

Fascinating World of Actinomycetes

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Introduction

Members of the genus *Streptomyces* are among the varied high G+C, Gram-positive bacteria found in the phylum Actinobacteria (order Actinomycetales). Bacteria known as actinomycetes have the ability to create branches, and these branches are mycelium produced by thallus. In nature, they were widely dispersed, mostly saprophytic, and just a few of them coexisted with plants. They spread in the form of spores or mycelium in the soil, air, and water, particularly in slightly alkaline or neutral soil with low water content and abundant organic matter. Actinomycetes have been used as a producing strain for antibiotics, vitamins, enzymes, and enzyme inhibitors ever since Waksman and Umezawa discovered the diversity of actinomycetes, making them a microbial community with enormous application values.

Structure of soil *Streptomyces* is

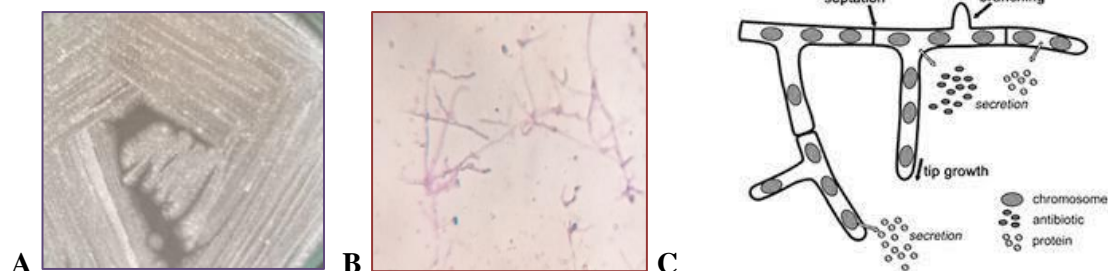


Figure1: A) Morphology of *Streptomyces* isolate on Starch Casein Nitrate agar medium B) Microscopic view of *Streptomyces* sp. C) Mycelia structure of *Streptomyces*

Biocontrol Activity of Actinomycetes

Streptomyces are efficient in biocontrol activities and produce a wide variety of compounds with biological activity. *Streptomyces* are a promising agent for biofertilizers and have been utilized as biological control agents against a number of plant infections.

Actinomycetes have a number of characteristics that may contribute to their capacity as biocontrol agents. These characteristics include the capacity to colonize plant surfaces, the antibiosis against plant pathogens, and the production of extracellular proteins in particular, and the degradation of antagonistic phytotoxins that can be measured as a clear zone as a result of the pathogen's mycelium growth being inhibited (Singh et al., 2018).

Antibacterial activity

Actinomycetes are known as biological antagonistic types. As *Streptomyces* are the ones that are employed and their metabolites are used to make antibiotics, they are of particular relevance. More over half (70%) of naturally occurring antibiotics with considerable economic value are produced by *Streptomyces*, which is also often tested for intriguing bioactive compounds (Meena et al., 2013).

Actinomycin D, one of the actinomycines, has undergone the most research and is used to treat malignant tumours such Wilms' tumour and paediatric rhabdomyosarcoma (Womer, 1997). Actinomycin D's biological activity is correlated with its capacity to bind to DNA duplexes, which are linked to DNA functioning and, subsequently, RNA and protein synthesis inhibition.

Antifungal activity

Streptomyces is well known for its ability to antifungal against diseases in both plants and animals. Actinomycete-fungus antagonistic property has been shown to exist for a wide range of plant diseases. Broad spectrum antifungal activity was demonstrated by *S. tricolour* HM10 (MN527236) and *S. thinghirensis* strain HM3 (MN527231) against ten investigated soil associated fungus. Moreover, *Streptomyces* sp. 9p was effective against *Collectotrichum gleosporioides* OGC1, *Alternaria brassicae* OCA3, *Phytophthora capsici*, and *Rhizoctonia solani* MTCC 4633, four phytopathogens (Shivakumar, et al. 2012). When culture filtrates were collected from the exponential and stationary phases, *Streptomyces hygrosopicus* strain SRA14 demonstrated *in vitro* antagonism and growth inhibition against *Colletotrichum gloeosporioides* and *Sclerotium rolfsii* fungi as a result of extracellular antifungal metabolites present in culture filtrates; however, isolated *Streptomyces* sp. VV/E1 and rhizosphere *Streptomyces* sp. VV/R4 strains, from grapevine plants reduce the fungal pathogens infection rate.



Plant Growth promoting Activity of Actinomycetes

Streptomyces bacteria can stimulate plant development by producing siderophores, indole acetic acid (IAA), phosphate solubilization, and phytopathogen biocontrol to lessen the need for extensive use of chemical fertilizers and fungicides. In root and shoot development as well as seed germination, the beneficial effects of *Streptomyces* treatment have been reported. *Streptomyces* may produce a wide range of biologically active substances, and their abundance in soil suggested that this class of organisms can contribute significantly to interactions between microbes and plants.

References

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