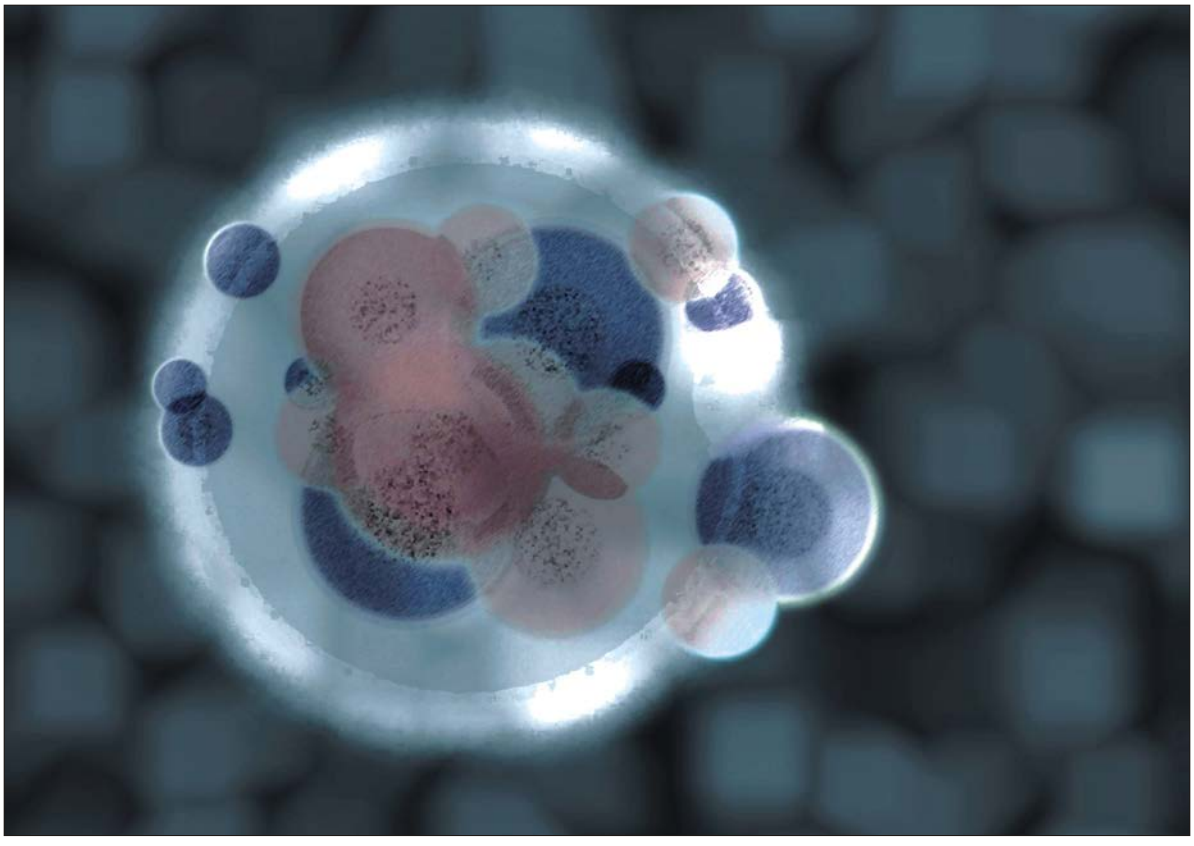

Journal of Biological Sciences

ISSN 1727-3048

science alert

ANSInet
an open access publisher
http://ansinet.com

OnLine Journal of Biological Sciences 1 (1): 40-42, 2001

Effect of Increasing Levels of Phosphorus and Seed Rate on the Economic Yield of Maize

M. Qasim, Himayatullah and M. Subhan
Faculty of Agriculture, Gomal University, D.I. Khan, Pakistan

Abstract: Number of cobs per plot, 1000-grain weight and grain yield were significantly effected by various levels of phosphorus and seed rate. Maximum number of cobs per plot (72.58), 1000-grain weight (334.08 g) and grain yield (3154.43 g) were obtained from plots receiving P_2O_5 at 200 kg ha^{-1}. Similarly, seed rate at 60 kg ha^{-1} gave comparatively higher economic yield. Hence P_2O_5 at 200 kg ha^{-1} and seed rate at 60 kg ha^{-1} proved to be the best fertilizer and seed rate among all the treatments.

