# CHAPTER : 5

## DOSE-DEPENDENT OVIPOSITION DETERRENCE DUE TO HEXANE FEMALE BODY-WASH

Dosimetry or the determination of the action of different concentrations/doses of any agent is an important aspect of study. It facilitates determination of a suitable/optimal dose level. From this important point of view dosimetric data are essential in regard to practical application of oviposition deterrent as a tool for strategy of future pest control practice. The present dosimetric study was, therefore, undertaken to determine the lowest suitable dose of the oviposition deterring action of the hexane female body-wash.

## MATERIAL AND METHODS

A series of choice experiments were carried out to determine the oviposition response of the female beetles to various concentrations of the hexane body-wash. The concentrations applied were in terms of female equivalents (FE). FE denotes the females equivalents which were adjusted by employing appropriate volumes of whole extract of 2000 beetles washed in a total volume of 10 ml. Following dose levels were employed:- 5 FE (0.025 ml), 10 FE (0.05 ml), 15 FE (0.075 ml), 20 FE (0.1 ml), 25 FE

(0.125 ml), 30 FE (0.15 ml), 40 FE (0.2 ml) and 50 FE (0.25 ml). For testing each concentration/dose level, 32 tobacco leaf disc-stacks were taken, 16 of which were "treated" with the body-wash and the other 16 were "control" stacks treated with the respective amount of solvent only. In this case the body-wash or the solvents were applied directly on to the leaf stacks using a micropipette. When the volumes were larger for a particular dose, the leaf disc-stacks were intermittently allowed to dry at room temperature so as to get soaked with complete volume. In all four leaf disc-stacks of "treated" and four of "control" were arranged alternately at 8 equidistant sites in one "choice dish" (Fig. 5.a). Thus in case of each dose a set of four "choice dishes" were available for testing. Adult males and females, 5-6 day post-emergent age, were allowed to mate. After 24 hrs of mating, 4 pairs of them were released into each "choice dish". The "choice dishes" were kept for 24 hrs in dark at ambient temperature and humidity. The number of eggs laid in each type of disc-stacks were recorded. Percentage-wise distribution was presented in Table 5.1. The deterrent activity of different dose levels of the wash was determined as percentage deterrence values, as described earlier.

## RESULTS AND DISCUSSION

The oviposition deterrent activity of the hexane female body-wash increased with concentration or dose

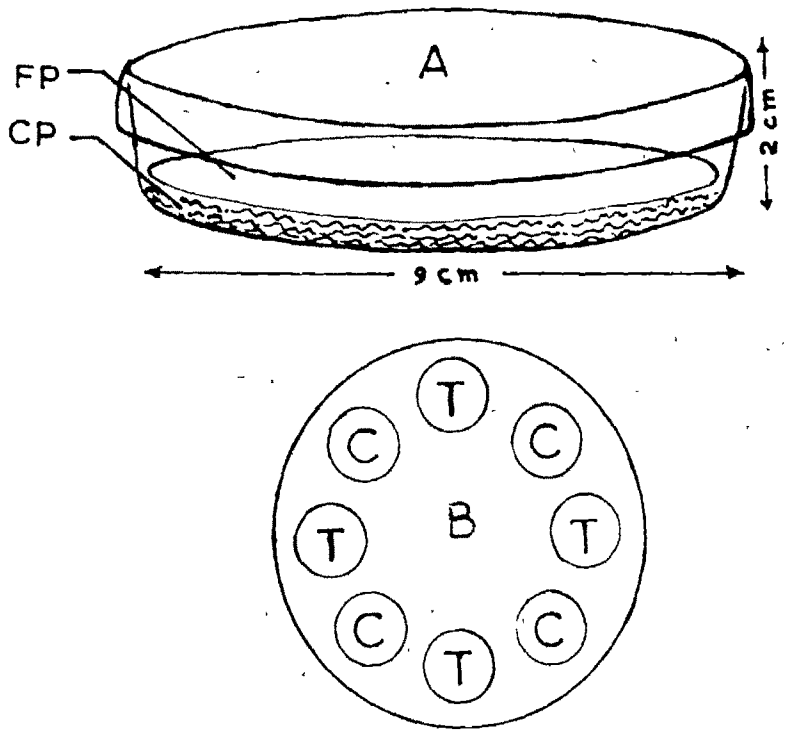
(Fig. 5.b). The figure showed a clear linear relationship (Y = 56.28 + 0.874 X) between the deterrence percentage and the dose of the extract applied (Table 5.1). From the perusal of the tabulated data it becomes very obvious that there was a dose-dependent deterring influence of the whole female body-wash prepared in hexane. Progressive rise in deterrent influence from the initial dose in that of 15 FE was significant (51.94 to 77.06), but thereafter, though further increase was observable, its rate was not so significant. Though maximum deterrence (92.86%) was obtainable with 50 FE it could be considered as too high a concentration for any practical utility. The range of percentage of eggs laid on "treated" leaf discs being 24.03 to 3.57, it is most logical to conclude that hexane wash positively contained an ODP. Behan and Schoonhoven (1978) and Klijnstra (1986) also described similar relationship between the reduction in oviposition and the concentration of egg washes in P. brassicae, recording that very high concentration of the ODP did not fully prevent the butterflies from laying atleast a few eggs on to the treated leaves, most probably accidently. Observations of Dittrick et al. (1983) on European corn borer, Ostrinia nubilalis were of similar nature as far as control of oviposition with methanolic larval frass extract. From the dose-response curve displayed in figure 5.b, there were no indications that low concentrations of the wash could least bit act as oviposition attractant, an important corollary at that.

