

A Marking Technique for *Exorista bombycis*(Louis) (Diptera:Tachinidae) by Adding Dye to the Adult Diet

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Abstract

Adding a non-fluorescent dye, Rhodamine-B, to the adult diet of uzi fly, *Exorista bombycis* (Louis) has shown to be a useful method for marking the eggs for flight range experiments. The method is timesaving and the dye is safe to handle and the marked eggs are easy to detect. Flies fed on the diet added with dye did not have much negative effect on adult mortality and fecundity, but egg hatchability was affected.

Key words : Rhodamine-B, marking technique, uzifly (*Exorista bombycis*)

Introduction

The uzi fly, *Exorista bombycis*(Louis) (Diptera : Tachinidae) is a serious larval endoparasitoid of the silkworm, *Bombyx mori* L. with wide distribution in Asia (Becher, 1889). It has remained as a major pest of silkworm in Karnataka State eversince its first occurrence in South India during May 1980 in Bangalore District. Presently, this pest is reported to cause 10~30% infestation worldover, particularly in tropical regions of secricultural countries during favourable seasons (Sengupta *et al.*, 1990).

The marking of insects with vital dyes incorporated in the food is a valuable tool. Feeding of non-fluorescent dyes formed an effective method for marking and monitoring the flight activities of adult insects (Foott, 1976). Bishop (1972) and Quarterman *et al.*, (1954a) successfully used fluorescent dyes to mark and subsequently identify the released house flies. Mosquitoes have been marked by feeding them on a 0.01% solution of Rhodamine-B in a sugar solution(Reeves *et al.*, 1948), while Quarterman *et al.*, (1954b) marked house fly eggs by feeding adults on milk containing Rhodamine-B. Similarly, eggs of oriental fruit fly, *Dacus dorsalis* M.

and melon fly, *D. cucurbitae* C. have been marked by feeding adults on sugar solution containing 0.1% Rhodamine-B (Vergas *et al.*, 1989). Hence, the present investigation was conducted with a view to identify the best egg marker and to know its effect on adult longevity, fecundity and egg fertility of uzi fly, *E. bombycis*.

Materials and Methods

The maggots of *E. bombycis* were collected from the cocoon Market, Vijayapura and were allowed to pupate in emergence cages. After emergence, flies were fed with 0.15% concentration of different stain/dye solutions prepared in 10% sucrose solution. A cotton wad soaked in each stain/dye solution was placed in the rearing cages, as diet. Fresh cotton wads soaked in each of these solutions were placed every dye until the death of all the flies. Three replications each with 50 male and female flies were used for each treatment. Twenty five early fifth instar *B. mori* larvae were provided in each cage for oviposition by flies. The colour intensity of the eggs laid by flies fed with different stain/dye containing diet, was recorded daily by vi-

sual observations and the same was graded as low, medium and high intensity groups. Among 14 stain/dyes tested, only Rhodamine-B fed adults laid eggs of high intensity pink colour and therefore, Rhodamine-B was selected for further studies.

Five concentrations viz, 0.100, 0.125, 0.150, 0.175 and 0.200% of Rhodamine-B were prepared in 10 percent sucrose solution and fed to different sets of newly-emerged flies as mentioned above. Fresh cotton wads soaked in the solution of respective concentrations were provided daily. Twenty five early fifth instar *B. mori* larvae were supplied to the flies of each replication of all the concentrations for oviposition. A fresh batch of 25 silkworms was provided on the subsequent days till the death of the latter. A separate set of 25 flies fed only on 10% sucrose solution served as control. Observations were made daily on the mortality of the flies, number of coloured and uncoloured eggs laid and egg hatchability. The data were analysed statistically employing ADOVA(Snedecor, 1961) and only the mean values of the results are presented.

Results and Discussion

The data on the efficacy of Rhodamine-B in marking the eggs of *E. bombycis* and its effect on fly mortality and fecundity and hatchability of marked eggs are discussed hereunder.

1. Egg marking by feeding adults with various stains/dyes

Among 14 stains/dyes tested, Rhodamine-B was found highly effective in imparting high intensity of pink colour to the eggs which could be detected easily. Malachite Green induced green colour while orange-G imparted medium orange colour to the eggs. However, the remaining stains imparted very low intensity of the respective colours to the eggs (Table 1). The eggs of mosquitoes; stable fly, *Stomoxys calcitrans*(L.) and house fly, *Musca domestica* L. have been marked by feeding adults with sugar solution containing 0.01% Rhodamine-B (Reeves *et al.*, 1948; Quarterman *et al.*, 1954a). Similarly, Macleod & Donnelly (1957) stained *M. domestica* eggs with fluorescein & Rhodamine-B. Zaidenov (1960)

