

Innovative IPM Tools

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Integrated pest management (IPM) emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. The traditional pest control philosophy has undergone a radical change in the light of the limitations of chemical pesticides, their environmental hazards and other devastating side effects. Indiscriminate application of chemical pesticides has several side effects which may lead to pollution of air, water, soil, food and feed and mortality of fauna. The implementation of location-specific eco-friendly Integrated Pest Management (IPM) technology can minimize this problem. While implementing IPM prog. in different ecological zones, the farmers face the problem of shortage of IPM inputs. The IPM inputs producing firms/industries/entrepreneurs also feel bottle-necks in mass-production of IPM inputs due to inheritance problems of manufacturing, lack of precision, limited automation, mass-multiplication of predators, parasitoids in desired number/quantity, its handling, storage, transport, high cost, etc. The automation process and low-cost IPM inputs are the key requirement of the time as insect-pests of various kinds are taking a heavy toll of crops. To meet these requirements, conceptualization, designing, development, fabrication, standardization and validation of new and innovative IPM tools, traps and techniques has been done at ICAR-NRIIPM, New Delhi; the details provided below:

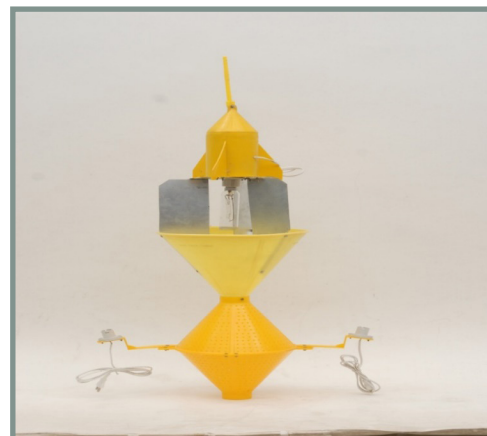
Light trap safer to beneficial insect

Light traps are the most widely used visual traps for the agricultural insect pests, and have been particularly important in surveillance programme and monitoring of the seasonal appearance of many species of moths, hoppers, beetles, etc. A light trap basically consists of a light source above a funnel and a container below to collect the catch. The present light trap safer to beneficial insects is for monitoring and mass trapping of insects in the crop fields. The porous insect collection container provided in the system helps in separating the beneficial (parasitoids) and micro sized non-targeted insect fauna from the harmful insect pests. The harmful insects can be easily removed from the light trap unit. Mass trapping of adults of both sexes of insect pests by light trap will help in minimizing their infestation in the crop fields. The key insect pests of cereal crops (rice, maize,

sorghum), pulse crops (chickpea, pigeonpea), vegetable crops (cauliflower, cabbage, tomato, brinjal), horticultural crops can be mass trapped by using this light trap. The newly invented trap is an important tool of eco-friendly integrated pest management technologies. The technology had been demonstrated in several states viz, Maharashtra, Haryana, U.P., M.P., A.P., Gujarat, Rajasthan, Chhatisgarh and Bihar covering more than 10 villages and a total of 5.5 lakh units were utilized in different agro-ecosystem.

The precise advantages of this light trap are:

- (i) It can be used to monitor or mass trap the population of phototrophic insects in the crop fields. The mass trapping of both the sexes may reduce the insect pest population in the fields.
- (ii) The micro sized beneficial/non-targeted insects will come out from the trapping system of the light trap through the porous means provided in the insect collecting chamber.
- (iii) The application of chemical pesticides may be minimized by the use of this trap.
- (iv) It is durable and may be used year after year.
- (v) The individual or a group of farmers can use this trap to save the beneficial insects.
- (vi) Expenditure on pesticides and their application will decrease. Biodiversity will increase.
- (ix) Decrease in the pressure of pesticides on other natural enemies will allow them to play an additive part in suppressing the insect pests.
- (x) It will control the menace of the insect pests at a very low cost and it would be boon to the poor farmers as an alternative cost-effective method of pest control.
- (xi) During rains most of the insecticides are washed away with the hopes of poor farmers. The light trap on the other hand continues catching harmful insect pests.



