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NUTRITIONAL REQUIREMENT OF GREEN GRAM (*VIGNA RADIATA* (L.) WILCZEK) GROWN IN RICE FALLOWS*

K. E. SAVITHRI, K. P. M. NAIR, M. OOMMEN, M. ABDUL SALAM
College of Agriculture, Vellayani - 695 522, Trivandrum, Kerala

Green gram is suitable for cultivation in rice fallows of Kerala. The present yield levels of green gram are among the lowest of the major grain legumes. This crop is reported to respond to nitrogen application (Choudhry and Bhatia, 1971, and Panda, 1972). Singh *et al.* (1975) reported that increasing levels of P from 0 to 60 kg P_2O_5/ha significantly increased the grain yield of green gram. Sawhney *et al.* (1975) found that applicatton of 17 and 34 kg K_2O/ha increased the grain yield of black gram. The present investigation was undertaken to study the nutritional requirement of green gram, grown in summer fallows under Kerala conditions.

Materials and Methods

The experiment was conducted in the rice fallows of the Instructional Farm, College of Agriculture, Vellayani during the year 1978-79 to study the effect of graded levels of nitrogen (20, 30 and 40 kg N/ha), phosphorus (30, 45 and 60 kg P_2O_5/ha) and potash (10, 20 and 30 kg K_2O/ha) in factorial combinations on the yield and quality of green gram var. Pusa Baisakhi. A 3^3 partially confounded factorial experiment confounding NPK in replication I and NPK^2 in replication II was laid out with 27 treatment combinations. The soils were sandy clay loam analysing for 0.112 per cent N, 0.002 per cent available P_2O_5, 0.001 per cent available K_2O and with a pH of 5.6.

The entire dose of fertilizers as per treatments was applied as basal dressing at the time of last land preparation. Rhizobium treated seeds of Pusa Baisakhi were dibbled at a spacing of 10 cm in shallow furrows taken at a spacing of 20 cm. Uniform cultural practices were followed for all the treatments. The crop was harvested by picking the mature pods thrice and the duration of the crop was 60 days.

The data relating to various yield attributes were collected from a sample of 10 plants in the net plot. Nitrogen content was determined by modified micro-kjeldahl method (Jackson, 1967) and crude protein per cent worked out by multiplying the nitrogen content by the factor 6.25.

Results and Discussion

The mean values of the yield and yield attributes, protein content and protein yield are presented in Table 1.

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Yield attributes

Among the yield attributes only the hundred seed weight and weight of seeds/plant were significantly influenced by the levels of N, P and K tried. Hundred seed weight was significantly decreased by the higher levels of phosphorus. The highest level of 30 kg K_2O/ha was found to have a positive significant influence on the weight of seeds per plant over the lowest level of 10 kg K_2O.

Grain yield

The maximum grain yield of 538 kg/ha was recorded by the application of 30 kg K_2O/ha. But the levels of N and P as well as the interactions of N, P and K were found to have no significant influence on the crop yield. Even though all the yield attributes except the weight of seeds/plant were not significantly influenced by the levels of potash, all of them showed an upward trend with an increase in the levels of potash. The cumulative effect of all these factors might have contributed for the significant increase in the grain yield. Signficant positive correlations were also observed between grain yield and various yield attributes. The addition of 20 kg K_2O over the lowest dose of 10 kg gave an extra yield of 169 kg/ha which was equivalent to 8.45 kg of grain/kg of K_2O added.

Bhusa yield

Though the levels of P and K had no significant influence on bhusa yield, highest level of N (40 kg/ha) was found to increase the vegetative growth in the early stages and thereby helped in the total bhusa production.

Protein

None of the levels of nutrients (N, P and K) could exert a significant influence on the grain protein content. Since the highest level of potash was found to have a significant influence on grain yield, the grain protein yield was also maximum from plots received 30 kg K_2O/ha.

While the protein content of bhusa was adversely affected by increasing the level of potash, this effect was not finally noted in the production of fodder protein. The reduction in the protein content was compensated by higher yield of bhusa, thereby nullified the adverse effect.

The data presented in Table 2 reveal that nitrogen application beyond 30 kg was not economical. Every additional one rupee spent on nitrogen gave an additional income of Rs 5.90 over 20 kg level while in the case of phosphorus, there was only a slight variation in the net profit between different levels. On the other hand, the lowest level or potash resulted in a net loss of Rs. 54.12 whereas the highest level of 30 kg K_2O gave a net profit of Rs. 695.14/ha, which worked out to Rs. 25.37 for every one rupee spent on K_2O over the lowest level of 10 kg.

