High Temperature Effects on Chickpea (*Cicer arietinum* L.)

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Abstract—*Prevalence of high temperature (heat stress) has become a global concern because it severely limits plant growth, metabolism, and crop yield worldwide, leading to endangering food security in the future. Chickpea (Cicer arietinum L.), a cool season crop is severely affected by heat stress (HS); its reproductive stage, is most sensitive to HS (>32/20°C day/ night) with consequent substantial loss of potential yields. The basis of present study aimed (i) Screening a large core-collection of chickpea against heat stress and to identify heat-tolerant and heat sensitive genotypes ii) Assessing the genotypes for damage by heat stress to the leaves and reproductive organs. (iii) Investigating the physiological mechanisms associated with reproductive failures. In the present study, two heat-tolerant and two heat-sensitive genotypes were identified after screening. These four genotypes were raised in outdoor conditions with two different times of sowing, normal and late to expose them to HS during reproductive stage (>32/20°C). Our study indicates that heat stress inhibited pollen function more in the sensitive genotypes than in the tolerant ones, and consequently showed significantly less pod set. Significant reduction in pod set (%) was associated with reduced pollen viability, pollen load, pollen germination and stigma receptivity in all four genotypes. It was concluded that heat stress leads to loss of pollen as well as stigma function and induces oxidative stress that cause failure of fertilization. Assessment of physiology of leaves indicates reduced chlorophyll, more membrane damage in heat sensitive genotypes than tolerant genotypes. Rubisco along with sucrose synthase decreased significantly in leaves due to heat stress leading to reduced sucrose content. Decrease in sucrose metabolism was detrimental as it affects the structure and function of pollen grains.*

ISBN-978-93-85822-93-3