

New Approaches to Controlling Striga Infestation

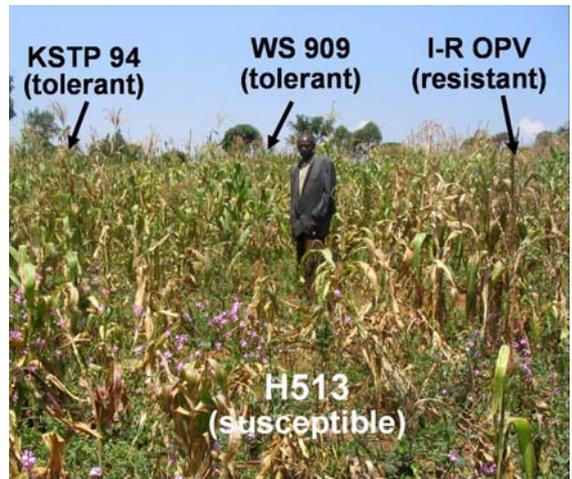
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Striga (*Striga harmonithica*) is a parasitic weed that attacks several cereal grains, particularly maize and sorghum, but also sugarcane, finger millet, napier and other native grasses. It originates from Africa but has spread to other parts of the tropics and warm temperate regions. In Kenya, striga infestation is most severe in Nyanza and Western Provinces, where it occurs in about 180,000 acres and results in crop losses estimated between KSh 800 and KSh 2200 million per year. Ironically, many farmers, including those in affected areas, are not fully aware of the threat posed by striga to their household food security and land quality.

For many years, agriculturalists in Kenya operated under the assumption that improved soil fertility provided a competitive advantage to overcome striga but, over that time the striga infestation has grown in size and severity. Farmers responded to striga infestation by hand weeding and, less often, burning affected fields but the efficacy of these practices remain questionable considering the large numbers of seed (≈ 50000) that a single, mature plant produces and returns to the soil. These seed remain dormant in the soil for up to 15 years and herein rests the dilemma, simple weeding and routine field sanitation procedures, even when combined with improved soil fertility management, appear insufficient to eradicate striga once it has become established within a farmer's field.

Striga has a rather complex lifecycle. The plant produces abundant, very small seeds that fall to the soil and are incorporated during tillage. The seeds remain dormant until they are stimulated to germinate by biochemical signals from plant roots. The germinating seeds penetrates the host root, and feeds from it for several weeks while living underground. Striga produces toxic chemicals that stunt and discolor the host plant. Then, the striga shoot emerges from the soil, producing fleshy green stems and narrow leaves, growing to a height of 50 to 100 cm. Next it produces numerous, small purple flowers that later form capsules containing many seeds. After the host plant dies, so too does the striga, causing the capsules to burst and the seeds to spread across the soil, and the cycle repeats itself.

Because the seeds are very small, they are easily spread to new areas by humans (for example on shoes or digging tools) and animals, as they move from one field or farm to another. When striga appears in a new location, farmers must take immediate action to 1) mark the area (patch) where the parasite occurs, 2) repeatedly hand



Different maize varieties may be resistant, tolerant or susceptible to parasitism by striga (J. Kundu Farm, Beliso, Bungoma, west Kenya).

weed the shoots as they emerge so that new seeds do not form and 3) the next season, do not plant hosts of striga in the patch but instead plant soyabean, groundnut and/or cowpea. The roots of these legumes will induce suicidal germination of striga seeds residing in the soil.

If striga is well established in a field, farmers may take additional actions. Even in large fields, striga usually appears in patches. If the striga has formed flowers and matured, farmers should dig a hole about 70 cm deep, gather the drying striga plants and put them in the hole, burn the plants and bury them. Then, burn the crop residues that occur in the affected patch to destroy any seeds that have escaped. A less practical option for smallholders is deep tillage (for example 50 cm), that placed striga seeds too deep in the soil to emerge and multiply. The simplest control practice is containment, meaning that care must be taken not to spread striga to neighboring fields and farms.

