Study of changes in Heliothis armigera flights with synthetic pheromone traps in Senegal

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Summary

The aldehyde (Z)-11-hexadecenal was tested with good results as an attractant for the male *Heliothis armigera*, the major tomato pest in Senegal. Traps baited with this synthetic sex pheromone afforded an opportunity to study the activities of the adult moth in the Cape Verde region of Senegal, a major vegetable-producing area. According to the 1979 findings, this pest was most active during the February-April dry season with sharp peaks in mid-February and at the end of March. During the rainy season (mid-August through December), it disappeared. Using the pheromone trap technique, control can now be oriented toward planned measures adapted to local conditions as oppowd to systematic applications of pesticides.

The tamato moth *Heliothis armigera* (Hiibn.) (Lepidoptera, Noctuidae) is polyphagous and causes substantial losses to various crops in Africa. In Senegal, it is the major tomato pest. causing losses ranging from 10 to 90 percent according to region or season (Collingwood and Bourdouxhe, 1980). More detailed knowledge of thr seasonal activities of these Lepidoptera was necessary in order to organize control measures and the applications of pesticides where and when really needed.

In 1977 Piccardi *et al.* (1977) isolated from the abdominal tip of *H. armigera* virgin females a compound that they identified as (Z)-11-hexadecenal. Both laboratory (Gothilf et *al.*, 1978; Piccardi *et ai.*, 1977) and field trials in the Sudan (Piccardi *et al.*, 1977) have shown this aldehyde to be a potsnt olfactory stimulant for the male *H. armigera.*

The test technique chosen for studying the changing pattern of *H. armigera* flights in the Cape Verde region of Senegal was the synthetic sex pheromone trap.

Materials and methods. The trials were conducted in 1979 at the Centre pour le développement de l'horticulture about 10 km east of Dakar in the Cape Verde region.

The pheromone traps were utilized throughout the year, beginning in November 1978. These are made of two plastic rectangles joined at each corner by rings. The inside of the bottom rectangle is covered with a sticky substance. A small rubber capsule saturated with the synthetic sex pheromone Z-11-C_{16}:Ald.[1] is attached at the centre of the sticky surface.

The baited traps were hung from poles 1.25 m off the ground (higher than the tops of the tomato plants) at intervals of at least 50 m. They were inspected every day for captured males. The capsule was replaced every week and a new coating of the sticky substance was applied to the bottom rectangle every ten to 15 days, as its stickiness waned.

Results and discussion, The pheromone proved to be highly specific. Despite the presence of numerous other species of moths, only the ***H.*** *armigera* male was caught.

To offset variations in the daily catch caused by outside influences, it was decided to use weekly total catch figures. Based on these totals, a histogram (Figure 1) was prepared diagramming the year-long activities of the adult insect and showing the changing pattern of ***H.*** *armigera* flights in the area selected for the esperiment. The first important catches in 1979 occurred during the second week of

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[1] Supplied by Montedison.

January. There were two subsequent pcaks of maximum activity: the second week of February, with a peak figure of 65 males trapped, and the last week of March. with 48 catches. The time interval between the two peaks of activity corresponds roughly to the life cycle of one generation. Catches continued to be frequent in April, dropped in May and became increasingly rare in June and July. No catches were recorded between August and mid-December. This is due to the migration of ***H.*** *armigera* populations to the cotton-producing areas of inland Senegal where the crop is grown during the July-November rainy season. The moth causes major losses of cotton bolls during this period, while damage to tomato plants in the Cape Verde region is very slight. With the onset of the dry season — December to June — H. *armigera* probably returns to the vegetable areas, particularly those where tomatoes are grown, and is one of the few sources of crop rot during this period. The histogram also shows those periods when rhe adult insects band together — probably to reproduce successive generations. The main features of the histogram appear to be rcpeated for the late 1979/early 1980 period.

As in the catch histogram, Figure 2 shows changes in the percentage of tomatoes attacked by ***H.*** *armigera.* The tomatoes were picked once a week, throughout the year, from untreated plots. The percentage of fruit destroyed rises rapidly with the onset of flights and well before peak catches of adults. This is probably due to the unusual fecundity of the females, which frequently lay over 500 eggs apiece, and to the fact that one worm can destroy several fruits. Graphs showing losses since 1576 have a similar shape each year, suggesting a similar pnttern of flights of ***Ii.*** *armigera.*

Early results with the new synthetic sex pheromone on H. *armigera* seem promising. Pheromone trapping, an easy technique to use and monitor, provides early and accurate information on the onset of flights and allows initial, low populations of H. *armigera* to be detected; so much so that one can say: if no insects are trapped, no treatment is neces-

