

LIGHT AND PHEROMONE TRAPS:  
THEIR PLACE IN MONITORING HELIOTHIS ABUNDANCE

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The scouting of cotton for eggs and larvae of *Heliothis spp* is a labour intensive and therefore expensive undertaking. The question arises whether cost savings could be made by using semi-automatic monitoring devices to partially replace crop scouting. This paper describes the advantages and disadvantages of light and pheromone traps and the information they can be expected to give, from experience gained in progressively developing trapping systems over the past eight years.

Trap Design

Light traps. Both mercury vapour light and black light sources have been used. The former attracts a wide range of insects and a 125W 240 volt globe may be effective for up to a 200m radius. The lamp requires a mains electricity supply.

Smaller mercury vapour lights can be operated off batteries but 12 volt fluorescent black light traps are more often used where mains electricity supply is not available. The size of catch is much smaller.

Light traps have an advantage of catching both male and female moths so that catch should better reflect the egg lay in an area compared with pheromone traps which capture males only. Unfortunately the large variety and number of insects caught in light traps makes their sorting an onerous task. Abrasion of specimens may also make identification of *Heliothis spp*

difficult, and dissection of genitalia may be necessary to confirm identification. This requires specialised knowledge that cotton farmers can not reasonably be expected to have and for these considerations the use of light traps will probably continue to be mainly limited to research purposes.

Pheromone traps. Two types of pheromone trap have been operated in cotton, the funnel and the cone trap.

At the previous conference the improved efficiency of cone (Texas) traps compared with funnel traps was mentioned. The cone traps have been further improved in the meantime by constructing them of a locally manufactured light and temperature resistant shade cloth Rheem "supermesh." Traps are now available made by the Sheltered workshop at Narrabri. The funnel trap has also been improved by replacing the flat top plate by an inverted dish, and reducing the gap between dish and funnel to 5cm but catch is still much smaller than in the cone trap (Fig. 1).

Trap location. Light traps provide a strong omnidirectional source of attraction and appear to give similar results when placed either within or on the edge of crops. On the other hand pheromone traps produce an attractive plume downwind of the trap only. Research in the past three seasons has shown the importance of placing pheromone traps WITHIN the crop to be monitored, not on the edge or outside it. In Fig. 1 is shown the catch in traps placed in the first row compared with that 40m within a crop of cotton. The mean catch was about double at the inner position (2.3-fold with *H. punctigera* and 1.8-fold with *H. armigera*).

By comparison with egg identification it has been found that traps placed inside the crop also give a more accurate

representation of the relative abundance of the two species than that obtained from the traps sited on the edge of the crop which have often shown a bias towards catch of *H. armigera* (see 1984 conference paper by Fitt et al).

#### External factors affecting trap catch

Three external factors are of importance in biasing trap catch so that it does not give a true indication of moth activity as indicated by egg lay. These are low temperature, high windspeed and strong moonlight. A fourth external factor, insecticide application may be correctly represented in a decline in moth catch.

(a) Temperature. A comparison of pheromone and light traps shows that the latter perform less efficiently under cool conditions. The threshold of catch in light traps appears to be about 12°C, while catches have been recorded in pheromone traps on nights with minima as low as 5°C. Use of pheromone rather than light trap data has greatly improved the accuracy of predictions of subsequent peaks from the initial moth emergence peak in spring (see Fig. 2).

(b) Windspeed. Light trap catch tends to be suppressed at windspeed greater than 1.7m/sec (3.8 mph) the effect being greater on *H. armigera*. Conversely pheromone traps may show increased catch during windy conditions because the pheromone plume will extend further downwind thereby attracting moths from a bigger area. Fortunately windspeed is usually low during the night when moths are active but quite severe distortions of catch can occur on occasions.

(c) Moonlight. Strong moonlight, i.e. that occurring at the full moon under cloud-free conditions, strongly suppresses light trap catch of *H. armigera* and to a lesser extent of *H. punctigera*. There is however no evidence that moth activity as gauged by egg lay is affected in the same way. Pheromone trap catch also appears to be slightly affected by strong moonlight (Fig. 2).

(d) Insecticide applications. Application of insecticides toxic to moths may substantially reduce moth populations, both by direct knockdown or through residual contact and feeding. In addition pyrethroids and chlordimeform display a repellency effect on moths. Unlike the other external effects described above, insecticides can be expected to affect both moth abundance and egg lays and therefore activity may be correctly represented by the traps.

With improved trap design and location it is now possible to assess more accurately the effects of the external factors described above on trap catch. It should then be possible to upgrade the moth catch numbers to give a more reliable index of moth activity in the field and resulting egg lay. One factor that remains to be investigated is competition between synthetic and feral pheromone scent. There are some indications of an underlying pheromone attraction bias towards scarce moth populations that will tend to be over-represented in catch, and this factor may also have to be built into the model describing true moth activity.

