FEEDING POTENTIAL OF PREDATORS OF *MYZUS PERSICAE*[1]/

GEORGE TAMAKI AND DARRYLL OLSEN
Yakima Agricultural Research Laboratory,
Agric. Res. Serv., USDA, Yakima, WA 98902

ABSTRACT

A rate of feeding for predator insects on th green peach aphid, *Myzus persicae* (Sulzer), was determined based on the number of aphids consumed from a more natural environment corrected for reproduction and natural death. Of the predator species studied, the largest, *Coccinella transversoguttata* Falderman, consumed about 10 times more aphids than the smallest, *Orius tristicolor* (White), and about 7 times more than the average for all other predator species combined.

INTRODUCTION

Pest management specialists working in the Yakima Valley of central Washington have needed a method of relating the abundance of certain predator insects to their potential effect on populations of the green peach aphid (GPA), *Myzus persicae* (Sulzer). A predictive model was therefore developed whereby the numerical census of a predator species is converted to factors that reflect the reductive impact of the predator complex against the GPA (Tamaki et al. 1974). Thus, one component of this model separates the predator complex into discrete groups, each with gross similarities in feeding capacity. Then each group is assigned a numerical factor related to its rate of consumption of aphids. The feasibility of the model was demonstrated by using factors drawn from date provided by Goodarzy and Davis (1958) and Simpson and Burkhardt (1960), concerning the predators of the spotted alfalfa aphid, *Therioaphis maculata* (Buckton), for demonstrating the feasibility of the model, but we now needed factors applicable to the predators of the GPA found in the Yakima Valley. However, workers studying aphidophagous predators in the past have usually introduced known number of prey into cage with a predator and then counted the number dead, partially eaten, or missing. Such a procedure cannot provide an accurate estimate of the impact of predators on a viable population of aphids. We therefore altered the procedure by providing a host plant for the aphids when we exposed them to predators so as to incorporate the effects of reproduction of the aphids and natural mortality on the prey searching of the predators. We also examined the apparent role and abundance of predator species in the field.

MATERIALS AND METHODS

In 1973, single adult predators were placed on a bouquet of sugarbeet leaves in 1-pint ice cream carton cages located at random on a laboratory bench under daylight-fluorescent lighting, which provided a 16 h photophase. Then 100 GPA from the laboratory colony (3rd and 4th instars and adults) were placed in each cage. The cages were examined each morning for 3 days (days 2, 3, and 4) after the predators were introduced and the number of aphids was counted. Also, on days 2 and 3, sufficient aphids were added to bring the total in each cage to 100. The smaller species of predators were found to consume only ca. 10 of the aphids/day; the larger species consumed ca. 50. The resulting differences between cages in the age distribution and reproduction of the aphids then produced inconsistent numbers of prey consumed. Therefore, in 1974, we used sugarbeet leaf bouquets and ice cream carton cages as before but reduced the number of aphids available to the smaller predators to 20/day. In this way all species of predators actually consumed about 50% of the prey available. Also, in 1973 and 1974, we noted that reproduction and natural mortality of the aphids began to be affected by the deterioration of the bouquets by the 4th day of the test. Therefore, in 1975, the aphids were placed on small sugarbeet plants in large plastic cages (Fig. 1). Otherwise (numbers of aphids per cage per day), the procedure was like that in 1974.

The insect predators used in the test were collected in the field from sugarbeet, clover, or alfalfa. Three species (determined by availability) were tested each week through the growing season.

Temperatures during the test period averaged 24°C (range of 19-33°C); the RH averaged 46% (range 44-48%). Rate of predation was determined as the average of the difference between the number of aphids available at the beginning of each day minus the number remaining after each day for 4 days. Each treatment was replicated 10 times on each of the 4 days.

RESULTS AND DISCUSSION

Although the difference in the test procedures in 1974 and 1975 resulted in differences

[1]/ Hemiptera: Aphididae.

