Agri. Res. J. Kerala, 1981, 19 (2) 10—14

EFFECT OF GRADED DOSES OF N, P AND K ON THE YIELD AND QUALITY OF BLACKGRAM VAR. KM.–I GROWN IN RiCE FALLOWS

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One of the reasons for the very low yield of blackgram is due to the neglected manuring of this crop. In field experiments Sawhney *et al*. (1975) found that 34 kg K_2O/ha and Panwar *et al*. (1977) found that 15 kg N and 43.6 kg P_2O_5/ha as optimum doses for increasing the grain yield of blackgram.

Blackgram can be successfully grown as a summer crop in rice fallows. In Kerala there are about 2.73 lakh hectares of paddy fields remaining fallow during the third crop season. By utilizing this area for biackgram cultivation the pulse requirement of the State as well as the income of the farmer can be enhanced to a great extent. Not much work has been done regarding the manurial requirement of blackgram in rice fallows under Kerala condition and hence the study in this direction was undertaken at the College of Agriculture, Vetlayani during the third crop season of 1978-'79 in rice fallows.

Materials and Methods

The soil was sandy clay loam containing on an average 0.13 per cent of total nitrogen, 0.0027 per cent available P_2O_5 and 0.001 per cent of available K_2O and pH of 5.2. The experiment was laid out in a 3^3 confounded factorial design with three levels each of nitrogen (20, 30 and 40 kg/ha) phosphorus (30, 45 and 60 kg/ha) and potash (10, 20 and 30 kg/ha). Nitrogen, phosphorus and potash were applied as ammonium sulphate, superphosphate and muriate of potash respectively as basal dressing. The variety used was KM-1, a selection from the progeny derived from the cross (G.31 x Khargone) x G.31 released from the Agricultural Experiment Institute, Kudumiamalai, Tamil Nadu, with a duration of 65-70 days. Rhizobium treated seeds were dibbled at therate of 2 seeds/hill in lines at a spacing of 20 cm x 10 cm. Cultural operations, irrigation and plant protection were adopted as per the recommendations of Package of Practices, KAU 1978. The mature pods of individual plots were hand picked thrice and harvest was completed by 70th day after sowing.

The data relating to various yield attributes were collected from a sample of ten 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 value of yield and yield attributes, protein content and protein yield and economics of fertilizer application were presented in Tables 1 to 3.

Yield attributes

All the yield attributes viz. number of pods per plant, length of pods, number of seeds per pod, seed yield per plant and 100 seed weight (Table 1) were significantly influenced by the levels of K tried while levels of N and P had no significant effect on these characters.

Grain yield

From Table 1, it may be noted that the maximum grain yield of 1757 kg/ha was recorded by the application of 30 kg K_2O/ha which was significantly superior to the lower levels of 10 and 20 kg K_2O/ha. But the levels of N and P were found to have no significant effect on grain yield. All the yield attributes were significantly increased by the levels of potash and the cumulative effect of all these factors might have significantly contributed to the increase in grain yield. Significant and positive correlations were also observed between grain yields and yield attributing factor such as the number of pods ($r = 0.9565$), number of seeds per pod ($r = 0.5189$), length of pod ($r = 0.4678$), 100 seed weight ($r = 0.3609$). By the addition of 10 kg of K_2O over the lowest dose of 10 kg an extra yield of 15.9 kg, grain/kg of potash was obtained. Further increment of 10 kg enhanced the yield to 24.3 kg grain/kg of potash and the difference of the highest level over the lowest level was averaged to 20.1 kg of grain/kg of K_2O. This indicates the increasing requirements of potash by the crop in the rice fields.

Bhusa yield

Though the level of N, P and K had no significant influence on bhusa yield (Table 1) the highest level of 40 kg N/ha increased the yield by 155 kg/ha over the lowest level. In contrast to this, P could increase the yield only upto 45 kg though the differences were not significant. This may probably be due to the influence of these nutrients on the vegetative growth of the crop. K levels showed practically no increase in the bhusa yield which indicate that it influenced more for the grain production than for bhusa production.

