

Comparison of different pheromone dispensers in luring *Musca domestica* towards delta trap

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ABSTRACT

The house fly sex pheromone (Z)-9-tricosene was impregnated into different pheromone dispensers (septa, plastic and polythene) and their efficacy in luring *Muscadomestica* towards red acrylic delta trap was studied. Out of the 514 house flies trapped, (Z)-9-tricosene when impregnated in circular plastic green lure attracted the maximum number of flies (165), followed by polyvial (132), silicone septa (111) and rubber septa (79) whereas the least number of flies was attracted with rectangular plastic dispenser (27). Among the house flies trapped, 46.49 per cent (239) were males and 53.50 per cent (275) were females. Predominance of male flies was observed with circular plastic green lure, polyvial and silicone septa, whereas in rubber septa and rectangular plastic lure, more number of female house flies were trapped. Observations revealed that circular plastic green lure, polyvial and silicone septa can be used as an effective dispensers to impregnate (Z)-9-tricosene in order of preference to facilitate slow and sustained release of pheromone and thereby trapping the optimum number of house flies towards delta trap.

Key Words: *Muscadomestica*, (Z)-9-tricosene, Pheromone dispenser, Delta trap.

INTRODUCTION

Pheromones are chemicals produced by insects which send signals to other members of the same species. The best known are sex pheromones emitted usually by the females of many insect species in order to indicate their location and willingness to

mate. Sex pheromones of *Musca domestica* have been studied in detail by researchers, amongst which only one pheromone, the (Z)-9-tricosene, produced by female house flies to attract males has been successfully employed for field use (Carlson *et al.*, 1971; Chapman *et al.*, 1998a, 1998b, 1999; Noorman and Den Otter, 2001; Butler, 2007 and Butler *et al.*, 2007). One of the major problems associated with the sustainable field use of (Z)-9-tricosene is its volatility and biodegradability. (Z)-9-tricosene based pheromone baits used to attract house flies do not last long unless they are impregnated into sustained release or slow release

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dispensers (Chapman *et al.*, 1998a). Even though control of flies using pheromones is a viable pest management approach, suitable pheromone dispensers however, are lagging behind the general availability of pheromones (Hummel *et al.*, 2013). Identification of the suitable pheromone dispenser is thus vital for successful impregnation of pheromones. The present *in vitro* study was therefore undertaken to study the comparative efficacy of different pheromone dispensers impregnated with (Z)-9-tricosene in luring *M. domestica* towards delta trap.

MATERIALS AND METHODS

Pheromone

The house fly sex attractant pheromone (Z)-9-tricosene - 97% (Sigma Aldrich, Germany).

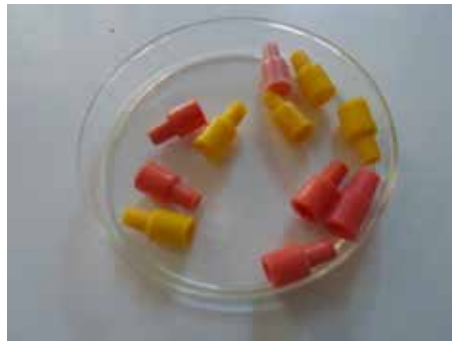
Pheromone dispensers

The pheromone dispensers included septa, both rubber and silicone, plastic dispensers, circular plastic green lure and rectangular plastic dispenser and polyvial, a polythene dispenser (Sun lure, Ambattur, Chennai) (Fig. 1).

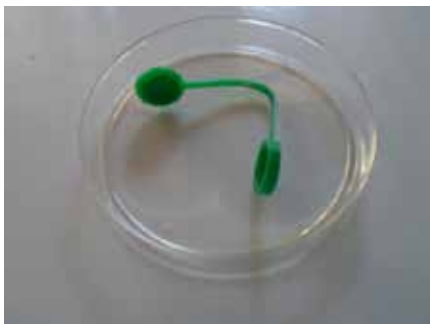
Figure – 1. (Z)-9-tricosene pheromone dispensers evaluated. a: Rubber septa dispenser, b: Silicone septa dispenser, c: Circular plastic green dispenser, d: Rectangular plastic dispenser, e: Circular plastic dispenser, f: Polyvial



a



b



c



d



e
Impregnation of pheromone into dispensers

All the dispensers were impregnated with 20 μ l of 0.22 per cent (Z)-9-tricosene dissolved in hexane.

