18-19

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IMPACT OF NPK FERTILIZERS ON MUSTARD (*Brassica juncea* coss)

1. Growth parameters.

S. F. Elahi, A H. M. Ahmed,* R. Mandal, and M. M. Hussain.
Department of Soil Science, University of Dhaka
* Department of Chemistry, University of Dhaka.

Abstract

Growth component of mustard plant (*Brassica juncea* coss) have been studied from a NPK field experiment. Addition of nitrogen significantly increased the height, number of branches and pod per plant. Phosphorus also had a similar positive effect but to a smaller extent. Potassium had, in contrast, decidedly negative effect for all the parameters studied. Correlation study revealed that formation of pod was directly influenced by the number of branch which was again dependent on the height of the plant. Maturation of the mustard seed was delayed by nitrogen while enhanced by phosphorus and potassium application

Introduction

Mustard is the most important oil seed crop in Bangladesh. By far the maximum acreage of rabi crops is under mustard. Better yield always results from better growth. Predeterminations and predefination of factors regarding the growth and yield, the final yield most often is reflected in the development of the tender plants from the very begining. Depending on the quality of growth during early stages efforts could be taken to improve the product by amendmending the soil physical and chemical characteristics to induce optimum growth. Such amendments have been shown to be effective by well known practices of split application of fertilizers and frequent application of irrigation. Identification of the need to improve the growth factors is most important in the early stages of growth. Therefore, a field experiment was conducted with NPK fertilizers to see their effects on the growth components of mustard plants.

Materials and Method

An area, belonged to Gopalpur series, was selected at Amla Experimental Station, Kustia managed by Bangladesh Water Development Board. The land was cultivated by tractor once while for all other agricultural operations viz horrowing, weeding, harvesting etc. usual traditional methods were followed. The land was devided into two blocks separated by space of 5' all around. Each block being again devided to four rows by 4' boundary space. Every row was further subdivi-

ded into 16 plots by 3' boundary space. The size of indevidual plot was 9' x 12'. There were all together 128 plots.

Four rates of each of N (urea), P (TSP) and K (MP) at the rate of 0, 33.6, 67.2 and 134.4 kg/ha as N, P and K were applied. The experiment was set up according to a 4^3 partially confounded factorial design with two replications.

After preparation of land the plots received NPK fertilizers as per treatment. Following fertilization 10g of *Brassica juncia* coss (locally called Tori-7) robust seeds was sown in each pot.

Height of the plant after 21, 35 and 56 days of growth, number of branches and pod per plant at maturity were taken into account. Five plant samples were collected from each plot at a random fashson.

Results and Discussion

The effect of NPK fertilizers on various growth components of mustard plants have been studied (Tables 1-4).

Nitrogen fertilization had a significant effect on height of the plant at 21, 35 and 56 days of growth (Table 1). In the initial stage of growth, the effect was quite subdued, though gradually. It can be observed that in any block of nitrogen treatment with phosphorus or potassium remaining constant, increasing doses of nitrogen produced an increased height. Maples and Keogh (1970) from a field trial experiment reported that fertilization of soybean with nitrogenous and phosphatic fertilizers produced increased vegetative growth. Puntamkar and Bathmal (1967) also recorded that application of nitrogen and phosphorus together with potassium resulted better growth of groundnut. Of the three fertilizers, phosphorus had the most significant effect on height of mustard plants at 35 days of growth. Sen and Lahiri (1960) and Mazzani *et al.* (1968) found that application of phosphorus promoted luxuriant growth of sesame and groundnut. Potassium thoroughout the growth stages resulted a depressing effect on height. The interactions of NK, PK and NP produced insignificant results.

Time as a factor of growth for mustard plants was assessed. In most of the cases, supply of nitrogen resulted uniform growth. In the initial stages of growth, no such response was recorded. This is probably due to the presence of available nitrogen enough to promote normal growth of plants resulting no marked response to added nitrogen. The demand, however, from applied phosphorus was significant in the middle stage of growth.

