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Short Communication

Effect of FYM, PSB and chemical fertilizers on available soil NPK status and nutreint content in summer cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.]

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ABSTRACT

A field experiment was conducted to study the effect of farm yard manure, phosphate solubilizing bacteria and chemical fertilizers on summer cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.]. It showed that there was an increased protein content, content and uptake of N, P and K in seed/stover as well as well as post harvest status of N, P and K in soil with application of FYM @ 5 t ha^{-1}, PSB @ 2.5 kg ha^{-1}and 30-60-00 NPK kg ha^{-1}.

Key words: Clusterbean, FYM, Nutrient content and uptake, Phosphate solubilizing bacteria, Protein content

Cluster bean or guar [*Cyamopsis tetragonaloba* (L.) Taub.] is a widely grown crop but not on commercial basis on large scale. Basically cluster bean is a drought hardy, deep rooted, summer annual legume. It is an important self pollinated, multipurpose and restorative leguminous vegetable crop. In India, green and tender pods of cluster bean are used as a favorite vegetable in many parts of the country. It is also grown as a forage crop. Sometimes it is used in reclamation of saline and alkaline soils. In the recent years, this crop has assumed great significance due to the presence of a good quality of gum in the endosperm of its seed. The natural polysaccharide water-soluble polymer found in the endosperm, as galactomannan gum, is the chief product used in many industries. Due to diversified uses of cluster bean gum in textile, paper, explosive and mining industries, pharmaceuticals, cosmetic goods and food stuffs, it has ever increasing demand in the international market. Among all these importance of cluster bean I had kept an objective to determine nutrient uptake and content by summer cluster bean.

The experiment was conducted at Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh during summer season in the year of 2014. Junagadh is situated at 21.5^{0}N latitude and 70.5^0 E longitudes with an altitude of 60 m above the mean sea level. Junagadh is situated in south Saurashtra Agro-climatic region of Gujarat state and enjoys a typically subtropical climate characterized by fairly cold and dry winter, hot and dry summer and warm and moderately humid monsoon. The soil of the experimental site was medium black clayey in texture and having low available nitrogen (237 kg ha^{-1}), high phosphorus (52.5 kg ha^{-1}) and high potassium (260 kg ha^{-1}). The experiment comprising of 12 treatment combinations of two levels of FYM (F_0-0t ha^{-1} and F_1-5t ha^{-1}), Two level of PSB (B_0-0kg ha^{-1} and B_1-2.5kg ha^{-1}) and three levels of chemical fertilizers [FD_1: 10-20-00 (kg ha^{-1}) NPK, FD_2: 20-40-00 (kg ha^{-1}) NPK and FD_3: 30-60-00 (kg ha^{-1}) NPK] was carried out in Factorial Randomized Block Design with three replications. The whole quantity of N and P_2O_5 was given as a basal dose in the form of Urea, Di ammonium phosphate, respectively. The FYM was applied 15 day before sowing in furrows as per the treatment. PSB culture was applied 12 DAS with irrigation water as per treatment. The area of experiment at field was 37.5 m X 36 m, while gross plot size was 5.0 m X 3.6 m and net plot sizes were 4.1 m X 3.0 m with spacing 45 cm x 15 cm. One inters culturing and one time hand weeding carried out throughout season to keep experimental field weed free. During crop growing period, six irrigation, each of 5 cm depth, were given at different time of period and when required by crop.

In the present investigation protein percent as well as content and uptake of N, P and K by seed and stover significantly highest (22.68%) with application of FYM@5 t ha^{-1}. Application of PSB 2.5 kg ha^{-1} executed their significant influence on protein content in seed which showed in Table-1. Significantly the highest protein content in seed was recorded with PSB application.Significantly maximum protein content in seed (22.82%) was recorded with treatment 30-60-00 NPK kg ha^{-1}, which was statistically at par with treatment 20-40-00 NPK kg ha^{-1}.

