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Effect of Phosphorus, PSB and Press Mud on Yield of Summer mung

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ABSTRACT

The present investigation was conducted at the technology park of KVK Jaunpur during summer seasons of 2018 and 2019. The twelve treatment *viz.,* control (T_1), P_{45} (T_2), P_{60} (T_3), P_{45}+2.5 t press mud/ ha(T_4), P_{60}+2.5 t press mud/ha (T_5), P_{45}+PSB (T_6), P_{60}+PSB (T_7), P_{45}+2.5 t press mud/ ha +PSB (T_8), P_{60}+2.5 t press mud/ha+PSB (T_9), 2.5 t press mud alone (T_{10}), PSB Alone (T_{11}), 2.5 t press mud/ ha +PSB (T_{12}) ware replicated thrice in randomized block design, the green gram variety Narendra moong1 was taken as test crop. The data observed revealed that 60kg P2O5+2.5t press mud + PSB/ ha significantly increased plant height, number of branches, fresh and dry weight of nodules and dry matter accumulation. The same treatment combination proved most effective improving yield and yield contributing characters *viz.,* number of pods and number of grain per pods improved under treatment 60kg P2O5+2.5t press mud +PSB/ ha, protein content was also fallowed by same treatment. Availability of phosphorus in soil was also recorded significantly higher under 60kg P2O5+2.5t press mud/ha. Phosphorus concentration in plant, phosphorus utilization efficiency and its uptake by crop of green gram were maximum with same treatment. A considerable improvement in buildup of phosphorus fraction in soil was observed under all treatment. Thus the recommendation 60kg P2O5+2.5t press mud +PSB/ha can be made to the farmer of eastern Uttar Pradesh for obtaining good yield quality of moog bean and improving soil health.

Key Words: Grain, straw yield and soil properties.

INTRODUCTION

Green gram (*Vigna radiata L. Wilkzek*) commonly known as mung bean is a principal important short duration and drought tolerant pulse crop in India. It belongs to the family *leguminosae* and sub family *Papilionaceae*. It cover the annual world production area about 5.5 mha. The major green gram states in India are Bihar, UP, Punjab, Rajasthan, MP and Gujarat. The average yield of green gram in eastern Uttar Pradesh was 8.32 q/ ha. Green gram seed contains 24.6 per cent protein, 0.5 per cent fat, 0.9 per cent fiber, 57.6 per cent carbohydrates and 3.7 per cent ash (Choudhary *et al,* 2003) and adequate amount of phosphorous, calcium and key vitamins. Its protein is rich in lysine making it an excellent complement to rice. Moongbean is the major *kharif* pulse crop in India covering 34.5 lakh ha of area with total production of 14 lakh tonnes and productivity of 1415.7 kg/ ha. It is commonly grown in summer season in India.

Green gram is leguminous crop and improves soil fertility through symbiotic nitrogen fixation. It improves the soil fertility by fixing 36 kg N/ha/ annum from atmosphere. Moong bean gave low yield at farmer's field due to less awareness of farmers about optimum date of sowing, effective

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weed control and balance use of fertilizers, pest management practices and proper planting pattern. Moong bean in delay planting results reduction in number of pods/plant, number of grains/pod, grain weight and ultimately grain yield. Summer pulses are very important for improving soil health, providing additional income to farmers and crop diversification in northern states of India. Bringing considerable area under pulses cultivation during summer season has been possible because of increased irrigation facilities, remunerative pricing policy and availability of short duration varieties. Manan *et al* (2019) emphasized that it was imperative to discourage cultivation of spring maize and farmers must be advised to go for short duration water efficient and sustainable crop such as summer mung bean. Growing crops like summer green gram can certainly lead to increase in household income of farmers and help in combating malnutrition and sustaining agricultural production.

