Internat. J. Plant Sci. Vol.2 No.2 July 2007 : 159-165

Screening of heat tolerant wheat varieties by membrane thermo stability index in relation to yield and yield attributing traits

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(Accepted :May, 2007)

SUMMARY

The membrane stability index (MSI) was taken as major parameter of screening wheat varieties for heat tolerance. High MSI was recorded in HD 2733, K9006, HP 1761, NW 1067 and NW 1012 under heat stress due to more leakage of electrolyte whereas, varieties like Halna, K8962, NW 1076 and NW1014 showed less MSI at vegetative as well as reproductive stage. Heat stress reduced Plant height, tiller number, spike bearing tiller, grain number per spike and grain yield due to faster phasic development. With increase in stress intensity, a progressive and significant decrease in yield and yield attributing traits were noted in all wheat varieties. Halna was found to be highly tolerant wheat variety followed by K 8962, DBW 14, NW 1076 and NW 1014 under moderate to high stress condition. Although variety HD 2733 gave high yield under control condition but it also showed high susceptibility to stress followed by HP 1761, NW 1012 and K 9006.

Key words: Heat stress, Membrane thermo stability index, Yield component, Wheat.

Wheat is the most important staple food crop of India as well as many parts of the world. India has 2.5 m.ha., area under wheat cultivation and consist second position in world wheat production after China. Production of wheat has many constraints among them heat stress is one of the major problems from last few years in all over the world (Fischer and Byelee, 1991). In India, especially Northern India is highly affected by high temperature at grain filling stage in wheat due to late sowing. It shortens the phases of growth and limits photo-assimilation as well as sink capacity leading to less production and reduces grain quality (Rawson, 1986; Wardlaw *et al.*, 1989). This suggested that to meet the burgeoning population demand and reduction in agriculture areas lead the intensification of cropping system. Thus the late planting of wheat pushes grain development to higher temperature regime (Zhong-hu and Rajaram, 1994).

The effect of high temperature stress on wheat is reviewed with an objective to critically examine the scope for improving the high temperature tolerance in wheat. The objective of this work was to determine the relationship among membrane thermo stability, yield and yield attributing traits of wheat under heat stress condition. Membrane stability of cell showed high correlation for heat tolerance in wheat when varieties exposed to heat stress (Saadalla *et al.*, 1990). Heat tolerant varieties have stable rate of photosynthetic activity, plant height, spike bearing tiller, grain number per spike, days to maturity and membrane thermo stability of field acclimatized flag leaves were the potential selection criteria for heat stress **(**Al-Khatib and Paulsen, 1990).

MATERIALS AND METHODS

In present study, the experiment was conducted during Rabi season 2005-06 with 10 wheat varieties namely Halna, K 9006, K 8962, HP 1761, NW 1014, HD 2733, DBW 14, NW 1067, NW 1076 and NW 1012 at Instructional Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar, Faizabad (U.P.). The soil of experimental field was saline-alkaline in reaction, poor in availability of nitrogen, medium rich in phosphorous and potassium with lower organic carbon content. A pre-sowing irrigation was done in the experimental field with an object to obtain optimum moisture condition for attaining good germination. The recommend dose of N 120 kg/ha, P_2O_5 60 kg/ha and K_2O 40 kg/ha were given in soil. Half dose of N and full dose of P_2O_5 and K_2O was applied as a basal dressing at the time of sowing. Rest amount of N was applied by broadcasting during crop period as per needs. The sowing was done at proper depth and spacing in three sets i.e. on 25th November (normal), 25th December and 25th January which was delayed by 30 days (T_1) and 60 days (T_2) from the normal sowing, respectively so that reproductive phase of second set and vegetative as well as reproductive phase of third set could come under heat

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