

DOSSIER ON EMMALOCERA DEPRESSEDILLA AS A PEST OF SUGARCANE

***Emmalocera depressella* (Swinhoe) (Lepidoptera: Pyralidae)**

Melissoblaptes depressella Swinhoe 1885

Polyocha depressella Hampson 1896

Polyocha saccharella Dudgeon 1905

Common names

Root borer, rootstock borer.

Distribution

India, Pakistan, Bangladesh.

Host plants

Sugarcane is the main host. Recorded also as feeding on *Sorghum bicolor*, *Sorghum halepense*, *Erianthus munja*, *Sclerostachya fusca* and *Pennisetum purpureum* (Sardana 1999).

Symptoms

Plants infested with *E. depressella* suffer dead hearts and general yellowing of the leaves (Fig. 1). Infestation also results in poor tillering in mature plants (Cheema, 1950; Bhatt *et al.* 1996).

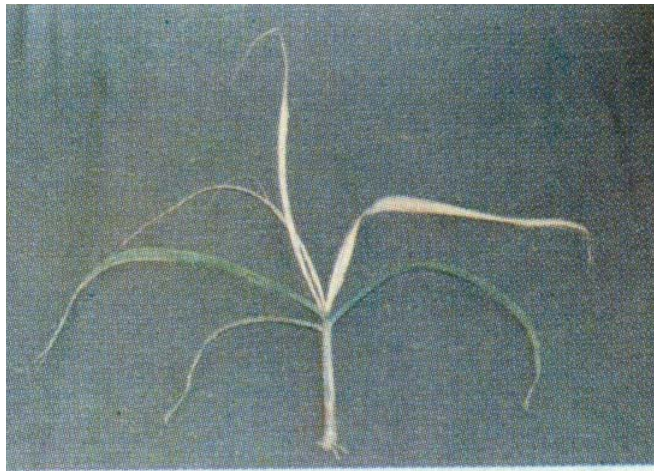


Fig. 1. Dead heart and yellowing of leaves caused by *E. depressella* (Dr. HR Sardana, NCIPM, India)

Economic impact

This species was first recorded in 1885 in sugarcane in India (Hampson 1896; Cheema 1947), however, it received attention as a key pest only recently (Sardana 1993). *E. depressella* is currently considered a major pest of sugarcane in some parts of India and Pakistan (Sardana 1993; Singh & Madan 2001). A recent outbreak of *E. depressella* was recorded during 2005-2006 in the West Nimar Valley of Madhya Pradesh in Central India (Das & Vida 2005). Studies from India report on varying levels of productivity loss ranging between 1.3-10% due to *E. depressella* infestation (Gupta & Avasthy 1952; Agarwala & Prasad 1954; Sardana 1993). A reduction of up to 66.2% and 73.0% of cane length and weight, respectively, has been recorded (Singh & Madan 2001). There could be a positive association between *E. depressella* infestation and increased incidence of wilt disease of sugarcane caused by *Fusarium moniliforme* in some varieties, but this association was not proven in all cases (Sardana *et al.* 2000). Massive yield losses can result from what is known as a “root borer – wilt complex” infestation (Sardana 1993; 1994; 1998; 2001b).

Morphology

No information is available on the morphology of this species. The following images were made available by Dr. HR Sardana, New Delhi.



Fig. 2. Adult male and female *E. depressella* while mating (Dr. HR Sardana, NCIPM, India)



Fig. 3. Eggs of *E. depressella* (Dr. HR Sardana, NCIPM, India)



Fig. 4. *E. depressella* larval and pupal stages inside a cane stalk (Dr. HR Sardana, NCIPM, India)

Detection methods

Check for symptoms of dead heart, poor tillering or poor cane growth (Fig. 1). Slice the bottom of the stalk and the stubble to look for larvae or pupae (Fig. 4).

