EFFECT OF VARIOUS NITROGEN LEVELS ON GROWTH, YIELD AND QUALITY CHARACTERISTICS OF TWO NEWLY EVOLVED MAIZE GENOTYPES

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A field trial to see the effect of different rates of nitrogen at a constant level of phosphorus on growth, grain yield and quality of maize *(Zea mays* L.) was carried out on a sandy clay loam soil having 0.04% total N, 14 ppm available P and 212 ppm K. Nitrogen and phosphorus levels were 0-0, 75-75, 150-75 and 225-75 kg NP ha^{-1}. The two new genotypes UM-6 and UM-31 were tested against variety Akbar. The results showed that the highest grain yield of 55.03 q ha^{-1} was obtained with the application of 225-75 kg NP ha^{-1} and UM-31 yielded higher than either Akbar or UM-6. Leaf area index also increased with the application of fertilizer. Similarly protein and oil contents were higher in variety UM-31 with the same dose of fertilizer compared to other treatments.

INTRODUCTION

Maize *(Zea mays* L.) is an important cereal crop which ranks third in production after wheat and rice. Maize crop has a high yield potential but its average yield in Pakistan is 1317 kg ha^{-1} which is low compared to the other maize growing countries of the world. Amongst the various yield determining factors, the astute use of fertilizer and genetic potential of cultivars to utilize the nutrient elements efficiently are of major importance. It is necessary to apply adequate and proportional dose of fertilizers to get higher yields and to improve the grain quality. Similarly, it is also essential to evolve the cultivars of high yield potential.

Increase in grain yield and yield components of maize with nitrogen application was reported by Ali *et al.* (1986) and Jokela and Randall (1989). An increase in grain oil and protein contents has been reported by Bari (1969), and Warren *et al.* (1980). On the other hand, Ketcheson and Beauchamp (1978) observed that grain yield of maize was suppressed by increasing N rates beyond 168 kg ha^{-1}. Ahmad (1989) obtained the maximum grain yield of maize by applying 150 kg N ha^{-1}. With this controversial response of maize to N application, it is pertinent to ascertain its suitable dose especially for newly evolved genotypes. The present research work was, therefore, carried out to find a judicial N fertilizer dose at a constant P level for two new maize varieties against a standard variety Akbar.

MATERIALS AND METHODS

A quadruplicated experiment laid out in a split plot design was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1989 on a normal sandy clay loam soil having 0.04% total N, 14 ppm available P and 212 ppm K. Net plot size measured 2.40 x 5.00 m. The N-P levels were 0-0, 75-75, 150-75 and 225-75 kg ha^{-1}. The test varieties were

UM-6 and UM-31 and Akbar was used as a standard variety.

The fertilizer levels and varieties were randomized in main and subplots, respectively. The crop was sown in 90 cm apart double-row strips with 30 cm row to row distance. The whole of phosphorus as single super-phosphate and half nitrogen as urea were drilled between the rows at sowing time while remaining nitrogen was applied with the first irrigation. All other cultural practices were kept normal and uniform for all the treatments. The data on growth, yield and quality parameters were collected by using standard procedures. The data were tabulated and analysed statistically using LSD test at 5% probability level (Steel and Torrie, 1986).

RESULTS AND DISCUSSION

It was noted (Table 1) that application of nitrogen at a constant level of phosphorus improved the grain yield and quality characteristics over the control. The highest values were observed at the highest level of N and P.

Grain yield was significantly the highest of all the treatments in treatment F_3 where 225 kg N was applied in combination with 75 kg P_2O_5 ha^{-1}. It may be attributed to the highest leaf area index, number of grain rows per cob, grains per row and the weight of 1000-grains. The oil and protein percentages increased by 1.2 and 1.5 times, respectively with the application of 225 kg N + 75 kg P_2O_5 ha^{-1} over the control. These results are supported by the findings of Bari (1969) and Warren *et al.* (1980).

Table 1. Effect of different fertilizer levels and varieties on grain yield and quality parameters in maize

Treatments	Leaf area index	No. of grains rows per cob	No. of grains per row of cob	1000-grain weight (g)	Grain yield (q ha^{-1})	Oil contents of grain (%)	Protein contents of grain (%)
a. Fertilizer levels (N + P kg ha^{-1})							
F0 (0 + 0)	1.24 c	13.63 b	20.99 c	227.67 d	32.81 d	2.62 d	7.94 d
F1 (75 + 75)	1.60 b	14.58 b	27.41 b	238.75 c	37.55 c	3.02 c	9.37 c
F2 (150 + 75)	2.05 a	15.42 ab	31.37 a	280.16 b	43.57 b	3.13 b	11.00 b
F3 (225 + 75)	2.17 a	16.57 a	33.46 a	317.69 a	53.03 a	3.24 a	12.20 a
b. Genotypes							
V1 (Akbar)	1.47 b	14.23 b	27.23 b	263.11 b	41.46 b	2.99 b	10.00 b
V2 (UM-6)	1.89 a	15.09 ab	27.72 b	258.78 c	39.57 c	2.91 c	9.69 c
V3 (UM-31)	1.93 a	15.84 a	30.12 a	276.31 a	44.20 a	3.11 a	10.71 a

(LSD at 5% probability level).
Means with different letters differ significantly from each other.

UM-31 gave the highest grain yield (44.20 q ha^{-1}) which may be due to an increase in number of grains per row and weight of 1000-grains. The leaf area index and number of grain rows per cob were also high in UM-31 but differed non-significantly from UM-6. Differences in varieties owing to their yield and yield contributing factors were also observed by Brinsmead *et al.* (1973).

The variety UM-31 had significantly the highest oil (3.11%) and protein (10.71%) contents of all the varieties. Variety Akbar followed UM-31 while UM-6 produced the lowest oil (2.91%) and protein (9.69%) contents. These findings are supported by the observations made by Bari (1969).

It can be concluded from these results that maize variety UM-31 had higher yield potential as well as the oil and protein contents in grain were higher than those of either UM-6 or Akbar. Out of the various fertilizer doses, application of 225 kg N along with 75 kg P_2O_5 ha^{-1} was the most suitable to get the maximum yield of 55.03 q ha^{-1} under Faisalabad conditions. These results are in contrast with those reported by Ketcheson and Beauchamp (1978) because a decrease in corn grain yield was obtained at higher dose of nitrogen level than that of lower one. They conducted this study over 10 years period and they grew corn with and without removal of stover or addition of poultry manure to the field in addition to adding a readily available source of nitrogen in the form of urea. In our experiment, the whole of the nitrogen applied to the crop was through a readily available source as urea which was used by the crop more efficiently. Hence the increase in yield occurred in the present study even at higher dose of nitrogen (225 kg ha^{-1}) in the presence of 75 kg P_2O_5 ha^{-1}.

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