Another significant fact is that the oviposition deterrent can easily be recognized in the hexane wash by the female L. serricorne even at the 5 FE dose. According to Klijnstra and Schoonhoven (1987) an ODP can also act as a modifier of pre-oviposition behaviour of females and may stimulate their dispersion. Perhaps in open storage conditions, where the insects can easily disperse, a much higher deterrence of oviposition may be obtained with 15 FE dose only. It was therefore, concluded that 15 FE is the most suitable and economically important dose. It was also decided that further experimentation with the wash should be carried out with 15 FE dose only.

## SUMMARY

Oviposition response of the tobacco beetle, L. serricorne (F.) to different concentrations of the hexane female body-wash was determined. A clear linear relationship between the concentration of the wash and the oviposition deterring activity was observed, that is a very obvious dose-dependent response was recorded. The oviposition deterring activity of the wash was found to increase sharply upto 75%, after that the rate of increase was slow, though it was increasing with the more higher doses. However, even at the highest dose of the wash could not fully prevent beetles from laying eggs on to the "treated" leaf samples. Following important points were noted:- (a) Female beetles

recognize ODP even with the least dose (5 FE) (b) There was no indication that the lowest dose may have attractant property (c) 15 FE dose may be more effective under open storage conditions where chances for dispersal/avoidance of preoccupied oviposition sites is possible for the female beetles (d) On the basis of the observations it was concluded that further studies may be carried out with 15 FE dose level, which is thought to be optimal deterrent.




FP - Filter paper

CP - Corrugated paper

◯ - Pinned stacks of tobacco leaf discs

T - Treated

C - Control

Fig. 5.a. Schematic diagrams of the arrangements of disc-stacks in "Choice dishes". (A) Choice dish (B) Experimental design

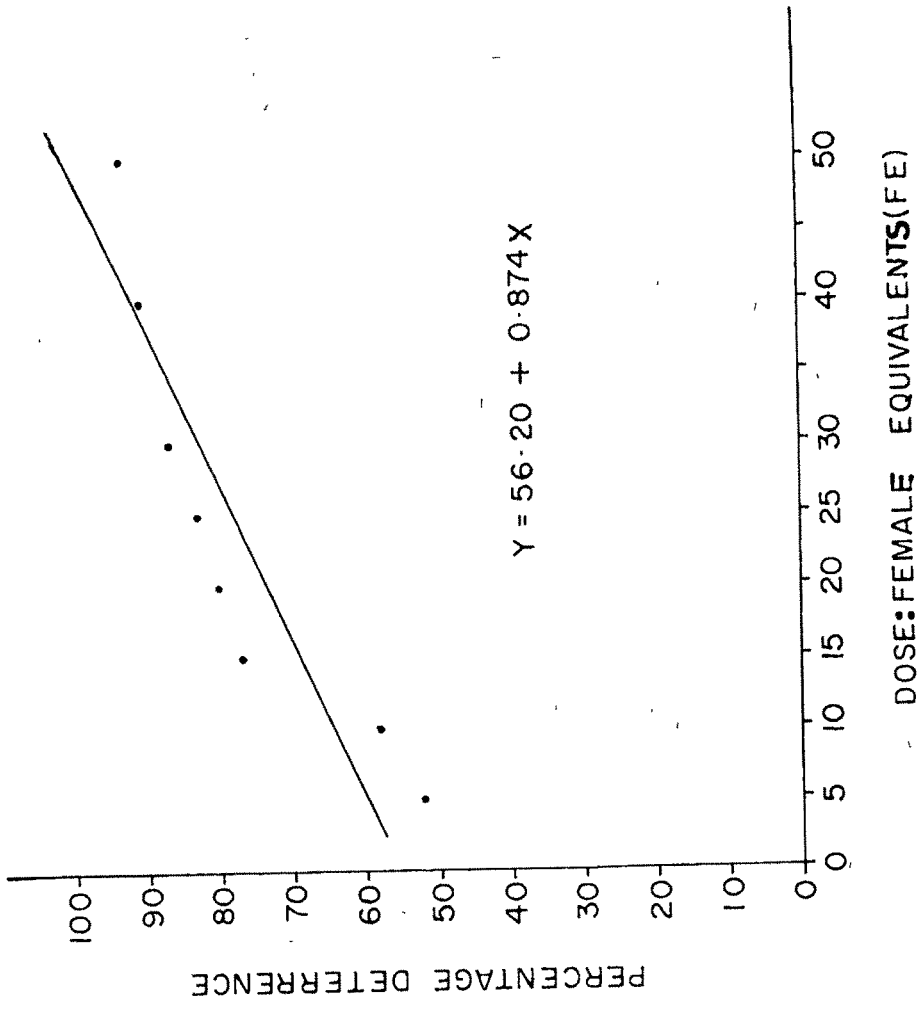



Fig.5.b. Depicting regression line in respect of deterrent activity of female body-wash in hexane at concentration range of 5 to 50 female equivalents per discs stack of leaf on the oviposition response of L. serricorne.

Table 5.1. Dosimetric study of hexane body-wash with respect to alterations in oviposition behaviour of L. serricorne. (Dose levels are expressed in terms of female equivalents of the whole female body-wash in hexane)

| Female Equivalents | Percentage egg distribution on Stacks | | Percentage Deterrence |
|---|---|---|---|
| | Treated | Control | |
| 5 | 24.03 | 75.97 | 51.94 |
| 10 | 20.92 | 79.08 | 58.16 |
| 15 | 11.47 | 88.53 | 77.06 |
| 20 | 9.95 | 90.04 | 80.09 |
| 25 | 8.59 | 91.41 | 82.82 |
| 30 | 6.74 | 93.26 | 86.58 |
| 40 | 4.74 | 95.26 | 90.53 |
| 50 | 3.57 | 96.46 | 92.86 |