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Genotypic Response of Maize Hybrids to NP Applications

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ABSTRACT

The effect of four NP rates (0-0, 110-85,160-135 & 210-185 kg ha^{-1}) on grain yield of two maize hybrids (double cross Cargil-922 (C-922) and Cargil-707 (C-707) was studied during the kharif seasons of 1998 and 1999. All the fertilizer rates significantly increased the grain yield, 1000-grain weight, grain weight and grain number per ear of both the hybrids over control. Hybrid C-707 produced significantly the highest grain yield of 5720 kg ha^{-1} when fertilized @ 210 - 185 kg NP ha^{-1} followed by 160-135 kg NP ha^{-1} (4664 kg ha^{-1}).

Key Words: Genotypic response; Maize; NP application

INTRODUCTION

Among cereals, maize is an important food and feed crop of the country and ranks third after wheat and rice in the world. Because of its variable use in the agro-industries, it is recognized as a leading commercial crop of great agro-economic value. In Pakistan, Maize is grown on an area of 0.97 mha with total annual production of 1.73 million tonnes of grain giving an average yield of 1810 kg ha^{-1} (Government of Pakistan, 2003). This is tremendously lower than the yields realized in other countries of the world. There are many reasons of low productivity. Among them mismanagement of plant nutrition, agronomic practices and proper crop varieties are considered to be the major ones.

There is stagnation in crop yield especially in intensive cropping regions where due to imbalanced use of fertilizers and continuous growing of crops (exhaustive) several nutrients have become deficient (Mahmood *et al*., 1999). Overall fertilizer use in Pakistan is quite low and to be intensified manifold to reach the level of developed countries. A number of soil fertility surveys have revealed that among the essential nutrient elements like N, P, K, S, Mg etc, our soils are deficient 100% in N and upto 90% in P (Anonymous, 2000). Therefore, the proper management of these two nutrient elements is very important for good crop production. N is the motor of plant growth and makes up 1 to 4% of dry matter of the plant (Anonymous, 2000). It enhances grain yield due to its active role in chlorophyll activity (Belger *et al*., 1978).

Phosphorus plays a key role in energy transfer and is thus essential for photosynthesis and other chemico-physiological processes in plants (Wasiullah *et al.*, 1995; Anonymous, 2000). It also enhances grain yield of the crop as it renders improvement and formation of grain (Anonymous, 2000).

According to Ahmad (1989), NP application increased the grain yield and yield attributes of maize to a significant level of application in appropriate combination. The present study was, therefore, planned to evaluate the genotypic response of hybrid maize to different NP combinations under the irrigated conditions at Faisalabad–Pakistan.

MATERIALS AND METHODS

The present study was conducted on a clay loam soil having pH value of 7.4, 0.044% N, 4.90 ppm available phosphorus and 130 ppm exchangeable potassium at tehsil Sammundri, Distt. Faisalabad. The experiment was replicated thrice in a randomized complete block design (RCBD) with split plot arrangement. The genotypes were randomized in main plots and fertilizer rates in sub plots. The treatments comprised two maize hybrids (C-922 and C-707) and four rates of NP fertilizers (0 - 0, 110-85, 160-135, and 210-185 kg NP ha^{-1}). Sowing was done with the help of a single row hand drill in 70 cm spaced rows. Thinning was done at three leaves stage with plant-to-plant distance of 20 cm. All P and half of the total N was applied at sowing. The remaining N was applied with second irrigation. At final harvest, the central two rows from each plot were harvested to record observations on yield and yield attributes. The data collected were subjected to analysis of variance technique and the treatments means were compared by using Duncan's New Multiple Range (DMR) test at 0.05% P (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Grain yield. All fertilizer rates increased the grain yield with maximum of 5658 kg ha^{-1} with the application of NP @ 210 + 185 kg ha^{-1} followed by 160 - 135 kg NP ha^{-1}, which yielded 4587 kg ha^{-1} against 1085 kg ha^{-1} in plot

where no fertilizer was applied (Table I). The increase in grain yield with the application of NP was attributed to increase in yield components like grain number per ear, grain weight per ear and 1000-grain weight (Table I). These findings are in line with those of Sarwar (1985), Sabir *et al*. (1987), Khalil *et al.* (1988) and Ahmad (1989) who reported increase in grain with the application of NP fertilizer. Both the hybrids showed a similar response to different NP rates showing there by almost similar genetic potential.

There was non-significant difference between the two hybrids for the grain number per ear and grain weight per ear

Table I. Grain yield and yield components as affected by the different NP rates

Treatments	Grain Yields (GYH) (Kg ha^{-1})	Grain Numbers ear $^{-1}$ (GNE)	Grain Weight ear^{-1} (GWE)	1000 Grain weight (g)
Hybrids				
Cargil-922	3617^{NS}	384^{NS}	82^{NS}	211^{NS}
Cargil-707	3563	392	79	206
NP rates (Kg ha $^{-1}$)				
0-0	1085d	213d	33d	172d
110-85	2820c	396c	74c	194c
160-135	4587b	453b	101b	219b
210-185	5658a	509a	117a	232a
LSD5%	815	46	11	10

* = Any two means a column not sharing a letter differ significantly at p=0.05

except for 1000-grain weight. Hybrid C-922 produced significantly heavier grains C-707. The variable genetic potential of the hybrids in relation to grain development probably caused such results. These results corroborate the findings of those of Biagovestra (1981) and Hanif (1990).

Hybrid x NP fertilizer interaction was significant for grain yield, grain per ear and 1000 grain weight (Table II). Both the hybrids C-707 and C-922 produced significantly highest grain yield of 5720 and 5590 kg ha^{-1} at NP level of 210-185 kg ha^{-1}. The same was true for 1000-grain weight per ear.

Table II. Interactive effects of Hybrids x NP rates on grain yield and yield components

Hybrids x NP rates	Grain yield (Kg ha^{-1})	1000-grain weight (g)	Grain weight ear^{-1} (g)
C-922 X 0-0	1160 e	183 e	36 e
C-922 X 1105-85	3189 c	207 d	82 c
C-922 X 160-135	4503 b	217 cd	97 b
C-922 X 210-185	5590 a	232 ab	115 a
C-922 X 0-0	994 e	161 f	31 e
C-922 X 110-85	2445 d	181 e	63 d
C-922 X 160-135	4664 b	222 bc	102 b
C-922 X 210-185	5720 a	236 a	122 a
LSD5%	870	12	9

* = Any two means in a column not sharing a letter differ significantly at P=0.05.

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