Researchers use omics technologies to accelerate yam research progress

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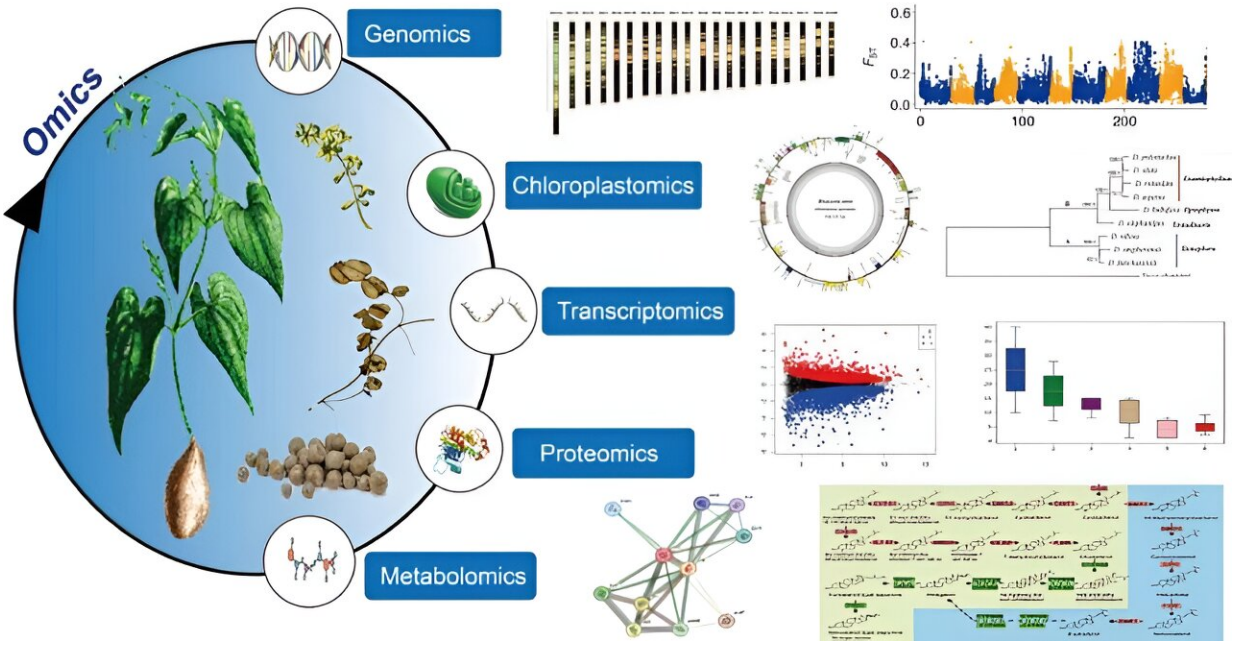

Omics technologies in yam research. Credit: *Vegetable Research* (2024). DOI: 10.48130/vegres-0024-0014

A research team has summarized current progress on the yam genome, plastome, transcriptome, proteome, and metabolome, highlighting the nutrient-rich and bioactive compound-laden Dioscorea species. This research holds significant value for genetic studies and molecular breeding in yams, particularly as their global production has doubled in

the past two decades, bolstering food security and sustenance in Africa.

Future applications include enhancing whole-genome sequencing, improving transcriptome data, advancing proteomics, and exploring multi-omics technologies to address broader scientific challenges.

Yams (Dioscorea spp.), essential horticulture crops with more than 600 species, are a staple food in African countries and a significant income source in Asia, the Pacific, and Latin America. Despite their importance, yams have been overlooked by researchers.

Global production has doubled in two decades due to the expansion of the overall planting area. Genetic and molecular breeding research is strengthening, yet yam omics studies are limited.

Current issues include environmental pollution during Diosgenin elements extraction and inadequate genetic markers for diversity analysis. Addressing these requires a comprehensive understanding of yams' genetic intricacies.

A study published in *Vegetable Research* on 17 May 2024, outlines the current state of genomic research on the Dioscorea genus, aiming to facilitate more in-depth studies and advancements in this field.

In this study, researchers reviewed the role of genomics in crop improvement, emphasizing that while gene sequencing alone is insufficient. Understanding the precise locations of all genes within a genome significantly enhances the practical utility of molecular marker technology. This knowledge allows for the identification of specific candidate genes responsible for traits such as greater yield and disease resistance.

In model species like rice and corn, genomics has been pivotal for

genetic advancements. For yams, the genomes of five species have been sequenced, with four reaching the chromosome level, revealing significant genetic diversity among yam species.

This review highlights the first genome of Guinea yam (D. rotundata) in 2017, which uncovered a genomic region linked to sex determination, enabling molecular markers for sex identification. Additionally, researchers discussed the domestication history of yams, such as Guinea yam's evolution from a hybrid of D. abyssinica and D. praehensilis, and ancient allotetraploidization events in Dioscorea lineage.

The analysis of diosgenin saponin biosynthetic pathways and the use of chloroplast genome sequences for phylogenetic studies further illustrate the advancements in yam genomics. This review underscores the importance of integrating genomics, transcriptomics, proteomics, and metabolomics to unravel complex genetic mechanisms and enhance yam molecular breeding and cultivation.

According to the study's lead researcher, Jinding Liu, "The research aspect is not only limited to the study of yam itself, but with the updating of sequencing technology and the accumulation of histological data, it is possible to overcome the difficulties encountered in other research, such as the extraction of special components of yam."

In summary, yams have become a vital global staple food, particularly in Africa, with production doubling over the past two decades. This review highlights advances in yam genome, plastome, transcriptome, proteome, and metabolome studies, aided by omics technologies.

Future research should focus on expanding whole-genome sequencing to other Dioscorea species, improving transcriptome data, enhancing proteomics, and exploring growth and metabolic mechanisms across species. Applying multi-omics technologies will address broader

scientific issues and facilitate molecular breeding in yams.

More information: Yahui Chen et al, Omics technologies accelerating research progress in yams, *Vegetable Research* (2024). DOI: 10.48130/vegres-0024-0014

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