Abstract

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Adaptation mechanism of mango fruit (*Mangifera indica Linn cv. Chaunsa White*) to heat suggest modulation in several metabolic pathways

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ABSTRACT

Climate change is becoming a global problem because of its harmful effects on crop productivity. In this regard, it is crucial to carry out studies to determine crops' response to heatwave stress. Response molecular mechanisms during the development and ripening of mango fruit (Mangifera indica L. cv. Chaunsa White) under extreme heatwaves were studied. Mango flowers were tagged and fruits 18, 34, 62, 79, 92 days after flowering (DAF) as well as fruits on 10 and 15 days of postharvest shelf life were studied through RNA-Seq and metabolome of the fruit mesocarp. The environmental temperature was recorded during the experiment. Roughly, 2,000,000 clean reads were generated and assembled into 12,876 redundant transcripts and 2,674 non-redundant transcripts. The expression of genes playing a role in oxidative stress, circadian rhythm, senescence, glycolysis, secondary metabolite biosynthesis, flavonoid biosynthesis and monoterpenoid biosynthesis was quantified as well as reactive oxygen species. Higher expressions of six abiotic stress genes and a senescent associated gene was found at 79 DAF (recorded temperature 44 ℃). Higher expressions of nucleoredoxin and glutathione S-transferase 1 family protein were also recorded. Activation of the GABA-shunt pathway was detected by the glutamate decarboxylase transcript expression at 79 DAF. Larger energy demands at the beginning of fruit ripening were indicated by an increase in fructose-bisphosphate aldolase gene expression. Finally, the radical scavenging effect of mango fruit inflorescence and fruit pulp extracts showed decline upon heatwave exposure. We recorded a broad genetic response of mango fruit suggesting the activation of several metabolic pathways which indicated the occurrence of genetic and metabolic crosstalks in response to intense heatwaves. Collectively, this study presents experimental evidence to help in the elucidation of the molecular mechanism of crops response to heat stress which in turn will help in the designing of protocols to increase crop productivity in the face of climate change.

Biography:

Zainab Khanum has her expertise in molecular biology and bioinformatics. She has studied the stress response mechanism in mango (Mangifera indica Linn cv. Chaunsa White) fruit during its development and has characterized modulation in several metabolic pathways. Her research work will help scientists and public to understand implications of climate change on food crops in general. Her research work ensures the development of sustainable methods and constructive strategies to tackle food insecurity in the face of climate change.