Delta trap bioassay in insectory for all dispensers

A red acrylic delta trap (fabricated at Technocrats, Chennai) was used for the study (Fig 2). The dimension of the delta trap was 22 cm L, 18.5 cm B, 8.5 cm H and



f
sides of 11 cm with a 20.5 x 16 cm insert at the base where a transparent polythene sheet of 17 x 13.5 cm was placed and glue was applied uniformly on it. The pheromone lure was suspended in the middle of the trap using a thread. The trap was kept in the floor of the insectory for 1 h. At the end of 1 h, trapped flies were counted and sexed under stereo zoom microscope (Leica M-29-5, Switzerland). After each experiment, the delta trap was thoroughly washed in hexane thrice and then used.

Figure – 2. Red acrylic delta trap used to evaluate the efficacy of (Z)-9-tricosene pheromone dispensers a: front view, b: top view



RESULTS AND DISCUSSION

Out of different (Z)-9-tricosene dispensers tested, the circular plastic green lure attracted the maximum number of flies, 32.10 per cent (165 flies) (Fig. 3) followed by polyvial which attracted 25.68 per cent (132 flies). The silicone septa attracted 21.59 per cent (111 flies) and rubber septa attracted 15.36 per cent (79 flies). The least number of house flies was attracted by the rectangular plastic lure, 5.25 per cent (27 flies). Overall, out of the 514 house flies trapped using different pheromone dispensers, 46.49 per cent (239 flies) were males and 53.50 per cent (275 flies) were females. In the circular plastic green lure, out of 165 flies lured, 40 per cent (66 flies) were males and 60 per cent (99 flies) were females. In polyvial, out of 132 flies attracted, 45.45 per cent (60 flies) were males and 54.54 per cent (72 flies) were females. In silicone septa, out of 111 flies attracted, 47.74 per cent (53 flies) were males while 52.25 per cent (58 flies) were females. With rubber septa, out of 79 flies lured, 58.22 per cent (46 flies) were males and 41.77 per cent (33 flies) were females. The rectangular plastic lure impregnated with (Z)-9-tricosene lured 27 flies of which 51.85 per cent (14 flies) were males and 48.14 per cent (13 flies) were females. The house fly sex pheromone (Z)-9-tricosene has been used to attract house flies (Carlson *et al.*, 1971; Chapman *et al.*, 1998b, 1999; Noorman and Den Otter, 2001; Butler, 2007 and Butler *et al.*, 2007). (Z)-9-tricosene indicates the male house fly that the female fly it had encountered is a *M. domestica* and not some other species. (Z)-9-tricosene acts as an attractant or aggregation pheromone. It is a highly volatile compound hence can

only influence the behavior of house flies at short ranges (Noorman and Den Otter, 2001 and Kelling *et al.*, 2003). In order to facilitate slow and steady release of pheromone, it needs to be impregnated successfully in a suitable dispenser. In the present study (Z)-9-tricosene was impregnated into different dispensers and evaluated for their efficacy in attracting house flies in the insectory using delta trap. Among plastic dispensers, circular plastic green lure was better than the rectangular plastic lure. With respect to septa dispensers, the silicone septa lured more flies compared to rubber septa. Polyvial was found superior to septa and rectangular plastic lure. In the present study, although the same concentration of (Z)-9-tricosene was impregnated in all the dispensers, the low efficacy observed in septa dispensers compared to plastic and polyvial dispensers could be presumably due to the comparatively reduced pheromone impregnation coupled with insufficient release of (Z)-9-tricosene. It was interesting to note variations in the attraction of male and female house flies towards the different dispensers. In the present study, more number of females were attracted than male flies towards circular plastic green lure, polyvial and silicone septa. This variation in the numbers of attracted male and female flies towards dispensers could be presumably due to the variation in the chemical ingredients of the dispensers as well as the colour, odour and physical structure that influences fly attraction. Female bias in the tested fly population could also be another reason for the increase in number of female flies. In addition, physiological and nutritional status of flies, environmental factors such as rheotaxis, sound, moisture and wind

velocity also could have contributed to this sex variation. Overall, the efficacy of the dispensers especially circular plastic green lure and polyvial indicates their ability to

retain the pheromone without deterioration and evaporation thereby help in sustained release of (Z)-9-tricosene and luring of house flies.

Figure – 3. House flies attracted towards circular plastic green lure



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