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Mass rearing technique of *Eublemma scitula* Ramb. (Lepidoptera: Noctuidae) an important predator of Brown scale, *Saissetia coffeae* Walker

S. K. PATHAK* and D. N. YADAV
Department of Entomology, B. A. College of Agriculture
Gujarat Agricultural University
Anand Campus, Anand 388110, Gujarat, India
E-mail: slg_pathak@sancharnet.in

ABSTRACT: **Three different methods were tried to find out suitable laboratory technique for mass rearing of *Eublemma scitula* Ramb. (Lepidoptera: Noctuidae) an important predator of brown scale insect *Saissetia coffeae* Walker (Homoptera: Coccidae) a serious pest of pointed gourd, *Trichosanthes dioica* Roxb in and around Anand, Gujarat. Out of these rearing methods, namely, a) on pointed gourd leaves, b) on green potato sprouts and c) on pumpkin fruits, the method c), which involved either releasing *E. scitula* eggs (c 1) or larvae (c 2) on pumpkin fruit with growing scale population was observed to be the best for mass rearing of the predator with seed to yield ratio of 1: 0.63 and 1: 0.73 in c 1 and c 2, respectively. On an average, 69.4 and 73 pupae could be produced in methods c 1 and c 2, respectively, from a single pumpkin in a single generation of the scale, within two months (October to November). The technique was found to be suitable for mass rearing of *E. scitula* to augment the predator during June-July for suppression of the host *S. coffeae* at its initial stage of infestation. Limitations observed in other methods of rearing were described.**

KEY WORDS: Biocontrol, *Eublemma scitula, Saissetia coffeae, Trichosanthes dioica*

Saissetia coffeae Walker (Homoptera: Coccidae) is a serious pest of pointed gourd, *Trichosanthes dioica* Roxb in Anand area of Gujarat, India. Both nymph and adult of the pest inflict damage by sucking the sap from the leaves, petioles and stem resulting in devitalization of the plant. The pest also excretes honeydew, which encourages the growth of sooty moulds on the leaves and stems, which interferes the photosynthesis process. The scale also attacks a number of other hosts like coffee, tea, loquat, *Cephalandra* (Fletcher, 1914), guava (Saad *et al.*, 1977), brinjal and coccinia (Valand, 1986).

Eublemma scitula Ramb. (Lepidoptera: Noctuidae) was reported as an important predator of *S. coffeae* in this area (Valand, 1986). Its life cycle and effectiveness as predator was studied in details by Pathak and Yadav (2000). They reported that a larva of *E. scitula* could consume as many as 22 mature female scales with an average of 18.5 during the three larval instars. It has a long period of activity and is highly fecund. The predatory larvae

*Present address: Tea Research Association, 15 Cooch Behar Road, Darjeeling 734101, West Bengal, India

are common on pointed gourd stems heavily infested by *S. coffeae*. They prepare protective covers made by scale's body parts during the growing period and move along with the covers while feeding on scales at their peak level of infestation.

Mass rearing of the natural enemies is an important prerequisite for any biological control programme. Considering the important role of *E. scitula* in the field, a study was conducted in the Insectary of Biocontrol Unit, Department of Entomology, Gujarat Agricultural University, Anand Campus, during 1986 to develop an easy and effective mass rearing technique for future use of the predator in biocontrol of *S. coffeae*. For this purpose, the following three methods were tried.

Method A – Rearing on pointed gourd leaf

In this method fresh, green pointed gourd leaves were collected from the kitchen garden and were placed individually inside a plastic bowl (10 x 5cm). The bottom of the bowl was provided with a wet U-foam sheet. The petiole of the leaf was wrapped with cotton wool and moistened to keep the leaf turgid. Mature female scales collected from the infested pointed gourd stem were placed on the leaf and allowed to settle. The females laid eggs within 2 to 3 days. The crawlers on hatching started settling down on the leaf.