Key words: P levels, seed rate, economic yield

Introduction

Maize (*Zea mays* L.) belongs to the family Gramineae and is an important cereal crop. Its cultivation is common all over the world for food, forage, industrial and other purposes. In Pakistan, it occupies a unique position both in production and consumption.

Agro-climatic conditions in Pakistan are of such types that this crop can be planted twice a year as spring and autumn crop.

Hence it occupies a key place in the existing cropping system because it is a short duration crop and provides more economic return to the growers.

Maize crop absorbs large quantities of nutrients from soil during its growth. The high yielding varieties are more responsive to fertilizers than local varieties and their yield potential can be achieved by judicious use of fertilizers.

Phosphorus, one of the major nutrient element, plays an important role in plant nutrition. It has been reported that application of 150 kg P_2O_5 ha^{-1} produced maximum grain yield, increased plant height, total dry matter and stalk yield (Shah *et al.*, 1971). Similarly, highly significant increase in number of grains per cob, 1000-grain weight, total biological yield and harvest index were found where N and P were applied at the rate of 150 and 200 kg ha^{-1}, respectively (Ahmad, 1989). Hooker *et al.* (1983) revealed that maximum grain yield of maize crop was constantly maintained with the application of 120 kg N ha^{-1}, P at the rate of 180 kg ha^{-1} and using seed rate of 50 kg ha^{-1}. Increase in yield of corn has been reported where P_2O_5 was used at the rate of 180 kg ha^{-1} and seed rate at the rate of 60 kg ha^{-1}.

Materials and Methods

An experiment to study the effect of increasing levels of phosphorus and seed rate on the economic yield of maize genotype "Kisan-90" was carried out at Agricultural Research Station Serai Naurang, District Lakki Marwat in a randomized complete block design using a net plot size of 5×3.6 m. Maize crop was sown in 2nd week of July. The soil of the experimental area was analysed for its physio-chemical characteristics before sowing of maize crop according to the methods suggested by Page *et al.* (1982) which are presented in Table 1. All other practices such as hoeing, weeding etc were kept constant and uniform for all treatments.

The experimental treatments were as under:

1. Seed Rate (kg ha^{-1})
   - S1 = 30
   - S2 = 40
   - S3 = 50
   - S4 = 60
2. P_2O_5 Levels (kg ha^{-1})
   - T1 = 0
   - T2 = 50
   - T3 = 100
   - T4 = 150
   - T5 = 200
3. N = 90 kg ha^{-1} as a basal dose

Data on the following parameters were recorded

1. Plants Density per plot
2. Number of cobs per plot
3. 1000 grain weight (g)
4. Grain yield (kg)

The data collected were analysed statistically by using analysis of variance techniques at 5% probability level (Steel and Torrie, 1980).

Table 1: Physical and Chemical Analysis of the Soil

Properties	Units	Values
Clay	%	41.80
Silt	%	32.0
Sand	%	26.20
Textural Class	-	Clay
Organic Matter	%	0.54
pH	-	8.40
EC_e	dSm/cm	4.20
CO_3	meq/L	Nil
HCO_3	meq/L	3.40
Ca + Mg	meq/L	7.50
Total N	%	0.05
Available P	mg/kg	9.50
Available K	mg/kg	225.oo
$CaCO_3$	%	14.50

Results and Discussion

Plants Density: Data in respect of plants density per plot as influenced by different seed rates and P levels are presented in Table 2. It is clear from the data that the number of plants per plot were significantly effected by the different seed rates and P levels. Maximum number of plants per plot (118.66) were recorded in control plot while minimum were produced (97.00) in plot receiving P_2O_5 at the rate of 150 kg ha^{-1}. Among the seed rate treatments, the maximum number of plants (113.00) were produced in

