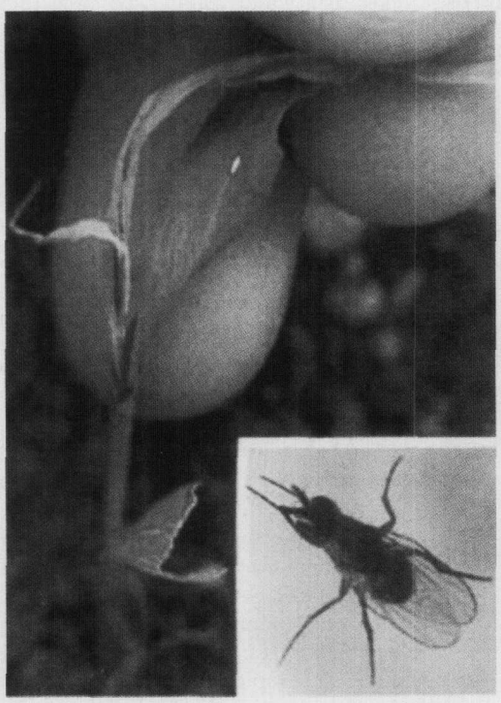
Insect problems? Try a little wax and hair



Deadheart, egg on leaf, with the culprit in the inset.

Credit: ICRISAT

Sorghum shoot fly, *Atherigona soccata*, is a particularly nasty pest of sorghum in Asia, Africa, and the Mediterranean area. Females lay single cigar-shaped eggs on the undersides of leaves at the one-to-seven leaf stage. The eggs hatch after only a day or two of incubation, and the larvae cut the growing point of the leaf, resulting in wilting and drying. These leaves, known as 'deadhearts', are easily plucked. When a deadheart is plucked, it releases an obnoxious odour.

Damage occurs one-to-four weeks after seedling emergence. The damaged plants produce side tillers, which may also be attacked. The shoot fly's entire life cycle is completed in 17-21 days. In India, shoot fly populations begin to increase in July, peak in August-September, and then decline. Infestations are especially high when sorghum planting is staggered due to erratic rainfall. Infestation is normally high in the post-rainy-season crop, which is sown in September-October. Temperatures above 35C and below 18C reduce shoot fly survival, as does continuous rainfall.

To identify sources of resistance to shoot fly, scientists at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) screened over 30,000 sorghum germplasm accessions at Patancheru. Nearly 45 accessions with moderate levels of resistance have so far been identified in the sorghum germplasm collection, and improved varieties have been developed. These lines have resistance comparable to original sources of resistance, and their yield potential is greater than that of the landraces.

Considerable progress has been made in understanding the mechanisms of resistance to shoot fly in cultivated and wild relatives of sorghum. Oviposition non-preference (a bit of entomology-speak that refers to the female's disdain for laying eggs on a particular genotype) is the primary mechanism of resistance.

Why? The answer can be summed up in one word: wax. The glossy leaf trait of resistant lines in sorghum is caused by a smooth amorphous wax layer, along with a few wax crystals. Cultivars with high transpiration rates are therefore preferred, since resistant lines have low leaf surface wetness.

Shoot fly-resistant genotypes impede the survival of larvae, as well as the survival, longevity and fecundity of females. Another defensive technique among some genotypes is an inherent ability to produce side-tillers after the main shoot is killed. These side-tillers can produce a reasonable yield if the plant is not attacked further.

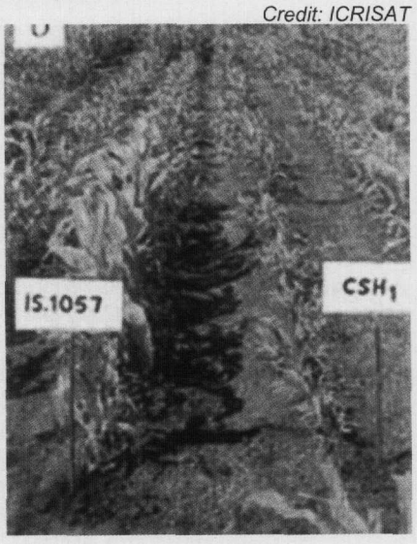
Shoot fly-resistant lines grow more rapidly and have greater seedling height and hardness, longer stems and internodes, and shorter peduncles than susceptible lines. Most shoot fly-resistant germplasm lines have hairy appendages called trichomes on the undersurface of leaves. Trichomes are absent in susceptible lines.

So, once entomologists and breeders identify lines with leaves that sport waxy flesh and hairy underarms, what's next?

Efforts are under way to transfer shoot fly resistance into high-yielding hybrid parents and varieties. Efforts are also under way to rear shoot flies on artificial diets to identify *Bacillus thuringiensis* toxins for developing transgenic sorghums with resistance, and identify molecular markers associated with resistance to this insect.

If all this comes to pass, an end to the shoot fly havoc in poor farmers' sorghum fields may be in sight.

For more information contact Dr H. Sharma, ICRISAT, Patanchera P.O., Andhra Pradesh 502 324, India. Fax: +91 40 241239. E-mail: h.sharma@cgiar.org Web Page: www.icrisat.org



Comparison of resistant lines with CSH-1, a susceptible line.

Credit: ICRISAT