

Studies on the Efficacy of *Bacillus subtilis* against the Root rot fungus, *Macrophomina phaseolina* on Urd bean

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Root rot disease caused by *Macrophomina phaseolina* often result in considerable loss of the crop especially under rainfed conditions. Success has been achieved in the biological control of plant pathogens using bacteria as antagonists. *Bacillus subtilis* is known to produce extracellular antibiotics that are inhibitory to some plant pathogens (Podile *et al.*, 1988). A commercial preparation of *B. subtilis* A.13 has been developed under the trade name QUANTUM 4000 and is recommended for treatment of peanut seeds for the control of soil borne disease (Weller, 1988).

Bacillus subtilis was isolated from soil samples collected from Coimbatore, South Arcot and Madurai districts and identified in accordance with Bergey's Manual of Determinative Bacteriology (Buchnan and Gibbons, 1974). The antagonistic effect of *B. subtilis* isolate B.s.9 was tested against *M. phaseolina* by dual culture method (Boosalis, 1956). In pot culture studies, sterilised soil was used. *M. phaseolina* grown in sand maize medium was incorporated in the pots @5g/kg of soil. Urd bean seeds were treated with *B. subtilis* (B.s.) isolates 5, 9 and 11 @ 3g peat based inoculum per 100 g of seeds, dried in shade and sown. The treatments were as follows.

1. Control
2. Pathogen alone
3. Pathogen + B.s 5 inoculation
4. Pathogen + B.s 9 inoculation
5. Pathogen + B.s 11 inoculation
6. Carbendazim seed treatment

In each pot, 25 seeds were sown. The treatments were replicated four times.

Of the 20 isolates of *B. subtilis*, 11 were found to be inhibitory to the growth

of *M. phaseolina* *in vitro*. Among them B.s.5 from Coimbatore and B.s.9 and B.s.11 from South Arcot districts recorded significantly higher inhibition zone of 2.6 , 3.0 and 2.3 mm respectively and these were utilised for seed treatment studies. The results are presented in Table 1. Seed treatment with B.s.9 and B.s.11 isolates of *B. subtilis* significantly reduced root rot disease of urd bean and they were on par with Carbendazim seed treatment.

Inhibition of some plant pathogenic fungi Viz., *Rhizoctonia solani*, *Sclerotium rolfsii* and *Fusarium solani* by *B. subtilis* was also reported by Podile *et al.* (1988). The isolate B.s.9 applied through seed has given the maximum protection against root rot disease of urd bean under pot culture conditions. Improved seed coating materials and methods may in-

Table 1. Effect of *Bacillus subtilis* isolates in controlling root rot of urd bean

Treatments	Disease %
Control	-
<i>M. phaseolina</i> alone	65
<i>B. subtilis</i> isolate 5	45
<i>B. subtilis</i> isolate 9	15
<i>B. subtilis</i> isolate 11	20
Carbendazim	20

C.D.(P = 0.05) 28

crease the effectiveness of antagonists (Utkhede and Rahe, 1980). Control of urd bean root rot disease by *B. subtilis* seed treatment has already been reported by Jeyarajan *et al.* (1991). Since root rot caused by *M. phaseolina* is a serious problem in rainfed pulses and economic chemical control measure is not

available, the present finding can be effectively utilised for the management of the disease.

Key Words : Urd bean, *Macrophomina phaseolina*, biological control, *Bacillus subtilis*

REFERENCES

- Buchanan, R.E. and Gibbons (eds.). 1974. *Bergey's Manual of Determinative Bacteriology*, 8th ed, Williams and Wilkins, Baltimore. pp 620-621.
- Boosalis, M.G. 1956. Effect of soil temperature and green manure amendment of unsterilized soil on parasitism of *Rhizoctonia solani* by *Penicillium vermiculatum* and *Trichoderma* sp. *Phytopathol.*, **46**, 473-478.
- Jeyarajan, R., Ramakrishnan, G. and Sridar, R. 1991. Bio-control agents for the control of root rot disease caused by *Macrophomina phaseolina*. Paper presented in XXXI Annual Conference of the Association of Microbiologists of India, January 23-25, 1991, pp. 83, TNAU, Coimbatore-3.
- Podile, A.R., Dileepkumar, B.S. and Dube, H.C. 1988. Antibiosis of Rhizobacteria against some plant pathogens. *Indian J. Microbiol.*, **28**, 108-111.
- Utkhede, R.S. and Rahe, J.E. 1980. Biological control of onion white rot. *Soil Biol. Biochem.*, **12**, 101-104.
- Weller, D. 1988. Biological control of soil borne plant pathogens in the Rhizosphere with bacteria. *Ann. Rev. Phytopath.*, **26**, 379-407.