# STUDY OF INOCULATION AND DISEASE EVALUATION TECHNIQUES FOR SCLEROTINIA STALK ROT (*SCLEROTINIA SCLEROTIORUM*) OF SOYBEAN

By

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## Summary

- *Sclerotinia sclerotiorum* (Lib.) de Bary causes destructive diseases on numerous plant species worldwide. The pathogen has a host range of more than 400 plant species including agricultural crops such as sunflower, dry beans, soybeans, potatoes, carrots and groundnuts. It was first reported on soybean as causing Sclerotinia stem rot in South Africa in 1979 and is currently common throughout the local production areas. To date no reliable and economically feasible method of control has been developed and local cultivars lack significant levels of resistance. As a result, the disease causes extensive quantitative as well as qualitative losses.

- The objectives of this study were to compare various inoculation techniques for *S. sclerotiorum* on soybeans in the greenhouse; determine the optimum conditions for infection, evaluate commercial cultivars for resistance to Sclerotinia stem rot in greenhouse; to determine an economically feasible and effective control method (chemical and biological) for Sclerotinia stem rot and to determine the genetic relationship and isolate variation of various *S. sclerotiorum* isolates collected from local production fields.

- Greenhouse evaluations of six different inoculation techniques on four soybean cultivars were conducted. Leaf damage and wilting incidence were evaluated using a 0–5 disease rating scale. Infection levels induced by various inoculation techniques differed and a spray mycelium method proved to be the most consistent and effective. An inoculation technique x cultivar interaction was recorded, especially when wounding of plants was included.

- Temperature and leaf wetness duration studies were conducted in the greenhouse. Optimum temperatures for disease development were determined at 20.90-22.75°C. Results indicated that high humidity or free moisture are critical for disease development and disease incidence and severity increased with increasing RH. Field evaluations indicated that the optimum temperature and humidity were 22.75°C and 95.37% respectively. Multiple regression analyses indicated that these were the only variables significantly related to disease potential.

- Various chemical and biological control agents are commercially available but these fail to control the disease effectively. Laboratory results revealed that chemicals applied at the regulatory rate failed to control mycelium growth effectively as opposed to the double rates which were effective throughout the evaluations. Biological control has the potential to act as a mycoparasite and suppress *S. sclerotiorum.* However further research is needed to optimize effectiveness. Benomyl and procymidone proved to be the most effective treatments in the laboratory and greenhouse. Application time relative to inoculation had a small but significant effect, indicating the need for correct application time.

- Growth studies, oxalic acid analysis, AFLP analysis and pathogenicity studies indicated genetic variation among the 18 isolates used in the current study. Isolates reacted differently to the various temperatures during growth studies and optimum growth was observed at 20°C. Some isolates were able to grow more readily at higher temperature than others. Isolates varied significantly in oxalic acid production but no correlation was recorded with the AFLP results which indicated small variation within isolates. Oxalic acid production by isolates could also not be correlated with pathogenicity although isolates varied in their ability to cause wilting and leaf damage.