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Application of novel alkalotolerant Actinomycete spp as biocontrol agents against fungal plant pathogens and as plant growth promoters

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Application of novel alkalotolerant Actinomycete spp as biocontrol agents against fungal plant pathogens and as plant growth promoters

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Fungal diseases of crops result in almost 20-30% losses in agricultural production worldwide. Actinomycetes are well known for their ability to produce several biologically active compounds, which may have antifungal properties. Several synthetic fungicides are used in the field of agriculture. Now a days there is increasing public pressure to reduce the use of chemical fungicides. Concerns have been raised about both, the environmental impact and the potential health hazards related to the use of these chemicals. Biological control approaches is an interesting substitute to synthetic fungicides. The alkalotolerant actinomycete strain A-03-1160 exhibiting antagonistic effect against several pathogenic fungi. In preliminary results in shake flasks, it was found that the actinomycete culture caused complete degradation of various fungi such as Macrococcus, Aspergillus niger, Aspergillus oryzae, Alternaria solani, Fusarium moniliforme, Curvularia fujii, Curvularia lunata, Claviceps purpurea, Helminthosporium, etc., indicating that the organism could be used as a potential biocontrol agent. Coating the seeds of Cicer arietinum with the spores provided protection against fungal contamination during germination as well as it promoted the growth of the plants.

Abstract

Materials & Methods

**Antagonistic effect**

- Actinomycete culture
- Crossed streaked in MICYP culture
- Incubation at 20°C for 5 days
- Growth of actinomycete culture

**Possible biocontrol activity of actinomycete strain**

- Actinomycete 72h
- Test fungus 24-48h
- Experimental flask
- Control flask
- Plating on MGYP (A)

**Testing of biocontrol activity on Cicer arietinum**

- Cicer arietinum Seeds (60)
- 3 h, 100 ppm sterile water
- 5 ml sterile water (5 ml/50 seeds)
- 3 h, 100 ppm sterile water (control)
- 5 ml sterile water (5 ml/50 seeds)
- 3 h, 100 ppm sterile water

**Effect of actinomycete spore on growth of Cicer arietinum**

- Cicer arietinum Seeds (30)
- 3 h, 100 ppm sterile water
- Sowed in water (5 ml/50 seeds)
- 3 h, 100 ppm sterile water (control)
- 5 ml sterile water
- 3 h, 100 ppm sterile water

Results & Discussions

- Fig 1: Antagonistic effect of the actinomycete culture against different fungi

- Fig 2a: Actinomycete and Colletotrichum gloeosporioides grown together
- 2b: Streaking from the relevant flask after 24 hours

- The actinomycete culture was able to grow on live fungal mycelium in a liquid culture and degrade it. This shows that this actinomycete strain has the potential to be used a bio-control agent.

- Fig 3: Testing of biocontrol activity on Cicer arietinum

- The actinomycete spores protected the seedlings of *Cicer arietinum* from fungal contamination and did not affect seed germination. This gives a lead that the culture by itself can be developed as a biocontrol agent for the direct application.

- Fig 4: Effect of actinomycete spore on growth of *Cicer arietinum*

- The average plantlet length was higher when treated with actinomycyte spore suspension. We may also predict that the culture probably releases some growth factors.

Conclusion

Results indicate that the actinomycete culture can be directly used as an antifungal biocontrol agent for plants. The actinomycete spores may be developed for direct application to plants or seeds to protect them against fungal contamination and to promote their growth.

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