Nitrogen supply significantly increased the number of branches in plant (Table 2). The highest dose of nitrogen (134.4 kg/ha) produced the highest number, 38/plant. Efficiency of nitrogen was acclerated by the presence of phosphorus. These results are in good agreement with the findings of other investigators (Sen and Lahiri, 1960 ; Puntamkar and Bathmal 1967 ; Maples and Keogh, 1970). Added potassium failed to promote the formation of branches.

Pod, a part of growth component, formation was significantly increased by nitrogen and decreased by potassium fertilization (Table 2). However, no such significant effect was recorded from phosphorus additon. Increase in nitrogen at a constant P or K level, increased the pod numbers about five to ten time than control. Increased number of pod formation

Table 1. Height of mustard plants (cm/plant) measured at different growth intervals as influenced by NPK fertilizers.

Treat-ments	N_0			N_1			N_2			N_3		
	21 days	35 dsys	56 days	21 days	35 days	56 days	21 days	33 days	56 days	21 days	35 days	56 days
P_0K_0	13.0	25.1	40.0	13.6	39.1	46.0	11.4	31.8	64.5	13.6	26.7	61.8
P_0K_1	11.1	21.4	42.0	14.5	30.3	56.3	14.7	22.4	46.1	12.0	22.7	45 5
P_0K_2	12.9	20.4	38.0	12.5	25.6	52.0	14.3	38.6	59.6	11.0	22 2	53.5
P_0K_3	12.6	24.5	67.0	14.4	22.2	45.4	12.2	28.6	47.1	18 4	20.2	57.5
P_1K_0	13.7	20.8	62.0	14.0	40.2	54.4	13.5	31.8	59.5	16.2	33.2	65.2
P_1K_1	11.4	20.8	46.0	15.2	27.1	50.4	12.8	28.3	65.0	16.1	37.2	60.3
P_1K_2	12.1	25.1	42 0	13.7	23.6	43.3	15.2	31.7	57.2	13.5	34.5	64.4
P_1K_3	13.5	27.4	36.0	15.5	30.7	50.1	15.6	34.4	44.3	13.4	25.3	66 5
P_2K_0	13.7	22.0	36.0	14.3	33.5	62.5	14.7	34 3	61.0	15.1	29.6	72.6
P_2K_1	12.4	29.0	45.0	14.3	33.1	64 7	18.6	37.3	71.6	15.1	36.2	64.5
P_2K_2	12.7	24.1	42.0	15.7	28.7	46.0	17.7	31.5	61.5	13.0	40.6	65.5
P_2K_3	13.3	24.7	45.0	15 6	30.7	49.0	10.8	33.9	56.8	14.5	30.2	70.6
P_3K_0	12 5	25.9	39.0	14.2	36.2	49.5	1 6.1	46 1	60.6	12.7	32.9	70.1
P_2K_1	11.9	22 2	47.0	16.7	32.3	54.2	15.6	37.5	66.6	18.0	50.7	69.0
P_3K_2	13.2	18.0	36.0	16.6	36.2	62.3	14.9	41.8	62.5	14.0	26.9	58.5
P_3K_3	12.7	26.4	48.0	11.5	34.9	46.5	15.7	40.3	68.5	16.9	39.4	73.0

CD at 5% level=5.21, 1876 and 25.74 for 21, 35 and 56 days respectivly.

0. 1. 2 represents 0, 33.6, 67.2 and 134,4 kg/ha respectivaly,

Table 2. Number of branches and pod per mustard plant at maturity as influenced by NPK fertilizers.