Protein

None of the levels of N, P and K could excert a significant influence on the grain and bhusa protein content (Table 2). But potash had significant effect on grain protein yield. This might be due to the significant linear effect of potash on grain yield. Maximum grain protein yield of 410.86 kg per hectare was obtained with 30 kg K_2O/ha.

Economics of fertilizer application

Bythe application of 40 kg N/ha there was a reduction in the profit over the next lower level (30 kg N/ha). With regard to phosphorus in both the higher levels (45 and 60 kg P_2O_5/ha) there was reduction in the profit compared to the

Table 1

Yield components, grain yield and bhusa yield of blackgram as influenced by graded levels of N, P and K

Treatments	No. of pods per plant	Length of pod (cm)	No. of seeds per pod	Seed yield per plant (g)	100 seed wt. (g)	Grain yield (kg/ha)	Bhusa yield (kg/ha)
20 kg N/ha	9.83	5.2	7.11	1.63	4.52	1506	2465
30 kg N/ha	10.03	5.3	7.13	1.68	4,56	1562	2563
40 kg N/ha	10.02	5.3	7.18	1.66	4.58	1558	2620
'F' test	N.S	N.S	N.S	N.S	N S	N.S	N.S
30 kg P_2O_5/ha	10.24	5.3	7.16	1.73	4.59	1579	2432
45 kg P_2O_5/ha	9.84	5.3	7.13	1.63	4.55	1524	2656
60 kg P_2O_5/ha	9.80	5.3	7 14	1.62	4.53	1523	2559
'F' test	N.S	N.S	N.S	N.S	N.S	N.S	N.S
10 kg K_2O/ha	9.04	5.1	6 98	1.44	4.45	1355	2548
20 kg K_2O/ha	9.87	5.3	7.17	1.63	4.59	1514	2549
30 kg K_2O/ha	10.97	5.4	7.28	1.90	4.62	1757	2550
'F' test	*	*	*	*	*	*	N.S
C.D (0.05)	0.571	0.09	0.118	0.136	0.115	147.3	—

Table 2

Protein content of grain and bhusa, grain protein yield and fodder protein yield of blackgram as influenced by graded levels of N, P and K

Treatments	Protein content of grain (%)	Protein content of bhusa (%)	Grain protein yield (kg/ha)	Fodder protein yield (kg/ha)
20 kg N/ha	23.36	13.58	352,18	359.57
30 kg N/ha	23.76	14.17	368.63	389.73
40 kg N/ha	23.72	14.03	368.65	392.81
'F' test	N.S	N.S	N.S	N.S
30 kg P_2O_5/ha	23.40	13.82	368.96	362.33
45 kg P_2O_5/ha	23.61	13.96	358.35	396.22
60 kg P_2O_5/ha	23.83	13.99	362.15	383.57
'F' test	N.S	N.S	N.S	N.S
10 kg K_2O/ha	23.79	14.17	320.06	387.61
20 kg K_2O/ha	23.69	13.86	358,55	379.21
30 kg K_2O/ha	23.36	13.65	410.86	375.29
'F' test	N.S	N.S	*	N.S
C D (0.05)	—	—	30.976	—

Table 3
Economics of fertilizer application/ha.

