Striga asiatica

Introduction

Striga asiatica (L.) Kuntze is an obligate parasite which becomes attached to the roots of cereals and other plants not only robbing them of nutrition but also causing various debilitating effects, hence the common name given to this pest – witchweed. *S. asiatica* produces numerous tiny seeds which remain viable in the soil for many years and do not germinate unless a sorghum or maize root grows very near to them.

Once established it is very hard to eradicate and in areas where infestation is heavy there may be total crop failure in some years. Witchweed is native of the semi-arid and grassland region of Africa and Asia. There are reports (unconfirmed) of its presence in the Caribbean (Cuba, Haiti). However, it is known to occur on the eastern seaboard of USA.

Identity

Authority : (L.) Kuntze
Classification
- Kingdom : Plantae
- Phylum : Angiospermophyta
- Class : Dicotyledonae
- Family : Scrophulariaceae
- Genus : *Striga*
- Species : *asiatica*
- Synonyms : *Striga lutea* Lour., *S. zangebarica* Klotzsch., *S. pusilla* Hochst., *S. coccinea* Benth., *S. spanogheana* Miq., *S. parvula* Miq., *S. hirsuta* Benth.
- Common name : Witc
- Role : Pest

Signs & Symptoms

Symptoms seen in host plants include stunting, chlorosis and wilting. Infested roots bear several haustoria of the parasite, which are attached to and feed on the plant.

Morphology

Kanampiu (2202)

The seedlings are not visible above ground, but white succulent shoots can be found attached to host roots.

Mature Plant

Foliage above ground contains chlorophyll and is bright green, typically sparsely covered with coarse, short, white, bulbous-based hairs. Stems are erect, stiff, branched, 15 - 30 cm tall, square in cross section in the upper portions of plants. Leaves are nearly opposite, narrowly lanceolate to linear, about 1-3 cm long, with successive leaf pairs perpendicular to one another (decussate). Underground stems are round with scale-like leaves, white, turning bluish when exposed to air.

Roots and underground structures

Succulent, round, white, lack root hairs, attached to host roots.

Fig. 1: *Striga asiatica*.
Habit of plant attached to maize.
(Photo credit: D. L. Nickrent)

Flowers

Summer-Fall. Sessile, axillary. Corolla two-lipped, tube bent, 10 mm long, 6 - 9 mm wide, bright to brick red, occasionally yellow or white, with outer surfaces sparsely covered with tiny glandular hairs. Calyx (sepals as a unit) are tubular, with 10 ribs, 5 lobes; bracts below calyx 2, linear-lanceolate, ~ 5 mm long; flowers self-pollinate before opening when sticky pollen balls cling to the elongating style.

Fruits and seeds

Capsules ovoid, **5-sided**, with a narrow wing at each corner; style 1, persistent, often with clinging pollen masses. Capsules can contain up to ~ 1400 seeds (~ 550 average). Seeds are brown, oval, **dust-like**, ~ 0.2 mm long; seed surfaces striated, overlayed with a reticulate pattern (visible with magnification).

Fig. 2: *Striga asiatica* seeds compared to maize and *Sorghum*.
(Photo credit: C. Parker, from "*Striga* Identification and Control Handbook")

Biology & Ecology Kanampiu (2002)

Seeds require an after ripening period of 6 weeks under warm conditions to 40 weeks under freezing conditions. Dormant seeds survive freezing [to –15º C (5º F)] for at least 49 days and can remain viable under field conditions for up to 14 years or more. Germination is complex and requires about a 1-3 week "conditioning" period at a suitable temperature regime [20-40º C (68-104º F), optimum 35º C (95º F)] under moist conditions, followed by a chemical signal from a nearby root of a host plant. Proximity of host root to seed must be within a few millimeters. Under these conditions, seeds germinate within 24 hours. After 3 weeks of conditioning without a chemical signal, germination ability of seeds decrease, and some seed may pass into a secondary dormancy. Light exposure or wet soils inhibit germination. Irregular or light rainfall appears to promote seed germination and plant

vigor. High soil nitrogen reduces damage to host plants. Corn is usually parasitized 2-3 weeks after planting and witchweed shoots emerge about 3-8 weeks later. Flowers develop about 3 weeks after emergence. Viable seed is produced within 2 weeks of flowering. A minimum of ~ 60 days is required from seed germination to seed production.

Witchweed is primarily associated with agricultural lands, especially those with light soils and/or low nitrogen fertility. Populations are highly variable, and flower color varies regionally, from red, orange, or yellow in Africa to pink, white, yellow, or purple in Asia.

Dispersal / vectors

The seeds disperse by means of water, wind, and soil movement, via shoes, farm machinery, tools and human activities.

Management

Propagation of *Striga* is very difficult to prevent as the seeds, which are very tiny, are produced in large quantities (50,000 seeds per plant) and retain their germination capacity for up to 20 years.
Much damage to crops can occur before witchweed emerges. Light infestations can usually be controlled by hand pulling before seed is produced. For heavier infestations, an integrated management plan is required:

i. *trap-crops* (those that stimulate witchweed seed germination but are not hosts of the parasite) such as cotton or catch-crops (susceptible crops that are harvested before witchweed seed is produced) for 3 or more years;
ii. fallow land for several years and inject the soil with ethylene (a germination stimulant);
iii. enhancing soil nitrogen fertility;
iv. tolerant cereal varieties;
v. herbicides that prevent witchweed emergence or seed production.
vi. Dinitroaniline compounds have given good control as pre-emergence treatments.
vii. post-emergent herbicides – paraquat and glyphosate (Eplee, 1984).
viii. institute measures to prevent the movement of the parasite into uninfested areas on transplants, agricultural products and machinery

Biocontrol

According to Greathead (1984) *Smicronyx spp*. are the natural enemies of *Striga* that show the most potential as biocontrol agents.

Host Notes

Main hosts – Sorghum, maize, millet, upland rice, sugarcane, tobacco.

Distribution

It is reported that the weed is presently in the Caribbean, possibly in Cuba and Haiti. In the U.S.A, infestations currently exist only on agricultural lands near the eastern border between

North and South Carolina. Infestations are widespread in Africa, Asia, Australia, Indonesia, Philippines, Madagascar, and New Guinea.

Pest Significance

Striga is of major importance and could be harmful to the farming sector should it be introduced to the Caribbean.

Inspection Procedures

Although the tiny witchweed seeds can be spread by wind or water, people are the chief means of dispersal. To prevent the spread of this pest, agricultural quarantine services must specify conditions for moving soil, plants or machinery out of infested areas.

Bibliography

Eplee, R.E. (1984) Chemical control of *Striga.* Workshop on the Biology and Control of *Striga*, *ICSU press* and *IDRC.* 216 p.

Greathead, D.J. (1984) The natural enemies of the *Striga* species and the prospects for utilization as Biological Control Agents. Workshop on the Biology and Control of *Striga*, *ICSU press* and *IDRC.* 216 p.

Kanampiu, F. (2002) New ways to Curb *Striga* Weed. *AGN Forum, Quarterly Newsletter, Agric. Research in eastern and Central Africa CIMMYT.*

Web Resources -

http:// www.esb.utexas.edu/palmer/bio303/group5/Striga.html - 7k

http://www.esb.utexas.edu/palmer/bio303/group5/Striga.html - 7k