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Management of yellow and white stemborers

Rice Technology Bulletin Series

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Foreword

One of the major crop production constraints in the Philippines is the damage caused by yellow stemborer (YSB) and white stemborers (WSB). Stemborer damage can decrease yield by 50%.

At PhilRice, our researchers have studied the occurence of YSB and WSB. This was done to come up with management strategies that farmers can use to control these pests.

This bulletin contains information on insect distribution, life stages, extent of damage, and management strategies. This bulletin could increase the knowledge of extension workers and rice farmers on effective management of YSB and WSB.

LEOCADIO S. SEBASTIAN
Executive Director

Introduction

Stemborer is one of the major insect pests of rice that infests the rice plant at all stages of growth. The yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) and white stemborer (WSB), *Scirpophaga innotata* (Walker) are the Philippine stem borer species that feed exclusively on rice.

Yield losses due to YSB and/or WSB may range from 25 to 50% or higher during outbreaks.

Stemborers injure the rice stem causing deadheart during vegetative stage; and whiteheads during reproductive stage. Deadheart is the drying of the central whorl while whiteheads refer to discolored panicles with empty or partially filled grains. Adult YSB and WSB differ in appearance, however, their larvae are difficult to differentiate by the naked eye.

Distribution and occurence

YSB occurs in both the tropics and subtropics in South and Southeast Asia while WSB is restricted to the equatorial tropics of Southeast Asia and Oceania.

YSB is more common in Luzon, YSB and WSB in Visayas, and WSB in Mindanao (Figure 1). YSB causes annual infestation in late-planted rice. High occurence of whitehead is expected when rice crops are planted later than regular planting period.