Significantly highest N, P and K content as well as uptake by seed and stover of cluster bean was recorded with application of FYM @ 5 t ha^{-1} than without FYM presented in Table 2. Application of PSB @2.5 kg ha^{-1} significantly increased N, P and K content as well as uptake by seed and stover. Crop fertilized with 30-60-00 NPK kg ha^{-1} were recorded significantly highest N, P and K content as well as uptake by seed and stover of cluster bean, which was statistically at par with application of 20-40-00 NPK kg ha^{-1}.

Application of FYM5@ t ha^{-1} significantly improves available N, P and K status in soil after harvest of crop over not applied FYM. Significantly increased available N, P and K status in soil after harvest of crop was recorded with application of PSB@2.5 kg ha^{-1}. *P. striata* fixed soil phosphorus through the production of organic acids and bringing down the soil pH. Crop fertilized with application

of 30-60-00 NPK kg ha^{-1} was recorded significantly highest available N, P and K status in soil after harvest of crop which was statistically at par with treatment 20-40-00 NPK kg ha^{-1} revealed in Table 3.

Application of FYM@5 t ha^{-1} increased protein content in seed which increase nitrogen in seed is directly responsible for higher protein because it is a primary component of amino acids which constitute the basis of protein Khandelwal *et al*. 2012. Increase the protein contents of the crop might be due to the fact that *P. striata* augmented the process wherein insoluble elements like nitrates, phosphates, etc. were solubilized and released in the form of soluble N, P and K which were taken up by the plants and ultimately increased the protein contents of the cluster bean crop (Manjunath *et al*. 2006). Crop fertilized with 30-60-00 NPK kg ha^{-1} directly added N and P is known to activate microbial population responsible for nodulation. This further enhanced N fixation that was utilized by the plants and enhanced the protein contents (Rathore *et al*. 2007).

Decomposition of FYM releases this nutrient and also increases the availability of native phosphorus due to liberation of carbon dioxide and production of organic acids (Patil *et al.* 1993). It might be noted that the managing with FYM increases the supply of potassium and also favors root development making them more efficient in absorbing the nutrients. The increase in the nitrogen, phosphorus, and potassium content and uptake of the crop might be due to the production of chelating compounds by *P. striata* which remove the cations from the insoluble elements like nitrates, phosphates etc. and then further release soluble N, P and K which may be taken up by the plants (Rajpal *et al.* 2002). Decomposition of FYM liberates carbon dioxide and organic acids, which increase the availability of nutrients from native as well as applied fertilizers (Patil *et al.* 1993).

Table 1. Effect of different treatments on content of protein, N, P and K in seed and stover of cluster bean

Treatment	Protein (%)	Seed Content			Stover Content		
		N (%)	P (%)	K (%)	N (%)	P (%)	K (%)
Farm yard manure							
0 t ha^{-1}	20.82	3.33	0.54	1.85	1.33	0.24	2.96
5 t ha^{-1}	22.68	3.63	0.58	1.97	1.38	0.25	3.19
S.Em±	0.39	0.06	0.008	0.02	0.01	0.003	0.04
C.D. at 5 %	1.14	0.18	0.02	0.08	0.05	0.009	0.12
PSB							
0 kg ha^{-1}	21.14	3.38	0.54	1.87	1.33	0.24	3.00
2.5 kg ha^{-1}	22.35	3.58	0.58	1.95	1.38	0.25	3.14
S. Em±	0.39	0.06	0.008	0.02	0.01	0.003	0.04
C.D. at 5 %	1.14	0.18	0.02	0.08	0.05	0.009	0.12
Chemical fertilizers (NPK kg ha^{-1})							
10-20-00	20.46	3.27	0.51	1.85	1.31	0.24	2.94
20-40-00	21.97	3.52	0.57	1.91	1.36	0.25	3.13
30-60-00	22.82	3.65	0.59	1.97	1.39	0.25	3.16
S. Em±	0.48	0.07	0.01	0.03	0.02	0.004	0.05
C.D. at 5 %	1.40	0.22	0.03	0.09	0.06	0.01	0.14
C.V. %	6.13	7.57	6.28	5.83	5.27	5.07	5.56

Table 2. Effect of different treatments on uptake of N,P and K by seed and stover of cluster bean