A total of 10 sets were studied. When the leaves of pointed gourd when dried up, fresh leaves were provided. This procedure was followed until the scales became mature. A newly hatched larva of *E. scitula* was released on the leaf when sufficient number of matured scales became available. When all the scales on the leaf were consumed by the developing larva of the predator, it was transferred to fresh food material in another bowl and the procedure was continued until the larva completed its development and pupae were formed. Observations were recorded on pupation and adult emergence.

Method B – Rearing on potato sprouts

In the second method green potato sprouts were used for mass multiplication of the scale. Blumberg and Swirski (1977) found that the green potato sprouts were the most suitable host for mass rearing of *S. coffeae*. For this purpose, sprouted potato tubers were obtained from the market and planted individually in a plastic bowl (10x5cm). Watering was done as and when necessary. When the sprouts attained a height of about two inches, they were artificially infested with laboratory reared scale crawlers with the help of a fine hairbrush. The crawlers settled on the sprouts within a day or two, continued to develop, and reached maturity within 25 to 30 days. At this stage, known numbers of newly hatched larvae of *E. scitula* were released on them.

When all the scales on a particular sprout were consumed by the developing larvae of the predator or the sprout became wilted as a result of excessive feeding of the scales, the predator larvae were transferred to the fresh food material on another potato sprout. This procedure was continued until the larvae completed their development and observations were recorded on success rate based on pupation, adult emergence and seed to yield ratio. To meet the requirement of mature scales for the predator, the potato sprouts were grown in batches at an interval of twenty days.

Method C – Rearing on pumpkin fruit

In the third method *E. scitula* was reared on pumpkin fruit infested with scales. Saad *et al.* (1977) reported pumpkin fruit as an alternative host of *S. coffeae*. For this purpose, fresh, medium sized, mature pumpkin fruits- *Cucurbita moschata* Poir were obtained from the market and thoroughly washed. Each pumpkin was placed vertically on a plastic bowl measuring 11x10x8cm to keep the fruit in up right position. The fruit with the bowl was then placed inside a round galvanized iron sheet cage measuring 35 cm in diameter and 10 cm in height. Water was poured inside the galvanized cage up to the height of 5 cm to prevent the entry of

ants, which were attracted by the honeydew secreted by the scales and also to increase the humidity required for the scale growth. Mature females of *S. coffeae* were collected from nearby infested pointed gourd orchards in a Petri-dish. These scales were placed carefully on the pumpkin and allowed to develop. The crawlers, after emerging from the eggs laid by these females, settled down on the pumpkin and remained stationary until they complete the development.

For rearing the predator on pumpkin, two different methods were followed. In the first method (C1), moths of *E. scitula* were allowed to lay eggs on cloth cover by holding them in one litre capacity glass jar and the cloth containing known number of eggs was placed on the scale infested pumpkin. This procedure was followed periodically and the numbers of *E. scitula* pupae ultimately obtained were recorded. In second method (C2), known number of newly hatched *E. scitula* larvae were released on the pumpkin fruit with the help of a fine camel hairbrush. The predator larvae fed on scales, became mature and pupated on the pumpkin fruit itself. The pupae thus formed were collected by gentle lifting and observations were recorded on success rate.

The result obtained is presented in Table 1. Out of the three methods tried, method A – rearing on pointed gourd leaf was found totally unsuccessful, as sufficient number of scales could not be reared on the pointed gourd leaves to support the breeding of the predator. Hence, not a single larva of *E. scitula* could be reared up to even pupal stage. Most of them died in second or third instar.

Method B – rearing on potato sprouts, was successful with seed to adult ratio of 1: 0.87. But this method also had some limitations. The sprouting of potato is season bound and remains for a limited period. The method was laborious and time consuming as a large number of potato sprouts had to be raised in batches to rear sufficient number of scales to support the rearing of adequate number of *E. scitula* larvae. In the study, only 5.2 pupae could be produced per set. If this method is followed, there is a chance of discontinuation of *E. scitula* population due to lack of prey during off-season when potatoes are not available. Hence, the method was found unsuitable for commercial rearing of *E. scitula*.

