INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/99/01–4–297–299

Agro-Economic Expression of Mungbean Planted under Varying Levels of Phosphorus and Potash

M. ASGHAR MALIK, RANA MAJID RAHMAN, S. SAMAR ABBAS AND MUMTAZ AKHTAR CHEEMA
Department of Agronomy, University of Agriculture, Faisalabad–38040, Pakistan

ABSTRACT

Studies were undertaken to determine the effect of 0–0, 50–0, 50–50, 50–70, 50–90, 70–50, 70–70, 70–90, 90–50, 90–70 and 90–90 PK kg ha^{-1} on the yield and quality of mungbean variety NM-92. A starter dose of 25 N kg ha^{-1} was applied in all the treatments except control. The experiment was laid out using a Randomized Complete Block Design with three replications and net plot size of 2m x 7m. The results showed that maximum seed yield of 893.61 kg ha^{-1} was obtained with the application of 70–70 PK kg ha^{-1} which also gave the highest net income of Rs. 13469.41 ha^{-1} and showed 46.22% increase over the control treatment.

Key Words: Mungbean; Fertilizer; Economic yield

INTRODUCTION

Mungbean (*Vigna radiata* L.) is an important pulse of our country because of its nutritive values, digestibility and non-flatulent behaviour. It can be grown on a variety of soils and climatic conditions, as it is tolerant to drought. It is the principal and cheap source of protein (22–24%) and amino acids and can be grown twice a year during spring and autumn. The average seed yield of mungbean (413 kg ha^{-1}) is very low in our country as against the inherent potential (1295 kg ha^{-1}) of existing promising varieties (Anonymous, 1994), hence there is an urgent need to improve the weak chains of production system. Besides improved cultural practices, the modern concept of crop production lays emphasis on the judicious use of artificial fertilizer to ensure a rich crop harvest. Being a legume crop it requires less nitrogen but phosphorus and potash are considered important inputs to get high yields per unit area. Yasin (1981) observed that combined application of 50 kg P_2O_5 + 50 kg K_2O ha^{-1} gave higher seed yield than individual application of P and K. Similarly, Akhter *et al.* (1984) stated that the application of 50–50 PK kg ha^{-1} gave the higher number of fruiting branches, number of pods $plant^{-1}$, 1000-seed weight and ultimately grain yield ha^{-1} of mungbean. However, Patel *et al.* (1984) found significant increase in mungbean yield with 20 kg N and 40 kg P_2O_5 ha^{-1}. They further observed that increasing phosphorus rate showed an increase in the number of pods $plant^{-1}$ and 1000-seed weight. While Ghafoor (1985) stated that maximum protein contents were obtained with the application of 25 + 100 kg N and P ha^{-1} to mungbean. However, Arya *et al.* (1988) reported that application of 25–75 kg P_2O_5 to *Vigna radiata* increased the seed yield, protein content and P uptake. Whereas, Ahmed (1989) reported that a combination of 25–75–75 kg ha^{-1} of NPK was the most suitable and economical dose of fertilizer for enhancing the seed yield of mungbean. While Rajput *et al.* (1992) concluded that NP fertilization to mung increased grain yield over control, where a fertilizer level of 34–67 kg NP ha^{-1} gave the grain yield of 802.50 kg ha^{-1}.

The present project was, therefore, envisaged to determine a suitable level of P and K for realizing the maximum yield potential and quality of mungbean under irrigated condition at Faisalabad.

MATERIALS AND METHODS

An experiment to determine the effect of varying levels of P and K on the yield and quality of mungbean was conducted at Post Graduate Agricultural Research Station (PARS), University of Agriculture, Faisalabad during 1996. Replicated three times, the experiment was laid out in a Randomized Complete Block Design with net plot size of 2m x 7m on a soil having N, available P and K as 0.05%, 8 ppm and 140 ppm, respectively. Mung variety NM-92 was sown on March 4, 1996 in 40 cm spaced rows with a single row hand drill using seed rate of 25 kg ha^{-1}. The treatments were 0–0, 50–0, 50–50, 50–70, 50–90, 70–50, 70–70, 70–90, 90–50, 90–70 and 90–90 kg ha^{-1} of PK. Besides, 25 kg N ha^{-1} was applied in all the treatments except control, as a starter dose. Whole of fertilizers (NPK) were side drilled at sowing time using urea, single super phosphate and sulphate of potash as their sources. All other cultural practices were kept normal and uniform for all the treatments.

The crop was harvested in the last week of May and observations were recorded on different plant parameters like number of fruiting branches $plant^{-1}$, number of pods $plant^{-1}$, number of seeds pod^{-1}, 1000-

seed weight, seed yield and protein content using standard procedures. For protein content 500 seeds from each treatment were taken and ground. The digestion was done by Gunning and Hibbards method of H_2SO_4 and distillation was made with micro kjeldhal apparatus (Jackson, 1962). Thereafter, protein content in the seed was calculated by multiplying total nitrogen in the seed with constant factor 5.71 (Peter *et al.*, 1980). The recorded data were analyzed statistically by using Fisher's Analysis of Variance Techniques and LSD test was applied at 5% probability level to compare the differences among treatment means (Steel & Torrie, 1984). Economic analysis was also exercised to know the economic usefulness of the treatments according to CIMMYT (1988).