Table 1. Intensity of egg colour of *E. bombycis* on feeding various stains and dyes

	Stain/Dye	Egg Colour	Intensity
1	Borax Carmine	pink	Low
2	Cresol Red	Red	Low
3	Eosin	Red	Low
4	Giemsa Stain	Blue	Low
5	Leishman's stain	Blue	Low
6	Malachite green	Green	Medium
7	Methylene blue	Blue	Low
8	Methyl blue	Blue	Low
9	Methyl Orange	Orange	Low
10	Methyl red	Red	Low
11	Orange-G	Orange	Medium
12	Rhodamine-B	Pink	High
13	Rose bengal	Red	Low
14	Safranin	Safron	Low

too marked *M. domestica* eggs with Thioroscin, Fluorescein and Orange-G. The current observations are in confirmation with the earlier ones.

2. Effect of Rhodamine-B on adult mortality, fecundity, egg hatchability and egg colour induction

1) Adult mortality

Flies survived up to eight days when fed on 0.1, 0.125 and 0.15% Rhodamine-B, which was on par with that of control. While those fed with 0.175 and 0.200% had a longevity of six days. The rate of mortality of these flies varied between 5.13 and 24.84% at different concentrations. The average mortality of the flies per day was 12.15% with 0.1, 0.125 and 0.150% Rhodamine-B which did not differ from control. Fly mortality was 16.66% at both 0.175 and 0.200% (Fig. 1). The mortality rate at 0.175 and 0.200% was significantly higher than those at lower concentrations. Thus it is obvious that Rhodamine-B does not have any influence on the adult mortality up to 0.150% concentration. Similar findings have also been reported in respect of *Culex* spp. (Reeves *et al.*, 1948), *Haematobia irritans*(L). *S. calcitrans* and *M. domestica* (Eddy *et al.*, 1962) and *Cochliomyia hominivorax*(Coq.) (Coppedge *et al.*, 1979) when fed with non-fluorescent dyes, including Rhodamine-B.

2) Fecundity

The flies fed on 0.1, 0.150, 0.175 and 0.2% Rho-

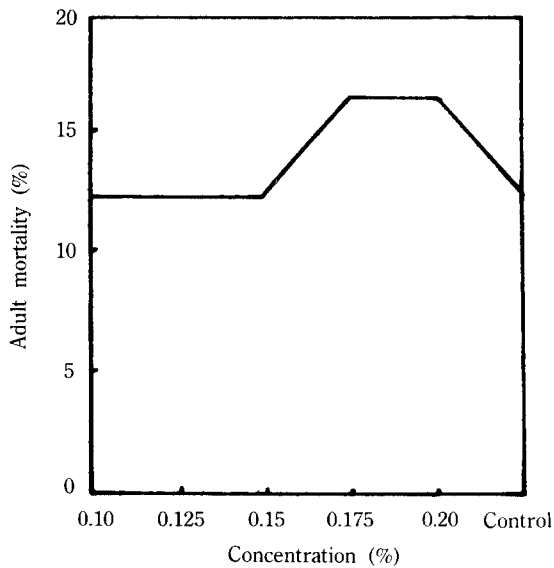


Fig. 1. Effect of different concentrations of Rhodamine-B on the adult mortality of *Exorista bombycis*.

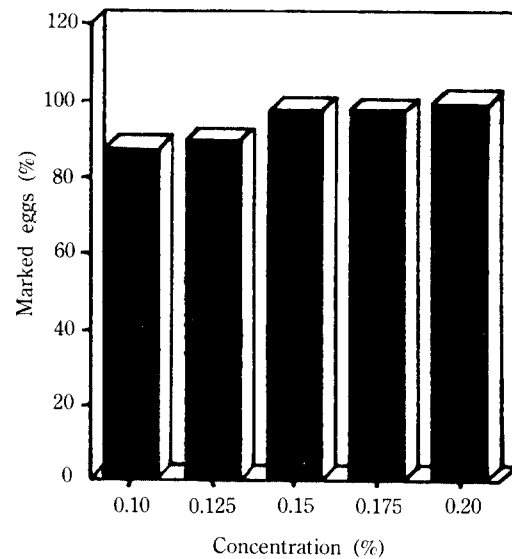


Fig. 3. Percentage of marked eggs deposited by *Exorista bombycis* fed with different concentrations of Rhodamine-B.

