# Metabolite diversity of fruits of selected African eggplant accessions for improved health and nutrition

**Elias K. Mibei[1], Willis O. Owino[1]*, Grace M. Wacheke[2], Jane Ambuko[3], Arnold N. Onyango[1] and James Giovannoni[4]**

[1]Department of Food Science and Technology, Jomo Kenyatta University of Agriculture and Technology, Kenya;
[2]Institute of Biotechnology Research, Jomo Kenyatta University of Agriculture and Technology, Kenya
[3]Department of Plant Science and Crop Protection, University of Nairobi, Kenya;
[4]USDA-ARS Robert W. Holley Center and Boyce Thompson Institute for Plant Research, USA.
***Contact:** willis@agr.jkuat.ac.ke

## Introduction

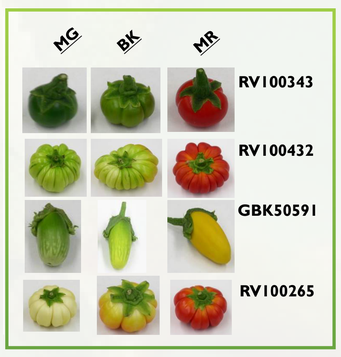
African eggplants (*Solanum aethiopicum* and *Solanum macrocarpon*) are the wild relatives of cultivated eggplants native to Africa. They are among the nutritionally important and valuable fruit vegetables consumed in Africa. They are reported to thrive under abiotic stresses such as drought. This resilience could be attributed to the accumulation and/or presence of metabolites which are essential for plant growth, development, stress adaptation and defense. However, there are limited studies to define the diversified metabolites which may arise due to such stresses.

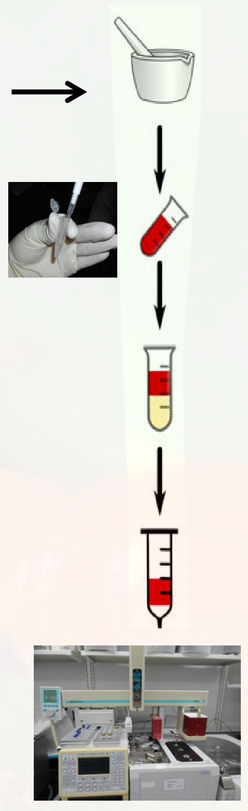
## Objective

To characterize metabolites of Africa eggplant fruits at different ripening stages subjected to drought stress

## Methodododology

74 Accessions → 19 Accessions → **Control** (Normal irrigation) / **Drought stress** (60% field capacity) → **Fruit sampling**
- Mature green (MG)
- Breaker (BK)
- Mature red(MR)



- 74 African eggplant accessions were obtained from the Gene Bank of Kenya and the World Vegetable Centre (AVRDC), Arusha, Tanzania.
- 19 accessions were selected based on their morphological traits including fruit size and weight, fruit shape, fruit length, flower color, leaf blade length and width.

- Homogenization with liquid N2
- Extraction solvent; methanol: isopropanol: glacial acetic acid (80:19:1, v/v)
- Solvent addition - shaking & centrifugation
- Ribitol was used as internal standard
- Derivatisation with MSTFA (heated for 1 hour at 80 - 90°C on a sand bath)
- GC-MS
- Component and peak alignment (Metabo analyst)
- Multivariate statistics (PCA, heatmap)

*The GC-MS analyses were carried on a Varian CP-3800 GC coupled to a CombiPal autosampler and a Varian 1200L triple quadrupole MS.*

## Results

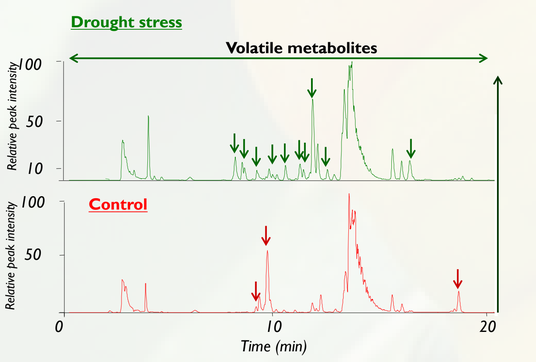


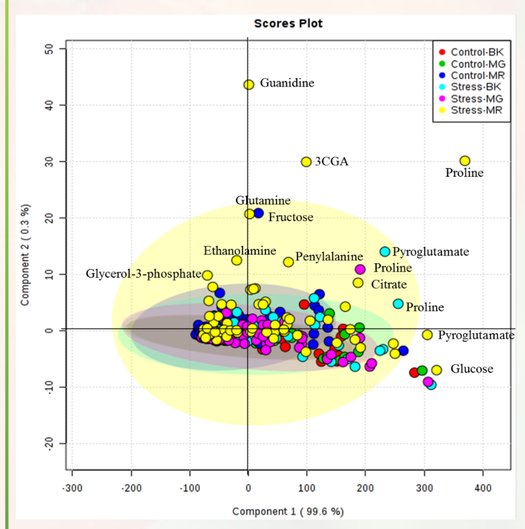

***Table 1:*** *GC-MS chromatogram of the identified metabolites from the African eggplant fruit tissues*

- Drought stress has significant impact on majority of metabolites.

