Agric. Res. J. Kerala, 1983, 21 (1) 47—50

Research Notes

EFFECT OF APPLIED POTASSIUM AND RHIZOBIAL INOCULATION ON NODULATION AND UPTAKE OF FERTILIZER NUTRIENTS BY SOYBEAN

Soybean (*Glycinemax* (L) Merrill) a potential source of plant protein and vegetable oil has gained importance in India during the last two decades. On an average, soybean seeds contain 40 percent protein and 20 percent good quality edible oil. Jones *et al*. (1977) observed that applied potassium increased the number of nodules per plant,and weight of nodules per plant more than by phosphorus. Rao and Patil (1977) found that inoculation of soybean seed with five commercial inoculants of *Rhizobium japonicum* increased the number and dry weight of the nodules. With the above results in mind, an effort was made to study the effect of applied potassium and inoculation on nodulation and content and uptake of fertilizer nutrients by soybean. The experiment was laid out in randomised block design with four replications at the Instructional Farm, College of Horticulture, Vellanikkara during the period from June to September 1980. The treatments consisted of factorial combinations of five levels of potassium (0, 30, 60, 90 and 120 kg K_2O/ha) and two levels of rhizobial inoculation (no inoculation and inoculation). The soil of the experimental area was sandy clay loam with a pH of 4.6. The soil contained 0,078 percent total nitrogen 2.15 ppm available phosphorus and 157.5 ppm available potassium. The variety used was EC 39821. All the plots received a uniform basal dose of 20 kg N, 80 kg P_2O_5 and 500 kg $Ca(OH)_2$ per hectare. Seed treatment was done as per the procedure recommended by the Tamil Nadu Agricultural University. Seeds were dibbled at a spacing of 45 x 5 cm. Plants were pulled out carefully at different growth stages from each plot after loosening the **soil** around them with the help of a hand fork and the mean number of root nodules per plant, weight of the nodules per plant and dry matter production per plant were recorded. The total nitrogen and potassium contents of seeds and plants were determined by micro-Kjeldahl and flame photometric methods, respectively (Jackson, 1958). The uptake of the fertilizer nutrients was calculated from the nutrient content and dry weight of plants.

There was no significant difference in the number and fresh weight of root nodules per plant due to potassium application and rhizobial inoculation (data not presented). The lack of response of rhizobial inoculation indicates that effective strains of *Rhizobium Japonicum* were available in the soil originally. Nair (1978) and Kurien (1979) reported a decrease in nodulation due to inoculation in sandy clay loam soils of Trichur. Data on yield, nitrogen and potassium content of seeds, potassium content of plants and nitrogen and potassium uptakes by plants are given in Table 1. There was no significant increase in grain yield either due to potassium application or inoculation. This indicates that the availability of potassium in the

Table 1

Effect of potassium and inoculation on yield of seeds, nitrogen and potassium contents of seeds, potassium content of plants and uptake of nitrogen and potassium by plants

Treatments	Yield of seeds kg/ha	N content of seeds (%)		Uptake of N by plants (kg/ha)		K content of seeds (%)		K content of plants (%)		Uptake of K by plants(kg/ha)	
		90th day	Harvest	90th day	Harvest	90th day	Harvest	90th day	Harvest	90th day	Harvest
Levels of K (K_2O kg/ha)											
0	1941	6.28	6.51	127.83	131.22	1.53	1.56	1.34	1.30	70.40	50.93
30	2148	4.61	5.50	149.43	139.43	1,65	1.64	1.86	1.42	119.33	71.37
SO	2252	5,64	5.84	135.72	140.68	1,67	1.78	1.75	1.52	104.56	78.28
90	2318	5.36	5.64	162.26	127.36	1.58	1.69	1.61	1.43	109 58	62.78
120	2118	4.54	5.64	152.13	196.47	1.56	1.71	1.65	1.47	115.26	101.05
SEm±	100.26	0.057	0.063	1856	20.648	0.009	0.013	0.084	0.075	12.906	9.631
CD (0.05)	NS	0.166	0.182	NS	NS	0.027	0.038	0.244	NS	NS	27.949
Rhizobial inoculation											
Uninoculated	2116	4.98	5.66	125.23	135.15	1,58	1,67	1.69	1.45	90.47	66.34
Inoculated	2198	5.56	6.00	165.72	158.19	1.62	1.68	1.59	1.41	117.18	79.42
SEm±	63.41	0.036	0,040	11.742	13.057	0.006	0.008	0.053	0.047	8.163	1.091
CD (0.05)	NS	0.105	0.115	34.062	NS	0.017	NS	NS	NS	23.688	NS

