

DOSSIER ON *TETRAMOERA SCHISTACEANA* AS A PEST OF SUGARCANE

Tetramoera schistaceana (Snellen) (Lepidoptera: Tortricidae)

Grapholita schistaceana Snellen, 1890

Tetramoera schistaceana (Snellen, 1891)

Argyroploce schistaceana Meyrick, 1930

Eucosma schistaceana (Snellen)

Cydia schistaceana (Snellen)

Laspeyresia schistaceana (Snellen)

Olethreutes schistaceana (Snellen)

Enarmonia schistaceana (Snellen)

Tetramoera schistaceana (Snellen) Diakonoff, 1967

Common names

Sugarcane gray borer, white borer, sugarcane shoot borer.

Distribution

Caroline Islands (Pacific Ocean), China, Indonesia, Madagascar, Malaysia, Mariana Islands (Pacific Ocean), Mauritius, Philippines, Réunion, Ryukyu Islands (Japan), Sri Lanka, Taiwan and Vietnam (CAB 1965; Williams 1978; Pan & Lim 1979; Perez *et al.* 1980; Alba 1990).

Host plants

Sugarcane

Symptoms

Tetramoera schistaceana is a borer of early shoots that mainly causes dead heart in young plants (Williams 1978; Cheng & Wang 1997). In mature plants, larvae feed externally on the internodes and around the buds (Fig. 1) but usually cause minor damage (Sallam, personal observation).



Fig. 1. *Tetramoera schistaceana* damage symptoms (Nader Sallam, BSES)

Economic impact

In Zhanjiang, Guangdong, China, heavy infestations averaging 25 – 29%, and in some cases reaching as high as 98% of the crop, were caused by *Tetramoera schistaceana*, *Chilo infuscatellus* and *C. sacchariphagus* collectively, with *T. schistaceana* being the predominant species (LiangZhen *et al.* 2000). Similarly, studies in Taiwan showed that, out of five borer species, *T. schistaceana* was the predominant borer and was responsible for $8.20 \pm 1.25\%$ damaged internodes in autumn cane and $4.42 \pm 0.55\%$ damaged internodes in spring cane (Cheng 1999). This species is a minor pest of sugarcane in Indonesia (Sallam, unpublished).

Morphology

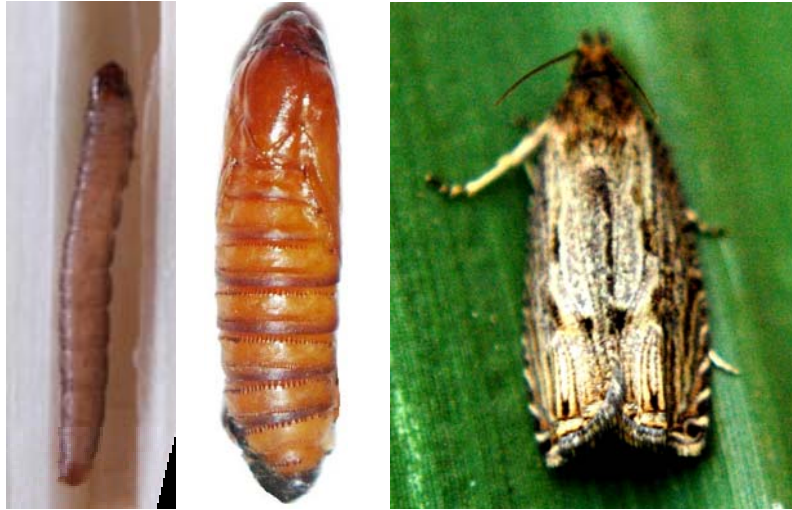


Fig. 2. *Tetramoera schistaceana* life stages (ISRI – Indonesia)

Detection methods

Check young shoots early in the season for dead heart symptoms and dissect the shoots to retrieve the larva. In mature cane, check the internodes for external feeding symptoms particularly around the bud.

Biology and Ecology

Traps baited with virgin female moths were used to study population dynamics of *T. schistaceana* in spring cane fields at the Taiwan Sugar Research Institute experiment farm. First peak of male catch was recorded between March and June with the catch of 11.22 males/trap/night. A second peak was recorded from October to February of the following year with the highest catch of 11.69 males/trap/night, while only 1.83-3.62 males/trap/night were caught in July through September (Cheng *et al.* 2000).

