

# Response of Some Maize (*Zea mays* L.) Genotypes to Different Irrigation Levels

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## ABSTRACT

Response of three maize genotypes namely Golden, Agaiti-2000 and Platinum to irrigation levels of 4, 5, 6 and 7 irrigations was studied under field conditions during kharif 2001. The application of 6 irrigations produced significantly the highest grain yield than all other irrigation levels due to maximum number of cobs plant<sup>-1</sup>, number of grains cob<sup>-1</sup> and 1000-grain weight. Yield and yield components did not vary significantly with different genotypes.

**Key Words:** Maize; Genotypes; Irrigation levels; Yield and yield components; Pakistan

## INTRODUCTION

In Pakistan, maize is grown on an area of 944.0 thousand hectares with total production of 1643.2 thousand tons making an average of 1741 kg ha<sup>-1</sup>. The average seed yield in Pakistan is very low as compared to many other maize producing countries of the world (Anonymous, 2002). The water availability is considered one of the most important factors to increase crop yields on per unit basis. Quaranta *et al.* (1998) found that post-sowing irrigation with two further applications (900 m<sup>3</sup> ha<sup>-1</sup>) gave highest 100-seed weight and grain yield of maize genotypes. Vicente *et al.* (1999) reported that the reduction in grain yield was 70% and 90% in intermediate water stress and severe water stress, respectively with grain yield fluctuating between 0.30 t ha<sup>-1</sup> and 2.41 t ha<sup>-1</sup> in severe stress. Normal irrigation and number of cobs plant<sup>-1</sup> were reduced by 50% in severe stress. Moreover reduction in plant height was found to be 36 cm in intermediate stress and 11 cm in severe stress. Monteih (1965) concluded that different maize genotypes varied significantly with regard to interception of solar radiation based on leaf surface per unit of land area. Dhillon *et al.* (1998) found that maize hybrids viz., Sangam, Sartaj and EH 2115 showed smaller reduction (31-34%) in yield than the other hybrids EH 2363 and EH 2085 (43-44%) under flood irrigation and stress tolerant varieties on average showed less reduction in height. Sheikh (1999) studied variability in grain yield among maize hybrid genotypes under conventional and drought treatments and found that grain yield of genotypes was not reduced severely under extreme drought stress in comparison with single crosses.

The present studies were conducted to determine the best combination of genotypes and irrigation levels suited to agro-ecological conditions of Multan–Pakistan.

## MATERIALS AND METHODS

The experiment was conducted at the Agronomic Research Area, University College of Agriculture,

Bahauddin Zakariya University, Multan during Kharif 2001, on a clay loam soil. The experiment was laid out in randomized complete block design with split plot arrangement and three replications having a net plot size of 3.0 m x 3.75 m. Three varieties of maize viz. Platinum, Agaiti-2000 and Golden were randomized in main plots and four levels of irrigation (4, 5, 6 & 7 irrigations) were randomized in sub plots. The crop was sown in 75 cm apart furrows by dibbling using a seed rate of 30 kg ha<sup>-1</sup>. The four irrigation levels were applied at 10, 8, 7 and 5 days intervals starting from 25 days after sowing. All other agronomic practices were kept normal and uniform for all the treatments. Standard procedures were adopted to record the data on various growth and yield parameters. Data collected were analysed statistically using Fisher's analysis of variance technique and least significant difference test at 0.05 probability was employed to compare the differences among the treatments' means (Steel & Torrie, 1984).

## RESULTS AND DISCUSSION

Data in Table I showed that neither the irrigation levels nor the genotypes had any effect on the number of plants m<sup>-2</sup>. Significant differences were observed among the varieties for leaf area index (Table I). The variety Golden produced maximum leaf area index (0.61). The lowest leaf area index (0.59) was given by Platinum. These results are in agreement with those of Monteih (1965). Different irrigation levels were found to be non-significant with regard to leaf area index (Table I). The interaction between varieties and irrigation levels was significant.

