

Finding the Bambara Groundnut That Can Thrive Anywhere

A science story by Prof. Olubukola Oluranti Babalola 

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A Short storytelling based on the peer-reviewed paper:

[Olanrewaju OS., Oyatomi, O](#)

[Babalola, O. O., Abberton, M.](#)

(2021). GGE Biplot Analysis of Genotype X Environment Interaction and Yield Stability in Bambara Groundnut. *Agronomy* 11:1839.

A farmer plants Bambara groundnut seeds and waits. The seeds germinate. The plants grow. The pods begin to form. But there is a question that farmers have faced for generations:

Will this variety perform just as well next season- and in a different place?

The answer is not always simple. A crop variety that produces an excellent harvest in one environment may perform quite differently somewhere else. Rainfall changes. Temperatures change. Soils differ. Growing seasons vary. Even when farmers plant the same variety, the harvest may not be the same.

For a crop such as **Bambara groundnut**, an important but underutilised African legume, understanding this variation is crucial. This was the challenge investigated by **O. S. Olanrewaju, O. Oyatomi, Olubukola O. Babalola and M. Abberton**. The researchers examined how different Bambara groundnut genotypes performed across different environments. Rather than looking only at the average yield of each genotype, they asked a more practical question:

Which varieties can produce good and dependable yields across different growing conditions?

To answer this, they used a powerful statistical tool known as **GGE biplot analysis**. The name may sound complicated, but the idea is relatively simple. Imagine testing several runners on different tracks. One runner may be fastest on a particular track but struggle on another. Another runner may not always be the fastest but consistently performs well across many tracks. For farmers, that second runner can be extremely valuable. The same principle applies to crop varieties.

The researchers used GGE biplot analysis to visualise the interaction between **genotype and environment**-in other words, how the genetic characteristics of a plant interact with the conditions in which it is grown. The analysis revealed that Bambara groundnut genotypes did not all respond to environments in the same way. Some genotypes were particularly suited to specific environments, while others demonstrated greater **yield stability** across environments. This distinction matters.

A variety that produces a spectacular harvest under ideal conditions may not necessarily be



the most useful choice for farmers facing unpredictable weather and variable soils. A stable variety-one that continues to perform reasonably well across different environments-can provide a more dependable harvest. The study therefore provides breeders with a valuable

way of identifying **high-yielding and stable Bambara groundnut genotypes**. It also highlights an important lesson about crop improvement:

There is no single environment.

Agriculture takes place in real landscapes, where conditions change from one location to another and from one season to the next. For African agriculture, where farmers may increasingly face climate variability, identifying crops that can perform reliably under different conditions is particularly important. Bambara groundnut has considerable potential in this context. It is a traditional African crop with nutritional value and the ability to grow under challenging conditions. Better understanding its genetic diversity and yield stability can help move the crop from being underutilised towards becoming a more widely cultivated food crop. The story is therefore not simply about a statistical graph. It is about giving breeders better information to answer a question that ultimately matters to farmers:

Which seed can I plant with greater confidence that it will give me a good harvest?

The answer begins with understanding how the plant's genes meet the environment. And sometimes, a carefully designed graph can reveal what years of field observations alone cannot easily show.

Research lesson:

The best crop variety is not always the one that produces the highest yield in one place. Sometimes, the most valuable variety is the one that can keep performing when the environment changes.

From Bambara groundnut fields to climate-resilient agriculture, understanding genotype × environment interaction can help us choose seeds that are better suited to an uncertain future.

Original citation

Olanrewaju OS, Oyatomi O, Babalola OO, Abberton M (2021) *GGE Biplot Analysis of Genotype X Environment Interaction and Yield Stability in Bambara Groundnut*. **Agronomy** 11:1839. <https://doi.org/10.3390/agronomy11091839>