

## **Striga and ways of control**

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**ABSTRACT:** Obligate parasitic plant witchweed (*Striga spp*) infects major cereal crops such as sorghum, maize, and millet, and is the most devastating weed pest. An understanding of the nature of its parasitism would contribute to the development of more sophisticated management methods. The Striga Technology Extension Project is an on-farm promotion activity that focused upon mobilising new approaches to striga control, specifically herbicide-resistant maize and legume suppression. The first year project goals were to deploy imazapyr-resistant maize and other innovative striga control technologies in a way that leads to the reduction of Striga in maize croplands and to introduce new striga management products to farmers through innovative input supply mechanisms. Striga is difficult to control once it gets bad, but understanding its life cycle can help prevent it getting bad in areas which are as yet uninfected. For this reason it is important to understand the life cycle. In the Striga control methods, the hoe weeded check resulted in lower grain yield as compared to plots that received followed by post-emergence Triclopyr 2,4 Deach at the rate of 0.36 kg a.i/ha or supplementary hoe-weeding.

**Keywords:** Striga, Control, Ways

### **INTRODUCTION**

Addition of nitrogen to the soil is generally considered to alleviate the effects of striga and to lower the amount of striga supported by the host (Mbwaga et al., 2001). Chivinge et al. (2001) reported that cowpea cultivars reduced striga emergence by 40%. The effectiveness of cereal/legume intercropping to influence striga germination depends on the effectiveness of the produced stimulant/inhibitors, root development, fertility improvement, shading effect and its compatibility to striga species because the response of striga to management options is specific (Mbwaga et al., 2001). The genus *Striga* (family *Scrophulariaceae*) includes a large number of tropical parasitic or hemi-parasitic plants. Some have attracted attention as important pests of crop plants, and have been treated as quarantine pests by countries where they are not present. The most important are considered in this data sheet. Some species remain fully parasitic till maturity, and may even hardly emerge above the surface of the soil. The *Striga spp.* which infect dicotyledonous plants belong in this category (e.g. *S. gesnerioides*). The development cycle typically lasts 90-120 days, and

requires a temperature of at least 20°C, but is optimal at 25-30°C. When the conditions for the germination are lacking, the seeds can remain viable in soil for a period up to 20 years. The roots are white and closely attached to the host roots by haustoria. *S. hermonthica* is a more striking larger plant (up to 60 cm), with large showy flowers. *S. gesnerioides*, a full parasite, is purplish or brownish in colour, branched, with leaves reduced to scales and the root swollen to a tuber. 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 and pull. In pushpull, desmodium neutralizes striga (Woomer, 2004). Intercropping cereal with cowpea in the same row gave the highest yield in Cameroon and in Ethiopia (Mbwaga et al., 2001). Intercropping with legumes also improves soil fertility through fixation of atmospheric nitrogen. Addition of nitrogen to the soil is generally considered to alleviate the effects of striga and to lower the amount of striga supported by the host. The effectiveness of cereal/legume

intercropping to influence striga germination depends on the effectiveness of the produced stimulants/inhibitors, root development, fertility improvement, shading effect and its compatibility to striga species (Mbwaga et al., 2001). The life cycle of Striga is mainly dependent on that of its host. Striga produces thousands of minute, dust-like seeds that can remain viable in the soil for over a decade (Bebawi et al., 1984). Germination of seeds is induced by exudates of many plants, including both the above-mentioned cereals and so-called trap crops (Bouwmeester et al., 2003). The latter plants stimulate Striga germination but without becoming infected by the root hemi-parasite, as subsequent attachment and haustorial formation can only take place on true hosts (Parkinson et al., 1987; Ejeta and Butler, 1993; Olivier, 1995). Approximately 75% of the overall Striga damage to the host is made during its subterranean stage of development (Bebawi et al., 1984; Parker and Riches, 1993). Although it has been demonstrated that up to 35% of the plant carbon demands are met by its autotrophic host (Pageau et al., 1998), this source-sink relations between Striga and its host does not fully explain the damage done by the parasite. Rank et al. (2004) demonstrated that Striga exerts a potent phytotoxic effect on the host. This phytotoxic effect is evident in the fact that the damage that Striga does to the cereal crops can reach maximum before the parasite emerges above ground. Managing Striga below ground is therefore a crucial for successful Striga management.

### **Controlling Striga**

Emerged *Striga* plants can be successfully killed with common herbicides. However, much damage is done by the fully parasitic young plants before emergence, so such herbicide treatments do not necessarily reduce yield losses. The main strategy for control is accordingly to reduce the seed bank of *Striga* in the soil by stimulating the seeds to germinate in the absence of host plants. This can be achieved by: 1) planting a Poaceous trap crop (susceptible cereal or grass) which is ploughed in a few weeks after sowing before the weeds mature and set seed; 2) sowing crops which stimulate germination, but are not parasitized, for several seasons (e.g. sunflower, groundnut, soybean); 3) treating the soil with ethylene, which simulates the chemical substances which exude from host roots and stimulate germination. In East Africa, the most promising new approach to *Striga* control is the use of resistant cultivars (e.g. of sorghum).

- Rotate crops so the weed does not have a chance to build up and so dies out.
- Plant trap crops with the maize. These stimulate Striga to germinate, but the parasite is unable to penetrate the root and the seed dies. Cowpeas are an example of a trap crop.
- Repeated pulling of Striga will lessen it, but pulling does stimulate the weed.

- Plant Striga resistant seed.