Table 2: Number of Plants per plot of maize as Affected by Different P levels

	Seed Rate (kg ha^{-1})				
P_2O_5 (kg ha^{-1})	30	40	50	60	Mean
Control	118.66 B	115.66 B	110.00 C	130.33 A	118.66 A
50	78.66 K	92.33 GHI	116.00 B	129.33 A	104.08 B
100	111.66 C	89.00 IJ	97.33 EF	91.33 HI	97.33 C
150	94.66 FGH	95.67 EFG	99.33 E	98.33 EF	97.00 C
200	85.66 J	104.66 J	99.66 E	115.70 B	101.41 B
Mean	97.86 C	99.46 C	104.46 B	113.00 A	

Means followed by same letters are non significant at 5% level of probability

Table 3: Number of Cobs per plot of maize as Affected by Different P Levels

	Seed Rate (kg ha^{-1})				
P_2O_5 (kg ha^{-1})	30	40	50	60	Mean
Control	56.66 I	56.33 IJ	63.33 GH	57.33 I	58.41 C
50	52.32 J	76.33 BC	57.33 I	56.66 I	60.66 C
100	71.33 DE	56.33 J	65.66 G	76.66 B	67.60 B
150	70.33 EF	61.33 H	75.33 BCD	76.33 BC	70.83 AB
200	66.66 FG	70.00 EF	72.33 CDE	81.33 A	72.58 A
Mean	63.46 B	64.04 B	66.80 AB	69.66 A	

Means followed by same letters are non significant at 5% level of probability

Table 4: 1000-grain Weight of maize (g) as Affected by Different P levels

	Seed Rate (kg ha^{-1})				
P_2O_5 (kg ha^{-1})	30	40	50	60	Mean
Control	83.66 JK	285.66 J	276.66 L	318.33 FG	291.08 E
50	269.33 M	301.33 H	346.00 D	280.66 KL	299.33 D
100	316.66 G	270.33 M	327.66 E	321.66 F	309.08 C
150	303.33 H	353.66 C	261.33 N	390.66 A	327.25 B
200	272.33 M	296.33 I	376.33 B	391.33 A	334.08 A
Mean	289.06 D	301.46 C	317.60 B	340.53 A	

Means followed by same letters are non significant at 5% level of probability

Table 5: Grain Yield (kg ha$^{-1)}$ of maize as Affected by Different P levels

	Seed Rate (kg ha^{-1})				
P_2O_5 (kg ha^{-1})	30	40	50	60	Mean
Control	2502.00	1940.44	2502.00	2594.66	2384.77 I
50	2835.60	2946.80	3076.66	2946.80	2951.46 D
100	2618.76	3187.73	3738.17	2668.80	3053.36 C
150	2965.33	3002.66	2780.24	3636.24	3096.06 B
200	2631.80	3465.46	2881.94	3638.53	3158.43 A
Mean	2710.69 D	2908.62 C	2995.75 B	3097.20	

Means followed by same letters are non significant at 5% level of probability

plot where seed rate was used at the rate of 60 kg ha^{-1} followed by the treatment receiving 50 kg of seed ha^{-1} while minimum number of plants (97.86) were recorded where 30 kg ha^{-1} seed was applied.

The interaction between the fertilizer and seed rates was found significant. It showed that maximum number of plants per plot (130.33) were obtained where 60 kg seed ha^{-1} and no fertilizer was used. The results support the findings of Paris (1993) who reported that addition of plant nutrients to the soil had little influence on the number of plants of maize except where soil nutrients status was very low.

Number of Cobs per Plot: Number of cobs per unit area is the major yield component of maize which contributes considerably to the final yield. The data presented in Table 3 indicated that the number of cobs per plot were significantly influenced by different levels of P as well as seed rates. Fertilizer application at the rate of 200 kg ha^{-1} produced significantly higher number of cobs per plot (72.58) than all other treatments. Similarly maize seed grown at the rate of 60 kg ha^{-1} produced the maximum number of cobs per plot (69.66) while the lower number of (58.41) cobs per plot were obtained from control plot. The interaction between fertilizer and seed rate was also statistically significant. Higher number of cobs per plot were obtained where P fertilizer at the rate of 200 kg ha^{-1} and seed rate of 60 kg ha^{-1} were used. Hassan (1991) also found that application of P fertilizer to maize crop significantly increased number of cobs per plot when such fertilizer was applied to the crop at the rate of 150 kg ha^{-1}.

