KEPHIS	**FACTSHEETS OF PESTS OF PHYTOSANITARY SIGNIFICANCE TO KENYA**	**7**

Helicoverpa armigera

Identity

Preferred Scientific Name: *Helicoverpa armigera* (Hübner, 1809)

Helicoverpa armigera

Other Scientific Names: *Bombyx obsolete* Fabricius, *Chloridea armigera* Hübner, *Chloridea obsoleta* Fabricius, *Helicoverpa commoni* Hardwick, *Helicoverpa obsolete* Auctorum, *Heliothis armigera* (Hübner), *Heliothis conferta* Walker, *Heliothis fusca* Cockerell, *Heliothis obsoleta* Auctorum, *Heliothis pulverosa* Walker, *Heliothis rama* Bhattacherjee Gupta, *Heliothis uniformis* Wallengren, *Noctua armigera* Hübner and *Noctua barbara* Fabricius.

Preferred Common Name: Cotton bollworm, Corn earworm, African bollworm, Gram pod borer, old world bollworm or tobacco budworm.

Taxonomic Position: Class: Insecta, **Order:** Lepidoptera, **Family:** Noctuidae

Hosts/species affected

It is a primarily pest of ornamental plants e.g roses, flowers, vegetable crops, cotton, tomatoes, Potatoes, Maize, Soya beans, lucerne, chickpeas, sorghum, *Phaseolus*, fruits (*Prunus, Citrus*) and forest trees.

Growth stages of host plant affected

- Vegetative growing stage
- Flowering stage
- Fruiting stage.

Biology and Ecology

Eggs: Eggs are 0.5 mm in diameter, round and yellowish-white in colour. The eggs darken before hatching and are deposited singly on tender parts of the plant. Egg-laying cycle generally coincides with early flowering of host crops.

Figure 1. Yellowish-white eggs before hatching. Photo: A.M. Varela, ICIPE.

Larvae: Larvae are yellowish-white to reddish brown in colour. Dark brown to black head, rows of black bumps with short hairs along the backs giving spotted appearance. 35 - 40 mm long when fully grown and normally drop from the plant and burrow into the soil to pupate.

Pupa: Pupa is shiny brown, about 16 mm long, smooth surface with two short parallel spines at the posterior tip of the body.

Figure 2. Fully grown caterpillars 3-4 cm long. Photo: A.M. Varela, ICIPE.

Adult: Adults are yellowish-brown with a dark speck, greyish irregular lines and a black kidney-shaped mark on the forewings. Hindwings are whitish with a black patch along the outer margin. The adults are 14 to 18 mm long with a wingspan of 35 to 40 mm.

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Figure 3. Shiny brown, about 16 mm long pupa. Photo: A.M. Varela, ICIPE.

Figure 4. Dark speck on the forewings of adult month. Photo: A.M. Varela, ICIPE

Life cycle:

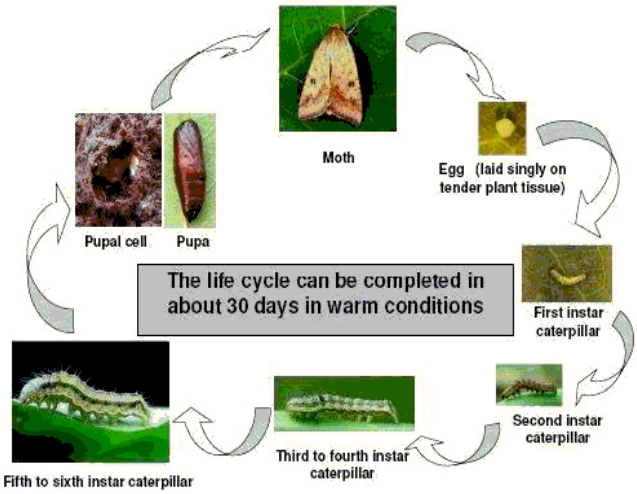

Figure 5. Life cycle is completed in about 25 to 60 days depending on temperature. Courtesy of A.M. Varela, ICIPE.

Symptoms

Larvae feed on leaves, flower buds, flowers, developing grains and bore into pods and fruits. The larvae also deposits excrements on damaged plant parts.

Means of movement and dispersal

Adults can migrate over long distances. Movement in international trade is mainly on ornamental plants and on cut flowers, in cotton bolls and tomato fruits.

Impact

H. armigera cause serious losses in particular to cotton, tomatoes and maize. On cotton, two to three larvae on a plant can destroy all the bolls within 15 days. On maize and baby corn, they consume developing grains. On tomatoes, they invade fruits, preventing development and causing falling. It destroys the quality of ornamental plants by feeding on leaves and inflorescence.

Movement in trade

The plant parts liable to carry the pest in trade include: Fruits, leaves and inflorescence.

