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Management of Rice Yellow Stem Borer and Gall Midge

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Abstract

Rice cultivated under different agro climatic conditions *viz.,* water logged, deep water, hills, high humidity, high temperatures, salinity, alkalinity and flood prone areas. The yield loss of rice crop takes place by many stresses throughout the crop growth period like different pests such as insects, nematodes, diseases, weeds and rats. To avoid this, adoption of integrated pest management (IPM) strategies is the best solution to tackle the pest problems. Rice IPM provides a framework for integrating knowledge, skills and information on rice pest management.

Introduction

Rice is ideal host crop for many insect pests. All the rice parts are vulnerable to insect feeding from the time of sowing to harvest. 100 species of insect pest affecting the rice cultivation like, yellow stem borer, gall midge, thrips, leaf hoppers, planthoppers, leaffolder, earhead bug, black bug, case worm and swarming caterpillar. Among these pests, the yellow stem borer and gall midge causing economic yield loss to the crop (Ali *et al.,* 2007). These pests can be well efficiently managed by several integrated pest management strategy including, cultural, physical, mechanical, bio-control agents, bio-pesticides and chemical methods.

Yellow Stem Borer (YSB): *Scirpophaga incertulas* (Crambidae: Lepidoptera)

The females of YSB are highly phototropic and attracted to light. The female lay disc-like eggs on near the tip of upper surface of the tender leaf blade and eggs are covered with buff coloured hairs. Incubation takes 5-8 days. This stem borer gets its name from the pale smooth yellowish body of the larva. Only one larva occurs in the nodal region of the plant. The newly hatched larva is pale yellow with dark brown head and prothoracic shield. It hangs down by a silken thread, falls on the water and swims freely to reach adjoining plant. Larva feeds on the leaf sheath and then bores into the stem. It becomes full-grown in 33-41 days. Before pupation the mature larva covers the exit hole with the webbing and then forms a white silken cocoon with in the stem and pupates. The pupae are found at the extreme base of the plant, often below the soil. The adult emerges in 6-10 days (Rath *et al.,* 2020)

Damage Symptoms

Yellowish larva bore into the stem and feeds on the inner surface of the stem walls, interrupting the movement of water and nutrient. The damage occurs in two stage of the crop. First, when the crops are young the central leaf of the damaged tillers turn brown. This damage

is called dead heart (Figure 1). If the damage occurs after the spikelets are formed, panicle turns white and no grain filling occurs. The damaged panicles are called white heads or white ears. Both can be easily pulled out by hand and may show insect feeding near the base. The damaged tillers are filled with frass. They have larval entrance and exit holes (Babendreie *et al.,* 2020)

Figure 1: Dead heart

Managements

• Plough the rice stubbles soon after the harvest.

• Avoid excessive nitrogenous fertilizers.

• Grow resistant varieties like Ratna, Jaya, TKM 6, IR 20, IR 26 and W 1213. They have more silicon in cells and larger number of sclerenchymatous tissues.

• Clip the tips of the seedlings off to get rid of egg masses before transplanting.

• Release the egg parasitoid, *Trichogramma japonicum* at the rate of 5 cc ha^{-1}, 30 and 37 days after transplanting (DAT).

• Apply *Bacillus thuringiensis kurstaki* @ 2 g l^{-1} + Neem seed kernel extract 5% in combination to reduce oviposition by the stem borer.

• Set up light and sex pheromone traps to attract and kill the moths (@ 5 $acre^{-1}$).

• Spray any one of the following insecticides with surfactant during early morning or late evening hours.

1. Indoxacarb 15 EC 80 ml $acre^{-1}$
2. Chlorantraniliprole 18.5 SC @ 0.3 ml l^{-1}
3. Flubendiamide 480 SC 0.4 ml l^{-1}

Rice Gall Midge: *Orseolia oryzae* (Cecidomyiidae: Diptera)

Adults of gall midge look like mosquito active at night. The female midge has a bright red abdomen. The male is generally smaller than the female. Both adults have bead-like antennae with more than 10 segments. The eggs are elongate-tubular form, laid singly or in groups on just below or above the ligules of the leaf blade. The larva hatches out from the egg in 3-10 days. It moves down to the shoot apex in 6-12 hours where it feeds on the growing point for 15-20 days. It pupation is takes place in inside the gall structure. The pupa is light pink in colour with abdominal spines. The pupal stage lasts 2-8 days. At the time of emergence of adult, the pupa wriggles up to the tip and whitish pupal case is protruding out of the tip. The whole life-cycle takes 14-26 days on rice (Fahad *et al.,* 2015).

Damage Symptoms

The symptom is popularly known as 'Silver shoot' or 'Onion shoot' or 'Anaikomban' (Figure 2) in Tamil because of the transformation of leaf sheath into a long cylindrical tubular gall bearing at its tip a small atrophied leaf blade complete with ligules and auricles. The gall is therefore

Figure 2: Silver shoot

a modified leaf sheath. It may be dirty white, purple or green, straight or twisted. Due to formation silver shoot leads to production of many compensatory tillers. The larva feeds on shoot apex resulting in the suppression of apical meristem. The elongation of leaf sheath is possibly due to an active substance called 'cecidogen' secreted by first instar larva (Savary *et al.,* 2012).

Managements

• Ploughing the stubbles after harvest reduces the infestation.

• Early planted rice varieties suffer lower infestation.

• Nitrogen application above 100 kg should be avoided.

• Alternative hosts are to be removed.

• Set up light trap @ 1 ha^{-1} as a monitoring device. Infra-red light trap attracts gall midge effectively.

• The resistant varieties are MDU 3, Shakthi, Vikram, Surekha, Eswarakora, HR 42, HR 63, Ptb 18, Ptb 21, Ptb 16 and Siam 29.

• Both eggs and larvae are effectively parasitized by *Platygaster oryzae* @ 1 per 10 m^2 in the main field at 10 DAT.

• Seed treatment with imidacloprid @ 0.5 kg a.i per 100 kg seeds provides protection for 30 days in the nursery.

Conclusion

The above mentioned IPM measures can be successfully imposed wherever applicable for the management of rice yellow stem borer and gall midge. The minimum yield loss caused by these pests can even be avoided. Thus natural enemies normally occur in the rice field will be greatly conserved which paves way for effective pest management.

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