# Tomato fruit borer (corn earworm) (112)

Photo 1. Caterpillar of the tomato fruit borer (corn earworm), *Helicoverpa armigera*, eating a tomato. Note the three stripes on the top of its body.

Photo 2. Caterpillar of the tomato fruit borer (corn earworm), *Helicoverpa armigera*, eating a tomato. Note that there may be considerable variation in the colour and marking of this insect; compare with all the others.

Photo 3. Caterpillar of the tomato fruit borer (corn earworm), *Helicoverpa armigera*, eating a tomato.

Photo 4. Caterpillar of the tomato fruit borer (corn earworm), *Helicoverpa armigera*, eating a tomato. Note, hairs on the body can be clearly seen towards the rear of the caterpillar.

Photo 5. The sloping hind end of the caterpillar and the presence of short stiff hairs sets *Helicoverpa armigera* apart from *Spodoptera litura*.

Photo 6. Caterpillars of *Helicoverpa armigera*, in cobs of maize, showing the dark green stripes along the back and a yellow stripe at the side (more clearly seen on the caterpillar at the top of the photo).

Photo 7. Caterpillar of *Helicoverpa armigera* in cob of maize. Note, this is much darker than those in Photo 6.

Photo 8. Caterpillar of tomato fruuit borer, *Helicoverpa armigera*, on potato.

Photo 9. Caterpillar of tomato fruit borer (corn earworm), *Helicoverpa armigera*, on fruit of chilli.

Photo 10. Adult corn earworm, *Helicoverpa armigera.*

Photo 11. Male *Helicoverpa armigera.* Note the indistinct inner border of the black markings on the hind wings.

Photo 12. *Spodoptera litura* provided for comparision.

## Common Name

Tomato fruit borer, corn earworm, cotton bollworm

## Scientific Name

*Helicoverpa armigera*, previously *Heliothis armigera*.

## Distribution

Worldwide. Asia, Africa, North (Florida) and South America, the Caribbean (Puerto Rico), Europe, Oceania. It is recorded from American Samoa, Australia, Federated States of Micronesia, Fiji, Guam, Kiribati, Marshall Islands, New Caledonia, New Zealand, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu..

## Hosts

Wide; especially beans, capsicum, cotton, maize, sorghum, tomato, and to a lesser extent legumes, tobacco, and many weeds.

## Symptoms & Life Cycle

The eggs are ribbed, about 0.5 mm diameter, laid singly on leaves, buds, flowers and young fruit; they are white at first then greenish-

yellow, and dark brown before hatching. The newly hatched larvae are translucent and whitish in colour, but the later stages - there are usually six - are variable in colour, ranging from greenish-yellow to red-brown with three dark stripes along the back and a yellow stripe on the sides (Photos 1-9). The length of the larval stage is affected by temperature, and also the food eaten, but 14-18 days is likely in most Pacific island countries. When mature, the caterpillars are up to 40 mm long.

The mature caterpillars drop to the ground, burrow into the soil for up to 10 cm and form a cell in which the pupa develops. About 2 weeks later, the adults emerge; mate and the females start laying eggs - about a thousand in a lifetime of 2 weeks. The adults have brown forewings with a single dark spot (Photos 10-11). Hind wings are generally lighter with a wide brown border at the wing tips, and brown veins. The entire life cycle lasts about 30 days.

Note that development can take place on weeds, and from these the larvae migrate to crops if they are nearby.

## Impact

The caterpillars do the damage. The young caterpillars feed only on leaves; later, when they reach the third stage in their development they feed on flower buds and fruits, boring holes in them in the process (Photos 1&2). Damaged fruits are invaded by fungi and bacteria causing rots, and the fruits fall. Indirect damage occurs in maize; damage to the tip of the cob allows weevils to invade. In Fiji, sorghum, tomato, maize and okra are the most important crops attacked by *Helicoverpa armigera*.

## Detection & inspection

Look for the caterpillars on the leaves or hidden in the fruits; look for frass or faeces, or cut open buds or fruits to find the pest. Often caterpillars of *Spodoptera litura* can be found on the same crops causing similar damage. Look for the narrow bright yellow lines on the back and sides of the body of the caterpillar of *Spodoptera litura* (Photo 12), but note there are variations in both! Look, too, at the rear end of the body; that of *Helicoverpa* slopes sharply downwards at about 45 degrees.

## Management

The corn earworm is a difficult pest to control because it has a wide host range, is migratory and has a relatively short life cycle. The difficulty is made worse because of its ability to develop resistance to insecticides. Recent strategies include area-wide management and IPM, but neither has been developed for crops grown in Pacific island countries.

NATURAL ENEMIES

Few of the natural enemies reported are specific to the pest, although many parasites and predators (bugs, beetles, spiders, lacewings and ants) attack *Helicoverpa armiger* worldwide. In the Pacific, little is known about natural enemies. Interestingly, it is an unimportant pest in Samoa, unlike the situation in Fiji, Solomon Islands and Tonga, where it is considered of great importance.

A number of introductions for biological control of *Helicoverpa armigera* have been made in Fiji, including *Cotesia marginiventris*.

In general, the success of biological control of the pest is affected by its migratory habit, meaning that when large numbers of egg-laying moths invade an area, the resident natural enemies are likely to be too slow to bring the larvae under control before significant damage has been done.

CULTURAL CONTROL

Cultural control offers only limited potential for this highly mobile pest, although weeding and the removal of the remains of crops may be beneficial. There is also evidence that sunflowers can be useful as a trap crop. *Helicoverpa* (and also *Spodoptera*) are attracted to the flowers and oviposit in the heads. Insecticides can then be used to minimise damge. This has been tried in South and Southeast Asia in peanut crops with good results. A few plants placed at random also attracted ladybird predators (and insectivorous birds, such as crows).

RESISTANT VARIETIES

None known for the crops of interest to Pacific island countries, although resistance is reported from India in some varieties of pigeon pea, peanut and chickpea.

CHEMICAL CONTROL

To be effective, scouting for eggs and young larvae is required. The reason for this is that insecticides are most effective against the early larval stages; the later stages burrow into plant parts and are more difficult to treat. If synthetic pyrethroids are used it is important that they are alternated with those from a different chemical group. In Australia, for instance, *Helicoverpa armigera* has developed a resistance to a wide range of insecticides, and has become difficult to control.

Biopesticides. There are two pathogens of *Helicoverpa armigera* that are commercially available, although not widely sold in Pacific

island countries: NVP (nucleopolyhedrovirus) and Bt, *Bacillus thuringiensis*. NVP is highly selective and will only infect *Helicoverpa armigera* and closely related species.

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Information from Waterhouse DF, Norris KR (1987) *Biological Control Pacific Prospects*. Inkata Press. Photos 1&2 Pita Tikai, ACIAR PC/2010/090, Solomon Islands. Photos 3-8,10&12 Mani Mua, SPC, Sigatoka Research Station, Fiji. Photo 9.Georg Goergen/IITA Insect Museum, Cotonou, Benin.

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