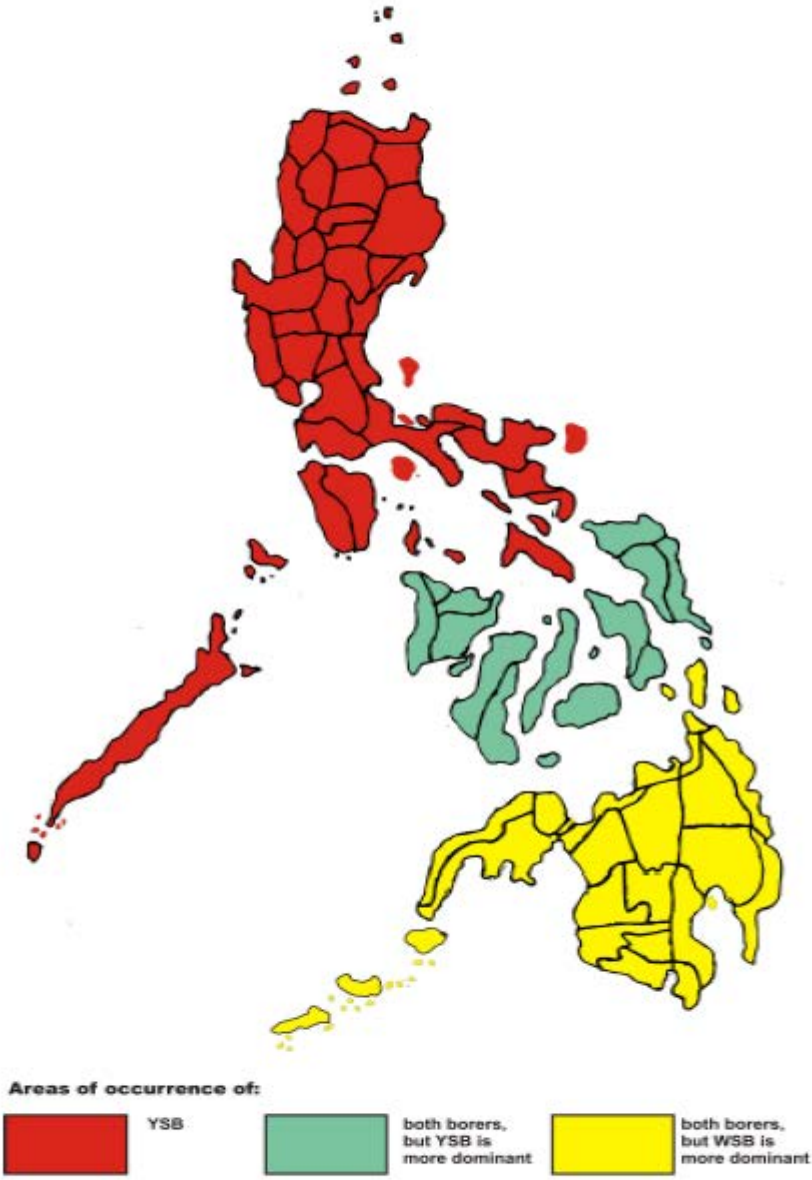

Figure 1. Prevalence of YSB and WSB in the Philippines

Life stages of YSB and WSB

<table>
<tr><th>YELLOW STEM BORER</th><th>WHITE STEM BORER</th></tr>
<tr><td colspan="2">Egg mass</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">▪ White, oval, and flat
▪ Covered with brownish hairs from the anal tufts of the female
▪ Length ranges from 2 mm to 8 mm
▪ 7-9 days incubation period
▪ 70-100 eggs per mass</td></tr>
<tr><td colspan="2">Larva</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>▪ Length of first instar is about 1.5 mm with yellowish green body. A full-grown larva about 20 mm long has brown head and prothoracic shield.</td><td>▪ A full grown larva is milky white and is 15-20 mm.</td></tr>
<tr><td colspan="2">▪ Larval period ranges from 28-40 days with the larva undergoing five instars.</td></tr>
</table>

Pupa	
	
▪ Fresh cocoon is pale brown and turns dark brown with age. The pupa is about 12 mm long. ▪ Pupation is completed in 8-13 days.	▪ Pupa is soft-bodied, pale, and 12 to 15 mm long.

Adult	
	

Damage

Larva of YSB or WSB bores into the rice stem and inner tissues resulting to deadheart or whitehead damage.

Deadheart

- Occurs at vegetative stage
- Central leaf whorl folds, turns brownish, dries up and dies (deadhearts)
- Damaged shoots can be easily pulled by hand.
- There is stemborer damage when tillers have tiny holes and fecal matter.
- When damage occurs at early tillering stage, plant compensates by producing additional tillers and yield loss is negligible.

Whitehead

- Occurs at reproductive stage
- Damaged tillers produce panicles that are whitish and with empty grains (whiteheads)
- Whiteheads can be easily pulled out by hand.
- There is stemborer damage when tillers have tiny holes or fecal matter
- Egg masses laid during the reproductive growth stage (panicle initiation) are critical because whiteheads may occur and yield loss could be significant.

Management strategies

An integrated approach to management of YSB and WSB (combination of cultural practices, biological control, and chemical control) must be employed. This integrated approach could maintain pest populations at economically non-damaging levels.

1. Practice synchronous planting after a fallow period

The field has been planted seven days before and after the majority service area has been planted after a fallow period of at least 30 days.

Synchronous planting avoids the overlapping incidence of insect and disease populations. A fallow period of at least one month breaks the insect pest cycle and destroys insect habitat. This scheme is largely affected by the availability of water in the locality.

2. Plant at the right time

- Know the peak of stem borer populations in your locality to determine the right planting time.

- .ight trap catches of adult YSB and WSB at PhilRice Nueva Ecija ınd Agusan showed pest populations are usually at peak from \pril to May, and from October to November (Figure 2). Based on this information, it is advisable to plant from December to January for the dry season, and June to July for the wet season so that the crop will be harvested before stem borer population reaches its peak.

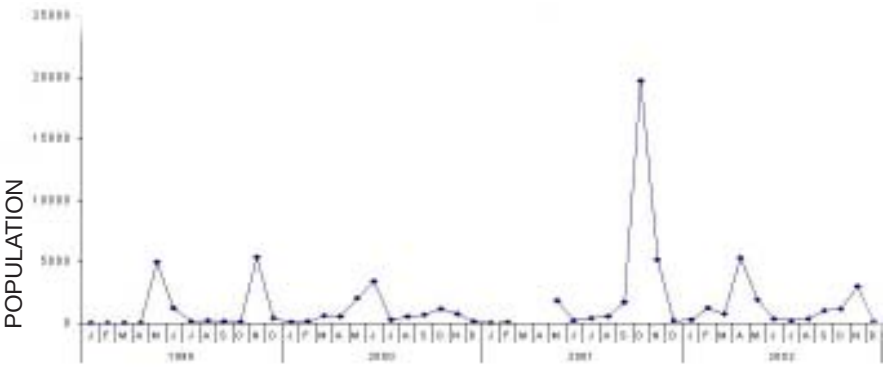

Figure 2. Pattern of stemborer population

NOTE: For a 120-day variety, it is important that the critical reproductive stage (50-60 days after transplanting or 70-80 days after direct wet-seeding) does not coincide with the peak of adult stemborer population based on light trap catches.

3. Conserve natural enemies

- Conserve biological control agents like parasitoids, predators, and microbial agents. Avoid indiscriminate use of pesticide as this disrupts the natural balance among insect pests and beneficial insects/organisms.

- Parasitoids that attack the eggs of stemborers play an important role in controlling stemborer population. When conserved, parasitoids reduce pest incidence and help maintain the natural balance of the agroecosystem. Parasitoids that are abundant in the field include *Telenomus* sp. (Scelionidae), *Tetrastichus* sp. (Eulophidae), and *Trichogramma* sp. (Trichogrammatidae). Among these parasitoids, *Telenomus* sp. is the most abundant.

