A SIMPLE AND EFFICIENT METHOD OF REARING APHIDOPHAGOUS HOVERFLIES (DIPTERA: SYRPHIDAE)

B. D. FRAZER[1]

ABSTRACT

Syrphid larvae and their aphid prey are reared together with minimal maintenance on caged broad bean plants. An essential feature of the cage for adults is a feeding platform raised well off the floor for the diet of cube sugar, water and freeze-dried pollen. Since mating occurs in flight, the cage must be higher than wide or deep.

INTRODUCTION

During investigations on the biotic mortality agents of aphids, the predators most often present in southwest British Columbia were syrphid larvae. Before their importance to aphid control could be assessed it was necessary to rear the various species in numbers for laboratory studies.

Few species of aphidophagous syrphids have been reared successfully because of their dietary and behavioral requirements: the adults need carbohydrate and protein to mature their eggs and the larvae need living aphids. The food of the adult is usually pollen and nectar. Sugar or honey water are substitutes for nectar, but in practice the adults often stick to gauze or paper wetted with sugary solutions. The collection of enough aphids to feed larvae is time consuming and not efficient if the feeding is done without plants, because many aphids die before they are eaten.

The rearing system discussed here solves these problems and has been very successful with the species studied.

METHODS AND MATERIALS

Unopened catkins of hazelnut trees *Corylus* sp. were collected in April, placed over radiators on sheets of paper and allowed to open. The dried catkins were screened and the pollen collected, freeze-dried and vacuum-packed in glass ampoules sealed with heat.

Gravid females, caught in the field, were brought into the rearing room, and allowed to oviposit on leaves or plants infested with aphids. The rearing room was maintained at 20+0.5C, 70-80% RH and light was provided 16 hr per day. When the eggs hatched, the larvae were allowed to feed for 1 or 2 days before being transferred with a moist #00 sable hair brush, to newly-sprouted broad bean plants, *Vicia faba* L. var. Exhibition Long Pod, growing in UC mix C, Fertilizer I (Matkin and Chandler, 1957) in 15 cm round, plastic pots. One larva was transferred to each plant in each pot. Nine pots were set in a cage for rearing the larvae and the plants were heavily infested with the pea aphid, *Acyrthosiphon pisum* (Harris). Within 10 to 14 days when the larvae had matured and pupated in the soil, the plants were cut down, and the soil was allowed to dry out. After a further 21 to 28 days the adults emerged, and were transferred to another cage (Fig. 1) and fed cube sugar, water and hazelnut pollen (Fig. 2). In 4 or 5 days, broad bean plants 10 to 15 cm high and infested with the black bean aphid, *Aphis fabae* Scopoli, were placed in the cage with the adults and left for 3 or 4 hr. The eggs produced were then handled as described for eggs from field-caught flies.

The cages for the adults are 45 cm wide, 60 cm long and 75 cm high and have a 20 x 20 cm platform 35 cm from the floor. The two side walls are of saran screening, the back and top of Kodapak clear sheets, and the front of wood with a 15 x 15 cm hole covered by a sliding door.

The cover of the cages for the larvae rests on a 15 cm high stand. The dimensions are 50 cm wide, 60 cm long and 30 cm high. The sides are covered with saran screening and the top with Kodapak. The top of the stand has 9 holes in it so that when the pots are in place, they are suspended in the holes by their rims over watering trays.

DISCUSSION

Black bean aphids are ideal for stimulating oviposition because they are small, sedentary, and not easily dislodged from the plant. If pea aphids are used for this purpose many are knocked or fall from the plants and wander about the cage causing the syrphids to oviposit on the cage. However, pea aphids are well suited as prey for the larvae because they are large, have a rapid rate of population increase, and are not toxic to the plants or to the syrphid larvae. Their mobility allows them to use all available areas of the plant.

[1] Research Station, Canada Dept. of Agriculture, 6660 N.W. Marine Drive, Vancouver 8, B.C.

