Conclusion

Our study isolated 165 actinomycetes from 8 soil samples collected from different regions of Gujarat. Based on the morphology and 16SrRNA amplification, three isolates were identified up to the genus level, and sequences were deposited in GenBank (NCBI). The strains were characterized and tagged *Streptomyces* sp. S-107, S-280, and S-9. *Streptomyces* sp. S-9 isolated from the rhizospheric soil of *Cajanus cajan* exhibited significant biocontrol potential against *Fusarium udum*. The bacterial strain was also positive for different PGP traits. The strain was able to enhance the growth and grain yield of *C. cajan* under pot and field conditions. The strain was able to enhance the growth of pigeon pea under diseased conditions. The S-9 strain has the potential to be a good biofertilizer for important crops, especially Pigeon pea.

The bioactive compounds investigation of *Sterptomyces* sp.S-9 revealed the presence of essential bioactive compounds. We identified four prominent compounds in the extract of S-9 which could be responsible for its acclaimed antifungal activity against *F. udum.* However, further studies are needed to isolate and investigate the mechanisms of actions of the compounds.

The statistical optimization of the antifungal production in S-9 has informed us that the enhancement of glycine and mannitol to 4.6g/L in the media could optimize the production of beneficial antifungal metabolites.

Our study has affirmed that the inoculation of arbuscular mycorrhizal fungi, *Rhizophagus irregularis* enhanced the effectiveness of *Streptomyces* sp.S-9 as a promising biocontrol agent. We could infer that the mycorrhization of *C. cajan* appeared to improve tolerance to *F. udum,* where increased yield was recorded. Therefore, the use of *R. irregularis* alongside *Streptomyces* sp.S-9 in the Pigeon pea cultivation system could be an effective alternative to chemical fungicides and fertilizers. The treatment with S-9 + *R. irregularis* significantly reduced the accumulated H_2O_2 and MDA. This is an indication of its disease ameliorating potential which posits it as a potential Biocontrol agent.

Our Study has been able to establish beyond reasonable doubt that *Streptomyces* sp. S-9 could be used as alternative to chemical biocontrol agents.