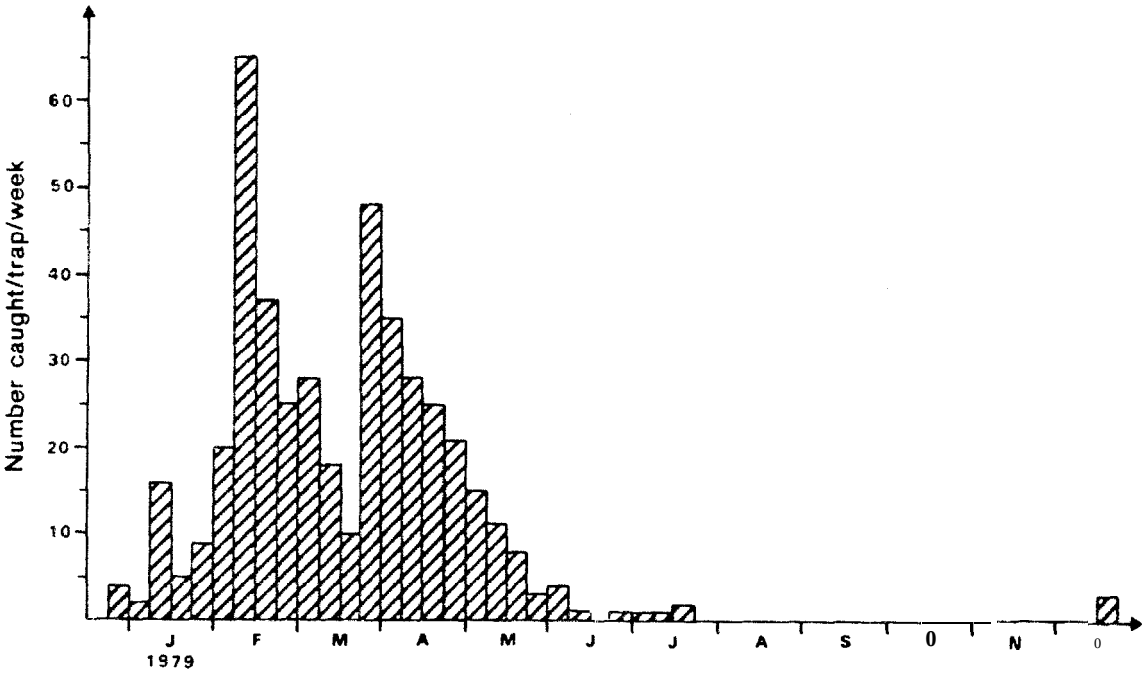

Figure 1. Catch *histogram* **of** *the male* **Heliothis armigera**

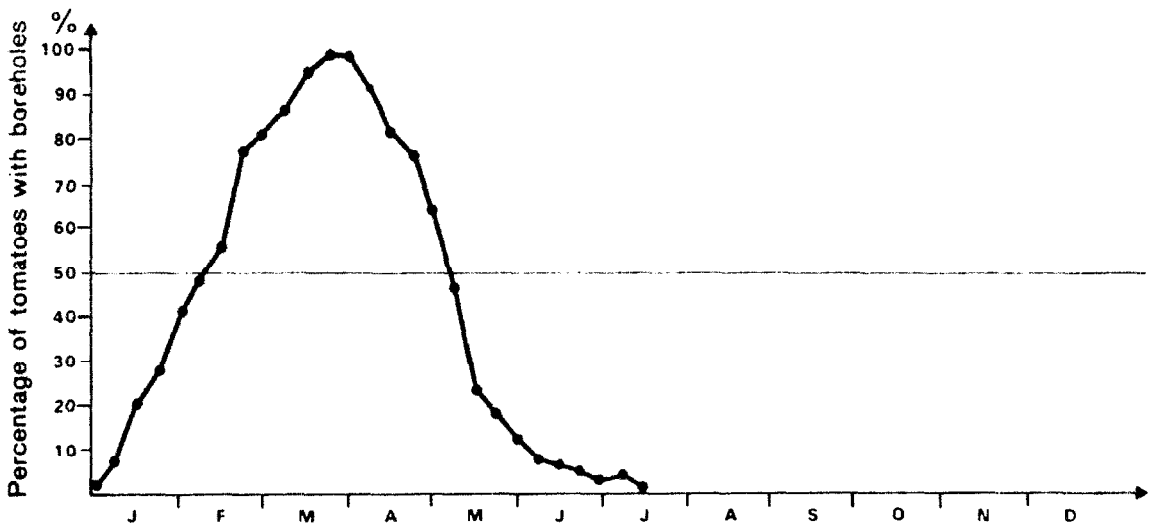

Figure 2. *Changes in tomato losses from* H. armigera, *1979*

sary. Catches should be interpreted as early warning signals and should help in monitoring the spread of the pest. However, they do not directly indicate either the date of or the need for treatment. For this, data on oviposition, egg hatching and similar factors should be taken into account in order to adapt control measures to the actual crop situation.

The technique of pheromone trapping can easily be fitted into a system of integrated control at the monitoring station or farm level. Since the technique provides more exact information about the size of *H. armigera* populations, pesticides could be applied as and where needed, making it possible to adapt control to local conditions. One can thus progress toward carefully planned control as opposed to systematic pesticide application programmes.

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