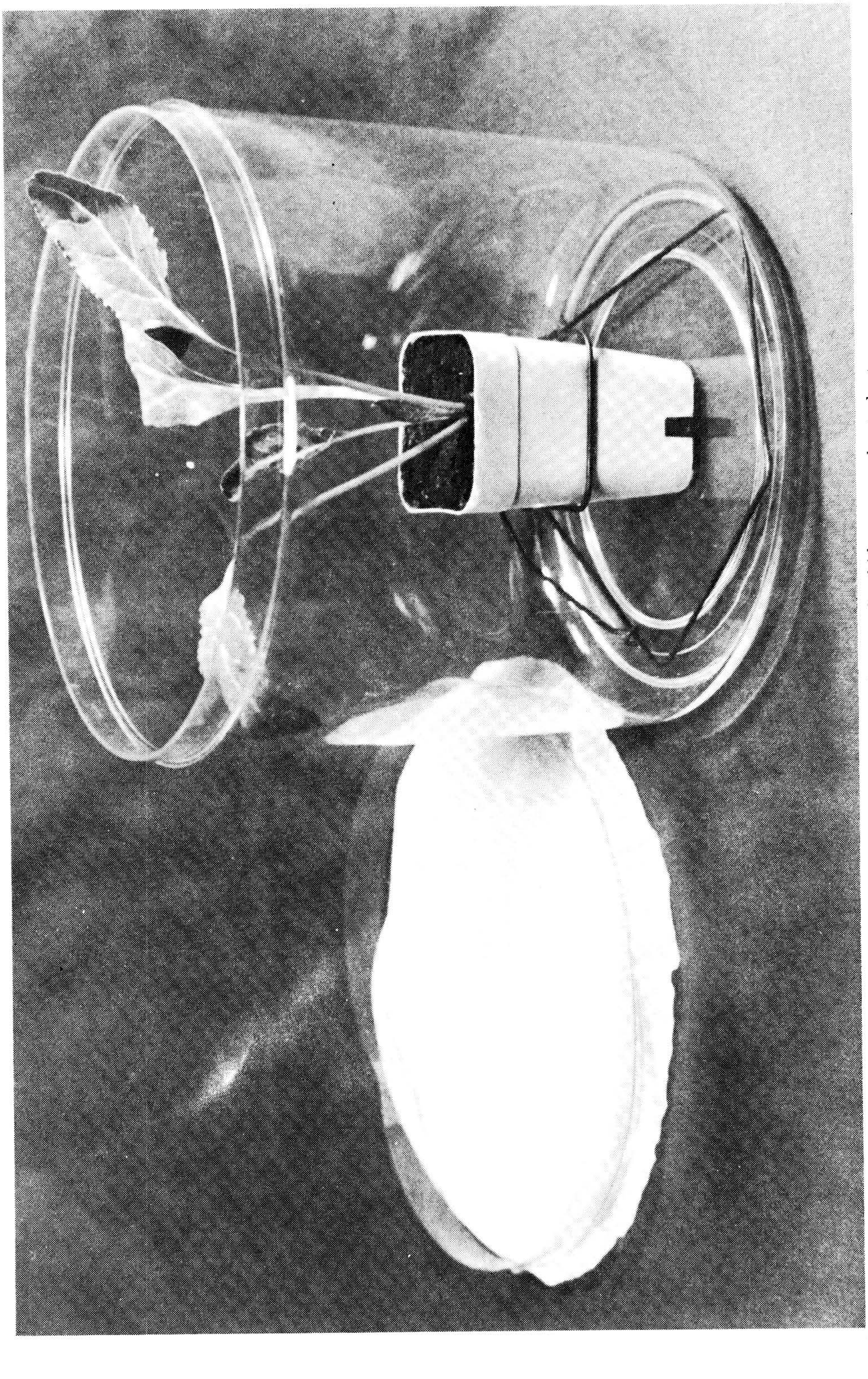

Fig. 1. Cage used to isolate predator and aphids on sugarbeet plant.

in aphid reproduction and natural death, the feeding rate for a given species of predator was similar both years; therefore, these data were combined in Table 1. Also, the data for the 2 *Bembidion* spp. were combined because only small numbers were tested and the feeding rates were very similar. Plainly, the size of the predator was of major importance. Thus, the daily consumption of GPA by *Coccinella transversoguttata*, the largest of the predators studied, was 10 times that of the smallest predator, *Orius tristicolor*, 5 times that of the combined average of all the other predator species listed in Table 1.

In the field, *C. transversoguttata*, one of the large coccinellid species, was more common than *Hippodamia convergens* Guérin-Méneville. *Nabis alternatus* was more common sugarbeets, alfalfa, and clover than *N. americoferus* Carayon though the latter was found frequently in these crops. *Geocoris bullatus*, which is larger than *G. pallens*, consumed ca. 2 more aphids/day. However, *G. pallens* was the most abundant in sugarbeets and potatoes; *G. bullatus* generally inhabits more permanent grass covers such as floors of orchards and also many perennial forage crops (Tamaki 1972). Little is known of *Scymnus marginicollis* except that we have frequently observed the larvae and adults of this small coccinellid feeding on GPA on sugarbeets.

Table 1. Average rate of predation of green peach aphid by selected adult predators.

Species	No. of predators	Mean (± se) predation/day per predator
Coccinella transveroguttata Falderman	70	52.70 ± 3.43
Nabis alternatus Parshley	100	10.37 ± .62
Anthocoris melanocerus Reuter	50	8.46 ± .74
Geocoris bullatus (Say)	80	8.30 ± .57
Scymnus marginicollis Mann	90	7.99 ± .43
Bembidion spp.	40	6.66 ± .67
Geocoris pallens Stal	80	6.47 ± .52
Orius tristicolor (White)	90	5.31 ± .43

The two small carabids, *Bembidion obscurellum* Mots. and *B. rupicola* Kby., were abundant in some fields of sugarbeets and potatoes. In the laboratory, these species will feed on larval scab gnat, *Pnyxia scabiei* (Hopkins), and GPA. Mitchell (1963) reported that the crop contents of *Bembidion lampros* (Herbst) consisted of parts of collembolans, small mites, and earthworm material and that in the laboratory, the adults and larvae would feed on most types of invertebrate animal prey found in soil samples.

