

BRADYRHIZOBIUM JAPONICUM AND PHOSPHOBACTERIA FOR SOYBEAN

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ABSTRACT

The effect of individual and combined inoculations of *Bradyrhizobium* and phosphobacteria along with application of super phosphate, rock phosphate and FYM on the growth and yield of soybean were studied. The combined inoculation of *Bradyrhizobium* and phosphobacteria was proved to be better than individual inoculations. The combined inoculations with FYM + SP registered the higher root length (29.6 cm), shoot length (97.3 cm), nodule number (31.8), DMP (8.7g/pt) and yield (1.90 t/ha) of soybean.

KEY WORDS: Combined inoculations, *Bradyrhizobium*,
Phosphobacteria

Soybean is an excellent source of protein and oil among the different grain legumes. Presently the crop area as well as productivity is low and there is a need to improve the yield. Low soil phosphorus status combined with sub optimal use of phosphatic fertilizers by poor farmers is one of the reasons for low soybean productivity. Use of phosphorus solubilizing bacteria may help in solubilizing insoluble phosphorus and accelerate rhizobial activity, which in turn, may increase the grain yield. Phosphate solubilizing microorganisms individually and in combination and grain yield of soybean through better uptake of nutrients. Present study was undertaken to find out the effect of individual and combined inoculation of *Bradyrhizobium japonicum* and phosphobacteria on the growth and yield of soybean.

MATERIALS AND METHODS

A field trial was laid out in split plot design, replicated thrice. The microbial inoculants viz., *Bradyrhizobium japonicum* and phosphobacteria applied individually and in combination consisted the main plots. Two phosphorus sources viz., super phosphate and rock phosphate either applied alone or with organic matter source in the form of farm yard manure constituted the sub plots. Nitrogen, Phosphorus and Potash at 20 : 80 : 40 kg/ha were applied. Observations on growth parameters, number of nodules and dry matter production (DMP) were recorded at harvest. The grain yield was also assessed.

RESULTS AND DISCUSSION

Combined inoculation of *Bradyrhizobium japonicum* and phosphobacteria enhanced growth

parameters, nodulation, dry matter production and yield of soybean. Among the individual inoculations, phosphobacteria performed better than *Bradyrhizobium japonicum*. With two different P sources applied individually and in combination with farm yard manure, the combination of super phosphate and farm yard manure responded very well followed by FYM + rock phosphate. For all the growth parameters and yield, interaction effects between the cultures and phosphorus sources were found to be significant. Inoculation of *B. japonicum* + phosphobacteria along with FYM + super phosphate recorded the highest root length (29.6 cm), shoot length (97.3 cm), dry matter production (8.70 g / pl) nodule number (31.8) and grain yield (1.90 t/ha) (Table 1).

Inoculation of *Bradyrhizobium* and phosphobacteria along with FYM + super phosphate significantly enhanced the growth parameters and dry matter production when compared to other treatments. The combined inoculations proved to be better than individual inoculation. Production of growth promoting substances such as indole acetic acid, gibberellic acid and cytokinin by *Bradyrhizobium* (Bhattacharya and Basu, 1991) and phosphobacteria (Sattar and Gaur, 1986) were reported. The availability of organic matter in the form of FYM (Rokade and Patil, 1993) and inorganic nutrients such as P, Ca and S through super phosphate might have influenced the seed and microbial interface favouring increased growth and grain yield. The present observations were corroborative with the report of Lee and Yun (1989), who observed increase in plant height, DMP and

Table 1. EFFECT OF INDIVIDUAL AND COMBINED INOCULATION OF *B. JAPONICUM* + PHOSPHOBACTERIA ON THE GROWTH AND YIELD OF SOYBEAN

Cultures	P sources	* Root length (cm)	* Shoot length (cm)	* No. of nodules	* Dry matter Production (t/ha)	Yield (t/ha)
Uninoculated	FYM	17.6	61.9	14.2	3.05	0.67
	RP	19.3	65.4	15.0	3.26	1.02
	SP	21.0	71.6	15.9	3.56	1.15
	FYM+RP	22.4	77.8	16.7	4.16	1.22
	FYM+SP	23.6	81.5	17.5	4.66	1.32
<i>B. japonicum</i>	FYM	19.1	72.3	18.2	3.73	.32
	RP	20.7	79.1	19.1	3.99	.37
	SP	22.0	83.2	20.1	4.09	.42
	FYM+RP	24.3	87.0	21.5	4.37	.50
	FYM+SP	25.0	89.7	25.1	4.96	.56
Phosphobacteria	FYM	20.6	79.7	16.7	4.01	1.13
	RP	22.0	84.9	17.8	4.71	1.20
	SP	23.8	88.2	18.8	4.78	1.25
	FYM+RP	25.6	90.6	18.7	5.51	1.35
	FYM+SP	27.6	94.1	20.8	7.12	1.45
<i>B. japonicum</i> + phosphobacteria	FYM	22.1	84.6	23.5	5.90	1.25
	RP	23.8	87.9	24.4	5.02	1.55
	SP	25.8	91.6	30.0	5.51	1.63
	FYM+RP	27.0	93.5	30.7	6.35	1.79
	FYM+SP	29.6	97.3	31.8	8.70	1.90
Factors CD (P=0.05)						Significance
Cultures	0.3935	0.5401	0.0654	0.3358	0.2060	*
'P' sources	0.4399	0.6038	0.0731	0.3754	0.2165	*
Sampling period (days)	0.3408	0.4677	0.0566	0.2908	0.0438	*
Interaction	0.2798	1.2077	0.1462	0.2508	0.4331	*
Two factor	0.3815	0.9355	0.1733	0.2815		*
	0.7620	1.0459	0.1266	0.1502		*
Three factor	0.8239	2.0915	0.2533	0.8004		*

* Mean of three values

yield in soybean as a result of *Bradyrhizobium* + phosphobacteria inoculation. It is therefore inferred that the combined inoculation of *Bradyrhizobium* and phosphobacteria with super phosphate and farm yard manure greatly augment growth parameters and yield of soybean.

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