1000-grain weight: 1000 grain weight of maize as affected by various levels of P fertilizer and seed rates are presented in Table 4. It is obvious from the table that the effect of the fertilizer levels and seed rates was significant with regard to 1000 grain weight. Plots supplied with 200 kg of P_2O_5 ha^{-1} recorded the maximum 1000-grain weight (334.08 g) than the rest of the treatments.

Similarly, maize seed sown at the rate of 60 kg ha^{-1}

recorded significantly higher 1000-grain weight (340.53) followed by 50 kg ha^{-1} seed rate (317.60 g). The interaction between levels of P fertilizers and seed rate was also found significant. The highest seed weight of 391.33 g was produced by application of P at the rate of 200 kg ha^{-1} and seed rate of 60 kg ha^{-1}. These results are in line with the findings of Ahmad (1989) who found maximum 1000 grain weight of maize crop where N and P were applied at the rate of 150 and 200 kg ha^{-1}, respectively.

Grain Yield: The grain yield is a function of the interaction effect of the yield components which are influenced differently by seed rate and fertilizer level etc. The data presented in Table 5 showed that the grain yield was influenced significantly by various levels of P_2O_5 and seed rate.

The maximum grain yield of 3158.43 was produced by the plot where maximum dose of P_2O_5 (200 kg ha^{-1}) was applied followed by the plot receiving 150 kg P_2O_5 ha^{-1} while the minimum grain yield was obtained from control plot (2384.77 kg ha^{-1}). Among the seed rate treatments, the maximum grain yield of (3097.20 kg) was recorded in the plot where 60 kg ha^{-1} seed was used followed by the treatment receiving 50 kg ha^{-1} seed rate. The interaction between P fertilizer levels and seed rate was found non significant. However, it is evident from the table that maximum grain yield was obtained where P was applied at the rate of 200 kg ha^{-1} and seed rate of 60 kg ha^{-1} as compared to the rest of the treatments. Similar results have been reported by Hooker *et al.* (1983) who revealed that maximum grain yield of maize crop was maintained with the application of 120 kg N and 180 kg P ha^{-1} and using 60 kg of seed ha^{-1}.

From the aforementioned results and discussions it could be concluded that application of 200 kg P and 60 kg of seed ha^{-1} would be the best suited dose of P fertilizer and seed rate for obtaining better yield of maize crop under the prevailing agro-climatic conditions of Lakki Marwat.

References

Ahmad, I., 1989. The effect of P application in different proportions with N on the growth and yield of maize. M.Sc. Thesis, Department of Agronomy, Agriculture University, Faisalabad.

Hassan, A., 1991. Effect of different P application on the growth and yield behaviour of maize. M.Sc. Thesis, Department of Agronomy, Agriculture University of Faisalabad.

Hooker, M.L., R.E. Gwin, G.M. Herron and P. Gallagher, 1983. Effects of long-term, annual applications of N and P on corn grain yields and soil chemical properties. Agron. J., 75: 94-99.

Page, A.L., R.H. Miller and D.R. Keeney, 1982. Methods of Soil Analysis Part 2: Chemical and Microbiological Properties. 2nd Edn., Am. Soc. Agronomy, Madison.

Paris, P., 1993. Fertilizer and yield improvement in Mediterranean Italy. Faculty of Agriculture, Piacenze.

Shah, V.H., O.P. Gautam and A. Singh, 1971. Comparative response of an open-pollinated variety and a double-cross maize hybrid of N, P and K. Indian J. Agric. Sci., 41: 932-937.

Steel, S.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics. McGraw Hill Book Co., New York, pp: 289.