



Crop breeders on verge of beating Africa's most noxious weed using cutting edge science technique

Written by ASNS Correspondent

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Every year the Striga weed attacks and kills Africa's most important food crops in more than 40 million hectares of farmland often leaving farmers with no harvest.



Agricultural researchers have successfully identified and transferred genes that confer resistance to Africa's most deadly weed (Striga) using the novel marker assisted selection technique successfully for the first time in the history of crop breeding in Africa.

Researchers have managed to confer resistance to Striga in sorghum, overcoming a barrier that has for decades held back scientists' efforts to protect key food crops - sorghum, millet, maize and rice, from this destructive weed. These crops are primary food sources for 300 million people across sub-Saharan Africa.

Striga (*Striga hermonthica*), also known as witchweed, destroys between 40 to 100 percent of a complete season's crop, its annual crop damage across Africa estimated at seven billion dollars (US\$7 billion). Currently, the weed threatens to wipe out cereal crops in most of Western Kenya and Eastern Uganda, national agricultural research institutes in the two countries have warned.

"Scientists have searched for the solution to Striga damage using a variety of methods, but without much success," says Dr Dionysious Kiambi, a molecular geneticist with the International Crops Research Institute for Semi-Arid Tropics (ICRISAT). "Through marker assisted selection, we have determined the precise segments of the sorghum genome known to confer Striga-resistance and have transferred them to farmer-preferred varieties through conventional breeding with very promising results".

Marker assisted selection is a new technique which entails use of genetic landmarks (markers) to tag and transfer specific genes or group of genes that control characteristics of interest such as improved crop productivity, resistance to diseases or pests, or tolerance to stresses like floods and drought. This is the first time the technology has been used successfully for crop improvement in Africa.



ICRISAT scientists has been working with national and international collaborators for several years experimenting with marker assisted selection in search for Striga resistance genes from other sorghum varieties conserved in gene-banks across the world. They found one sorghum variety (N13), that is neither high-yielding nor drought-tolerant, to possess the highly sought after Striga-resistance genes. Segments of the N13 sorghum DNA containing genes for Striga-resistance were tagged with markers and crossed with farmer varieties using conventional breeding. The use of markers enabled scientists to precisely transfer only the Striga- resistance genes to farmer-preferred sorghum varieties without jeopardising farmer-desired characteristics such as drought-tolerance and higher yields.

"We had to make sure that other genetic information from N13 was not transferred to farmer varieties alongside the qualitative trait loci with Striga-resistance. We were not replacing any genetic components of farmer varieties, we are just adding to it," says Dr Kiambi. "The resulting variety is almost identical to the original farmer variety plus the component that confers Striga resistance."

ICRISAT has been collaborating with scientists from the University of Hohenheim in Germany and national agricultural research institutes of Eritrea, Kenya, Mali and Sudan. The team has to date created five Striga-resistant sorghum varieties whose initial trials on-station have been able to ward off Striga attacks, some as effectively as the donor parent, sorghum N13. In Kenya, Mali and Sudan, scientists are currently testing the new witchweed-resistant varieties in farmer fields.

Researchers in Africa have for decades experimented with a number of "potentially successful" techniques for managing this deadly weed including breeding for Striga tolerance in various crops, promotion of rotational cropping of cereals with legumes such as groundnuts, cowpeas and soybean in order to break the weed's breeding circle, as well as the use of biological and herbicidal control methods.

Africa's resource-poor farmers manage Striga primarily by weeding, a pointless, back-breaking activity which comes too late. By the time the crop sprouts, the weed, whose seeds reside in the soil, has long-since attached to plant roots and begun sapping off plant nutrients in earnest. Striga is a prolific seed producer, whose seeds lie dormant in the soil for up to two decades.

Crop breeders are enthusiastic about marker assisted breeding because it significantly reduces the duration required to produce improved crop. While conventional breeding is a hit-or-miss technique that requires scientists to wait for the crops to grow to maturity in order to observe expression of desired traits like Striga-resistance, marker assisted breeding enables scientists to check for the transfer of the trait as early as when the plant is only two weeks old, and focus on plants with the desired trait. This has more than halved the amount of time crop breeders need to develop improved varieties.

If the on-station results are successfully replicated on-farm, Africa's biggest cereal crop menace – Striga - may well be reigned in, boosting agricultural production, food security and farmer incomes across the continent.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a nonprofit, non-political organization that does innovative agricultural research and capacity building for sustainable development with a wide array of partners across the globe. Its mission is to help empower 600 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT, is one of 15 centers supported by the Consultative Group on International Agricultural Research (CGIAR).



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