Light trap safer to beneficial insects

(1) Aerial Insect Trap

It was developed for sampling air born insects i.e., aphids. It is zero energy trap which moves with the help of air thrust. Also, the population of parasites and predators can also be known with this Aerial-Insect Trap. Furthermore, the natural enemies caught are alive can be released back to the field. The Aerial Insect Trap (AIT) comprises of broad barrel shaped structure made of cotton cloth supported by a wire frame. Inside of this barrel, this cone section acts as a trap. The barrel is held horizontally over a pole fixed on the ball bearing. The ball bearing provides the free movement of the barrel. The air thrust keeps the trap always opposite the direction of the wind. The height of the trap can be adjusted by the provision for adjustment made in its stand. The flying insects enter in the trap by their flight and also with the gush of the wind. The trap is kept just above the height of the crop throughout the season. The insects are periodically collected and examined. The insects are not attracted by any kind of lure or suction force. The aerial insect trap was installed in the mustard (KVK, Sonapat, Haryana) and chickpea crop (village Shikohpur, U.P and village Korai, Distt. Fatehpur, U.P.) during the Rabi season of 2001-2002 and onwards and has been found effective in monitoring air borne insects.



Aerial Insect Trap

(2) Egg cleaning device

The insect *Corcyra* is reared in the insectaries all over the country. It is needed for the mass multiplication of several biocontrol agents viz., egg parasitoids- *Trichogramma* spp.; egg-larval parasitoid- *Chelonus blackburni*; larval parasitoids- *Bracon* spp., *Goniozus nephantidis*, *Apanteles* spp.; insect predators *Chrysoperla carnea*, *Mallada bonienseis* and *Cyrtorhynchus lividipennis*. Besides, some entomopathogenic nematodes such as *Steinernema feltiae* (*Neoplectana carpocapsea*) is also reared on the larvae of *C. cephalonica*.

Eggs are obtained in billions by rearing *Corcyra*. The egg laying is accompanied by shedding of mounds of scales, which are health hazardous. They cause pulmonary problems (Tuberculosis and Asthma). To collect and clean the eggs, the said device is very efficient. Clean eggs are segregated from the scales with great ease without harming the workers and the hazardous scales are safely disposed. This mechanical device was developed to separate *Corcyra* eggs from dust, insect scales,

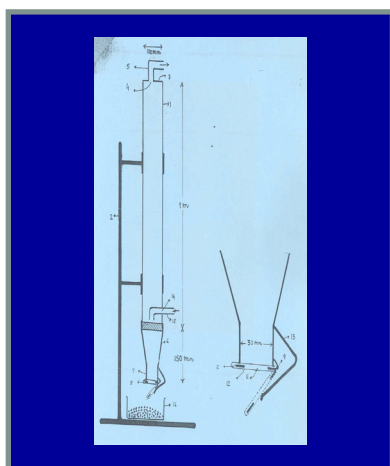
insect body parts (antennae, legs, wings etc.) in the biocontrol laboratories. This device works with the help of vacuum cleaner.

Trichogramma is produced in several:

- ❖ Sugar mills (There are more than 250 sugar mills in Maharashtra, U.P. and other states)
- ❖ Agricultural Universities (30 Agricultural Universities)
- ❖ Agriculture Colleges

Private companies producing Bio-control agents (There are >130 Pvt. Companies) and NGO's

This device can be used in their biocontrol lab.