Table I

Yield characteristics and protein content of green gram as influenced by graded levels of N, P and K
(Mean effects averaged over other treatments)

Treatments	No. of pods per plant	Weight of seeds per plant(g)	100 seed weight (g)	Grain yield (kg/ha)	Bhusa yield (kg/ha)	Protein content of grain (%)	Protein content of bhusa (X)	Grain protein yield (kg/ha)	Fodder protein yield (kg/ha)
20 kg N/ha	3.79	0.87	3.38	433.06	827.08	18.322	8.535	80.14	144.05
30 kg N/ha	3.84	0.99	3.49	494.13	811 19	18.493	8.886	93.13	165.20
40 kg N/ha	3.69	0.85	3.20	440.30	1053.10	18.615	8.990	82.05	183.99
'F' test	NS	NS	*	NS	*	NS	NS	NS	NS
30 kg P_2O_5/ha	3.70	0.87	3.17	438.68	864.82	18.254	8.719	79.83	150.39
45 kg P_2O_5/ha	3.79	0,91	3.40	459.97	929.52	18.493	8.785	85.37	165.26
60 kg P_2O_5/ha	3.83	0.93	3.49	458.86	997.03	18.683	8.906	90.12	177.59
'F' test	NS	NS	*	NS	NS	NS	NS	NS	NS
10 kg K_2O/ha	3.55	0.74	3.30	369.65	848.22	18.757	9.282	70.36	156.59
20 kg K_2O/ha	3.78	0.91	3.35	459.41	924.13	18.186	8.504	84.37	157.44
30 kg K_2O/ha	3.99	1.06	3.41	538.41	1019.03	18.486	8.625	100.59	179.21
'F' test	NS	*	NS	*	NS	NS	*	*	NS
C. D. (0.05)	—	0.211	0.222	103.693	178.218	—	0.644	19.541	—

Table 2

Economics of fertilizer application (Rs./ha)

Treatments	Cost of production (excluding the treatment) Rs.	Additional cost for the treatment Rs.	Total cost of production Rs.	Yield kg/ha Grain	Yield kg/ha Bhusa	Value Rs Grain	Value Rs Bhusa	Value Rs Total	Additional profit from the treatment over the lowest level Rs. ±	Net profit Rs.±
N kg/ha										
20	1677.00	92,68	1769.68	433.06	827.08	1948.77	82.71	2031 .48	—	+261.80
30	1677.00	139.02	1816 02	494.13	811.19	2223.59	81.12	2304.71	+273.23	+ 488.69
40	1677.00	185.37	1862.37	440.30	1053.10	1981.35	105.31	2086 .66	+55.18	+224.29
P_2O_5 kg/ha										
30	1661.35	103.13	1764.48	438.66	864.82	1973.97	86.48	2060 .45	—	+295.97
45	1661.35	154.69	1816.04	459.97	929.52	2069.87	92.95	2162.82	+102.37	+346.78
60	1661.35	206.25	1867.60	468.86	997.03	2109.87	99.70	2209.57	+149.12	+341.97
K_2O kg/ha										
10	1788.70	13.67	1802.37	369.65	848.22	1663.43	84.82	1748 .25	-	-54.12
20	1788.70	27.33	1816.03	459.41	924.13	2067.35	22.41	8159.76	+411.51	+343.73
30	1788.70	41.00	1829.70	538.43	1019.03	2422.94	101.90	2524 84	+776.59	+ 695.14
Mean	1709.02	107.02	1816.03	455.83	919.35	2051.24	91.93	2143.17	—	+ 327.14

Price of 1 kg nitrogen = Rs. 4.63
Price of 1 kg P_2O_5 = Rs. 3.44
Price of 1 kg K_2O = Rs. 1.37

Price of 1 kg grain Rs. 4.50
Price of 1 kg bhusa = Rs. 0.10

Summary

A field experiment to study the effect of three graded levels each of nitrogen (20, 30 and 40 kg/ha), phosphorus (30, 45 and 60 kg P_2O_5/ha) and potash (10, 20 and 30 kg K_2O/ha) on the yield and quality of green gram variety, Pusa Baisakhi grown in rice fallows of the Instructional Farm, College of Agriculture, Vellayani, Trivandrum has shown that the grain yield was significantly increased by highest level of potash over the lowest level and bhusa yield by highest level of nitrogen over the lower levels. Levels of nutrients had no significant influence on grain protein content, but highest level of potash significantly increased the grain protein yield over the lowest level. In the case of protein content of bhusa, higher levels of potash showed an adverse effect whereas fodder protein yield was not significantly affected by the treatments.

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സംഗ്രഹം

നെൽപാടങ്ങളിൽ മൂന്നാം വിളയായി കൃഷിചെയ്യുമ്പോൾ ചെറുപയറിന്റെ (ഇനം പൂസാ ബൈസാഖി) വിളവർദ്ധനവിൽ പാക്യജനകം, ഭാവഹം, ക്ഷാരം എന്നീ സസ്യ പോഷക മൂലകങ്ങളും എത്രമാത്രം സ്വാധീനം ചെലുത്തുന്നുവെന്നറിയാൻ വെള്ളായണി കാർഷിക കോളേജിൽ 1978–79ൽ നടത്തിയ പരീക്ഷണത്തിൽ നിന്നും ക്ഷാരത്തിന് വിളവർദ്ധനവിൽ കാര്യമായ പങ്കുണ്ടെന്ന് കണ്ടു. മാത്രമല്ല, ഹെക്ടറൊന്നിന് 30 കിലോഗ്രാം ക്ഷാരം ചേർത്താൽ 695.14 രൂപ അറ്റാദായം കിട്ടുമെന്നും ബോദ്ധ്യമായി.

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