Detection and inspection

The feeding larvae can be seen on the surface of plants but they are often hidden within plant organs (flowers, fruits etc.). Feeding holes and heaps of frass (excreta) are visible, but it is necessary to cut open the plant organs to detect the pest.

Phytosanitary significance

In the EU directive 2000/29/EC, Annex 1 part A, the pest is listed in section II as a harmful organism known to occur in the community and relevant for the entire community (EPPO, 2016).

Management

Cultural practices

- **Monitoring and Decision Making:**
  Early detection is achieved by regular scouting of the crop. Monitoring moth population can also be done by use of pheromone traps.

- **Sanitation**

  - Remove and destroy plant residues immediately after harvesting.
  - Plough the soil after harvesting. This exposes pupae, which may then be killed by natural enemies or through desiccation by the sun.

- **Mechanical control**

  - Hand picking and destroy eggs and small caterpillars. This is feasible in small plots or green houses when infestation is low.
  - Sort out the harvested crop very thoroughly during grading to remove the caterpillars manually.

Habitat Management

- **Intercropping and trap crops**

Adult Moths prefer laying eggs on certain crops (e.g. pigeon pea, chick pea, crotalaria, maize, tobacco, African marigold, sorghum and sunflower), especially during the flowering period. Those crops may be utilized to distract moths from crops that are more vulnerable to African bollworm damage. If trap crops are planted in strips or around the field, the moths will lay eggs on them instead of the main crop. African marigold has been used as trap crop in tomato. Marigold planted after every eight rows of tomato has been observed to attract most of the African bollworms moths to marigold (Negash and Abate, 2002).

Intercropping of cotton with chickpea, cowpea, onion, pearl millet, crotalaria, pigeon pea and marigold in strips is reported to divert the populations of sucking pests and the African bollworm from cotton (Dejen and Tesfaye, 2002).

- **Crop rotation**

Avoid planting crops after each other that are susceptible to bollworm like cotton, maize, sorghum, tobacco, soybean and tomato. This helps in preventing build-up of bollworm populations. To be effective crop rotation should be done over large areas since moths can fly long distances (CABI, 2002).

Some crops not susceptible to bollworm that could be planted in rotation with susceptible crops are small grains like rice and plants of the onion family.

Biological Control

- **Natural enemies:** *Trichogramma spp* has been tried successfully as an egg parasitoid (Cherry et al, 2003).

Chemical Control

Various chemical and Bio-pesticide products are registered in Kenya against *H. armigera* available in various brand names.

Name of product (Active Ingredient)	**Purpose of registration**
Dimethoate 400 g/L, Imidacloprid 100g/L + Betacyfluthrin 45g/L, Cypermethrin 10% w/v + Chlorpyrifos 35%w/v and Alpha-cypermethrin 10g/L	Control of *H. armigera* in Cotton
Indoxacarb 150g/L	Control of *H. armigera* in Tomatoes
Bacillus Thuringiensis var. Kurstaki (Btk) 9 x 10^7 spores/mg	Control of *H. armigera* in French beans
Helicoverpa armigera SNPV 8% w/w 2x9$_9$ polyhedra per ml , Etofenprox 30% and Tebufenoxide 20%	Control of African bollworm in Tomatoes
Methomyl 90% w/w	Control of *H. armigera* in Flowers and horticultural crops.

For more information refer to the list of registered pest control products provided by the Pest Control Products Board (PCPB) Website: www.pcpb.or.ke

Note: Repeated use of a given chemical creates resistance.

References

CABI. (2016). Crop Protection Compendium, 2016 Edition. © CAB International Publishing. Wallingford, UK. www.cabi.org. Retrieved on 23th April 2016

Cherry, A., Cock, M, van den Berg, and Kfir, R (2003). Biological control of *Helicoverpa armiguera* in Africa. In Biological Control in IPM Systems in Africa. Neuenschwander, P., Borgemeister, C and Langewald. J. (Editors). CABI Publishing in association with the ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA) and the Swiss Agency for Development and Cooperation (SDC). pp. 329-346. ISBN: 0-85199-639-6.

Dejen, A. and Tesfaye (2002). Cultural control of the African bollworm, *Heliothis armiguera* (Hb.). In African Bollworm Management in Ethiopia. Status and needs. Proceedings of the National Workshop held at the Plant Protection Research Centre Ambo, Ethiopia. April 2002. pp 99-105.

EU Directive 2000/29/EC. http://eur-lex.europa.eu. Accessed on 23th April 2014

List of Registered Pest Control Products (10Th Edition). www.pcpb.or.ke

Negash, T. and Abate, S. (2002). African bollworm management in the southern Region of Ethiopia. In African Bollworm Management in Ethiopia. Status and Needs. Proceedings of the National Workshop held at the Plant Protection Research Centre Ambo, Ethiopia. April 2002. pp 59-62.

EPPO (2016). EPPO Global database. Retrieved from https://gd.EPPO.int/.