In method C – rearing on pumpkin fruit, both the procedure by releasing eggs (C 1) and releasing larvae (C 2) were found successful with seed to yield ratio of 1: 0.63 and 1: 0.73. Although, method C 2 gave better recovery than method C1, it was found to be more laborious and time consuming as the tiny larvae (1 mm in length) were to be handled with great care while placing them on the pumpkin

Table 1. Mass rearing of *E. scitula* in the laboratory

Methods	No. of *E. scitula* eggs/larvae	No. of of pupae released/set	Av. no. of pupae set	Per cent emergence			Seed to Sets yield ratio
				Male	Female	Total	
A – On pointed gourd leaf	10	1	0.0	0.00	0.00	0.00	0:00
B – On potato sprouts	10	6	5.2	50.00	46.15	96.15	1: 0.87
C – On pumpkin fruit							
i. Releasing eggs	5	110	69.4	48.99	46.11	95.10	1: 0.63
ii. Releasing larvae	5	100	73.0	47.94	45.21	93.15	1: 0.73

fruit infested by scale. On the other hand, releasing eggs, laid in large numbers (more than 100 by a single female) on single muslin cloth, was much easier. In this method, mass production of *E. scitula* was possible and on average 69.4 and 73 pupae could be produced per set by methods C1 and C2, respectively, from a single pumpkin in a single generation of the scale within two months (October to November). Results also showed that there was no adverse effect on the emergence as well as sex ratio of the adults (Table 1). The only problem encountered in this method of rearing was of excessive honeydew secreted by the scales on the pumpkin fruits, which hampered the movement of the predatory larvae. This however, could be minimised to some extent by placing the pumpkin fruits outside the laboratory before releasing *E. scitula* to attract the black ants, which feed on the honeydew and thereby make the scale culture free of honeydew within 2 or 3 days, without any damage to the scale.

Thus the method of rearing *E. scitula* on scale infested pumpkin fruit was found satisfactory and can be suggested for economic mass rearing of *E. scitula* in laboratory. By this method, the predator could easily be reared successfully throughout the year. It is concluded that *E. scitula* being highly fecund, having longer period of activity, good feeding potential (Pathak and Yadav, 2000) and easy to multiply in the laboratory, warrants its augmentation in the field during early stage of the scale infestation (i.e. June–July) so as to prevent the build up of scale population. The technique described can be utilized for mass multiplication and inundative release of the predator.

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REFERENCES

Blumberg, D. and Swirski, E. 1977. Mass breeding of two species of *Saissetia* (Homoptera: Coccidae) for propagation of their parasite. *Entomophaga*, **22**: 147 – 150.

Fletcher, T. B. 1914. Some South Indian Insects. pp. 199, 381. M/S. Bishen Singh and Mahendra Pal Singh, Dehra Dun, India.

Pathak, S. K. and Yadav, D. N. 2000. Biology of *Eublemma scitula* Ramb. (Lepidoptera: Noctuidae) a predator of brown scale, *Saissetia coffeae* Walk. (Homoptera: Coccidae) infesting pointed gourd, *Trichosanthes dioica* Roxb. *Journal of Entomological Research*, **24**: 167-175.

Saad, A. H., El-Minishawy, A. M. and Hammad, S. H. 1977. Studies on bionomy of *Scutellista cyanea* Motsch. (Hymenoptera: Pteromalidae). *Zeitschrift fur Angewandle Entomologyt*, **83**: 155-161.

Valand, V. M. 1986. Biology and control measures of brown scale, *Saissetia coffeae* Walker (Homoptera: Coccidae) on pointed gourd (*Trichosanthes dioica* Roxb.). Ph. D. thesis. Gujarat Agricultural University, Anand, Gujarat.