### ***Spraying with herbicide (chemical weed-killer)***

Herbicides are available in many countries to control weeds. Sprays must be selective; they must be able to differentiate between the crop and weed and destroy only the crop. The weeds must be correctly identified if herbicides are to be correctly deployed. Herbicides must be treated with care as some of them are poisonous so strict safety regulations should be observed such as wearing protective clothing and disposing of old chemical containers responsibly. The disadvantages of non-chemical control of weeds are the use of hand tools, forks and cutlasses can damage the roots and shoots of crops. Continuous hoeing of the soil damages the soil structure leading to soil erosion and aids the decomposition of the soil organic matter. This would make chemicals a no-brainer in terms of addressing weed control. This is true for large estates (with larger budgets) and at high altitudes, but chemical spraying for weed control for small farmers has had little impact for the following reasons: High cost of herbicides makes them unsuitable for small farmers. Hand weeding does not cost cash.

- Where intercropping is practiced, it is difficult to find a herbicide that will take out weeds in a mixture of different species.
- There is a general low level of education and a lack of advice for farmers pertaining to chemical use.
- Herbicides historically were not readily available in small quantities. This is gradually changing though.
- Chemical herbicides harm fish and aquatic fauna.
- Counterfeit pesticide and illegal imports can be highly damaging to crops, land and people.
- Introduction of herbicides can kill off one weed and enable another weed to take its place.
- Plant cover crops which smother weeds. These, often creeping plants, must not compete too much with the main crop. Examples are Muncana planted with maize in Benin has been successful in controlling spear grass.
- Rotating crops reduced weed build up associated with one particular crop.
- New varieties allow closer planting of seed which crowds out weed competition.
- Fresh tadpole shrimp in paddy fields helps control the weeds by eating the young buds and roots of the weed plant.
- Proper seed selection
- Use seeds that are Striga seeds-free. Avoid using seeds from the previous harvest if the crops were infested with Striga. Buy the seeds for your next cropping from an agricultural seed store in your locality.

- Regular plant monitoring
- Intercropping sorghum with cowpea
- Intercropping corn with silver leaf desmodium (*Desmodium uncinatum*) or green leaf desmodium (*D. intortum*). Desmodium is a leguminous plant that is a good source of fodder for the farm animals. When planted as an intercrop, it covers the surface in between the rows of the main crop (corn, sorghum, or millet). Desmodium emits chemical into the soil that is unfavorable for Striga's growth. 2.5 kg of seeds are needed for 1 ha.
- Hoeing and hand weeding before Striga plants start to flower. Late weeding requires the burning of collected plants to kill the seeds. Never put them in your compost pile or pit.
- Off-barring and hilling-up the rows
- Apply organic fertilizer and other organic soil supplement to improve the crop's stand.
- Crop rotation with legumes such as soybean, mungbean, and other leguminous crops, to improve the soil condition and deprive the parasitic weeds from favored host plant

Rotating the infested maize or sorghum areas to wheat/barley, pulses, or groundnuts are viable and effective options in Ethiopia. A season of non-host cropping allows for a large portion of the striga seeds to deteriorate into nonviability. Seriously infested areas should be rotated to non-host crops for two years followed by closely supervised weeding. In Ethiopia two years of cropping to a non-host was reported to reduce striga infestation by 50% (Shank, 2002). In Sahel the results of a four year experiment in bush fields indicated that one season cowpea in 1998, had a positive effect on subsequent millet grain yields, soil organic carbon and nitrogen, and reduced striga infestation. The increase in yields due to millet-cowpea rotation was 37% in 1999 compared to 3-5 years continuous millet cropping (Samake, 2003). Sanitation consists of taking care to note infested areas and to isolate them. Wind, rainwater, ploughing, and soil on tools or root crops can spread seeds in the soil. Seedpods on striga plants attached to maize or sorghum plants pulled for forage will infest manure and feeding areas. It is suggested that a striga disposal pit be constructed to prevent seed maturation of green or drying plants that are pulled (Shank, 2002). Mulches from *Collophospermum mopane*, *Acacia karoo* and *Acacia nilotica* reduced the incidence of *S.asiatica* and delayed its emergence and flowering. Mulch from *C.mopane* was the most effective in suppressing the weed between the 4th and 5th weeks after its application. *A. karoo* increased the number of days to emergence from 47 days to 68 days while that from *C. mopane* and *A.nilotica* increased the number to 58 days. Mulches from *A. nilotica*, *A. karoo* and *C. mopane* increased the number of days to flowering from

75 to 108, 125 and 100, respectively. maize and sorghum are vulnerable to stalk twisting and lodging if 2,4-D is sprayed into the leaf whorl. Spraying should only be done after users have been trained and cautioned to these hazards. Experimentally, anti-transpirant type herbicides applied only to the base of the row of sorghum-striga or maize-striga were very effective (Shank, 2002). Herbicides such as trifluralin and pendimethalin, have been effective against *S. asiatica* when incorporated shallowly in a layer above the cereal seed by

inhibiting shoot growth of the parasite (Mloza-Banda and Kabambe, 1997). Traore et al. (2001) reported that use of herbicides is more cost effective than mechanical weeding and it enhanced striga control. all the known methods of striga control have shortcomings. however, the sampling of control methods presented here shows that the weed is not invincible. more information is needed on ways in which farmers and researchers are successfully controlling striga using means available to small holders. those who have experience in this area are invited to share it with other readers of international ag-sieve.

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