All the varieties showed significant differences for plant height (Table I). The Platinum gave the maximum plant height (181.35cm), but it was statistically at par with Agaiti-2000 (177.9). These results can be attributed to differences in genetic constitution of the genotypes. Dhillon *et al.* (1998) had also reported similar results. Various irrigation levels did not affect the plant height (Table I) significantly. These results are not in line with those of

**Table I. Response of different irrigation levels on growth and yield of maize genotypes**

Treatments	No. of plants (m <sup>2</sup> )	Leaf area index	Plant height (cm)	No. of cobs plant <sup>-1</sup>	No. of grains cob <sup>-1</sup>	1000 grain weight (g)	Grain yield t ha <sup>-1</sup>	Biological yield t ha <sup>-1</sup>	Harvest index %
<b>Genotypes (G)</b>									
Platinum	4.83 <sup>NS</sup>	0.59 <sup>C</sup>	181.35 <sup>A</sup>	1.01 <sup>NS</sup>	405.58 <sup>NS</sup>	220.62 <sup>NS</sup>	4.27 <sup>NS</sup>	15.40 <sup>NS</sup>	27.72 <sup>NS</sup>
Agaiti-2000	10.70	0.601 <sup>B</sup>	177.9 <sup>A</sup>	0.93	405.08	205.24	4.18	17.10	24.44
Golden	11.40	0.61 <sup>A</sup>	171.37 <sup>B</sup>	1.04	437.80	204.90	3.96	16.80	23.57
<b>Irrigation levels (I)</b>									
4	8.80 <sup>NS</sup>	0.66 <sup>NS</sup>	168.19 <sup>NS</sup>	0.77d	367.27c	153.90c	2.17d	13.33b	16.89c
5	9.30	0.58	165.55	0.91c	400.90bc	175.27c	2.92c	12.40b	24.40b
6	11.83	0.60	188.55	1.23a	483.74a	275.21a	6.48a	20.04a	35.58a
7	11.88	0.63	185.22	1.06b	412.70b	229.96b	4.97b	19.62a	24.14b
<b>G x I</b>	NS	**	NS	NS	NS	**	NS	NS	**

Means sharing same letters are statistically non-significant at 5% probability level; NS =non-significant; \*\* = highly significant

Vicente *et al.* (1999) who reported significant effect of water stress conditions on plant height. The interaction between varieties and irrigation levels was found to be non-significant.

Different maize genotypes did not vary significantly as regards the number of cobs plant<sup>-1</sup> (Table I). Significant differences were observed among the irrigation levels for number of cobs plant<sup>-1</sup> (Table I). The application of 6 irrigations produced the maximum number of cobs plant<sup>-1</sup> (1.23) while the minimum number of cobs plant<sup>-1</sup> (0.77) were given by supplying maize genotypes with 4 irrigations. Vicente *et al.* (1999) had also reported reduction in number of cobs plant<sup>-1</sup> under severe water stress. The interaction between genotypes and irrigation levels was significant.

Various maize genotypes did not produce a significant effect on number of grains cob<sup>-1</sup> (Table I). All the irrigation levels produced statistically different number of grains cob<sup>-1</sup>. Application of 6 irrigations produced significantly the maximum number of grains cob<sup>-1</sup> (483.74) whereas the lowest number of grains cob<sup>-1</sup> (367.27) were recorded in case of 4 irrigations. The interaction between genotypes and irrigation levels was found to be non-significant.

The maize genotypes did not affect significantly the 1000-grain weight (Table I). Irrigation levels varied significantly from one another regarding 1000-grain weight. Application of 6 irrigations showed significantly the maximum 1000-grain weight (275.21 g) whereas the application of 4 irrigations produced the minimum 1000-grain weight (153.9 g). These results are in confirmation with those of Quaranta *et al.* (1998). The interaction between varieties and irrigation levels was significant (Table I).

All maize genotypes produced similar grain yield. Different irrigation levels significantly affected the grain yield (Table I). The application of 6 irrigations produced significantly the maximum grain yield (6.48 t ha<sup>-1</sup>) while the lowest grain yield (2.17 t ha<sup>-1</sup>) was obtained in case of 4 irrigations. These results are in agreement with those of Quaranta *et al.* (1998), Sheikh (1999) and Vicente *et al.* (1999). The interaction between factors under study was non-significant.

The biological yield was statistically similar in all the genotypes (Table I). The biological yield varied significantly with regard to various irrigation levels. The application of 6 irrigations produced significantly the maximum biological yield (20.04 t ha<sup>-1</sup>) which was statistically at par with 7 irrigations (9.62 t ha<sup>-1</sup>). The interaction between genotypes and irrigation levels was found to be non-significant.

The maize genotypes did not exhibit a significant effect on harvest index (Table I). Application of different irrigation levels resulted in different harvest indices (Table I). The application of 6 irrigations produced significantly the maximum harvest index (35.58%) whereas the minimum harvest index (16.89%) was given by application level of 4 irrigations. The interaction between genotypes and irrigation levels was significant.

## CONCLUSION

Genotype platinum and application level of six irrigations may be preferred over other genotypes and irrigation levels due to maximum grain yield.

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