Management

Chemical control

A mixture of trichlorfon and dimehypo applied to the whorl of sugarcane plants gave 72.1-83% control (LiangZhen *et al.* 2000).

Biological control

Parasitoids

***Allorhogas pyralophagus* (Hymenoptera: Braconidae):** Larval ectoparasitoid. Introduced to Mauritius from Mexico for the control of *Chilo sacchariphagus*, and was found to attack larvae of *Tetramoera schistaceana* in the laboratory (Rajabalee & Banymadhub 1986).

***Cotesia flavipes* (*Apanteles flavipes*) (Hymenoptera: Braconidae):** Larval parasitoid, recorded to result in low parasitism rates in Taiwan (Cheng *et al.* 1987).

***Trichogramma australicum* (Hymenoptera: Trichogrammatidae):** Egg parasitoid, Taiwan (Cheng *et al.* 1978).

***Trichogramma chilonis* (Hymenoptera: Trichogrammatidae):** Egg parasitoid, Taiwan and the Philippines (Alba 1990; Cheng 1999).

***Trichogramma confusum* (Hymenoptera: Trichogrammatidae):** Egg parasitoid, China (Liu 1987).

***Trichogramma nubilale* (Hymenoptera: Trichogrammatidae):** Egg parasitoid. This species was introduced into Guangdong, China, from the USA in 1983. Inundative releases in China reduced infestation by *Tetramoera schistaceana* specially during summer months (Liu 1987).

***Trichogramma ostrinae* (Hymenoptera: Trichogrammatidae):** Egg parasitoid, Taiwan (Cheng *et al.* 1998).

***Trichogramma sp. nr. nana* (Hymenoptera: Trichogrammatidae):** Egg parasitoid, Mauritius (Williams 1978).

Pathogens

***Beauveria amorpha*:** Entomopathogenic fungus. Laboratory trials in Taiwan showed that a strain of this fungus kills larvae of *Tetramoera schistaceana* (ZuNan 1996).

Pheromone attractants

Studies in Japan showed that a 100:1 mixture of (*Z*)-9-dodecenyl acetate and (*E*)-9,11-dodecadienyl acetate plus a synergist, (*E*)-7,9-decadienyl acetate, was strongly attractive to *Tetramoera schistaceana* males. Best results were achieved when a mixture of the two pheromone components and the synergist at a ratio of 1000:10:1 was used (Kinjo *et al.* 1996). In Guangdong Province, China, a sex pheromone has been identified as *cis*-9-dodecenyl acetate and it was shown to cause mating disruption. The pheromone remained active for about 5 days when supplied on a small rubber tube, resulting in a noticeable drop in the total number of dead hearts in the field (Anon 1981).

Means of Movement

The most likely means of entry of this species into Australia would be by the introduction of infested planting material. The chance of the introduction of moths or eggs on aircraft, in luggage, or on people is much smaller, though still significant.