***Table 1:*** *List of identified metabolites from the African eggplant fruit tissues*

| Sugars and sugar alcohols (16) | Amino acids (23) | Organic acids (22) |
|---|---|---|
| Fructose-6-phosphate | Alanine | Dehydroascorbate |
| Glycerol-3-phosphate | Arginine | 4-hydroxy-benzoic acid |
| Glucose-6-phosphate | Aspartate | 3,4-dihydroxybenzoate |
| Raffinose | Glutamate | 3-chlorogenic acid |
| Arabitose | Glutamine | 2-methylmalate |
| Galactose | Asparagine | Octadecanoate |
| Fructose | Methionine | 2-oxyglutarate |
| Glucose | Phenylalanine | Erythronate |
| Maltose | Tryptophan | Nicotinate |
| Sucrose | Isoleucine | Threonate |
| Xylose | Threonine | Glycolate |
| Glycerol | Histidine | Succinate |
| Erythritol | Tyrosine | Palmitate |
| Galactinol | Leucine | Benzoate |
| Myo-inositol | Glycine | Glycerate |
| Benzyl alcohol | Proline | Isocitrate |
| | Lysine | Fumarate |
| **N-compounds (7)** | Valine | Pyruvate |
| 5,6-dihydrouracil | Serine | Malate |
| Ethanolamine | GABA | Quinate |
| Putrescine | Ornithine | Citrate |
| Guanidine | Pyroglutamate | Phosphorate |
| Adenine | 4-hydroxyproline | |
| Uracil | | |
| Urea | | |

- A total of 68 metabolites were detected and identified in the African eggplant fruits;
- Majority comprised of amino and organic acids.




- Clear discrimination of metabolites were observed between the different accessions, ripening stages and stress.
- Under drought stress, levels of majority of the organic acids and a number of amino acids except ornithine and serine significantly increased

- Treatments induced clear differences in the metabolites;
- Metabolites accumulated due to ripening and drought stress;
- Fruits at mature stages has improved metabolite content.

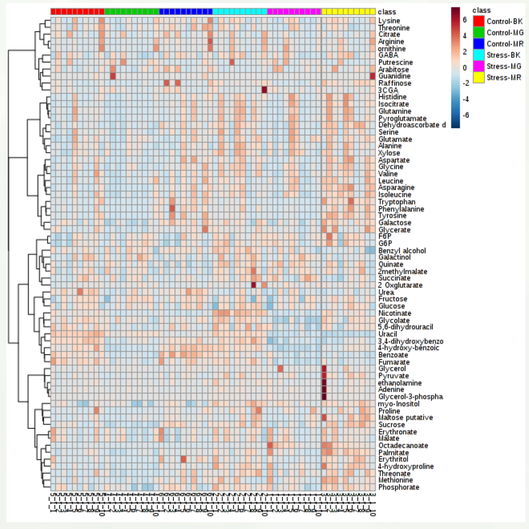



***Figure 2:*** *Heat map representation of changes in metabolite levels measured in African eggplant fruits at different ripening stages under drought stress. Regions of brown or blue indicate that the metabolite content is increased or decreased, respectively.*

***Figure 3:*** *PCA cluster and scores plot of GC-MS metabolites of African eggplant fruits*

## Conclusion

- The study illustrates that African eggplant metabolites are dependent on the accession, ripening stages and treatment (drought stress);
- Proline, glutamate, $\gamma$-amino butyric acid, 3-chlorogenic acid, glucose, sucrose, myo-inositol, citrate, quinic acid & ornithine increased with stress;
- These metabolites are known to be osmolytes which aids in drought stress tolerance and this demonstrates that metabolomic studies is a useful tool for studying plant stress tolerance;
- Besides, these metabolites contributes to vegetable quality;
- Therefore consumption of these crops provides the much-needed dietary nutritional and nutraceutical potential for improved nutrition and health.

## Acknowledgment

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