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Heat sensitivity on physiological and biochemical traits in chickpea (*Cicer arietinum*)

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Abstract. Four chickpea cultivars viz. kabuli (Pusa 1088 and Pusa 1053) and desi (Pusa 1103 and Pusa 547) differing in sensitivity to high temperature conditions were analyzed in earthern pot (30 cm) at different stages of growth and development in the year of 2010 and 2011. Pusa-1053 (kabuli type) showed maximum photosynthetic rate and least by Pusa-547 (desi type), whereas maximum cell membrane thermostability were recorded in Pusa-1103 and minimum in Pusa-1088. Among the treatments, the plants grown under elevated temperature conditions had produced 13.01% more significant data in comparison to plants grown under continuous natural conditions. Stomatal conductance were reduced 44.25% under elevated temperature conditions than natural conditions, whereas 35.56%, when plants grown under initially natural conditions upto 30DAS, then 30-60DAS elevated temperature and finally shifted to natural conditions till harvest. In case of Pusa-1103, stomatal conductance was maximum as compared to rest of 2.7% from Pusa-1053, 8.9% from Pusa-1088, and 10.3% in Pusa-547 throughout the study. Plants grown under continuous elevated temperature conditions had produced 15.30% and 15.32% more significant membrane thermostability index in comparison to continuous natural conditions at vegetative stage and 19.40% and 18.44% at flowering stage, while the better response was recorded at pod formation stage. Pusa-1053 had given 2.8% more membrane thermostability index than Pusa-1088 and Pusa-1103 had given 1.6% more membrane thermostability index than Pusa-547 in the present study. The membrane disruption caused by high temperature may alter water ion and inorganic solutes movement, photosynthesis and respiration. Thus, thermostability of the cell membrane depends on the degree of the electrolyte leakage.

Keywords: chickpea; photosynthetic rate; stomatal conductance and cell membrane thermostability index

1. Introduction

Gobal warming and changes in cropping systems are driving chickpea production to relatively warmer growing conditions. By the end of the 21st century, the earth's climate is predicted to warm by an average of 2-4°C (IPCC 2007), due to both anthropogenic and natural factors (Eitzinger *et al*. 2010). Emission of green houses gases and nitrous oxide from agricultural systems is one of the major sources contributing to this global increase of temperature (Maraseni *et al*. 2009, Smith and Olesen 2010). The impact of high temperature at night is more devasting than day

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