Reference 22 African rice gall midge

Summary

This reference complements Reference 21, which presented an overview of the insect pests and useful insects. African rice gall midge, *Orseolia oryzivora*, causes such severe damage to rice crops and has such a complex behavior that it requires a special reference. This reference provides more detailed information about the insect to help the facilitators develop a strategy to control it. This reference presents the life-cycle of African rice gall midge and also some integrated control methods.

Description

In the inland valleys in Sub-Saharan Africa, African rice gall midge (*Orseolia oryzivora* Harris and Gagné) causes significant damage. During its life-cycle, it completes four stages:

- ***The egg*** is elongated and about 0.5 mm long; initially a brilliant white color, it becomes yellow then amber with red dots before hatching (when the larva leaves the egg).
- ***The larva*** is initially whitish with two pairs of spines at the abdomen; at the end of the larval stage, the larva is milky white, the mouth spirals brown, and the abdominal spines have disappeared.
- ***The pupa*** (female gall midge 5 mm) is pale pink except for the wing buds. The legs, eyes and antennae become brown first, well before emergence. The leg buds are detached from the abdomen, the back-end segments have rows of strong spines bent backwards.
- ***The adult***: a rice gall midge is the size of a mosquito (4.8 mm long), is reddish with dark antennae and thorax, and black eyes.

Biology and damage

The adult often enters the rice field unnoticed. It lives 2 to 4 days. The female lays 200 to 400 eggs, individually or in groups of 3 to 5 on the stem base, on or in the vicinity of the ligules, on the underside of the leaf sheath or even on the surface of the water. Incubation takes 2 to 5 days.

At hatching, the larva makes its way down between the leaf sheaths and the stem to the growing point (apical meristem), and then penetrates into the tiller. The larva causes the plant to form an initially oval, hollow gall at the tiller's growing point, within which it stays its whole life. In each gall there is one larva. The gall develops on young tillers, before distinct internodes can be observed. The gall is formed by a bulbous thickening at the growing point (which is destroyed).

After about two weeks, the larva transforms into a pupa (cocoon). The pupa is mobile. Towards the end of the pupal stage (which lasts 3–5 days), the gall elongates into a hollow tube, very long and pearly white, so that the plant looks like an onion leaf. The pupa moves upwards inside the gall tube near to the tip of the gall. Here it cuts a hole in the wall and the adult midge emerges and crawls out leaving the pupal skin protruding from the exit hole.

Recognizing gall midge damage

The long, silvery galls are obvious on young rice plants; however, on older plants they are less conspicuous, either because they are hidden by the rice leaves, or else because they are green under poor growing conditions (and therefore not easily distinguished from plant leaves). Each 'onion leaf' is a lost stem. After the emergence of the adult, the 'onion leaves' become yellow, then dry; after which further elongation is impossible. The plant reacts by producing new tillers, which are often infested too.

Orseolia oryzivora can proliferate locally for years, or when two rice crops a year are cultivated. Every year, the midge is found at certain locations, particularly in the Guinea and derived savanna and humid forest zones. Rapid population growth is favored by sequential or asynchronous planting of rice (enabling midges to infest one field after another) and cloudy, humid weather (more than 50% relative humidity favors egg laying and incubation). Only rice fields at tillering stage can be infested. The younger the plant at the time of attack (28 to 42 days after transplanting), the worse the infestation.

Gall midge survives the dry season on cultivated-rice ratoons and volunteers, or on wild rices (*Oryza barthii, O. longistaminata*, *see* Figures 22.1 and 22.2). Infestation is most severe when rains are early and followed by a dry period delaying transplanting or sowing. A first infestation then builds up on wild rice and when the rice crop grows, it is immediately severely infested. In irrigated regions, a second rice crop can be severely attacked at the beginning of the dry season.

Control

Crop management practices

The following crop management practices should be used:

- Early sowing/planting: to avoid the peak period of the insect.
- Synchronized planting: farmers have to plant their rice at about the same time so that the insect does not continually find young plants to build up its population.
- Fertilizer doses: avoid over-doses (especially of nitrogen) as these lead to over-profuse leaf formation and favor gall-midge infestation.
- Destruction of wild rice, *O. longistaminata*: this is a perennial weed in which the insect survives during the dry season and transfers to young rice plants at the beginning of the rainy season. The ratoons and volunteers of cultivated rice should be destroyed for the same reason.
- Preservation of *Paspalum scrobiculatum* (*see* Figure 22.3): this is a host plant for gall midge parasites: *Platygaster diplosisae* and *Aprostocetus procera*.

Using crop management practices to control gall midge requires a certain organization among farmers. They may find difficulties in implementing the activities requiring joint action (e.g. synchronized planting), or because of socio-economic problems (e.g. meeting the requirements to be able to sow or transplant at the same time).

