**Role of Actinomycetes in diseases control in agriculture and horticulture crops**

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**ABSTRACT**

The actinomycets as a suitable biofertilizer and biocontrol agent in Agriculture and Horticulture crops compare to other microbes because lab to field transfer easily and good self life under different biotic and abiotic factors. The prokaryotes with the highest commercial and biotechnological value are actinomycetes. *Streptomyces* spp., a genus of actinomycetes, are widely employed for the manufacturing of antibiotics and agrochemicals as well as biological control agents against fungal phytopathogens such *P. ultimum, F. oxysporum, S. homeocarpa, and Phytophthorafragariae* that cause soilborne diseases. *Streptomyces coelicolor's* HHFA2 starin is responsible for preventing bacterial rot in onions. *Streptomyces, Amycolatopsis, Micromonospora, Frankia, and Nocardia*actinobacterial strains have been shown to effectively reduce soil-borne diseases while assisting host plants in mobilizing and acquiring macro- and micronutrients. Testing was done on isolates of *Actinoplanesphilippinensis, Actinoplanesmissouriensis*, and *Streptomyces clavuligerus* against *Drosophila melanogaster*. Synthetic pesticides are widely used, which has resulted in the emergence of pathogens and insect pests that are resistant to them, environmental pollution, contamination of groundwater, and an overall ecological imbalance.

**Keywards:**Actinomycets; Habitate; Biofertilizer; biopesticide, Agriculture; Pigments

**INTRODUCTION**

The major problem to increasing agricultural crop production is the presence of diseases and insect pests. Due to their eco-friendliness, low production costs, and decreased use of non-renewable resources, mode of application potential bacteria with secondary metabolite and antimicrobial capabilities has emerged as one of the most alluring solutions for improving the sustainability of agricultural production. Actinomycetes are a good alternative among them for the control of illnesses and pest insects. Prokaryotic microorganisms called actinomycetes are used as biocontrol agents to treat plant diseases and insect pests. Their synthesis of primary and secondary metabolites with antibiotic properties against a variety of diseases is well documented (1, 2, 6, 7, 8). These prokaryotes are the most valuable in terms of technology and the economy. These make up a significant amount of the biomass of soil-dwelling microorganisms and are capable of producing a wide range of secondary metabolites. Actinomycetes have been found to create a variety of important bioactive metabolites, including those that are insecticides, herbicides, antibacterials, antifungals, and antibiotics. Streptomyces species, which are primarily used for the synthesis of antibiotics and agrochemicals, are responsible for the creation of more than 60% of all known antibiotics (4, 5). Multipliable research experiment in scientifically proved for actinomycetes are an effective alternative for the management of insect pests and diseases, and a number of well-documented publications have examined their potential (1, 2, 7, 8). Streptomyces has been used extensively in the manufacture of antibiotics, fungicides, bactericides, herbicides, insecticides, and acaricides. They are frequently used as wettable powder, wettable granule suspension, wettable spore suspension, and wettable culture filtrate on target crops. The biocontrol of plant diseases is efficient and risk-free for all living creatures, even though it takes some time to take effect. The rhizosphere-colonizing bacteria are great candidates for use as biological control agents against soilborne diseases, as demonstrated by Weller (1988). The lytic enzymes, antibiotics, and secondary metabolites that Streptomyces species produce have been extensively as a efficient soil born disease causal organism *Phytophthora fragariae, F. Oxysporum* (11)*, S. Homeocarpa* (12), *P. Ultimum* (10)*, and other fungal phytopathogens* (13)*.*

Isolated strain of *Streptomyces lavendulae* HHFA1 and *Streptomyces coelicolor* HHFA2 was used agriculture field experiment for management of onion bacterial rot disease causal organism *S. coelicolor* HHFA2 to enhancement of the photosynthetic pigments and some foliar growth parameters of its growth promoting effect. In order to control the biocontrol of soil-borne plant diseases, actinobacterial, bacterial, and fungal antagonists have been used. Actinobacterial strains of Streptomyces, Amycolatopsis, Micromonospora, Frankia, and Nocardia have been demonstrated to successfully lower soil-borne illnesses while supporting host plants in mobilising and absorbing macro- and micronutrientsThese distinct actinomycetes with their wide range of PGP- and antagonistic-promoting traits must be employed for sustainable agriculture. This chapter presents a comprehensive overview of the major soil-borne diseases that impact chickpea and pigeon pea, as well as prospective control techniques utilising broad-spectrum actinomycetes, mainly Streptomyces spp (19).

