Adaptation Mechanism of Mango Fruit (*Mangifera indica L.* cv. Chaunsa White) to Heat Suggest Modulation in Several Metabolic Pathways

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Abstract

Climate change is becoming a world problem because of its harmful effects on crop productivity. In this regard, it is crucial to carry out studies to determine the crop's response molecular mechanism 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 with 18, 34, 62, 79, 92 days after flowering (DAF) as well as fruits with 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 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 changes in reactive oxygen species. Higher expressions of six abiotic stress genes and a senescent associated gene was found at 79 DAF (recorded temperature 44 °C). 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 evidences 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 World's climate change.

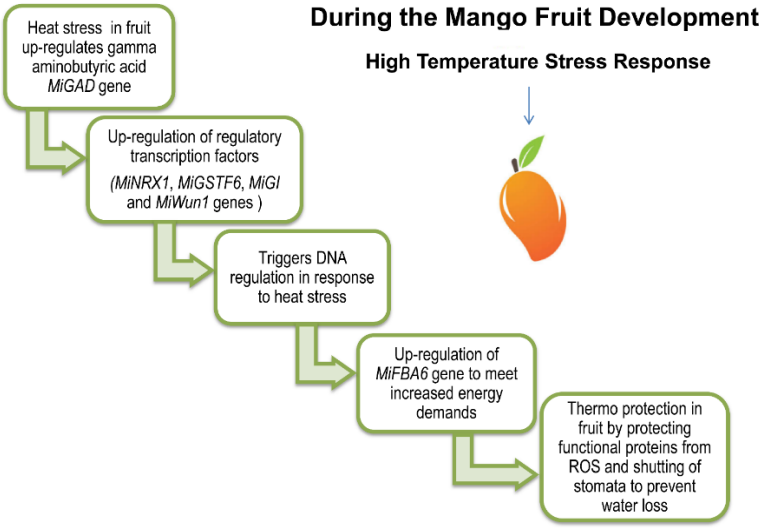


Figure 1: Chaunsa mango (*Mangifera indica L.*) fruit response molecular mechanisms to extreme heatwave stress.

Recent Publications

1. Zainab K (2020) **Adaptation mechanism of Mango fruit (*Mangifera indica L.* cv. Chaunsa White) to heat suggest modulation in several metabolic pathways**. Royal Society of Chemistry Advances, 2020, 10, 35531.
2. Zainab K (2020) **Cytotoxic Evaluation of Antioxidant and Gamma-Amino Butyric acid (GABA) Enriched Mango (*Mangifera indica cv.* Chaunsa) Mesocarp Extract on HER2-Positive Breast Cancer Cells**. Journal of Chemical Society of Pakistan, 2020, 42, 06.



Biography

Zainab Khanum has her expertise in next-generation sequencing, bioinformatics, GC-MS analysis, and functional genomics. Her research interests include developmental genetics and Cancer related functional genomics. She is a Biotechnology graduate from the University of Karachi, Pakistan. She is currently enrolled in the Ph.D. program at the International Center for Chemical and Biological Sciences, University of Karachi, Pakistan. Her training at ICCBS has earned her the post-doctoral research opportunity at University of Adelaide, Australia.

Her Ph.D. research work is focused on understanding the adaptation mechanisms of food crops to climate change, especially extreme heatwave stress. This will help scientists and agriculturists to identify sustainable solutions to counteract climate change and food insecurity.

She looks forward to conducting her future research on projects that will benefit the health sector, agriculture sector, and economy of her country.

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