* etc.
2. Plant Growth Promoter: Solubilization of phosphates and micronutrients which help in the deep penetration of plant roots into soil because of which plant growth is promoted.

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3. Elicitors of disease: They induce resistance in plants by production of hypersensitive response, ethylene production and other stress related defense methods.
4. Bioremediation: they play an important role in bioremediation of soil that are contaminated with different pesticides, insecticides, fungicides and herbicides.

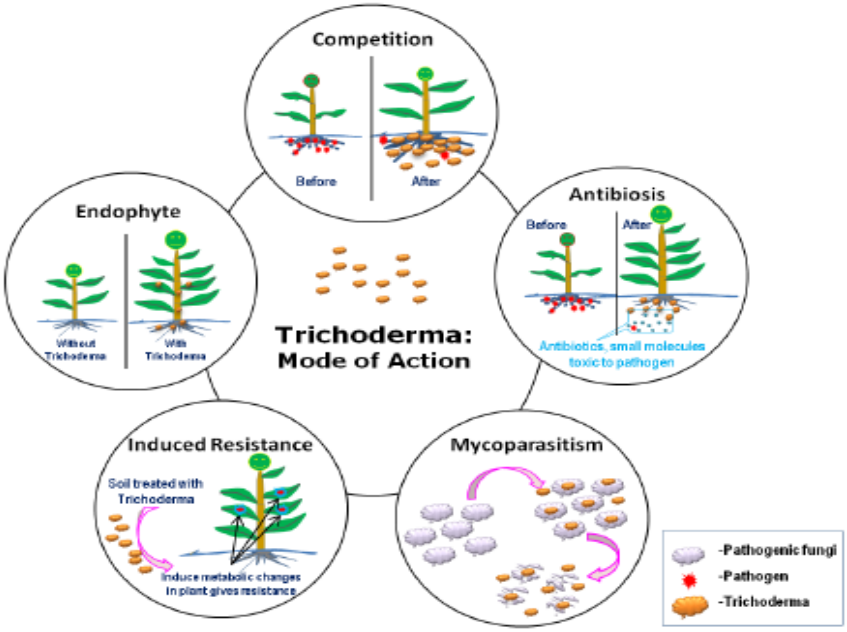

Figure 1. Model depicting mode of action of *Trichoderma* spp. against pathogen and plant growth improvement.

Source: Trichoderma: A significant fungus for agriculture and environment. African Journal of Agricultural Research. (Waghunde *et al*, 2016).

Advantages of *Trichoderma*

1. They produce gluconic and citric acids.
2. They reduce the soil pH.
3. They enhance the solubilization of mineral components such as phosphates, iron, magnesium, manganese etc.
4. Not harmful to beneficial organisms.
5. Mode of action is broad spectrum.
6. They are less costly and cheaper.
7. They give protection to plant throughout life.
8. Don't cause toxicity to plants.
9. No residual problem.

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10. They are highly effective against certain species.
11. They can be combined with other bio-fertilizers.
12. They are easy to manufacture and handle.

Limitations of *Trichoderma*

1. Only used against specific diseases.
2. Have slow effect.
3. Large quantities are not available.
4. Less effective than fungicides.
5. The shelf life is short approximately four months for *T. viride*.
6. Their efficacy is mainly decided by environmental conditions.
7. It is a preventive measure and not curative.

Some diseases controlled by *Trichoderma*

Diseases	Pathogens
Black scurf of potato	*Rhizoctonia solani*
Wilt of pigeon pea	*Fusarium udum*
Fusarium wilt of tomato	*F. oxysporumf.sp. lycopersici*
Crown, stem and root rot of tomato	*Selerotinia spp., Pythium*
Wilt of chickpea	*Fusarium, Scerotinia, Rhizactonia*
Ring rot of apple	*Botryosphaeria beregeriana*
Dry rot of chili	*Rhizactoniasolani*
Leaf blight of wheat	*Alternaria triticina*
Loose smut of wheat	*Ustilago segetum*
Bakane of rice	*Fusarium moniliforme*
Die back of guava	*Lasiodiplodiatheobromae*
Damping off	*Pythium and Phytophthora spp.*
Seedling blight	*Pythium*
Dutch elms	*Botrytis cinerea*

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Conclusion

Biological control is an alternative method for disease suppression and control. *Trichoderma* is an asexual free-living fungus which is found in all types of soils and decaying matter. They are found to be parasitic to many soils borne diseases of fruits and vegetable crops. The novel aim of *Trichoderma* is that it is environment friendly and helps in the plant resistance, plant growth and development of the plant and also increases productivity. So, it is being advised by many scientist and researchers that the use of *Trichoderma* will be beneficial for farmers in regard to economic prospect and as well as to ecosystem.

References

Waghunde, R.R., Shelake, R.M. and Sabalpara, A.N. 2016. Trichoderma: A significant fungus of agriculture and environment. African Journal of Agricultural Research, 11(22): 1952-1965.