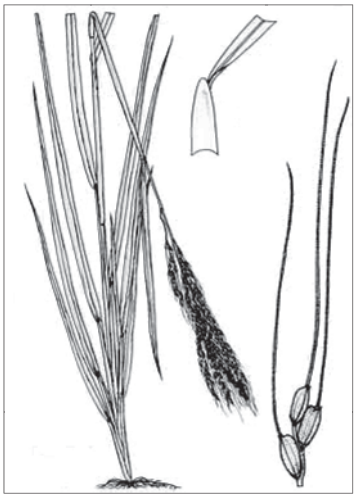

Figure 22.1. ***Oryza barthii***

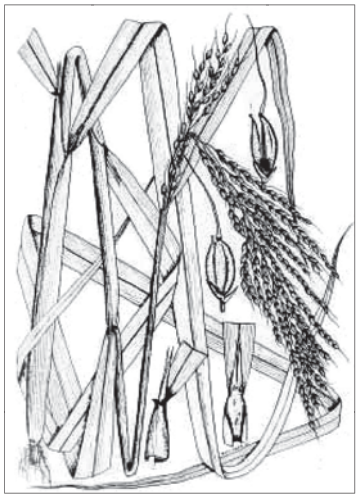

Figure 22.2. ***Oryza longistaminata***

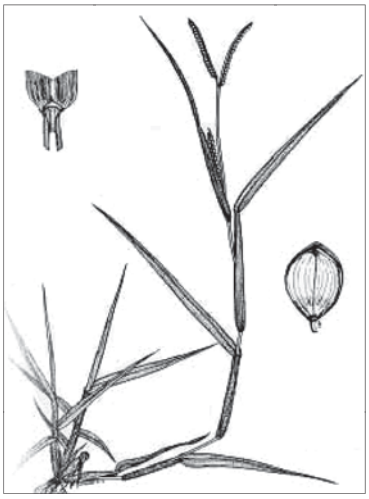

Figure 22.3. ***Paspalum scrobulatum***

Biological control

Biological control means trying to preserve the life of useful insects (Reference 21):

- Predators: red ants, damsel flies, crab spiders, long-jawed spiders, wolf spiders and jumping spiders eat adult and larval midges.
- Parasitoids: the most common parasitoids of gall midge are *Platygaster diplosisae* and *Aprostocetus procera*. Both are small wasps living on another gall-midge species associated with the weed *Paspalum scrobiculatum*. This is the reason why this weed is useful in the integrated control.

Indeed, during the dry season, *Platygaster diplosisae* and *Aprostocetus procera* develop on the other midge species on *Paspalum scrobiculatum* and increase their population. During the rainy season, when the rice is in place and African rice gall midge appears, they attack and destroy the gall midge. They lay their eggs inside the midge eggs, larvae and pupae, thus killing the gall before it reaches the adult stage. *Platygaster diplosisae* attacks the eggs and the larvae of gall midge on the outside of the rice plant, and *Aprostocetus procera* only attacks the pupa inside the plant. So, if farmers destroy *Paspalum scrobiculatum*, they destroy at the same time the useful insects *Platygaster diplosisae* and *Aprostocetus procera*. Thus, *Paspalum* (the main host plant for these insects) has to be preserved, whereas *Oryza longistaminata* (which hosts African rice gall midge itself) has to be destroyed.

Control with insecticides

The use of insecticides to control gall midge does not seem a good option, especially because the two control methods mentioned above are effective. They not only preserve useful insects, but also do not harm the environment.

Control through varietal resistance

This is using rice varieties that are resistant to the pest or tolerant to the presence of the pest. This ability to resist can result from the morphological constitution discouraging the insect (hard plant tissue, bad taste, repulsive odor, leaf characteristics not appropriate to hatching, etc.). All these different characteristics may be inherent to the plant or introduced through breeding.

The two cultivated rice species *Oryza sativa* (Asian) and *O. glaberrima* (African) both have gall-midge-resistant varieties. Resistant varieties from the African species are: TOG 7106, TOG 7206 and TOG 7442. Several varieties of *O. sativa* are resistant: Cisadane (released in Nigeria), BW348-1 (selected in Burkina Faso and Nigeria, but not yet released) and TOS 14519 (a traditional variety in The Gambia). WARDA is developing interspecific resistant varieties from crosses between *O. glaberrima* and *O. sativa*. On the photo pages, images of the life cycle of the African rice gall midge (Photos 22.1; 22.2; 22.3; 22.4) and damage symptoms on the rice plant (Photos 22.5; 22.6) can be found.

Bibliography

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