Treatments	N_0		N_1		N_2		N_3	
	Branch	Pod	Branch	Pod	Branch	Pod	Branch	Pod
P_0K_0	15.0	60.8	17.5	45.4	22.0	101.8	19.0	61.2
P_0K_1	12.0	42.0	16.5	35.2	14.5	44.5	18.5	83.3
P_0K_2	14.5	31.4	22.5	58.8	15.5	89.8	19.0	43.2
P_0K_3	12.5	25.4	14.0	26.6	17.0	43.7	14.5	27.2
P_1K_0	14.0	37.2	13.0	35.9	18.5	68.2	23.5	174.0
P_1K_1	15.5	43.8	19.0	60.8	18.5	93.5	18.5	77.7
P_1K_2	18.5	26.2	13.5	53.8	16 5	49.0	20.0	63.7
P_1K_3	12.0	23.9	14.5	38.4	16 0	40.2	15.5	80.6
P_2K_0	9.5	18.2	13.0	26.2	16.0	64.0	22.0	128 6
P_2K_1	8.0	29.7	18.0	61.3	17.0	95.4	38.5	136.0
P_2K_2	16 5	57.5	12 5	39.4	19.5	40.0	28.5	92.7
P_2K_3	11.5	26.0	12.5	42.3	15.5	37.9	21.0	65.0
P_3K_0	9.5	14.2	10.0	26.3	18.0	94.3	36.0	142.6
P_3K_1	8.0	23.0	12.5	23.4	18.0	55.4	20.5	97.5
P_3K_2	17.5	35.3	17.0	63.7	17.0	64.6	17.5	81.0
P_3K_3	11.5	26.8	11.5	34.1	13.5	36 9	25.0	130.4

CD at 5% level=12.54 and 23.74 for branches and pod respectively
Symbol same as Table 1

Table 4. Values of the correlation coefficient between various parameters of mustard plant.

Variable	Correlation matrix				
	Branches/ plant	Pods/plant	Height at 56 days	Height at 35 days	Height at 21 days
Branches/plant	1.000				
Pods/plant	0.215[1]	1.000			
Height at 56 days	-0.071	0.371[2]	1.000		
Height at 35 days	-0.010	0.418[3]	0 420[3]	1.000	
Height at 21 days	-0.035	0.123	0 076	0 069	1.000

1, 2, 3 denotes level of significance at probability level 0.1, 0.01, 0.001 respectively.

Table 3. Days of maturity of mustard plants as influenced by NPK fertilizers.

Treatments	N_0	N_1	N_2	N_3
P_0K_0	79	78	79	78
P_0K_1	77	77	80	77
P_0K_2	76	78	79	79
P_0K_3	73	75	77	79
P_1K_0	78	76	76	82
P_1K_1	78	78	77	79
P_1K_2	76	77	77	80
P_1K_3	77	76	78	81
P_2K_0	77	78	78	82
P_2K_1	76	78	79	80
P_2K_2	76	77	80	81
P_2K_3	77	75	77	80
P_3K_0	77	76	78	83
P_3K_1	78	75	78	79
P_3K_2	77	78	77	81
P_3K_3	76	76	78	81

CD at 5% level=5.28

Symbol same as Table 1.

due to nitrogen addition was also demonstrated by Singh *et al.* (1960). With regard to interactions, all of NP, KP and NK were significant at 1% level. Lower levels of phosphorus (33.6, 67.2 kg/ha) with nitrogen resulted a negative effect. The effect, however, was offset slightly at 134.4 kg P/ha. This might be due to interaction of the fertilizer elements.

Maturation of the mustard seeds was significantly delayed by nitrogen application (Table 3). The average date of maturity at 134.4 kg N/ha level was 80-83 days which was reduced to 76-77 days in the absence of nitrogen. P and K stimulated the early maturity of seeds though not significantly. This supposes that early maturity may be beneficial to offset any detrimental change in weather.

Correlation study of each of the growth parameters with the rest (Table 4) suggests that height at 21 days and number branches/plant were not significantly correlated with any of the growth parameters. However, height at 35 and 56 days were significantly correlated at 0.1-1% level with all the factors except branches. Pod formation was also significantly correlated with all the factors but number of branches. Significant correlation with height suggests that increase in height produced larger number of pods. Weight of grains per plant showed a direct significant bearing with height and number of pods per plant.

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