

Short Communication

A native *Rhizobium* strain of lentil: DL-1

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Biological nitrogen fixation (BNF) is one of the most important natural processes, which fixes about 175 million metric tonnes of nitrogen annually, contributing 65% of nitrogen used in agriculture. The most important contribution to BNF comes from symbiotic association of *Rhizobium* with roots of leguminous plants accounting 20% global biological nitrogen fixed annually (Brockwell *et al.* 1995). However, there are several constraints in the large scale adoption of bio-fertilizer technology, the most important being lack of efficient native rhizobia strains. The present study was undertaken to find out most efficient native *Rhizobium* strain by evaluating its effect on nodulation status and grain yield of lentil (*Lens culinaris* Medikus), the fifth most important pulse crop in India.

A field experiment was conducted under AICRP on MULLaRP at Agricultural Research Station, Durgapura, Jaipur during *Rabi* 2003-04, 2004-05 and 2005-06 to find out the most efficient native *Rhizobium* strain in terms of nodulation status and grain yield of lentil. Six native *Rhizobium* strains of lentil were isolated from fields of lentil. For isolations, the lentil plants were carefully uprooted and nodules were extracted. Selected nodules were washed in water and surface sterilized (0.1% HgCl₂ solution for 3-4 minutes) and washed with sterilized distilled water. Inoculum from the crushed nodule was spread on Yeast Extract Mannitol Agar (YEMA) plates and colony of *Rhizobium* was isolated (Subba Rao 1984). The *Rhizobium* colonies were subcultured and maintained on YEMA at 4°C. Whenever, required, they were multiplied on YEMA broth (Burton 1967).

Carrier based inoculants of six native *Rhizobium* strains of lentil *viz.*, DL-1, DL-2, DL-5, DL-6, DL-10, DL-103 and a national check, LLR-22 (procured from PAU, Ludhiana) were prepared by growing each of these microorganisms on YEMA up to stationary phase and then mixed with sterilized lignite (sterilized at 30 p.s.i. for 45 minutes) at the rate of 20 ml/100g (Kandaswamy and Prasad 1971).

Seeds of lentil cv. Sapna, were treated with carrier based *Rhizobium* strains each at the rate of 3.5 g/kg seeds and mixed well to assure the inoculum to stick on to the surface of the seeds. The treated seeds were dried in shade for an hour and used for sowing. An uninoculated check was also maintained. The experiment was replicated thrice in a randomized block design with plot size of 2.4 x 4 m². All practices were followed as per package and practices of the zone. The nodules were

counted 40 days after sowing. A basal dose of P₂O₅ @ 40 kg/ha was added at the time of sowing.

All the seven treatments showed significantly higher nodulation and grain yield over uninoculated control (Table 1). In pooled analysis of three *rabi* seasons, number of nodules/plant (8.0), dry weight of nodules/plant (102 mg) and grain yield (11.5 q/ha) were maximum when seed

Table 1. Native *Rhizobium* strains of lentil and their screening in the field (pooled data *rabi* 2003-04, 2004-05 & 2005-06)

Isolate	Number of nodules/plant	Dry weight of nodules (mg/plant)	Grain yield (q/ha)	Increase over control (%)	B:C ratio
DL-1	8.0	102	11.5	45.5	1.88
DL-2	7.0	94	10.0	26.6	1.64
DL-5	6.0	91	10.5	32.9	1.72
DL-6	7.0	86	10.6	34.2	1.74
DL-10	6.0	75	9.9	25.3	1.62
DL-103	6.0	77	9.7	22.8	1.59
LLR-22	7.0	99	11.2	41.8	1.84
Uninoculated	5.0	44	7.9	-	-
C.D. at 5%	1.0	34	1.50	-	-

*Average of three replications

inoculation was done with strain DL-1. It gave about 45.5% increase in the grain yield over uninoculated control (7.9 q/ha). Chanway *et al.* (1989) have also reported that the inoculation of lentil with one or more of the rhizobacterial strains significantly increased emergence, vigour and nodulation. Increase in the grain yield of lentil with *Rhizobium* inoculation over uninoculated control has also been reported by Dhingra *et al.* (1988). It may be attributed to the more nitrogenase activity as compared to the uninoculated one (Dhingra *et al.* 1988) as well as influence on the growth of mycorrhizal fungi which are known to be associated with legumes (Aulakh and Sharma 2005). Strain DL-1 was at par with DL-2, DL-6 and LLR-22 with 26.6–41.8% increase in grain yield over check.

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