Treatment	Cost of production excluding the treatment Rs.	Additional cost of treatment Rs.	Total cost of production Rs.	Yield of grain kg/ha	Yield of bhusa kg/ha	Value of grain Rs.	Value of bhusa Rs.	Total value of grain & bhusa Rs.	Additional profit from the treatment over the lower level Rs.	Net profit Rs.
N kg/ha										
20	1677.00	92.68	1769.68	1506	2465	4518	246.50	4764.50	—	2994.80
30	1677.00	139.02	1816.02	1562	2563	4686	256.30	4942.30	177.80	3126.28
40	1677.00	185.37	1862,37	1558	2620	4764	262.00	4936.00	171.50	3073.63
P_2O_5 kg/ha										
30	1661.35	103.13	1764.48	1579	2432	4737	243.20	4980.20	—	3215.72
45	1661.35	154.69	1816.04	1524	2656	4572	265.60	4837,60	–142.59	3021.56
60	1661.35	206.25	1867.60	1523	2559	4569	255.90	4824.90	–155.30	2957.30
K_2O kg/ha										
10	1788.70	13.67	1802.37	1355	2548	4065	254.80	4319.80	—	2517.43
20	1788.70	27.33	1816.03	1514	2549	4542	254.90	4796.90	477.10	2980.87
30	1788.70	41.00	1829.70	1757	2550	5271	255.00	5526.00	1206.20	3696.30
Mean	1709.02	107.02	1816.03	1542	2549	4626	254.91	4880.91	—	3064.88

Price of 1 kg N Rs. 4.03
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. 3.00
Price of 1 kg bhusa Rs. 0.10

lowest level of 30 kg P_2O_5. (Table 3). This shows that higher levels of nitrogen or phosphorus could not help in increasing the production or net return.

In the caseof potash higher level of 20 kg K O/ha provided an additional profit of Rs. 477.10 over the lowest level and the highest level of 30 kg K_2O/ha boosted up the profit to Rs. 1206.20. While examining the net profit received from the various treatments, the maximum amount of Rs, 3696.30 was obtained from the plot which received 30 kg K_2O/ha. This shows that even with the available soil moisture and a few spring showers blackgram cultivation in rice fallows is a profitable proposition to the farmers.

Summary

The field experiment conducted during the third crop season of 1978-79 in the rice fallows of Instructional Farm, College of Agriculture, Vellayani, Trivandrum to study the effect of three levels each of nitrogen (20,30 and 40 kg ha), phosphorus (30, 45 and 60 kg/ha) and potash (10,20 and 30 kg/ha) on the yield and quality of blackgram and economics of fertilizer application to blackgram variety KM-1 revealed that the grain yield was significantly increased by increase in the level of potash. The maximum grain yield of 1757 kg/ha was recorded at 30 kq K_2O/ha. Though the levels of nutrients had no significant influence on protein content, grain protein yield was significantly increased with increase in the level of potash, giving the maximum grain protein yield of 410.86 kg/ha with 30 kg K_2O/ ha. The maximum net profit of Rs, 3696.30 was also obtained from the plot which received 30 kg K_2O/ha.

Acknowledgement

The authors are grateful to the Dean, College of Agriculture, Vellayani. Trivandrum for having provided all the facilities for this work and for the encouragement given.

സംഗ്രഹം

നെൽപ്പാടങ്ങളിൽ മൂന്നാംവിളയായി ഉഴുന്ന് (ഇനം കെ. എം. 1) കൃഷി ചെയ്യുമ്പോൾ വിളവർദ്ധനവിൽ പാക്യജനകം, ഭാവകം, ക്ഷാരം എന്നീ സസ്യപോക മൂലകങ്ങളും എത്ര മാത്രം സ്വാധീനം ചെലുത്തുന്നു എന്നറിയാൻ വെള്ളായണി കാർഷിക കോളേജിൽ നടത്തിയ പരീക്ഷണത്തിൽനിന്നും ക്ഷാരത്തിന് വിളവർദ്ധനവിൽ ഗണ്യമായ പങ്കുണ്ടെന്ന് കണ്ടു. ഹെക്ടറൊന്നിന് 30 കിലോഗ്രാം ക്ഷാരം ചേർത്തപ്പോൾ 3696.30 രൂപ അറാദായം കിട്ടുമെന്ന് ബോദ്ധ്യപ്പെട്ടു.

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{M. S. received on 9.4.81}