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Effect of High Temperature on Tomato (*Lycopersicon esculentum*) Genotypes under Controlled Conditions

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Abstract

Tomato (*Lycopersicon esculentum* Mill.) is usually produced during the winter period in Sudan. In summer due to high temperatures, monthly average temperatures are between 31 to 35 °C, a shortage of tomatoes is common. General environmental changes, especially global warming, may have an adverse effect on crop production in Sudan.

The objective of this study is **(i)** to investigate the effect of heat stress on vegetative and productive development of heat sensitive and tolerant tomato genotypes, **(ii)** to compare the growth and development of different genotypes under defined heat stress conditions (intensity and duration) as well as **(iii)** to investigate if there are any positive effects of grafting or heat shock treatments to increase heat tolerance of tomatoes.

Different experiments were carried out under simulated temperature conditions in plant growth chambers at the Humboldt University of Berlin as well as under field conditions at the University of Khartoum, Sudan. Here only results obtained from experiments under controlled condition are presented. Plant high, leaf area, fresh and dry weight of leaves, stem and roots, number of clusters, number of flowers, number of pollen grains per flower as well as assimilation and transpiration rate were recorded.

The reproductive processes in tomato were more sensitive to high temperatures than the vegetative ones. The number of pollen grains produced by the heat tolerant genotypes, were higher than the numbers produced by the heat sensitive genotypes. Night temperature had a significant effect on the number of pollen grains produced and released. Additionally heat tolerant genotypes showed higher photosynthetic rate at flowering stage compared to the heat sensitive one. Preliminary results in this study suggest that photosynthetic rate at heat stress condition could be used as criteria for screening genotypes for heat tolerance.

However, under field condition in Khartoum, Sudan other factors such as low relative humidity, insect and virus diseases as well as soil physical properties have also to be considered. Optimization of microclimate could be very important to ensure a good performance of new tolerant varieties cultivated in summer periods in Sudan.

Keywords: Heat stress, photosynthetic rate, pollen grains, Sudan, summer period, tolerant genotypes, tomato

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