

Effect of water logging durations on plant height, leaf area, starch content, catalase activity and grain yield of maize genotypes

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(Accepted :May, 2007)

SUMMARY

A pot culture experiment was conducted at experimental site of department of crop physiology NDUAT, Kumarganj, Faizabad (U.P.) in *kharif* season. Four maize genotypes (CM-500, CM-136, CM-128 and CM-210) were selected to expose 5 days and 8 days durations of water logging (WL) separately to 30 days old plants. Plant height, leaf area and starch content were decreased under WL condition. Severity of decreasing pattern was found more as WL duration increases irrespective of genotypes. The significant differences were noted among genotypes for WL tolerance. CM-500 and CM-136 were less affected to WL durations because it possessed high starch content before WL and high catalase activity just after WL. Grain yield was recorded only in 5 days WL plant where as 8 days WL plant failed to produce any grain yield. High accumulation of starch before WL and more catalase activity just after WL can be used as trait for identification of WL tolerant maize genotypes.

Key words: Water logging, starch content, Catalase activity, Yield, Maize genotypes.

Maize (*Zea mays* L.) is one of the important cereal crops of India. It is grown over 6.25 m.ha area in different parts of the country. The major area of this crop is mainly confined to U.P., Bihar, Gujarat, Rajasthan, Punjab, Haryana, and M.P. with average productivity of 19.98 q/ha. The major abiotic constrain for low productivity of maize in India is WL (Water Logging) which affects 2.5 m.ha area of total 6.25 m.ha during *kharif* season. The major growing area of U.P. and Bihar are highly prone to floods and WL during the monsoon season. On an average 30-40 per cent loss of maize crop due to WL is common in this region every year.

The plant growth stages are severely affected due to WL stress. Maize is most susceptible to WL at the early growth stages, (especially at 30 days stage) which ultimately reduce the plant height, dry matter and grain yield (Mukhtar *et al.*, 1990). Under WL condition, cell division, cell elongation and leaf area enlargement are badly affected due to poor photosynthesis (Malik *et al.*, 2001; Traught and Drew, 1980c). Water logging creates hypoxia or anoxia condition in soil as well as in plant system. In this condition, normal aerobic respiration shifted to anaerobic respiration and produce harmful metabolites, which cause massive damage to cell membrane (Armstrong 1979, Setter *et al.*, 1987c). The important physiological traits regarding WL tolerance in maize is however, yet to be identified. This paper tries to analyze the effect of WL duration on growth and yield of maize

genotypes under various WL durations.

MATERIALS AND METHODS

The experiment was conducted in iron trays (30x30x30) at experimental sites of department of crop physiology, NDUAT, Kumarganj, Faizabad, U.P. during 1999 and 2000 *kharif* season. Each tray was filled with clay loam soil (pH 7.5, Ec 1.4 dS/m). Fertilizers were applied to the soil at the rate of 120, 60, and 40 kg/ha of N, P, and K, respectively. Four maize genotypes CM-500, CM-136, CM-128 and CM-210 were obtained from directorate of maize research, IARI, New Delhi for investigation. Five bold and healthy seeds of each genotype were sown in iron tray in two sets with three replications. Thinning was done after seedling establishment 15 days after sowing (DAS) to maintain only three healthy and uniform plants in each tray. Water logging stress was given to all genotypes at 30 days old stage. The WL treatment was applied uniformly by placing all trays in an artificial pond in such a way that water remains 4-5 CM above the trays continuously in two sets for 5 and 8 days, respectively with their respective control. All the necessary agronomical practices and plant protection measure were applied time to time as per needs.

The observations related to plant height, leaf area, starch content and catalase activity were taken at the termination of five days and eight days WL treatment with their respective control. Plant height (cm) was

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