Biology and Ecology

E. depressella infests sugarcane plants at all stages of development (Singh *et al.* 1996). In sub tropical cane plantation areas of India, infestation by *E. depressella* starts from May and continues till harvest time, with borer incidence reaching a peak in August-November (Sardana 1997; 2001a). Sardana (1997) concluded that temperature ranging between 31– 34°C combined with high humidity create favourable conditions for this pest, while very low or very high temperatures combined with low humidity negatively impact on pest development. Sardana (1998) studied *E. depressella* life cycle in Haryana, India and recorded incubation period, pupal stage and adult longevity to require 5-12, 7-18 and 15-18 days at 27°C, respectively. Laboratory studies also showed that one female can lay more than 200 eggs under 27°C. Other studies in Karnal recorded an average of up to 270.50 eggs per female in the second generation, and recorded 5 larval instars with larval duration ranging of 27.0-39.8 days (Singh *et al.* 1996). Total life cycle was complete within 54-68 days at 27°C and no development occurred when temperature dropped below 15°C (Sardana 1998). Studies in India record the number of generations in the field to vary between 3, 4 and 5 in Uttar

Pradesh, Haryana and the Punjab regions, respectively (Gupta & Avasthy 1952; Sardana 1998). Larvae usually tunnel inside the base of the stalk or in the stubble (Fig. 4). Mature larvae enter hibernation in cane stubble starting in mid November – early December, usually at an average depth of 3.4 cm below soil surface, with the length of hibernation tunnels varying from 5.76 to 13.0 cm depending on the variety (Fig. 5). In the majority of cases, only one larva is found hibernating per cane plant (Sardana 1996). Hibernating larvae turn to the pupal stage by the end of March or early April and emerge as moths around Mid April to early May. Eggs are laid singly, mostly on the lower side of the leaves (Fig. 3). New hatchlings crawl downwards towards the base of the plant through soil cracks and tunnels into the base of the stalk (Kundu *et al.* 1994). Freshly hatched larvae may make 1-7 tiny holes in the internodes below soil levels in their attempt to enter the base of the stalk (Cheema 1950) (Fig. 6). Dead heart can start forming after 12-17 days after hatching of eggs (Sardana 1998), and larvae may in some cases move out of the original tunnel to enter another shoot (Cheema 1950). Sardana (1996) observed that infestation is usually more abundant in well irrigated, sandy – sandy loam soils. Similar observations were made by Alagesan *et al.* (1991), where infestation was detected for the first time in Tamil Nadu, India, and was mainly abundant in lighter soils as opposed to wet - heavy soils.



Fig. 5. Exit tunnel made by larva of *E. depressella* (Dr. HR Sardana, NCIPM, India)

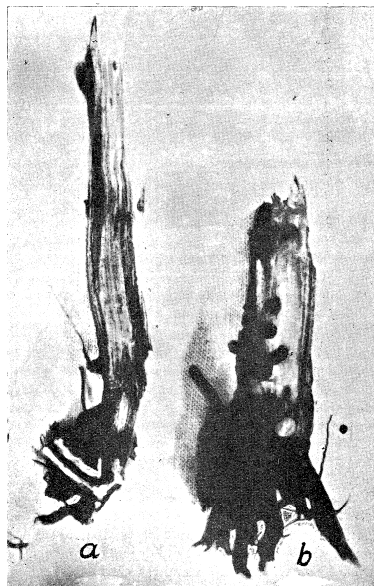


Fig. 6. (a) Tunnel made by root borer while migrating from one shoot to another, (b) round and irregular holes in the root stock made by the root borer (Reproduced from Cheema 1950).

Management

Chemical control

Confidor EC (imidacloprid) at 0.5 kg a.i/ha was effective against *E. depressella* in Karnal, India (Sardana 2001c). In Mardan, Pakistan, field trials showed that application of granular insecticides Curaterr 3G or Sevidol 4:4 at 25 kg/ha in May followed by light earthing-up resulted in some control of both the root borer *E. depressella* and the shoot borer *Chilo infuscatellus* and increased CCS and crop yield (Khan & Jan 1994). Other trials in Karnal, India, using Regent 0.3 (granular formulation) and Regent 5 SC at 75 g a.i/ha resulted in good control of both root and shoot borers (Sardana 2001b). In Bangladesh, Lorsban 15G, applied at 2 kg/ha repeatedly in March, May and July resulted in good control of the root borer (Rahman & Taleb 2004).