MATERIALS AND METHODS

The present investigation was conducted at technology farm of the KVK Jaunpur during summer seasons of 2018 and 2019. The soil of the experimental plot was sandy (24.32-25.42%), silt (54.20-53.15%), clay (21.48-21.43%) with a pH (7.4-7.3), low in organic carbon (0.36-0.37%), electrical conductivity (dSm^{-1}) 0.33-0.35, available N (218.13-220.34 kg/ha), available P (14.76-14.89 kg/ ha), available K (215.21-220.12 kg/ ha), Iron (1.85-2.03 ppm), Aluminum (1.25-1.10 ppm), calcium (4.99-5.10 ppm). The experiment was laid out in randomized complete block design (RCBD) consisting of twelve treatment *viz.,* control (T_1), P_{45} (T_2), P_{60} (T_3), P_{45}+2.5 t press mud/ ha (T_4), P_{60}+2.5 t press mud/ ha (T_5), P_{45}+PSB (T_6), P_{60}+PSB (T_7), P_{45}+2.5 t press mud/ ha +PSB (T_8), P_{60}+2.5 t press mud/ ha+PSB (T_9), 2.5 t press mud alone (T_{10}), PSB Alone (T_{11}), 2.5 t press mud/ ha +PSB (T_{12}) with combinations in variety Narendra Moong-1, replicated three times. Pre-sowing irrigation was followed by preparation of fine seed bed. The sowing of crop was done on 27/04/2018 and 29/04/2019 respectively and beds were prepared in east- west direction in 40X20 cm crop geometry with a seed rate of 20 kg/ha in all the treatment. The plant height of five randomly selected plants was measured at the maturity. The number of seeds was counted from ten pods from each selected plant of each plot. The weight of 1000-grain weight was recorded from each plot and expressed in gram. Number of days taken to maturity days were counted from each plot after the color of the plant and pod turned yellow. After threshing of crop, the data on seed and stover yields was recorded from each plot and expressed as kg/ha. Harvest index (HI) was calculated by using following formula:

$$\text{H.I.}(\%) = \frac{\text{Grain yield}}{\text{Biological yield}} \text{ x } 100$$

The soil samples were collected as initial before and after harvest of the crop and analyzed for chemical properties by following standard methods (Jackson, 1973).

RESULTS AND DISCUSSION

Yield

Data pertaining to grain and straw yield as influenced by various treatment indicate that grain and straw yield of moog bean increased significantly with increasing level of P up to 60 kg/ ha but in case of press mud incorporation, significantly increased was noted up to 60kg $P_2O_{5/}$ ha. The increase in garin and straw yield was highest with to 60kg P_2O_5/ ha when applied with press mud. As compared to control, all the treatment found significantly effective in increase gain and straw yield of moog bean. The maximum grain and straw yield was recorded 60kg P_2O_5 /ha+2.5 t pressmud/ ha+PSB 11.09 q/ha same finding reported by Bansal (2009). All the treatment gave higher harvest index against control. Maximum harvest index was recorded with application of 60kg P_2O_5 /ha+2.5 tone press mud/ ha+PSB followed by 60kg P_2O_5 /ha+2.5 tone press mud/ ha, 60kg P_2O_5 / ha+PSB and 45 kg P_2O_5 /ha+2.5 t preesmud +PSB, respectively during both the year (Saxena *et al* 2013).

Table1. Economic of various treatment combinations.

	Treatment	Seed Yield (q/ha)		Stover Yield (q/ha)		Cost of Cultivation (Rs/ha)		Gross Income (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
1	Control	4.83	5.49	11.56	12.42	15983	16088	28014	31842	12031	15754	1.75	1.98
2	P_{45}	7.56	8.53	14.12	15.00	17810	17915	43848	49474	26038	31559	2.46	2.76
3	P_{60}	9.10	10.02	14.15	15.10	18420	18525	52780	58116	34360	39591	2.87	3.14
4	P_{45}+2.5 t press mud/ ha	8.67	9.87	14.10	15.05	18123	12128	50286	57246	32163	45118	2.77	4.72
5	P_{60}+2.5 t press mud/ ha	10.40	11.56	15.87	17.25	18733	18838	60320	67048	41587	48210	3.22	3.56
6	P_{45}+PSB	8.58	9.69	14.05	15.37	17855	17960	49764	56202	31909	38242	2.79	3.13
7	P_{60}+PSB	10.17	11.33	15.69	17.07	18465	18570	58986	65714	40521	47144	3.19	3.54
8	P_{45}+2.5 t press mud/ ha +PSB	10.07	11.10	15.06	16.38	18168	18272	58406	64380	40238	46108	3.21	3.52
9	P_{60}+2.5 t press mud/ ha+PSB	10.50	11.68	15.91	17.30	18778	18883	60900	67744	42122	48861	3.24	3.59
10	2.5 t press mud alone	5.13	5.90	12.99	14.07	16295	16400	29754	34220	13459	17820	1.83	2.09
11	PSB Alone	5.05	5.68	12.91	12.80	16028	16133	29290	32944	13262	16811	1.83	2.04
12	2.5 tone +PSB	5.35	6.02	13.27	14.28	16340	16445	31030	34916	14690	18471	1.90	2.12
13	SEm+	0.30	0.41	0.61	0.66	-	-	-	-	-	-	-	-
14	CD at 5%	0.87	1.18	1.75	1.92	-	-	-	-	-	-	-	-

