

EFFECT OF RHIZOBIUM JAPONICUM, PHOSPHORUS AND IRON ON GRAIN YIELD, PROTEIN CONTENT AND NITROGEN FIXATION BY SOYBEAN

M. Ibrahim Azad, A. Sattar Javed and M. Saleem Dogar*

ABSTRACT

A pot study was conducted to evaluate the effect of inoculation with *Rhizobium Japonicum* in conjunction with P (at 65 kg ha⁻¹) and Fe (at 3 mg kg⁻¹ and 6 mg kg⁻¹) in an alkaline calcareous loam soil on grain yield, grain protein and nitrogen fixation in soybean, variety, Willium. A mix culture of *R. Japonicum* strains, SB-AARI and 61-A-155 was used for seed inoculation. Results showed that inoculation proved very effective and increased the grain yield, grain protein and nitrogen fixation significantly. Maximum increase (95.0 per cent) in grain yield was obtained in case where *R. Japonicum* 3 mg kg⁻¹. Inoculum also gave maximum increase (11.9 per cent) in grain protein and nitrogen fixation (131.58 kg N ha⁻¹) when it was used along with P and Fe (65 kg P ha⁻¹ + Fe at 3 mg kg⁻¹). Application of Fe at higher concentration (6 mg kg⁻¹) reduced the beneficial effect of the culture. Use of inoculum in conjunction with P and Fe enhanced the nitrogen fixation of soybean in the order of P at 65 kg ha⁻¹ + Fe at 3mg kg⁻¹ > P at 65 kg ha⁻¹ + Fe at 6mg kg⁻¹ > P at 65 kg ha⁻¹ > control.

INTRODUCTION

The fact that legumes through symbiosis with effective root nodule bacteria can utilize atmospheric nitrogen, led the scientists to develop laboratory grown cultures for the introduction of suitable *Rhizobia* in soils. Grain and forage legumes vary in their nutritional requirements and are better adapted to soils low in nitrogen provided proper *Rhizobial* cultures are used for seed inoculation. With the establishment of effective symbiosis, crop requirement for other essential nutrients like phosphorus, iron and molybdenum are proportionally increased as these are essential for symbiotic N fixation process (Postagata, 1976). The availability of Fe is reduced in alkaline calcareous soils

MATERIALS AND METHODS

The study was carried out in pots under controlled conditions at Ayub Agricultural Research Institute, Faisalabad. Pots were filled with 15 kg air dried ground loam soil which was passed through 2 mm sieve. The soil was analysed for physical and chemical characteristics (Table 1) as per methods prescribed by U.S. Salinity Laboratory Staff (1969) and Jackson (1960). Following treatments were applied.

Treatment No.	Treatments
T1.	Control.
T2.	P @ 65 kg ha ⁻¹ .
T3.	P @ 65 kg ha ⁻¹ + Fe @ 3mg kg ⁻¹
T4.	P @ 65 kg ha ⁻¹ + Fe @ 6mg kg ⁻¹
T5.	T1+Inoculation.
T6.	T2+Inoculation.
T7.	T3+Inoculation.
T8.	T4+Inoculation.

Table 1. Physical and chemical characteristics of the soil used

Characteristics.	Values
pH	8.1
ECe	0.29 dSm ⁻¹ 25°C
Total nitrogen	0.5 mσ Kσ ⁻¹