Biological control

Parasitoids

***Goniozus* sp. (Hymenoptera: Bethyridae):** Larval parasitoid, recorded attacking *E. depressella* larvae in India (Bhat *et al.* 1996).

***Neohybothorax* sp. (Hymenoptera: Chalcididae):** Recorded attacking *E. depressella* in India (Sardana 1994).

***Trichogramma chilonis* (Hymenoptera: Trichogrammatidae):** Egg Parasitoid. Releases in India showed little impact on infestation (Sardana 2000).

Pathogens

The fungi *Beauveria bassiana* and *Metarhizium anisopliae* were observed attacking hibernating larvae in India (Sardana 1996).

Varietal Resistance

Varietal tolerance has been observed in Karnal, Haryana, India, with variety Co 89003 being highly susceptible compared to Co 7717 (Sardana 1996). Another detailed study in Karnal ranked varieties CoJ84, CoH99 and CoH96 to be moderately tolerant, while Cos88230, C088024 and CoP84211 were highly susceptible (Singh & Madan 2001).

Cultural practices

Intercropping sugarcane with cowpea reduced infestation. Other crops such as green gram and black gram were found to reduce infestation only during the growth period (July), but there was no difference in infestation levels later in the season between intercropped and non-intercropped sugarcane (Sardana 2001). Flooding of fields any time between July-January reduced infestation by up to 33.9% (Sardana 2000). Light-trapping of adult moths between June-October reduced subsequent borer infestation (Sardana 2000). Field studies in the Dinajpur district of Bangladesh showed a negative association between high soil levels of nitrogen and sulphur and root borer infestation (Kundu *et al.* 1994).

Means of Movement

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

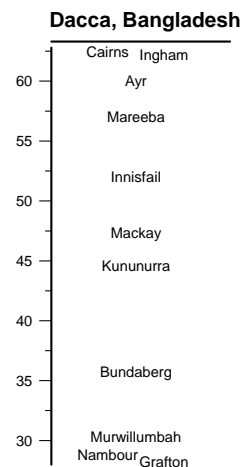
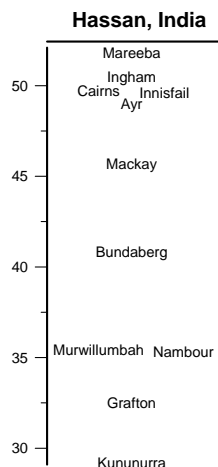
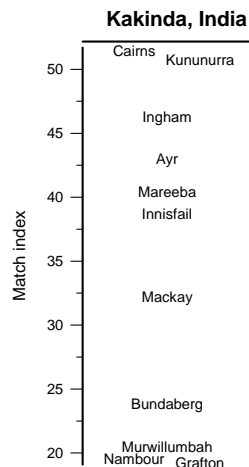
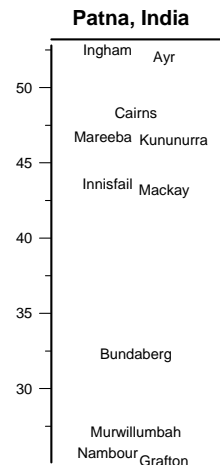
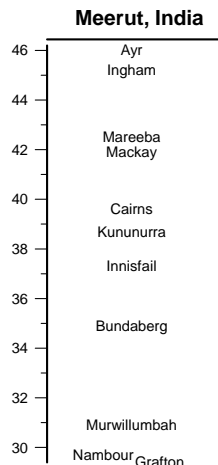
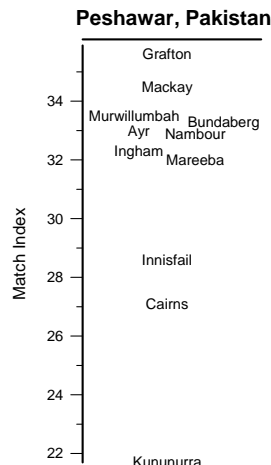
Phytosanitary Risk

Entry potential: Low – Medium. Seems to have a restricted geographical distribution.

Colonisation potential: High in all sugarcane areas in Queensland and New South Wales.

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).



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