Table2. Available N, K (Kg/ha) and Organic Carbon in soil at harvest as influenced by the phosphorus, Press mud and PSB

Treatment		Nitrogen at harvest		Potassium at harvest		O.C. at harvest (%)		Fe-P (%) Total Of P		Al-P (%) Total Of P		Ca-P (%) Total Of P	
		2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	
T_1	Control	192.72	197.21	223.11	224.10	0.430	0.440	2.20	2.24	1.29	1.23	5.40	5.43
T_2	P_{45}	202.58	207.40	234.08	235.10	0.460	0.470	3.65	3.72	2.40	2.47	10.08	10.10
T_3	P_{60}	205.40	210.58	248.14	249.12	0.470	0.490	3.70	3.71	3.10	3.13	13.02	13.10
T_4	P_{45}+2.5 t press mud/ ha	204.70	209.65	237.17	238.15	0.480	0.490	3.73	3.75	2.70	2.76	10.8	10.87
T_5	P_{60}+2.5 t press mud/ ha	207.10	212.85	240.28	241.25	0.480	0.490	3.78	3.80	3.40	4.43	13.6	13.64
T_6	P_{45}+PSB	203.66	208.20	233.10	234.19	0.470	0.480	3.74	3.76	2.60	2.63	10.40	10.47
T_7	P_{60}+PSB	206.20	211.66	236.78	237.68	0.470	0.480	3.83	3.84	3.30	3.37	13.20	13.23
T_8	P_{45}+2.5 t press mud/ ha +PSB	210.40	214.20	239.10	240.12	0.500	0.510	3.75	3.77	3.00	3.04	12.60	12.67
T_9	P_{60}+2.5 t press mud/ ha+PSB	211.58	215.12	247.13	248.10	0.520	0.540	4.08	4.10	4.10	4.13	17.63	17.66
T_{10}	2.5 t press mud alone	197.12	201.58	229.09	230.12	0.460	0.470	2.95	3.01	1.70	1.77	6.80	6.87
T_{11}	PSB Alone	197.67	20140	228.40	229.50	0.460	0.470	2.90	2.95	1.60	1.63	6.40	6.43
T_{12}	2.5 tone +PSB	198.40	202.67	230.20	231.10	0.470	0.480	3.00	3.05	1.90	1.97	7.60	7.67
SEm+		3.17	3.14	3.49	3.62	0.013	0.013	0.074	0.079	0.050	0.054	0.235	0.236
CD at 5%		9.15	9.07	10.05	10.45	NS	NS	0.214	0.229	0.145	0.155	0.679	0.682

