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An Overview of Biotechnology Techniques to African Yam Bean Crop Development

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Climate change is a key contributor to food and nutrition insecurity on a global scale, decreasing agricultural output and availability. Despite attempts to reduce food insecurity, millions of people continue to suffer from malnutrition. Diverse cropping systems must be established instead of depending just on a few basic crops to accomplish the United Nations (UN) Sustainable Development Goal of Food Security. Many orphan legumes contain latent potential that might be useful in producing new cultivars that are more resistant to changing climate conditions. Sphenostylis stenocarpa Hochst. Ex A. Rich. Harms, also known as African yam bean, are an example of an orphan crop (AYB). The crop is a tropical legume that is underutilised, climate-resistant, and has a lot of promise.

However, these efforts have not resulted in varietal development, and poor yields continue to be a problem. The use of appropriate biotechnologies to improve AYB is critical for greater production, long-term use, and conservation. Biotechnological techniques with potential implications for AYB improvement are discussed in this study. These strategies' possible hazards are also noted. Crop diversity, food security, and climate change are all intricately linked. Food security will be nearly hard to accomplish without crop diversity. Climate change is a key contributor to food poverty on a global scale, affecting agricultural productivity and food availability. Despite attempts to reduce food insecurity, millions of people still suffer from malnutrition owing to a lack of protein and vitamin deficiencies. Protein, vitamin, and mineral deficient diets are harmful.

Simultaneously, a constant diet of high-calorie meals can lead to obesity and overweight. Africa has around 250 million malnourished people and Asia has 500 million, making these two continents the most malnourished places on the planet. Crop diversification may assist people's diets and livelihoods while also reducing hunger. There are around 30,000 edible crop species worldwide. Only 103 crop species are eaten, with rice, wheat, and maize being the most widely grown. Reliance on a few staple crops may be hazardous to the environment, nutrition, and economy. After cereals, legumes are the second most significant agricultural category. They serve an important role in human diets by delivering protein, lipids, and minerals, therefore improving health and minimising the risk of numerous diseases.

Because of their nitrogen-fixing capabilities, orphan legumes contribute to sustainable agriculture by reducing the usage and effect of artificial nitrogen fertilisers. With climate change influencing global agriculture, orphan legumes are viable crop options. Orphan crops are small crops that have gotten little scientific interest across the world. As a result, orphan crops in most emerging nations have remained commercially viable primarily in restricted geographical areas. Orphan crops are sometimes known as "underutilised," "neglected," "promising," or "small crops." Climate-resilient legumes have the added benefit of providing nutritional security. African yam bean (Sphenostylis stenocarpa), Bambara groundnut (Vigna subterranean), and Kersting's groundnut Macrotyloma geocarpum are some examples of underutilised legumes.

The implementation of several biotechnology methods and their possibilities for enhancement in African yam bean are highlighted in this review (AYB). These technologies' possible hazards are also explored. Underutilized legumes may be improved to create a stable agricultural system that addresses food and nutrition security. Underutilized legumes still have a lot of untapped potential, and there's a need to put a lot of effort into enhancing them for food and revenue, like AYB. These underutilised crops can benefit from biotechnological technologies that have been used to boost staple crops. Using genomic and biotechnological technologies, the International Institute of Tropical Agriculture and independent researchers are attempting to enhance AYB. This study revealed various AYB improvement bottlenecks, and using

Although genetics and genomics have advanced, additional omics technologies are yet to be investigated in AYB. To make the crop fit for food and income security in Sub-Saharan Africa, modern techniques for yield increase, shortened cooking time and maturity period, as well as pest and disease resistance, must be used. The combination of all omics technologies can aid in the evaluation of AYB's complicated cellular life. Biotechnology can aid in unlocking AYB's genetic potential for agricultural enhancement, which might lead to further research opportunities.

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