Conserve these natural enemies!

Natural enemies of stem borer during its life stages

Egg
Wasps (T*etrastichus, Telenomus, Trichogramma*)

Larva
Water bug (Mesovilia), Assasin bug (Polytoxus), Earwig (Euborellia), and Lady beetle (Coccinelids

Pupa
Wasps (Goniozus, Apanteles, Bracon, Rhaconatus, Stenobracon, Tropobracon, Amauromorpha, Eriborus, Isochnojoppa, Isotima, Temelucha, Pteromalus) and Pathogen (Beauveria)

Adult
Spiders (Pardosa, Oxyopes), Longhorned grasshopper (Conocephalus), Dragonfly, and Damselfly

Wasp

Earwig

Longhorned grasshopper

4. Use resistant varieties

- Plant resistant varieties such as PSB Rc100 *(Santiago),* PSB Rc76H *(Panay),* PSB Rc50 *(Bicol),* PSB Rc44 *(Gohang),* NSIC Rc122 *(Angelica),* NSIC Rc106 *(Sumilao)*, and NSIC Rc11 *(Canlaon)*.

- Change or rotate varieties every two to four cropping seasons to delay insect pest adaptation and prevent insect pest buildup.

5. Use insecticide when needed

- Do not apply insecticide within 40 days after planting. During this growth phase, rice plants can compensate for the damage by producing more tillers.

- When stem borer egg masses are observed in the field at panicle initiation stage, collect and place them in a covered bottle. Observe the parasitoids that emerge from the eggs. If the population of parasitoids emerging from the eggs is greater than the larvae, do not apply insecticide. At this stage, egg masses population is usually less than 1 per $sqm^{2.}$

- If 1-2 egg masses are observed in every square meter in the field, application of systemic insecticide is recommended. Systemic insectide passes throughout the plant's system. Insects are killed when they feed on the sap.

- When white heads appear, there is no need to apply insecticide

- Use light traps to monitor the monthly occurence and population of stemborers.

Light trap

6. Apply fertilizer properly

- Know and manage the nitrogen needs of your plants based on the leaf color chart (LCC) and asseses other nutrients based on the Minus One Element Technique (MOET) test.

- Use the LCC to assess crop need for N fertilizer. Excessive N fertilizer can make the plant more succulent, prone to lodging, and more susceptible to stemborers.

- Conduct MOET test 30 days before transplanting or direct-wet seeding to assess soil nutrient deficiencies and apply the optimum fertilizer requirement.

Try LCC and MOET!

LCC

Assess the "real time" crop need for N fertilizer with the use of LCC.

Use LCC every 7 days from 21 days after transplanting or 28 days after direct wet-seeding until early flowering.

MOET

MOET is the diagnostic kit for limiting nutrients such as phosphorus, potassium, zinc, and sulfur. Soil nutrient deficiencies are assessed based on plant nutrient deficiency symptom.

7. Rotavate the soil immediately after harvest

Rotavate the soil immediately after harvest. This practice exposes the larva and pupa to the sun, thereby, killing them. This also destroys the habitat of stemborers.

Figure 3. Summary of pest management strategies for YSB and WSB at various crop growth stages.

CROP ESTABLISHMENT	VEGETATIVE (Tillering)	REPRODUCTIVE (Early panicle initiation to flowering)	RIPENING	HARVEST AND POST HARVEST
				
▪ Practice synchronous planting after a fallow period. This will deprive stem borers of continuous food supply, thus, preventing continued reproduction of the pest. ▪ Plant at the right time so that the crop will be harvested before the stemborer population peaks. ▪ Use resistant varieties. ▪ Change varieties every two to four cropping seasons.	▪ Conserve natural enemies as they play an important role in regulating stemborer population. ▪ Do not apply insecticide within 40 days after planting. Plants compensate the damage during this growth stage by producing more tillers. ▪ Apply fertilizer properly.	▪ Use insecticide when needed. ▪ Do not apply insecticide when the population of parasitoids is greater than the larvae (based on egg mass collected from the field and reared in covered bottles). At this stage, egg mass population is usually low (less than one egg mass a sqm^2. ▪ Apply systematic insecticide when 1-2 egg masses are observed in every square meter in the field.	▪ When white-heads appear, there is no need to apply insecticide.	▪ Rotavate the soil immediately after harvest to kill the larvae and pupae.

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It accomplishes this mission through research, development, and extension (RD&E) through its central and branch stations coordinating with a network that includes 57 agencies and 70 seed centers strategically located nationwide.

PhilRice R&D structure for 2006-2010 includes four programs implementing 25 major projects. Its programs are favorable environment, unfavorable environment, knowledge management and promotion, and impact and policy research. With these programs, PhilRice aims to develop and promote technologies that are ecosystem-based, location- and problem-specific, and profitable to the Filipino farmers.

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