Chemical properties of soil

The results revealed that improved soil physical conditions reflected by lower bulk density of soil, when applied chemical sources of nutrients continuously. Integration of organic sources was found more effective as compared to single application in building up fertility and improving physical status of soil. The buildup of neutral soil organic carbon were recorded as compared to treatment (T_{13}) The higher availability of nutrient N, P and K in soil, increased with the application of phosphorus, press mud and PSB alone or in combination by Sharma *et al* (2013). The application of Phosphorus 60 kg with alone or in combination PSB and press mud increased the availability of nutrient. The significant increase on availability of nitrogen, phosphorus and potassium over control was observed Balachandran *et al* (2005) and Mishra (2003). This might be due to the fact that the application of Phosphorus enhanced root development and established good root system. The application of Phosphorus stimulates the nodulation and nodulation bacteria for more fixation of atmospheric nitrogen which resulted an increase in its content in soil. The maximum availability of nutrient was significant higher when phosphorus was applied with *Rhizobium* and PSB inoculation alone or in combination over control during both the year. The Phosphorus press mud and seed inoculation with PSB on the amount of phosphorus, fraction in soil at harvest. Application of chemical fertilizer alone or their combined use with pressmud and PSB increased all the forms of phosphorus faction(Fe-P, Al-P and ca-P). the amount recorded in Fe-P Al-P and Ca-P from increase significantly with the application of inorganic fertilizer and their combined use with press mud over control. The allocation of recommended inorganic phosphoric fertilizer significantly increase the soil P-faction (Fe-P, Al-P, Ca-P and Total P) and application of press mud @5 t/ ha significantly increase variation of faction (Fe-P, Al-P, Ca-P and Total P) by Prasad *et al* (2014).

The maximum available of N, P, Fe-P, Al-P Ca-P and organic carbon at harvest was recorded with application of 60kg P_2O_5 /ha+2.5t pressmud/ ha+PSB and at par with T_4, T_6 and T_7 ,respectively. Application of phosphorus with 2.5t press mud/ ha+PSB also increase availability of N,P, Fe-P, Al-P Ca-P and Organic Carbon significantly over control. The P press mud and PSB application in soil did not influence of improved the soil health as well as availability of soil nutrient.

CONCLUSION

Application of phosphorus either alone or in combination with 2.5t pressmud/ha increased the yield of mung bean. PSB inoculation with phosphorus also enhanced the grain yield. phosphorus availability increased significantly with increasing level of phosphorus up to 60 kg P_2O_5 / ha alone and its combination with press mud and PSB inoculation. Highest phosphorus availability in soil was found at various stage of crop growth with the application of 60 kg P_2O_5 /ha alone the combination of 2.5t press mud. The application 60 kg P_2O_5 /ha alone the combination of 2.5t press mud and in combination with phosphorus solubilizing bacteria (PSB) was found most suitable for gating maximum yield and improving soil health as well as net return.

REFERENCES

Balachandran Sripriya, Deotale R D, Hetmode CN, Titare Priyanka S and Thorat Archana W (2005). Effect of biofertilizer (Pressmud, *Rhizobium* and PSB) and nutrient (NPK) on morphological parameters of green gram. *J Soil and Crop* **15**(2) 442-447

Bansal R K (2009). Synergistic effect of Rhizobium, PSB and PGPR on nodulation and grain yield of munbean. *J Food Legume* **22** (1) 37-39.

Bouyoucos G J (**1936**). Direction of making mechanical analysis of soil hydrometer method. *Soil Sci* **42**: 225-228.

Manan Jatinder, Sharma M, Singh Gobinder and Singh Gurmeet (2019). Effect of irrigation water on profitability as well as sustainability of summer mung bean versus spring maize cultivation in Kapurthala district of Punjab. *J Krishi Vigyan* **7** (2) : 88-93

Mishra S K (2003). Effect of rhizobium inoculation, nitrogen and phosphorus on root nodulation pratein production and nutrient uptake in cowpea (*Vigna sinensis* Savi). *Annals of Agril Res* 24(1) 139-144.

Sharma S B, Sayyed R Z, Trivedi M H and Gobi T A (2013). Phosphate solubilizing microbes: sustainable approach for managing phosphorus deficiency in agricultural soils. Springer Plus. 2: 587.

Prasad S K, Singh M K and Singh J (2014). Response of *Rhizobium* inoculation and phosphorus levels on mungbean (*Vigna radaita* L.) under guava-based agri-horti system. *The Bioscan* **9** (2): 557-560.

Chaudhary RP, Sharma S K and Dhama A K (2003). Yield component of grren gram (*Vigna radiata*) as influenced by phosphorus and thiourea. *Annals of Agril Res* **24** (1): 203-204

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