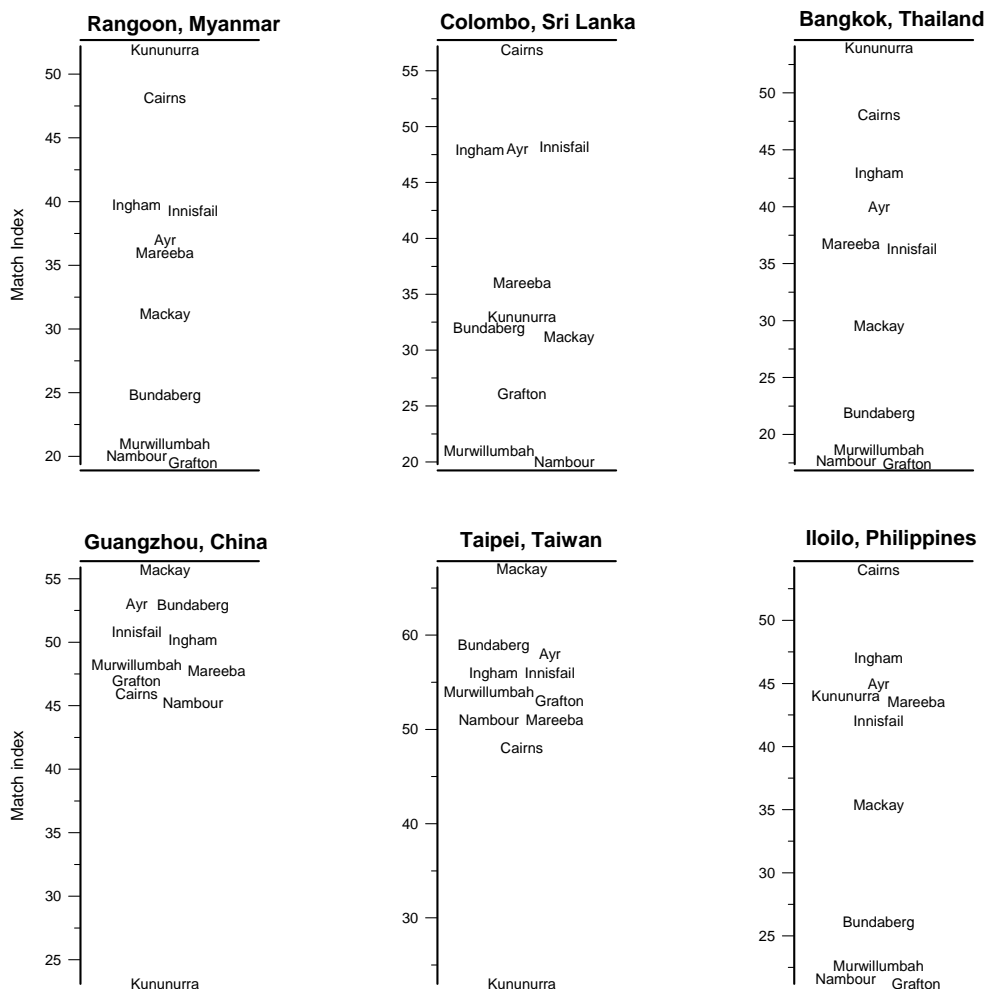
Phytosanitary Risk

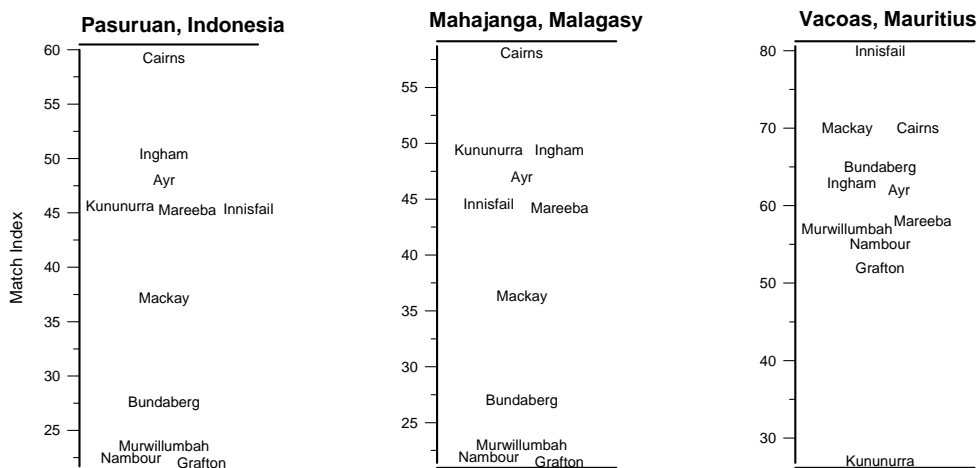
Entry potential: High, present in Java, and proven to disperse globally and colonise new habitats.

Colonisation potential: High in northern Australia.

Spread potential: High.

Establishment potential: High in all sugarcane growing areas of Queensland and NSW (see Match Indexes for climate in principal Australian areas below).





