Harnessing Genomics of Edible African Solanaceae Plants For Improved Nutritional and Food Security

Owino W.O.[1*] Ambuko J.[2], Mibei E.K.[1], Mungai[1], G., Giovannoni J.[3]

[1], Jomo Kenyatta University of Agriculture and Technology, [2]Department of Plant Science and Crop Protection, University of Nairobi, Kenya;

[3]USDA-ARS Robert W. Holley Center and Boyce Thompson Institute for Plant Research, Cornell University.





- **African solanaceae have been neglected and underutilized despite being important food security crops.**
- **Their growth is affected by a number of stress factors but have developed mechanisms to protect themselves against these stresses;**

This project characterized the agronomical, genomics, nutritional and bioactive phytochemical potential of these crops

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Research Approach

1. Morphological & Agronomic characterization

67 African tomato & 74 African eggplant landraces

Under field and greenhouse conditions

2. Transcriptome Analyses

1. Seedling
2. Mature Green
3. Breaker
4. Mature red






mRNA Library

Illumina sequencing

3. Metabolomic Analyses

19 eggplant & 18 tomato accessions

Drought stress

Control

Leaf & Fruit Extractions

- ✓ Ascorbic acid
- ✓ Carotenoid
- ✓ GC-MS+LC-MS

Anti Diabetic Analyses

- 42 days old male BALB/c used
- Diabetic treated with extract, metformin, untreated, Normal nondiabetic
- Body weight + blood glucose level monitored and After 28 days biochemical parameters analyzed using reflontron

4. Management of bacterial wilt in tomato using resistant African eggplant rootstocks

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Key results

- **Identification of novel traits** in these African Solanaceae that can impact on cultivated Solanaceae crops with respect to **nutrition (Ascorbic acid, carotenoid and lycopene content), pathogen response, stress tolerance and fruit quality traits**

- **Single nucleotide polymorphisms (SNPs** diversity revealed population admixture among specific landraces from Kenya, South Africa, Ethiopia, Morocco and Madagascar

- The African egg plant has the **much-needed dietary nutraceutical potential**; justified by metabolite and **antidiabetic properties** observed

- Capacity Building through training of 2 PhD and 5 M.Sc students in plant genomics, metabolomics, Food Science and Nutritional Sciences

- 4 publications in peer reviewed journals and 2 under review and 2 in preparation

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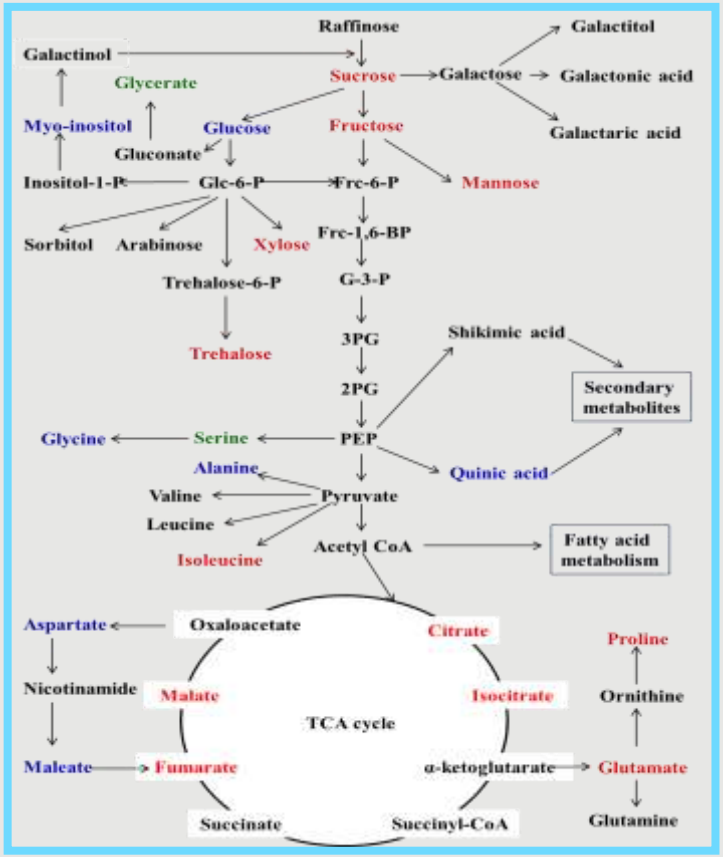
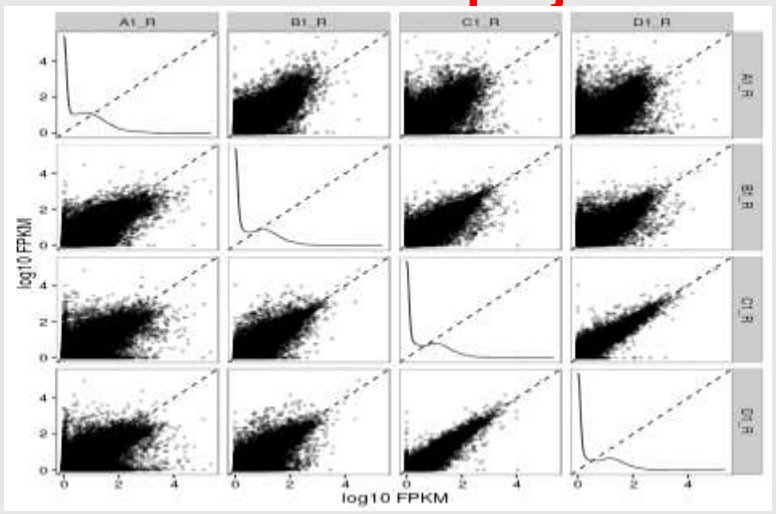
Graph or diagram showing major results of research/project



The metabolic pathway indicating metabolism of various identified metabolites



Scatter matrix showing differential gene expression among and within the four different African tomato fruit. (A- before fruiting, B- Mature green, C- mature breaker, D- mature red)

GREEN - detected not significantly affected by drought stress;
RED - metabolites with greater relative response ratios under drought conditions;
BLUE - metabolites with lower relative abundance in the stress.

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Top next steps for your project:

- There are novel and predicted genes expressed in this study that could be analyzed further to find out their role and function for plant breeding programs
- Carry out further antidiabetic studies with bigger animals and elucidation of the metabolites

How data and results from your project will impact stakeholder decisions and the development problem:

Adoption of grafted tomato onto the identified African eggplant rootstock as an effective cultural practice on a commercial scale would enable farmers to achieve maximum profits with minimal resource input.

Challenges you have faced in collecting meaningful data

- Weakening of the local currency

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Acknowledgment

- **PEER Program**
- **NSF**
- **USDA-ARS**
- **BTI- Cornell University**
- **Graduate Students** - Elias –PhD Food Sci & Nutrition
- -Grace -PhD –Plant Biotechnology
- -Ken and Samson- M.Sc Agronomy
- -Naomi- M.Sc Food Science & Technology
- -Tefania- M.Sc Plant Health