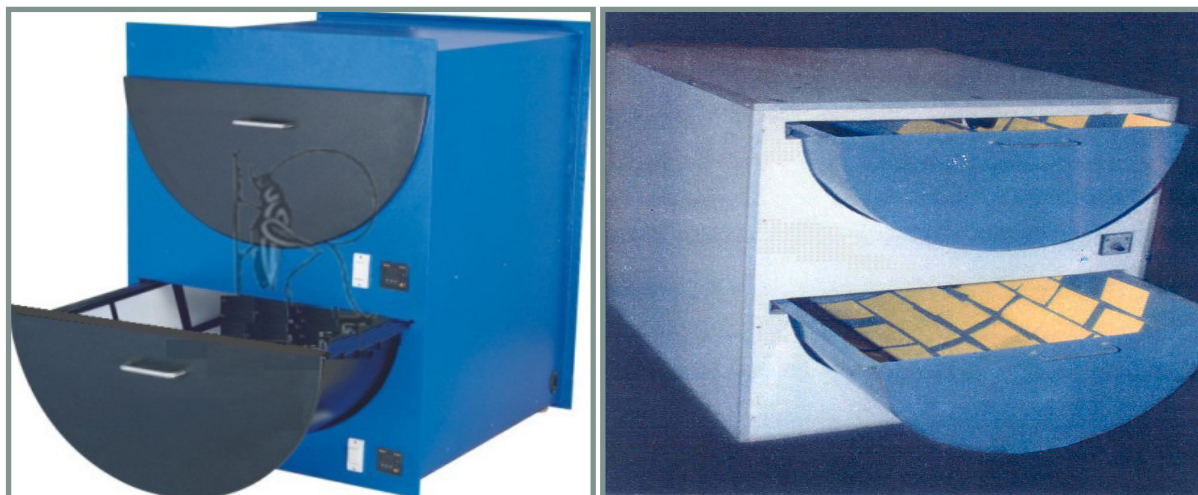
Egg cleaning device

(3) UV Sterilization chamber for *Corcyra* eggs

For the mass production of *Trichogramma*, the *Corcyra* eggs are to be sterilized before use. For quick and uniform sterilization of *Corcyra* eggs a new type of sterilization chamber has been developed. The said sterilization chamber comprised of a cuboid box, 105 cm long, 88 cm broad and 105 cm high. It is closed on all the sides except from the front. The chamber is divided into two equal parts by a horizontal partition. Each partition is provided with a drawer which has a semicircular base of radius 35 cm. The cross section of this drawer is semicircular. The length of the drawer is 100 cm. In the inner surface of the semicircular base the drawer is provided with longitudinal flanges of 2 mm thick and 9 cm apart. These flanges prevent the egg bearing cards to glide one over the other from the curve surface. 75 post card size cards bearing eggs on its upper surface (Trichocard) can be arranged in one drawer. There are two such drawers, which can be pulled out and pushed back in place easily in the manner as table drawers are operated. The ceiling of each drawer is provided with a 30 W UV tube light. Each tube light is connected with a 30 minutes timer thus there are two timers. The time of the timer can be set for a desired time with a least count of one minute.

Features:

- ❖ 75 cards can be exposed to UV at a time in each drawer.
- ❖ Since the source of light is at the center of the curve exposure by UV rays is uniform on the surface of the cards.
- ❖ Since there are two drawers, the time required to arrange the cards in one drawer is sufficient to sterilize the cards in another drawer. Thus, one can sterilize 75 cards per 10 minutes using these drawers alternately.
- ❖ The timers ensure to prevent over exposure or under exposure of the cards.
- ❖ Since the cards are exposed to UV radiation in a closed box, the undesired exposure to UV radiation is ruled out in the structure.



UV chamber for *Corcyra* eggs sterilization

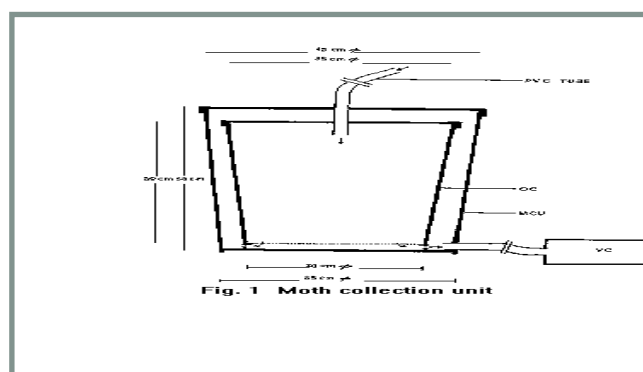
(4) Cage for rearing *Corcyra cephalonica*

It was developed at ICAR-NRIIPM and found very successful in working *i.e.*, to stop the attack of larval parasitoid – *Bracon hebetor* on the *Corcyra* culture.

(5) *Corcyra* moth collection unit

It was made for the collection of *C. cephalonica* in insect biocontrol laboratories. The unit works with the help of vacuum cleaner.

Corcyra moth collection unit



The Patents were granted to ICAR-NRIIPM, New Delhi for the various innovative IPM tools developed and invented, the details are provided as below:

S. N.	Patents title
National Patents	
1.	Egg cleaning device (Indian Patent No. 213744)
2.	Aerial Insect Trap (Indian Patent No. 226238)
3.	An insect rearing device for multiplication of insect larval parasitoids (Indian Patent No. 274901)
4.	Non-sticky Insect Trap (Indian Patent No.278215)
5.	Insect rearing and collection apparatus (Indian Patent No. 280435)
6.	Light trap for managing insects (Indian Patent No. 293621)
7.	Insect oviposition and egg collection apparatus' (Indian Patent No. 294933)
8.	Light Trap Safer to beneficial insects (Indian Patent No.479233)
International Patents	
1.	Light trap for managing insects (Australia) (Australian Patent No. 2012208304)
2.	Light trap for managing insects (Indonesia) (Indonesian Patent No. IDP000043686)
3.	Light trap for managing insects (Vietnam) (Vietnam Patent No. 22361)

*These inventions are patented by ICAR-NRIIPM, New Delhi. The license(s) of these technologies can be obtained through M/s Agrinnovate India Ltd., New Delhi.