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Effect of rhizobial inoculation on growth and nodulation in winged bean

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The nodulation capacity and effect of inoculation in winged bean [*Psophocarpus tetragonolobus* (Linn.) DC] have so far not been adequately studied in India. Mascfield (1961) and Harding *et al.* (1978) reported its profuse nodulation and better inoculation effects compared with other legumes. Hence an experiment was con-

ducted to find out the effect of rhizobial inoculation on yield and nodulation potential at different stages of growth of winged bean grown on alluvial soils of West Bengal.

A rhizobial strain was isolated from effective pink nodules of 'Lucknow 1'. The seeds were inoculated with this strain by the method described by Subba Rao (1982). Each inoculated seed carried 12 million rhizobia, by viable plate count. The experimental fields were divided into

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2 equal plots, each having 3 rows with 100 cm spacing and with 15 plants/row spaced 75 cm apart to accommodate 45 plants/plot. The inoculated and control seeds were sown on 30 June 1983 in the plots where rhizobial population was 600/g soil. The soil was alluvial loam with pH 7.2, low in N (0.22% organic carbon) but medium to high in available P (36 kg/ha) and K (215 kg/ha). The crop was grown rainfed without fertilizer but with occasional weeding during the growth period.

Three random plants from the inoculated and control population 40, 70, 100 and 130 days after sowing were selected, washed and dried. Data were recorded on dry matter/plant, N(%) in shoots and starch (%) in roots, and dry weight of nodules/plant. Samples were oven-dried for dry matter and laboratory analysis. Nitrogen content was determined through standard micro-kjeldahl method (Byers, 1967), whereas starch content of roots was estimated as described by Singh (1982).

The nodules/plant were recorded 40, 70, 100, 130 days after sowing. On 5 random plants from the inoculated and control plots, data were recorded on pods/plant, pod weight/plant and root dry matter/plant 180 days after sowing. At different harvests standard F-tests were performed, whereas for yield data, to determine the differences, t-tests were done.

The rhizobium inoculation isolated from the experimental cultivar increased the dry weight of plant, nodules/plant, N and starch contents in shoot and roots respectively (Table 1). The effect was negligible at early stages of vegetative growth, but was highest 130 days after sowing. Nodulation was maximum at late stage (130 days after sowing), contradicting the findings of Igwilo (1982) in field bean (*Vicia faba* Linn.).

The dry matter of tops and its N increased significantly with age and with inoculation; similar increase was noted for starch of roots—suggesting positive effect of nodulation, particularly at the late vegetative stage. This may be

Table 1. Effect of inoculation on plant characters on successive growth stages of winged bean

Harvest	Dry matter (g/plant)		N% in shoots		Starch% in roots		No. of nodules/plant		Dry weight of nodules/plant (g/plant)	
	Control	Inoculated	Control	Inoculated	Control	Inoculated	Control	Inoculated	Control	Inoculated
<i>Days after sowing</i>										
40	3.18	4.84	3.38	3.66	0.72	1.10	6.00	12.00	0.117	0.310
70	60.50	83.40	3.43	4.05	5.20	8.50	17.70	25.70	0.467	0.917
100	90.00	131.50	3.56	4.50	18.82	25.60	13.30	19.30	0.800	1.120
130	167.70	266.60	3.68	4.88	25.60	35.70	38.30	59.70	4.000	7.070
CD at 0.05										
Harvest	19.64		0.40		0.70		2.990		0.244	
Inoculations	15.60		0.02		0.61		2.125		0.173	
Harvest x inoculation	22.44		1.30		1.22		3.856		0.349	

attributed to increasing nodule number. Greater increase of growth and nutritional parameters at successive growth stages in control plants suggest good rhizobial population in the soil (Date and Vincenz, 1962). Inoculation increased the pod number, pod weight and dry weight 84, 35 and 53% respectively, which along with great nodulation capacity of winged bean (Harding *et al.*, 1978) suggest its potential as a multipurpose crop. The results confirm our previous findings (Banerjee *et al.*, 1984) that winged bean has good potential as a vegetable crop with good pod yield and that inoculation increases its nodulation capacity, contributing to better growth and yield.

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