



Isolation and Development of Native Strains of *Rhizobium* and P-solubilising Bacteria for Rice Fallow Blackgram

N Trimurtulu and A Lalita Kumari

Agricultural Research station, Amaravathi, Guntur (Dt.)

ABSTRACT

Isolation of native strains of *Rhizobium* and P-solubilising bacteria was done from rhizosphere soils of rice-fallow blackgram. Native Rhizobial strains of RBG 314 and RBG 301 were found promising and RBG 314 recorded the highest plant drymatter production. The PSB isolates AMT 1001 and AMT 1005 produced the higher solubilization zones. A pot experiment conducted using the combination of these isolates, indicated significant effect on dry matter production in blackgram and also indicated synergistic effects of dual inoculation of *Rhizobium* & PSB on blackgram.

Key words: Dry weight of plants, Native strains of *Rhizobium*, P-solubilising bacteria, Solubilisation zone.

A successful microbial inoculant needs to be more competitive than that of the existing rhizosphere microflora in forming effective colonisation on the roots of a particular crop. Establishment of introduced strains depends on several factors like their ability to compete with native bacteria, different soil factors, moisture availability etc., This indicates the necessity for manipulation of rhizobia in the legume rhizosphere with the most effective native strain for successful nodulation and consequently higher yields in blackgram. Application of P-solubilising bacteria along with *Rhizobium* has an added advantage and can support for more rhizobial activity and may increase grain yields of blackgram.

MATERIAL AND METHODS

Rhizosphere soil samples were collected from rice fallow blackgram growing areas of Guntur district. Native strains of *Rhizobium* were isolated from these soils by serial dilution method with yeast extract mannitol medium (Somasegaran and Hoben, 1985). Isolated colonies which did not absorb the congo-red stain were picked up and streaked on slants. P-solubilizing strains were isolated on hydroxy apatite and tricalcium phosphate media and the strains showing maximum solubilisation zones were selected (Sundara Rao and Sinha, 1963).

The efficiency of native strains of *Rhizobium* was studied by plant infection studies. The Rhizobial strain which recorded the highest plant dry weight and the PSB strain which recorded the highest solubilisation were selected for further studies. An experiment was done with rice fallow blackgram by collecting undisturbed soil cores from Rice fallow soils to study the influence of two Rhizobial isolates (RBG 314 and RBG 301) and two PSB isolates (AMT 1001 and AMT 1005) against blackgram crop.

RESULTS AND DISCUSSION

Isolation of native strains of *Rhizobium* from rhizosphere soils of rice fallow blackgram was done and different Rhizobial isolates were named with labn code numbers. Out of eighteen isolates screened, seven isolates of blackgram *Rhizobium* were found to be promising among others. It was observed that RBG 314 could give significantly higher plant dry weights (5.246 g plant⁻¹) than other isolates (Table 1). This was followed by isolate RBG 301 which could give the plant dry weight of 4.992 g which was significantly higher than other isolates except RBG 314. The increase in plants dry weight may be due to high nitrogen fixation of respective isolates. Further it was indirectly supported by showing more number of effective nodules by RBG 314 and RBG 301 isolates.

Table 1: Screening of Rice fallow Rhizobial isolates against blackgram crop under pot culture conditions

Name of the Isolate	Plant Dry weight (g)
RBG 301	4.992
RBG 305	3.563
RBG 311	4.538
RBG 312	4.242
RBG 313	3.944
RBG 314	5.246
RBG 315	4.514
Control	3.156
CD (0.05)	0.295
CV (%)	6.45

Table 2. Solubilising efficiency of phosphate solubilising bacterial isolates on hydroxy apatite and Tricalcium phosphate media.

Isolate code	Solubilisation zone diameter (mm)	
	Hydroxy apatite medium	Tricalcium phosphate medium
AMT 1001	48	26
AMT 1005	46	24
AMT 1006	38	20
AMT 1007	29	18
AMT 1008	26	17
AMT 1009	34	21

Phosphate solubilising cultures were also isolated from the above rhizosphere soils and culture AMT 1001 and AMT 1005 were found to be associated with more P-solubilization efficiency by forming 24mm and 26mm solubilization zones on tricalcium phosphate medium (Table 2) respectively within an incubation period of 48 hours.

The results indicated that *Rhizobium* 1 (RBG 314) along with PSB 1 (AMT 1001) or PSB 2 (AMT 1005) could significantly increase the shoot, root and total plant dry weights over control and *Rhizobium* 2 (RBG 301) + PSB 1 (AMT 1001) / PSB 2 (AMT 1005) treatments (Table 3). The results clearly indicated that for developing mixed formulation there is a need of thorough screening for checking the compatibility of *Rhizobium* and PSB isolates. These results further

Table 3: Effect of dual inoculation of Rhizobial and PSB isolates on Blackgram in rice fallow soils

Treatment	Shoot dry weight (g)	Root dry Weight (g)	Total plant dry Weight (g)
T1-Control	3.881	0.503	4.384
T2-RHI1 + RHI2	6.357	0.884	7.241
T3-PSB1 + PSB2	6.044	0.775	6.819
T4-RHI1 + PSB1	7.893	1.034	8.927
T5-RHI1 + PSB2	7.660	1.255	8.915
T6-RHI2 + PSB 1	5.379	0.723	6.102
T7-RHI2 + PSB2	5.232	0.705	5.937
T8-RHI + PSB (popular)	5.381	0.724	6.104
CD at 5%	1.77	0.28	1.84
CV (%)	28.27	32.0	25.98

revealed that there is a quite good compatibility between *Rhizobium* 1 (RBG 314) and PSB 1 (AMT 1001) or PSB 2 (AMT 1005).

In general native strains of microbial inoculants were found more promising than the exotic strains and always had an added advantage of better acclimatisation to the local conditions. The native isolates of RBG 314 and RBG 301 were superior over others by recording higher plant dry weights (Table 1). Similarly PSB isolates AMT 1001 and AMT 1005 recorded the higher solubilization zones (Table 2). Maier and Triplett (1966) also reported that native isolates of symbiotic bacteria are always more complicate over exotic strains. The pot experiment conducted with the combination of above promising isolates also indicated the effect of these isolates. The highest plant dry weight of 8.927 g plant⁻¹ was recorded by the combination of RBG 314 + AMT 1001 followed by 8.915 g plant⁻¹ by the combination of RBG 314 + AMT 1005. It was also reported that dual inoculation of PSB and *Rhizobium* could increase grain yields of green gram upto 49.8 per cent over control. Renu Agarwal and Tilak (1989) reported synergistic effects of *Rhizobia* with *Azospirillum* on various legumes.

LITERATURE CITED

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