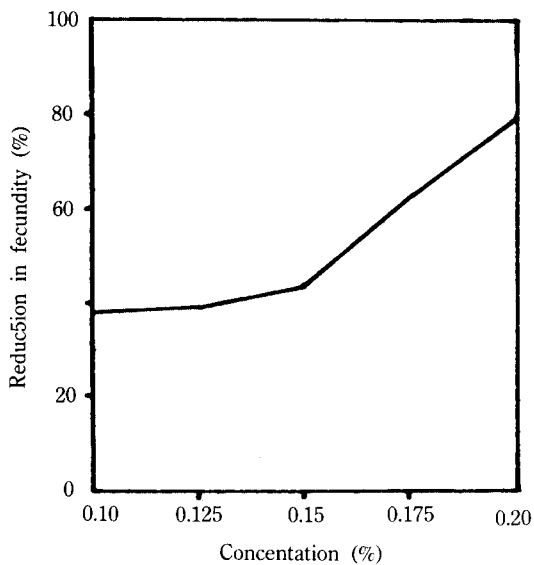


Fig. 2. Reduction in fecundity of *Exorista bombycis* over control.

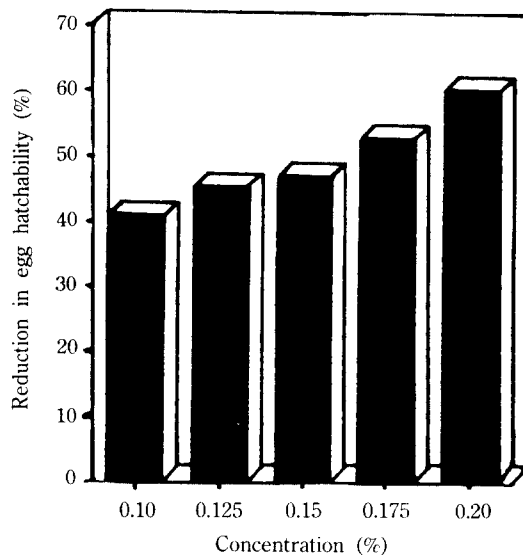


Fig. 4. Reduction in egg hatchability of *Exorista bombycis* over control.

damine-B, laid 434.64, 402.00, 298.68 and 165.60 eggs respectively, compared with 594.88 eggs laid by control flies, thus showing a reduction of 38.49, 39.35, 43.63, 62.76 and 79.35% reduction in fecundity over the control (Fig. 2). Reeves *et al.* (1948)

and Eddy *et al.* (1942) observed no change of fecundity in *Culex* spp., *R. irritans* and *S. calcitrans*, when fed on fluorescent dyes. The present observations are contradictory to the findings of earlier workers

which may probably be ascribed to the lower concentrations of the dyes used by these workers. The variation may also be attributed to the insect species used in these studies.

3) Extent of marked eggs

The flies laid 87.02, 89.42, 97.43, 97.48 and 99.12 percent coloured eggs when fed on 0.100, 0.125, 0.150, 0.175 and 0.200% Rhodamine-B, respectively (Fig. 3). Coppedge *et al.* (1977) found 97 to 100 percent coloured eggs when adults of *C. hominivorax* were fed with fluorescent dyes, which is comparable to the present observations.

4) Egg hatchability

The percentage of hatchability of eggs laid by the flies fed on 0.1, 0.125, 0.150, 0.175 and 0.200% was 40.50, 37.49, 36.37, 32.40 and 26.68 respectively compared to 68.32% in control. This accounts for 40.61, 45.12, 46.95, 53.55 and 60.06% reduction in egg hatchability over the control (Fig. 4). But, earlier reports on these lines are not available for comparison. The current fact that Rhodamine-B reduces the egg hatchability to an extent of 40.61 to 60.06% is an added advantage since that much of parasitization by *E. bombycis* to the major sericigenous insect, *B. mori* is reduced. More so, egg unhatchability does not impede the objective of study as the extent of flight is assessed shearly based on the coloured eggs on body of silkworm.

It is clear that the dye, Rhodamine-B at 0.150% had less influence on adult survival and fecundity and exerted some ill effect on egg hatchability besides imparting high intensity pink colour to the eggs. Hence, 0.150% Rhodamine-B prepared in 10% sucrose solution can be used as egg marker to study the flight range of uzi fly, *E. bombycis*.

摘 要

비행광성 염료인 Rhodamin-B를 누에의 기생파리인 *Exorista bombycis*(Louis)의 성충사료에 첨가하여 산란한 알을 표시한 실험으로써 비행 범위에 대한 조사를 행하였다. 이 방법은 시간이 절약되고 처리가 안전하며 표시된 알을 쉽게 관찰할 수 있으며, 또한 염료가 처리된 사료를 섭취한 파리의 치사율이나 산

란성에는 나쁜 영향을 미치지 않았다. 그러나 이 파리가 산란한 알의 부화율을 저하시키는 경향이 있었다.

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