Treatment	Seed Content			Stover Content		
	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})
FYM						
F_0 = 0 t ha^{-1}	25.64	4.16	14.20	19.37	3.53	43.30
F_1 = 5 t ha^{-1}	30.73	4.96	16.42	23.41	4.16	54.18
S. Em±	0.90	0.13	0.38	0.63	0.09	1.62
C.D. at 5 %	2.63	0.38	1.12	1.85	0.27	4.77
PSB						
B_0 = 0 kg ha^{-1}	25.98	4.13	14.33	19.82	3.62	44.95
B_1 = 2.5 kg ha^{-1}	30.39	4.99	16.29	22.97	4.17	52.52
S. Em±	0.90	0.13	0.38	0.63	0.09	1.62
C.D. at 5 %	2.63	0.38	1.12	1.85	0.27	4.77
Chemical fertilizers (NPK kg ha^{-1})						
FD_1= 10-20-00	24.31	3.83	13.59	19.37	3.51	43.49
FD_2= 20-40-00	29.03	4.73	15.62	21.47	3.93	49.56
FD_3 = 30-60-00	31.22	5.11	16.72	23.33	4.24	53.16
S. Em±	1.10	0.16	0.47	0.77	0.11	2.00
C.D. at 5 %	3.23	0.46	1.37	2.27	0.33	5.84
C.V. %	13.54	11.93	10.58	12.52	10.10	14.14

Table 3. Effect of different treatments on available N, P and K status of soil at harvest of cluster bean

Treatment	Available nutrients (kg ha^{-1})		
	N	P	K
FYM			
F_0 = 0 t ha^{-1}	263	59.2	267
F_1 = 5 t ha^{-1}	284	60.5	280
S. Em±	3	0.3	3
C.D. at 5 %	11	0.9	9
PSB			
B_0 = 0 kg ha^{-1}	267	59.1	268
B_1 = 2.5 kg ha^{-1}	280	60.6	279
S. Em±	3	0.3	3
C.D. at 5 %	11	0.9	9
Chemical fertilizers (NPK kg ha^{-1})			
FD_1= 10-20-00	264	58.9	266
FD_2= 20-40-00	272	60.0	271
FD_3 = 30-60-00	283	60.5	283
S. Em±	4	0.4	4
C.D. at 5 %	13	1.2	12
C.V. %	5	2.3	5

Application of FYM 5 t ha^{-1}, PSB 2.5 kg ha^{-1} and fertilizing crop with 30-60-00 kg ha^{-1} significantly increased the protein per cent in seed as well as nitrogen, phosphorus and potassium content in the plant and also the uptake of nitrogen, phosphorus and potassium by the plant. Available N, P and K status in the soil were increased significantly with application of FYM 5 t ha^{-1}, PSB 2.5 kg ha^{-1} and fertilizing crop with 30-60-00 kg ha^{-1}.

REFERENCES

Gaur AC. 1990. Phosphate solubilizing microorganisms as biofertilizers. Omega Scientific Publishers, New Delhi. pp.42

Khandelwal R, Choudhary SK, Khangarot SS, Jat MK and Singh P. 2012. Effect of inorganic and bio-fertilizers on productivity and nutrients uptake in cowpea. Legume Research **35(3):** 235-238

Manjunath MN, Patil PL and Gali SK. 2006. Effect of organic-amended rock phosphate and P-solubilizer on growth, yield and quality of French bean under vertisol of Malaprabha command of north Karnataka. Karnataka Journal of Agricultural Sciences **19(1):** 30-35

Patil AB. 2002. Integrated nutrient management in pigeonpea [*Cajanus cajan* (L.) Mill sp.]. M.Sc. (Agri.) thesis submitted to GAU, Junagadh

Rajpal Meena, Jat NL and Meena NL. 2002. Effect of phosphorus and biofertilizers (*Rhizobium* and PSB) on yield and quality of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub Annals of Agricultural Sciences **23(2):** 349-351

Rathore VS, Singh JP, Soni ML, Yadava ND and Beniwal RK. 2007. Productivity, quality and resource utilization by cluster bean [*Cyamopsis tetragonoloba* (Linn) Taub.] as influenced by nutrient management. Indian Journal of Agronomy **77(6):** 349-353