soil is adequate for its growth and potentiality to yield. Levels of potassium and inoculation influenced the nitrogen content of seeds on 90th day and at harvest. At both stages, plots receiving no potassium and inoculated treatments recorded the highest nitrogen contents. In this study an inverse relationship between protein and oi! content was noticed due to potassium application The decrease in nitrogen content of seeds with higher levels of potassium may be due to the mobilization of the plant metabolites to synthesise oil at the expense of organic nitrogen compounds. In general potassium application, inoculation and their interactions had no marked influence on the nitrogen content of plants (data not presented). There was no significant difference in the uptake of nitrogen by plants due to potassium application at any of the growth stages. The results indicated adequacy of available potassium in the soil. Inoculation significantly increased the nitrogen uptake only on 90th day. Similar result was reported by Kurien (1979). Levels of potassium had significant effect on the potassium content of seeds on 90th day and at harvest and 60 kg K_2O/ha recorded the highest content at both the stages. Inoculation influenced the potassium content of seeds significantly only on 90th day and the inoculated treatment gave highest potassium content of seeds. The effect of potassium on potassium content of plants was significant only on 90th day and 30 kg K_2O/ha recorded the highest content and was on par with 60 and 120 kg K_2O/ha. Similar result was reported by Jones *et al.* (1977). The effect of inoculation was not significant. Potassium influenced the uptake of potassium by plants at harvest and highest uptake was recorded by 120 kg K_2O/ha. Inoculation significantly increased the uptake of potassium by plants only on 90th day.

സംഗ്രഹം

പൊട്ടാസ്യത്തിനും റൈസോബിയത്തിനും സോയാപയറിൽ മൂലാർബുദങ്ങളുടെ ഉൽപാദനം, ഘനം, വിത്തുൽപാദനം, അടങ്ങിയിരിക്കുന്ന പ്രധാന സസ്യമൂലകങ്ങളുടെ അളവ്, ഒരു ഹെക്ടറിൽ നിന്നും മാറ്റപ്പെടുന്ന മൂലകങ്ങളുടെ ഘനം എന്നീ ഘടകങ്ങളിൽ ചെലുത്താൻ കഴിയുന്ന വ്യതിയാനങ്ങൾ കണ്ടുപിടിക്കുന്നതിന് കേരള കാർഷിക സർവകലാശാലയുടെ വെള്ളാനിക്കരയിലുള്ള ഗവേഷണ തോട്ടത്തിൽ നടത്തിയ പരീക്ഷണങ്ങളിൽ നിന്നും അവയ്ക്ക് മൂലാർബുദങ്ങളുടെ എണ്ണം, ഘനം, വിത്തുൽപാദനം എന്നിവയിൽ കാര്യമായ വ്യത്യാസം ഉണ്ടാക്കുവാൻ സാധിച്ചില്ല എന്നു കണ്ടു. എന്നാൽ അവയ്ക്ക് വിത്തിലെ നൈട്രജന്റെയും പൊട്ടാസ്യത്തിന്റെയും അളവിൽ ഗണ്യമായ മാറ്റം വരുത്തുവാൻ കഴിഞ്ഞു.

Reena Grittle Pinhero
E. Tajuddin
M. Abdul Salam
R. Vikraman Nair

College of Horticulture
Vellanikkara 680 654
Trichur, Kerala

References

Jackson, M, L. 1958. *Soil Chemical Analysis.* Prentice Hall Inc, U, S. A., 111-204.

Jones, G. D., Lutz, J. A. and Smith, T. J. 1977. Effects of P and K on soybean nodules and seed yield. *Agron. J.* 69, 1C03-10C6.

Kurien, T, *M.* 1979. Effect of phosphorus nutrition, liming and rhizobial inoculation on soybean (*Glycinemax* (L) Merril). M. Sc. thesis, Kerala Agricultural University, Vellanikkara, Trichur.

Nair, P. G. 1973. Nitrogen nutrition and rhizobial inoculation on soybean *Glycine max* (L) Merrill). M. Sc. thesis, Kerala Agricultural University, Vellanikkara. Trichur.

Rao, J. V. D, K. K. and Patil, R. B. 1977. Symbiotic response of *Glycine max* (L) Merrill to inoculation with different commercial inoculants of *Rhizobium japonicum* from agricultural institutions *Mysore J. agric.Sci.* 11,342-344.