References

- Alba MC. 1990. Use of natural enemies for controlling sugarcane pests in the Philippines. *FFTC-NARC International Seminar on 'The use of parasitoids and predators to control agricultural pests', Tukuba Science City, Ibaraki-ken, 305 Japan, October 2-7, 1989.* 24 pp.
- Anon. 1981. Grey borer control in sugarcane by synthetic pheromone in disrupting communication between sexes. *Entomology Newsletter, International Society of Sugar-Cane Technologists* 10, 9-10.
- CAB International. 1965. *Argyroploce schistaceana. Distribution Maps of Plant Pests Map 197.*
- Cheng WY. 1999. Borer infestation of millable cane. *Report of the Taiwan Sugar Research Institute* 165, 1-14.
- Cheng WY, Chang CH & Wang ZT. 1987. Occurrence of *Cotesia flavipes* Cameron (Hym: Braconidae) in autumn sugarcane fields. *Report of the Taiwan Sugar Research Institute* 117, 31-41.
- Cheng WY, Chen SM & Wang ZT. 1999. Parasitism of *Trichogramma chilonis* and *Trichogramma ostrinae* on different host eggs. *Report of the Taiwan Sugar Research Institute* 166, 19-34.
- Cheng WY, Su TH, Jiang PH, Yang WY, Yu TS, Hung TH & Hung JK. 1978. Mass liberation of *Trichogramma australicum* Girault for the control of sugar cane moth borers in Taiwan. *Report of the Taiwan Sugar Research Institute* 21- 36.
- Cheng WY & Wang ZT. 1997. Occurrence of different dead hearts in the spring-planted cane fields. *Report of the Taiwan Sugar Research Institute* 157, 1-25.
- Cheng WY, Wang ZT & Chen SM. 1998. Trapping of *Trichogramma* with sterilized host eggs in spring-planted cane fields. *Report of the Taiwan Sugar Research Institute* 159, 1-14.
- Cheng WY, Wang ZT & Chen SM. 2000. Catches of male gray borer moths by virgin female traps in spring cane. *Report of the Taiwan Sugar Research Institute* 167, 35-48.
- Kinjo N, Nagamine M, Sugie H & Tamaki Y. 1996. Sex pheromone of the sugarcane shoot borer, *Tetramoera schistaceana* Snellen (Lepidoptera: Tortricidae: Olethreutinae). Isolation and identification. *Japanese Journal of Applied Entomology and Zoology* 40(3), 191-197.
- LiangZhen G, RongYang F, EnYi L, DongTian W & FuGuo K. 2000. Infestation by *Tetramoera schistaceana* Snellen, *Chilo infuscatellus* Snellen and *C. sacchariphagus* of sugarcane plants and their control by chemicals. *Plant Protection* 26(1), 23-25.
- Liu WH, Guo MF, Han SC, Wu HH & Li LY. 1987. Inundative release of *Trichogramma nubilale* Ertle & Davis to control sugarcane borers in large areas. *Chinese Journal of Biological Control* 3(4), 149- 151.
- Pan YC & Lim G. 1979. The biological control of sugarcane borers in Gula Perak Plantation, Malaysia. *Malaysian Journal of Agriculture* 52(2), 129- 134.
- Perez JR, Van Khu N, Thi Van T & Castro S. 1980. Diseases and pests of sugar-cane in the Socialist Republic of Vietnam. *Ciencias de la Agricultura* 6, 156-158.

- Rajabalee A & Banyamadhuh N. 1986. Elevage et tentative d'implantation d'*Allorhogas pyralophagus* Marsh, un braconid ectoparasitaire de *Chilo sacchariphagus* Boj., le foreur ponctue de la canne a sucre a l'ile Maurice, avec quelques notes sur sa biologie. *Revue Agricole et Sucriere de l'Ile Maurice* 65(2-3) 67-72.
- Williams JR. 1978. An annotated check list of the invertebrates (insects, mites, nematodes) of sugarcane in Mauritius. *Occasional paper No. 31*. Mauritius Sugar Industry Research institute, 22pp.
- ZuNan W. 1996. Three entomogenous fungi from Taiwan and their pathogenicity to some insects. *Report of the Taiwan Sugar Research Institute* 154, 15-30.