The agricultural research community has responded by exploring several avenues of striga reduction and control. Striga tolerant maize varieties were identified and commercialized over the past several years, and now affected farmers may purchase either open pollinated or hybrid varieties that are able to produce a smallish ear when parasitized. These varieties are WS 909, WH 502 and KSTP 94. WS 909 and WH 502 are marketed by Western Seed Company in Kitale. KSTP 94 was developed by the Kenya Agricultural Research Institute (KARI) and is marketed by Lagrotech in, Kisumu.

The roots of several legumes are known to induce suicidal germination of striga seeds, and this feature has become incorporated into striga

suppression strategies involving cereal-legume rotation or intercropping. Silverleaf desmodium is particularly effective in suppressing striga and has been incorporated into a biological control system known as Push-Pull. In Push-Pull, desmodium neutralizes striga and napier grass serves as a lure for the maize stalk borer, but this system may be difficult to establish because desmodium may prove difficult to establish. The small, slow growing desmodium seedlings cannot be easily weeded with the farmers' traditional jembe and smaller weeding instruments are required.

Pre-emergent and post-emergent herbicides (e.g. Oxyfluorfen, Goal 58) are successfully employed elsewhere, but are not commercially available in Kenya. Ethylene gas induces striga to germinate, so fields may be covered and fumigated with the compound Etherel (this is also used to induce uniform ripening of pinapples). A novel approach is under development by the international research organization CIMMYT that is based upon inherited resistance to a systemic herbicide (Imazapyr). When Imazapyr-resistant (I-R) maize seed is coated with the herbicide, striga attempting to parasitize the resulting plants are destroyed. Indeed, now farmers can actively



Imazapyr-resistant maize is grown with a staggered soyabean intercrop in field trials designed to combat striga infestation in Vihiga, west Kenya.

suppress and reduce striga seed banks in soil by protecting maize with a "chemical barrier" to striga infection.

These advanced control practices were developed in isolation of one another and, until recently, little effort has been made to integrate them into routine smallhold farming operations. The African Agricultural Technology Foundation (AATF) has commissioned the Striga Management Project through grants to several Non-Governmental Organizations (NGOs) active in Nyanza and Western Provinces. SACRED-Africa will coordinate the establishment of 360 eight-treatment on-farm trials in six districts over the next three cropping seasons. Two other NGOs, ARDAP and Resource Projects Kenya will assist in this network and their efforts will be backstopped by researchers at Moi University and KARI-Kibos. The Sustainable Community-Oriented Development Project (SCODP) will assemble and test market approximately 2500 "I-R-based striga control packages" through its affiliated farm input supply network in Bondo, Busia and Siaya Districts. SCODP will also establish 300 field-scale demonstrations in the areas that are worst affected by striga. The Forum for Organic Resource Management and Agricultural Technologies (FORMAT) will develop information tools on striga management and organize several stakeholder and media awareness events. Finally, TSBF-CIAT will conduct a series of experiments that examines the potential for striga eradication using integrated control practices.

During the project, 33 farmer field days will be conducted that will offer farmers guidance, literature and striga control products. The expected impacts from this project include familiarization of thousands of smallhold farmers throughout Western and Nyanza Provinces with several different striga control interventions; commercialization and distribution of the most promising of these technologies, greater expertise among NGOs in striga control, the development of more holistic approaches to striga management among participating national and international research organizations and, hopefully, the design of a program for striga confinement and eradication that will serve as a model for west Kenya and elsewhere in Africa.

We are seeking partners for this project that will begin with the long-rains 2005. Any interested NGO, farmer organization or grassroots group whose members are victims of striga in Kenya are encouraged to contact **The Striga Management Project c/o FORMAT, P.O. Box 79, The Village Market, Nairobi, Kenya** or email plwoomer@africaonline.co.ke