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EFFECT OF WATER STRESS ON GROWTH AND YIELD COMPONENTS OF MAIZE VARIETY YHS 202

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Abstract: This investigation was under taken to study the effect of water stress on growth and yield of maize CV. YHS 202 at Research Area of University College of Agriculture, Bahauddin Zakariya University, Multan during 2000.The study comprised of six treatments viz control (Six irrigations), five, four, three, two and one irrigation only. Data revealed that stem height, stem diameter, leaf area and days to complete flowering, decreased significantly with increasing water stress. Yield components such as number of grains per cob, 1000-grain weight and grain yield have also been decreased by increasing water stress. Maximum grain yield (3.5 t ha^{-1}) was obtained in control treatment (six irrigations) and minimum grain yield (0.4 t ha^{-1}) was obtained by applying one irrigation.

Keywords: Water stress, Growth, Yield, Maize.

INTRODUCTION

Maize (*Zea mays L*) is the third most important cereal after wheat and rice all over the world as well as in Pakistan. Maize is grown on an area of 9622000 ha with an annual average production and yield of 1665000 tones and 1730-Kg ha^{-1}, respectively [Anonymous 2000]. Maize had its origin in a semi-arid area but it is not a reliable crop for growing under dry land conditions, with limited or erratic rainfall [Arnon 1972]. Maize is apparently more drought resistant in the early stages of growth than when fully developed. Extreme water stress at different stages of crop development has been reported to reduce the yield significantly [Dhillon *et al.* 1995]. Water stress has been found to reduce leaf area; photosynthesis, leaf chlorophyll contents and consequently grain yield [Jun-Chen and Dai-Junying 1996].

This study with an objective of determining the effect of water stress on growth and yield of maize was conducted in agro-climatic conditions of Multan at Research Area of University College of Agriculture, Bahauddin Zakariya University, Multan during the year 2000.

MATERIALS AND METHODS

Maize hybrid YHS202 was sown on 3rd March 2000,to explore its yield potential and different plant characteristics under six irrigation levels viz. one, two, three, four, five and six irrigations. First irrigation was applied to all the treatments. Second irrigation was applied to all treatments except T_5. Third irrigation was given to all treatments except T_4 and T_5. Fourth irrigation was applied to T_2, T_4 and T_0. Fifth irrigation was applied to T_1 and T_0 treatments and sixth irrigation was given only to T_0 treatment.

The experiment was laid out in randomized complete block design having four replications with a plot size of 4.5m x 3.0m. Normal cultural operations during the growth period were performed at the appropriate time in all the treatments. Data on various growth and yield components was collected by using standard procedures. Data was analyzed statistically by using Fisher's analysis of variance technique [Steel and Torrie 1984]. Least significant difference test at 0.05 probability was employed to compare the means.

RESULTS AND DISCUSSION

Stem height was significantly affected by water stress (Table 1). Maximum stem height was produced when six irrigations were applied and it was at par with 4 and 5 irrigations. However, it differed significantly with rest of the treatments. Minimum height was obtained when only one irrigation was applied which is statistically at par with 2 irrigations. Porro and Cassel [1986], and Hernandez [1980] also reported a decrease in plant height due to water stress.

Table 1: Effect of water stress on different growth and yield components of maize.

Treatments	Stem height (cm)	Stem diameter (cm)	Leaf Area in (cm)	Days to complete flowering	No. of grains cob^{-1}	1000-grain weight (gm)	Yield (t ha^{-1})
T_0	1.5a	2.15a	594.96a	20.25a	318.25a	276.75a	3.57a
T_1	1.42 a	1.96b	567.46b	17.5b	276.0b	276.50a	2.43b
T_2	1.46a	1.81c	559.94b	16.5b	190.25c	225.5b	1.30c
T_3	1.18b	1.73c	472.11c	15.75b	160.75d	161.0c	0.88d
T_4	0.98c	1.54d	371.15d	13.00c	145.75e	150.0cd	0.48e
T_5	0.92c	1.27e	305.59e	13.25c	121.75f	119.0d	0.46e
LSD	0.11	0.09	22.96	1.90	12.84	31.85	0.34

Means sharing the same letters are statistically non-significant at 5% probability level.

Data in Table 1 revealed that maximum stem diameter and leaf area were obtained in T_0, which gradually decreased with increasing the water stress. Minimum stem diameter and leaf area was obtained when only one irrigation was applied. These results are coinciding with the work of Verasan and Ronald [1978], Porro and Cassel [1982].

Maximum number of days were taken to complete flowering in treatments where six irrigations were applied while T_5 treatment completed its flowering in minimum number of days (Table 1). These findings are in close agreement with those reported by Jun-Chen and Dai-Junying [1996].

Number of grains per cob and 1000-grain weight were significantly affected by water stress (Table 1). Number of grains per cob and 1ooo-grain weight decreased with decreasing number of irrigations. Maximum number of grains per cob were obtained when six irrigations were applied, however, minimum number of grains per cob were obtained when only one Irrigation was applied.

Grain yield was significantly affected by water stress (Table1). Maximum grain yield was obtained in treatments where six irrigations were applied which was followed by five, four, three and two irrigations treatment. Each of the above treatments produced significantly different grain yield as compared with other. However, grain yield of treatment T_4 was statistically at par with treatment T_5. So grain yield of maize decreased with increasing water stress. These results confirm the findings of Hernandez [1980], Dunker *et al.* [1982], Hussain and Fapobunda [1985], Porro and Cassel [1986], Zhirkov [1995], Jun-Chen and Dai-Junying [1996], El-Sheikh [1999] and Vicente *et al.* [1999].

CONCLUSION

Water stress decreased fodder and grain yield by decreasing stem height, stem diameter, leaf area, number of grains per cob and 1000-grain weight.

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