In Summary:

- (1) Both light and pheromone traps have various advantages and disadvantages but the expertise and heavy labour input required to run light traps precludes their widespread use on cotton farms.
- (2) Pheromone traps have a place in scouting cotton, particularly when it is desired to know which *Heliothis* species is the most numerous, but traps must be sited well within the crop for accurate results.
- (3) With improved knowledge of factors distorting trap catch it should be possible to produce a computer model upgrading catch so that it better represents moth activity, as measured by oviposition.

Acknowledgments

The use of egg abundance and species data shown in Fig. 2, from Ken Brook and Neil Forrester respectively is gratefully acknowledged.

FIG. 1

Total moth catch per trap 31-12-85 to 7-4-86

HP - *Heliothis punctigera*, HA - *Heliothis armigera*

CONE MEANS - HP Edge 842, HP Inside 1953 ; HA Edge 1365 , HA Inside 2557

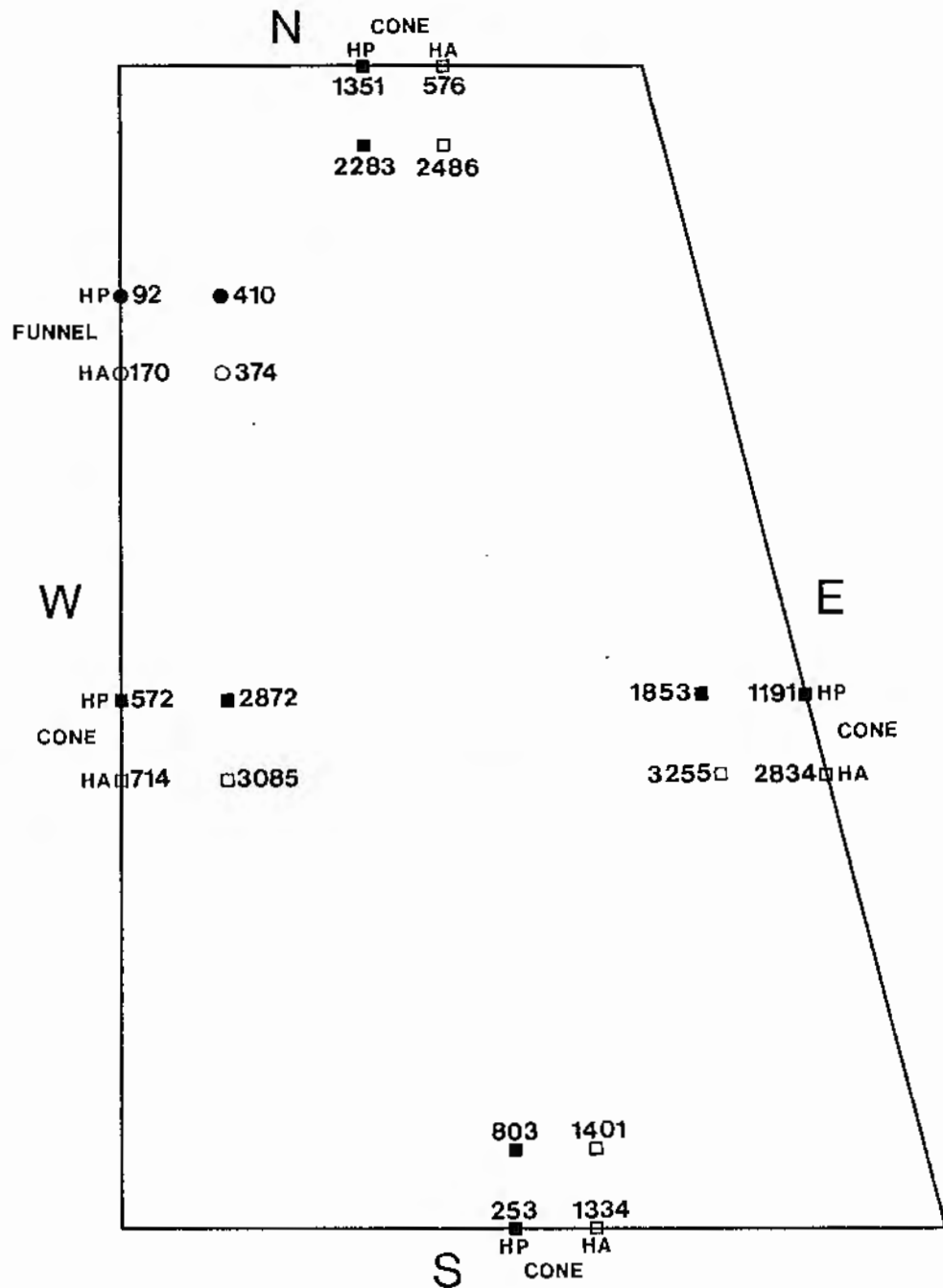


Fig. 2