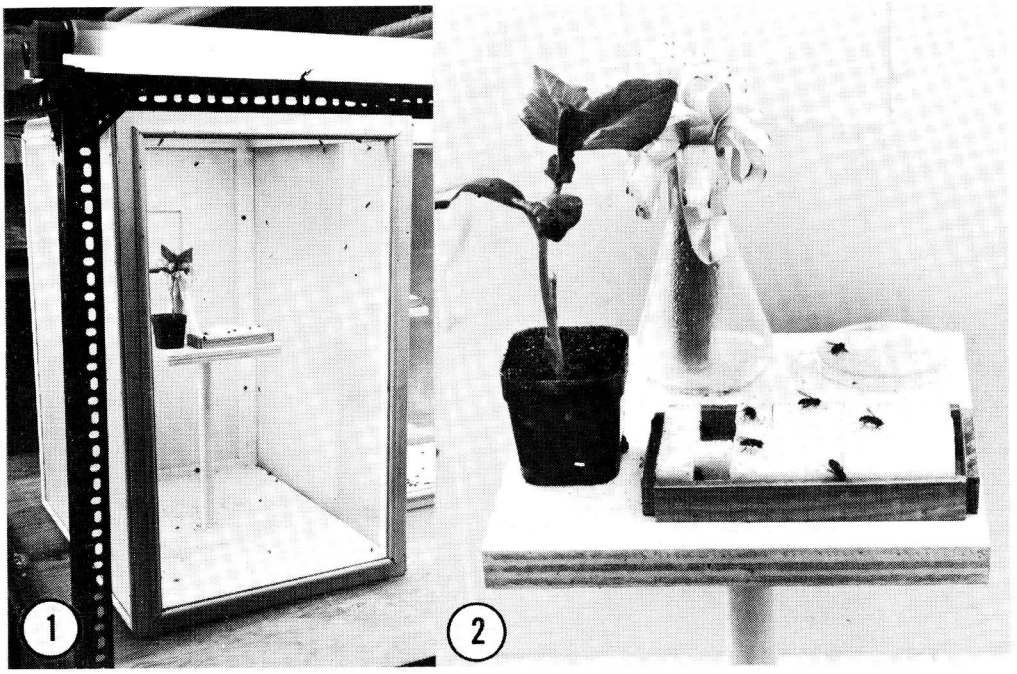

Fig. 1. Cage for rearing adult aphidophagous syrphids.
Fig. 2. Elevated feeding platform in the cage.

Female flies can produce eggs more or less continuously but it is best not to allow them to do so. If eggs are laid over an extended period or are very numerous, the larvae will eat the unhatched eggs and smaller larvae. Provision of an infested plant for 8 hr twice a week results in large numbers of eggs of the same age. Newly hatched, uniform larvae are left on the plants to feed because they are easier to transfer when they have grown.

The combined rearing of the larvae and aphids eliminates the need for mass rearing of the prey species, which is usually the limiting factor in rearing predators. Set up correctly, the 9-pot cages are well balanced predator-prey ecosystems and no further addition of aphids is needed. Emerging adults reach the surface of dry U.C. mix quicker than if soil is used. Cutting the plants makes their capture easy.

The large size and shape of the adult cage (Fig. 1) and presence of the platform (Fig. 2) are essential features, for most syrphids mate in flight and seldom visit the floor of a cage. In small cages without platforms, the adults flew only if frightened and seldom fed.

The adult diet of dry sugar cubes, tap water and freeze-dried vacuum-packed pollen produced the best results and was the simplest of the diets tested. Yeast, soya bean flour, and yeast hydrolysate mixtures became caked on the flies' feet and abdomens, and condensed milk and molasses mixtures on bread, saran paper or cheese cloth trapped the flies. Honey and sugar solutions were accepted by the flies but they were messy and required frequent attention and renewal. With the method described routine maintenance involves only the refilling of the water flask every second day, bi-monthly replacements of the sugar cubes and bi-weekly additions of pollen.

Species successfully reared by this method were: *Syrphus torvus* O.S., *S. ribesii* (L), *S. opinator* O.S., *Metasyrphus* spp., and *Scaeva pyrastri* (L).

Acknowledgements

I am grateful to Dr. J. R. Vockeroth, Entomology Research Institute, Canada Department of Agriculture, Ottawa for identifying the syrphid species.

References

Matkin, O. A. and P. A. Chandler. 1957. The U.C. system for producing healthy container-grown plants, K. F. Baker (ed.) California Agr. Expt. Sta. Manual 23, p. 73.