

## Commercial Mass Rearing and Utilization of Predators in the Management of Vegetable Pests

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### Introduction

The major obstacle in the promotion and development of biological pest control programme is the difficulties associated with the mass breeding of such biological control organisms (van Drieche and Bellows, 1996). In addition to the need to supply the right quantity, there are problems of storage, transport and distribution. In Malaysia, mass rearing of parasitoids has been successfully ventured commercially in cocoa and sugarcane but not so with predators (Lim, 1990). Intensive research at UPM has led to the selection of a candidate predator, *Menochilus sexmaculatus* Fab. for biological control of vegetable pests. However, research on mass breeding, production and field release, are still lacking (Hussein, 1997). This research projects attempted to develop integrated system of mass breeding of the predator and to put biological pest control of vegetable pests in to practical case .

### Materials and Methods

Small scale laboratory culture system of the major predator (*M. sexmaculatus*) of chilli aphid, *Aphis gossypii*, was extended to larger mass rearing in bigger insectary with the possibility of developing artificial food rather than relying on the natural prey aphid. Utilization of the predator in controlled environment and open environment were commenced. It was envisaged to set up factorial combinations of pest-predator-polycrops experimental setting to evaluate efficacy and efficiency of predation in a chemical free agroecosystem. The quantitative role of each crops of a dominant pool and reservoirs of pest and predator were defined. Data from spatial temporal identities above was blended into generic models with the pest species as dependent variable in relation to crop yield.

### Results and Discussion

Small scale laboratory cultures over 30-day period beginning with a pair of adult predators have generated interesting and promising results. Based on the life table data generated from earlier experiments in this project vis-à-vis a net reproductive rate (R) of 187, developmental time of 12 days, intrinsic rate of increase of 0.45 and doubling time of 1.54 days, 5,000 adults predator were produced using the diet of live prey (aphids). The female predator could reach a maximum fecundity of 25 eggs/day on day 15. Two methods of mass rearing the predators i.e. individual method and colony method were tested over a 30-day period. Relevant parameters such as material costs, labour costs, yield of adult predators and cost/adult were measured and used to compare and determine which method would be more suitable for commercial mass rearing and utilization of coccinellid predators in the management of vegetable pests especially chilli. The results showed that the colony method is superior than individual method of mass rearing *M. sexmaculatus*. The colony method was able to generate more than twice (5100 adults) the number of adult predators than the individual method (2300 adults). In term of material and labour in rearing the predators, the colony method was 50% less costly and requires 20% less labour. Based the rough estimates and preliminary biological data, it will cost only 11 cents per adult to rear the predator using the colony method.

### Conclusions

Mass rearing of *M. sexmaculatus* on live prey of aphid is possible under certain laboratory conditions. The commercial viability of the colony method of mass rearing still needs further testing and refinement. Individual method of rearing the predators is more costly, more labour intensive and produce lower yield.

### Benefits from the study

The use of natural enemy such as *M. sexmaculatus* in controlling vegetable pests is not only environment-friendly but also provide an alternative to hazardous and toxic chemical insecticide. Biological method of pest control using

coccinellids produced through mass rearing technique is effective under small and large commercial farms or plantations.

**Patent(s), if applicable**

Bio-product (beneficial insect) specially reared on certain species of aphid prey and specially formulated artificial diet. Process of mass rearing with guaranteed quality control procedures raw materials.

**Stage of Commercialization, if applicable**

Seeking private companies or venture capitalist to conduct up scaling and commercial viability testing.

**Project Publications in Refereed Journals**

1. Maisin, N., Hassan, S.T.S., Hussein, M.Y. and Sajap, A.S. 1997. Mating behavior of *Menochilus sexmaculatus* Fab. (Coleoptera: Coccinellidae). Malaysian Applied Biology 26: 57-61
2. Wagiman, F.X., Hussein, M.Y., Muhammad, R., Sajap, A.S. and Ismail, A. 1998. Distribution pattern of *Aphis gossypii* and its coccinellid predator, *Menochilus sexmaculatus* in the chilli ecosystem. Indonesian Journal of Plant Protection 4: 32-37.
3. Maisin, N., Hassan, S.T.S., Hussein, M.Y. and Sajap, A.S. 1998. Contrasting characteristics of egg laid by females from a single cohort of *Menochilus sexmaculatus* Fab. (Coleoptera: Coccinellidae). Malaysian Applied Biology 27: 113-117.

**Project Publications in Conference Proceedings**

- 1 Hussein, M.Y., Sari, M.G. and Khor, S.E. 1999. Advances on the development artificial diets of *Menochilus sexmaculatus* Fab. Proceeding of the 5<sup>th</sup> International Conference of Plant Protection in the Tropic, Kuala Lumpur. p
- 2 Sari, M.G. and Hussein, M.Y. 2001. Vitamin as dietary requirement for larval development of *Menochilus sexmaculatus* Fab. (Coleoptera: Coccinellidae). In: Proceedings of the 4<sup>th</sup> Asia Pacific Conference of Entomology, Kuala Lumpur. p 155.

**Graduate Research**

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
F.X. Wagiman Adisubroto	Performance of <i>M. sexmaculatus</i> as aphid predator	Biological Control	PhD	1998
Navis Maisin	Mating behavior and reproduction of <i>M. sexmaculatus</i>	Biological Control	M AgricSc	1999
Makhrani Sari Ginting	Developing artificial diet for mass production of <i>M. sexmaculatus</i> in the laboratory	Biological Control	M AgricSc	2002

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