*J.Biol.Control*, 7 (1), 51-52, 1993

# Studies on the Compatibility of *Rhizobium* with Biocontrol Agent *Bacillus subtilis* in Urdbean

R.SRIDAR, G.RAMAKRISHNAN, D.DINAKARAN and R.JEYARAJAN
Department of Plant Pathology
Tamil Nadu Agricultural University
Coimbatore 641 003

*Bacillus subtilis* has been used for many years to control soil-borne plant pathogens and increase plant growth (Turner and Backman, 1991). The increased yield of urdbean *(Vigna mungo)* due to *Rhizobium* application has been reported by Balasubramanian and Palaniappan (1983). *B. subtilis* seed treatment also improved the crop stand and yield (Merriman *et al.*, 1974). Therefore, studies were conducted to assess the effect of seed treatment with antagonists on the nodulation and root rot incidence.

The antagonism of *B. subtilis* (Bs.9) against root rot fungus *Macrophomina phaseolina* under *in vitro* conditions has been proved in our laboratory. This was used in the investigation to see the effect, in comparison with a systemic fungicide carbendazim (2 g/kg of seed) with and without *Rhizobium* inoculation, on the nodulation and root rot incidence in urdbean. Rhizobium strain BMBSP47 was used for seed treatment. The pot culture experiment was laid out with Co.5 urdbean. The trial was replicated four times. All the pots were inoculated with sclerotia of *M. phaseolina* @ 500 mg/kg of soil (Elad *et al.*, 1980). Urbean seeds were treated with *Rhizobium* and *B. subtilis* each @ 600 g/seeds required for one hectare. A slurry was prepared with peat-based ($10^8$ cells/g of peat) *B. subtilis* inoculum and rice gruel. Seeds were mixed with the slurry gently so as to get a uniform coating of inoculum over the seeds. Then the seeds were dried in shade and sown. The same procedure was adopted for combined treatment of *Rhizobium* and *B. subtilis*. The nodulation was recorded 30 and 45 DAS and root rot incidence was recorded 60 DAS.

The observations regarding the nodulation, disease incidence as influenced by various treatments is shown in the Table 1.

**Table 1. Interaction of *Bacillus subtilis* and *Rhizobium* on nodulation and root rot incidence of urdbean**

| Treatments | Nodules/plant | | Root rot incidence (%) |
|---|---|---|---|
| | 30 DAS | 45 DAS | |
| *Rhizobium* alone | 8.7 | 16.1 | 100.0 (90.0) |
| *B. subtilis* alone | 0.0 | 0.0 | 42.5 (40.7) |
| *Rhizobium* + *B. subtilis* | 10.7 | 20.0 | 37.5 (37.5) |
| Carbendazim | 0.0 | 0.0 | 67.5 (55.2) |
| *M.phaseolina* alone (Control) | 0.0 | 0.0 | 100.0 (90.0) |
| CD | 0.5 | 0.9 | 13.0 |

(Figures in parentheses are transformed values)

The results clearly showed that *B. subtilis* when combined with *Rhizobium* did not inhibit nodulation but significantly increased the nodulation. The combined treatment enhanced the nodulation by 23% and 24.2% on 30 and 45 DAS respectively compared to *Rhizobium* treatment alone. Haral and Konde (1983) reported that *B. subtilis* + *Rhizobium* treatment increased the nodulation over *Rhizobium* treatment alone in chickpea. Turner and Backman (1991) reported that treatment of peanut seeds with *B. subtilis* was associated with increased nodulation by *Rhizobium* spp. They also found that nitrogen content was higher in peanut plants treated with *B. subtilis* due to increased nodulation. Similar observations were made in this investigation also.

*B. subtilis* + *Rhizobium* treatment reduced the root rot incidence significantly compared to pathogen alone treated crop. *B. subtilis* + *Rhizobium* treatment registered 37.5% incidence compared to *B. subtilis* treatment alone which registered 42.5% incidence. Turner and Backman (1991) reported that treatment of peanut seed with *B. subtilis* reduced the level of *Rhizoctonia solani* incidence. Beneficial association of antagonists with *Rhizobium* sp. has been reported by Haral and Konde (1983). Thus, increased nodulation and reduced root rot disease can be achieved by treating the urdbean seeds with both *Rhizobium* and *B. subtilis*.

KEY WORDS : *Rhizobium,* antagonist, *Bacillus subtilis,* nodulation, root rot,

## REFERENCES

BALASUBRAMANIAN,A. and PALANIAPPAN,S.P. 1983. Performance of Rhizobial inoculants in the acidic soils of Vamban. *Pulse crops Newsl.*, **37**, 60-61.

ELAD,Y., CHET,I. and KATAN,J. 1980. *Trichoderma harzianum,* biocontrol agent effective against *Sclerotium rolfsii* and *Rhizoctonia solani. Phytopathology,* **70**, 119-121.

HARAL,A.K. and KONDE,B.K. 1983. Biological management of soil-borne plant pathogens. Effects on nodulation and dry matter of chickpea. *J. Maharastra agric. Univ.*, **8**, 112-113.

MERRIMAN,P.R., PRICE,R.D., KOLLMORGEN,J.F., BIGGOT,T. and RODGE,E.H. 1974. Effect of seed inoculation with *Bacillus subtilis* and *Streptomyces griseus* on the growth of cereals and carrot. *Aust. J. agri. Res.*, **25**, 219-225.

TURNER,J.T. and BACKMAN,P.A. 1991. Factors relating to peanut yield increases after seed treatment with *Bacillus subtilis. Plant Dis.*, **75**, 347-353.