Actinomycetes strains (*Streptomyces pactum* Act12 and *Streptomyces rochei* D74) used in monkhood growth promotion and soil-borne root disease biocontrol after applying a mixed Actinomycetes preparation to the soil, we also looked at the long-term effects on disease prevention and plant growth. *Sclerotium rolfsii*, a fungus that can cause southern blight, and *Fusarium oxysporum*, a fungus that can cause root rot, were both suppressed by the addition of cell-free culture filtrates from the strains Act12 and D74 in A. Carmichaelii (14). *Actinoplanesphilippinensis*, *Actinoplanesmissouriensis*and*Streptomyces clavuligerus*isolates were tested against *Drosophila melanogaster*. The three actinomycetes were individually applied against *D. melanogaster*, andthen in combinations of two and all three actinomycetes isolates were used to study synergistic and antagonistic effectsbetween them.

Scientific evidence for this claim is provided by (16) proven actinomycetes effectiveness against Culexquinquefasciatus and (15) very high mortalityof larval and pupal stages of Musca domestica reaching up to 90% of mortality following actinomycetes treatments. The ability of actinomycetes to produce the enzyme chitinase, which breaks down the chitin surface of insects and enables the penetration of bioactive toxic lethal compounds into the insect body, is particularly responsible for the effective action of these organisms against insects (17).

**Figure 1: Actinomycetes as diseases and pest control**

Continue using of chemical fertilizer application to agriculture field, it will support soil born pathogen and create huge lose of agriculture productivity and create environment segment pollution and imbalance of ecosystem (3).

**MARKET AVAILABLE PRODUCTS**

Important producers of enzymes like cellulases, quininases, proteases, and peptidases are actinomycetes. The most crucial enzymes in the process of controlling phytopathogenic fungus are quitinases. Actinovate, a biofungicide obtained from streptomycetes species, is used to combat soil- and seed-borne plant infections (Fusarium, Alternaria, Phytophthora, and Pythium) that cause damping-off and root diseases. This includes MYCOSTOP. For fresh market tomatoes, a strain of this species called Streptomyces lydicus WYEC108 has been developed to effectively control fungal plant pathogens. PRESTOP is also used to effectively control the commercially available cucumber diseases Didymella (Mycosphaerella) gummy stemblight and Botrytis greymould, as well as damping-off and root diseases (Pythium, Fusarium, Phytophthora, and Rhizoctonia)

**Figure 2: Markedly available products**

**APPLICATION METHOD OF ORGANIC BIOPESTICIDES AND BIOFUNGICIDES**

**Drone based spraying**

Actinomycetales are characterised by aerial mycelium development and substrates. They are the microorganisms in soil that are most prevalent. They are crucial in the organic matter cycle and prevent the growth of a number of plant diseases in the rhizosphere. Actinomycetes have been investigated as a natural pest management for insects and phytopathogenic fungi that cause significant losses in agriculture due to the presence of enzymes including proteases and chitinase. Actinomycetes are favoured for the management of pests due to their diversity of generated metabolites and facilities for the industrial modification of cultures. Actinomycetes are also a "green" alternative to traditional pesticides because they are organic components of soil and do not harm the environment. Due to their capacity for degradation and capacity to produce stable humus, they also aid in the production and stabilisation of compost piles, which contribute to the long-term sustainability of soil.

Although the management of fungus-related plant diseases by Streptomyces is well documented, there aren't many commercial products on the market that use particular strains of the microorganism or its metabolites. The use of prospective microorganisms in biocontrol programmes like S. plicatus connecting their enzymatic characteristics seems practicable to create ways for manufacture and extraction of secondary metabolites, or the direct use of extract of broth, even though it is unmanageable for scale production (18).

For crop spraying on vast regions quickly, drones can transport appropriately sized reservoirs that can be filled with fertilisers, herbicides, or pesticides. Due to its autonomous and pre-programmed operation on predetermined schedules and routes, crop spraying is significantly safer and more economical. Drones can also be set to automatically alter their speed and altitude.

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