RESULTS AND DISCUSSION

The number of fruiting branches plant^{-1} was significantly increased by the fertilizer use. The maximum productive branches plant^{-1} (11.83) were obtained with the application of 90–50 kg ha^{-1} PK which differed significantly from rest of all the treatments (Table I). The minimum number of pod bearing branches (6.90 plant^{-1}) was noted in case of control where no fertilizer application was made. The production of significantly higher number of fruit bearing branches in 90–50 kg ha^{-1} PK could be because of higher level of inputs (P and K) leading to availability of adequate amount of these essential elements. Almost similar results were reported by Ghafoor (1985). Number of pods plant^{-1} were highest in case of 70–70 kg ha^{-1} PK treatment. Whereas, minimum number of pods (7.07) plant^{-1} were noted in case of control treatment (Table I). The higher level of pods bearing in 70–70 kg ha^{-1} PK was probably because of balanced form of essential nutrients i.e. P and K ensuring better utilization of these elements by the plants. Rajput (1992) also reported similar results. Similarly the maximum number of seeds pod^{-1} (12.80) were produced where 70–70 kg ha^{-1} PK were applied. Whereas, the minimum number of seeds per pod (8.67) was noted in case of control where no fertilizer was applied. 1000-seed weight was also highest in case of 70–70 kg ha^{-1} PK which differed significantly from rest of all the treatments except 70–90 kg ha^{-1} PK where both were found statistically alike. The results are partly supported by that of Rajput (1992).

Fertilizer applications had also significant effect on seed yield (Table I). The treatment 70–70 kg ha^{-1} PK resulted in the production of maximum seed yield (893.61 kg ha^{-1}) and it was significantly higher than that of control, 50–0 and 50–50 kg ha^{-1} PK but was statistically at par with rest of the treatments under study. These results are in line with those of Ghafoor (1985) and Rajput *et al.* (1992). Data further reveal that application of P and K significantly affected seed protein contents. Maximum seed protein content (23.92%) was recorded with the application of 90–90 kg ha^{-1} PK which, however, did not significantly differ from that of 70–70 kg ha^{-1} PK.

Table I. Yield components, seed yield and quality of mungbean as influenced by different P & K applications.

Treatments (kg ha^{-1}) P	K	Number of fruiting branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	1000-seed weight (g)	Seed yield (kg ha^{-1})	Protein content (%)
0	0	6.90 f	7.07 d	8.67 d	50.50 f	602.05 c	19.42 g
50	0	7.33 ef	8.87 bc	9.60 cd	50.70 ef	684.56 bc	19.75 fg
50	50	7.97 ef	8.87 bc	10.33 bcd	51.30 d	725.80 bc	19.87 efg
50	70	8.02 ef	9.40 abc	10.93 abcd	51.80 c	755.98 ab	20.23 efg
50	90	8.27 de	9.60 ab	11.20 abc	52.20 c	775.84 ab	20.85 de
70	50	8.47 cde	9.63 ab	10.33 bcd	51.10 de	769.61 ab	20.67 ef
70	70	10.33 b	10.43 a	12.80 a	53.60 a	893.61 a	23.17 ab
70	90	9.33 bcd	9.67 ab	12.07 ab	53.30 a	870.07 a	21.96 c
90	50	11.83 a	8.60 bc	10.00 bcd	51.30 d	821.58 ab	21.80 cd
90	70	9.67 bc	8.33 c	11.20 abc	50.80 ef	785.36 ab	22.44 bc
90	90	9.50 bcd	8.47 bc	12.33 ab	52.70 b	785.39 ab	23.92 a

ECONOMIC ANALYSIS

The data regarding economic aspects packed in Table II show that treatment 70–70 kg ha^{-1} PK gave the highest net income of Rs. 13469.41 ha^{-1} which showed 46.22% increase over the control treatment.

Table II. Economic analysis

Treatment (kg ha^{-1}) P	K	Grain yield (kg ha^{-1})	Gross income (Rs. ha^{-1})	Total expenditure (Rs. ha^{-1})	Net income (Rs. ha^{-1})	%Increase over control
0	0	602.05	15051.25	5840.00	9211.25	-
50	0	684.55	17113.98	6928.88	10185.1	10.57
50	50	725.80	18145.00	8004.88	10140.12	10.08
50	70	755.98	18999.50	8435.28	10464.22	13.60
70	90	775.84	19396.00	8865.68	10530.32	14.32
70	50	769.61	19240.25	8440.44	10799.81	17.25
70	70	893.61	22340.25	8870.84	13469.41	46.22
70	90	870.07	21751.75	9301.24	12450.51	35.16
90	50	821.58	20539.50	8876	11663.50	26.62
90	70	785.36	19634.00	9306.4	10327.60	12.12
90	90	785.39	19634.75	9736.80	9897.95	7.46

Foot Note:

a. Mungbean Rate/40kg = Rs. 1000

b. Fertilizer Rates

i. Urea: Rs. 344 bag^{-1} ii. S.S.P.: Rs. 196 bag^{-1} iii. S.O.P.: Rs. 538 bag^{-1}

c. Fertilizer application charges: 2 Men days @ Rs. 50/Man/Day= Rs. 100

CONCLUSION

From the present studies, it can be concluded that a combination of 70–70 PK kg ha^{-1} could be suitable under the given situation for drawing maximum net benefits.

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(Received 10 July 1999; Accepted 08 October 1999)