Anthocoris melanocerus Reuter and *Orius tristicolor* are in the same family, Anthocoridae, but *A. melanocerus* is ca. 4-5 times larger than *O. tristicolor* and consumed nearly twice as many GPA. *A. melanocerus* is primarily known as a predator of psyllids on deciduous fruit trees (Madsen 1961 and Watson and Wilde 1963); however, it has also been reported feeding on aphids on many vegetable and forage crops (Tamaki and Weeks 1968). *Orius tristicolor* was rarely observed to feed on aphids in the field; in fact, it was seen to run between aphids in attempts to capture a thrip. Smith and Hagen (1956) also reported that *O. tristicolor* preferentially fed upon mites and thrips, rarely aphids. In the laboratory, however, *O. tristicolor* will feed on aphids if no other prey is available.

Although the feeding rates of the predators that we report are based on laboratory studies, most of these predators (except *O. tristicolor* and *Bembidion* spp.) would probably feed at the same rates in the field if aphids were abundant. However, when aphid numbers are minimum, searching time and prey preference would probably lower the rates.

Predators of *Myzus persicae*
Anthocoris melanocerus
Bembidion spp.
biological control
Coccinella transversoguttata
Geocoris bullatus
Geocoris pallens
insect predators
Myzus persicae - green peach aphid
Nabis alternatus
Orius tristicolor
Scymnus marginicollis

References

Goodarzy, K., and D. W. Davis. 1958. Natural enemies of the spotted alfalfa aphid in Utah. J. Econ. Entomol. 51: 612-6.

Madsen, H. F. 1961. Notes on **Anthocorus melanocerus** Reuter (Hemiptera: Anthocoridae) as a predator of the pear psylla in British Columbia. Can. Entomol. 93: 660-2.

Mitchell, B. 1963. Ecology of the two carabic beetles, **Bembedion lampros** (Herbst) and **Trechus quadristriatus** (Shrank). I. Life cycles and feeding behavior. J. Anim. Ecol. 32: 289-99.

Simpson, R. G., and C. C. Burkhardt. 1960. Biology and evaluation of certain predators of **Therioaphis maculata** (Buckton). J. Econ. Entomol. 53: 89-94.

Smith, R. F., and K. S. Hagen. 1956. Enemies of spotted alfalfa aphid. Calif. Agric. 10: 8-10.

Tamaki, G. 1972. The biology of **Geocoris buttalus** inhabiting orchard floors and its impact on **Myzus persicae** on peaches. Environ. Entomol. 1: 559-65.

Tamaki, G., J. U. McGuire, and J. E. Turner. 1974. Predator power and efficacy: A model to evaluate their impact. Environ. Entomol. 3: 625-30.

Tamaki, G., and R. E. Weeks. 1968. **Anthocoris melanocerus** as a predator of the green peach aphid on sugarbeets and broccoli. Ann. Entomol. Soc. Am. 61: 579-84.

Watson, T. K., and W. H. A. Wilde. 1963. Laboratory and field observations of two predators of pear psylla in British Columbia. Can. Entomol. 95:435-8.

THE SYSTEMATIC POSITION OF THE APPLE-AND-THORN SKELETONIZER:

This moth, also known as squeletteuse du pomier et du cenellier (Benoit 1975), has been referred to in North America as *Anthophila pariana* (Cl.) since the 1930's and usually as *Hemerophila pariana* (Cl.) before then. To check its identity in Western Canada the genitalia and the external morphology of specimens from the Vancouver, B.C., area were compared with data in European studies on the taxonomy and systematics. It was confirmed that the species found in the Vancouver district, where it was usually abundant in 1976, is a single species rather than a complex and is the same species found in Europe and the USSR; but that, in line with the conclusions of Danilevsky (1963) and Danilevsky and Kuznetzov (1973), it is of the genus *Hemerophila* Hübn. rather than of *Anthophila* Haw. The correct name of the species found in the Vancouver district, and presumably elsewhere in North America, is therefore *Hemerophila pariana* (Cl.). - *M. Doganlar*, Pestology Centre, Simon Fraser University, Burnaby, B.C.

References

Benoit, P. 1974. Noms Francais d'Insectes au Canada. Agric. Que. publ. QA38-R4-30.

Danilevsky, A. S. 1963. [new species of Glyphipterygidae (Lepidoptera) in the USSR] Ent. Rev. 48: 585-593.

Danilevsky, A. S., and V. I. Kuznetzov. 1973. [A review of the Glyphipterygid moths of the genus **Hemerophila** Hb. (Lepidoptera, Glyphipterygidae) of the fauna of the USSR]. Tr. Vsesoyuz. Entomol. Obshch. 56: 8-17.