

VORACITY AND BIOMASS CONSUMPTION OF *MENOCHILUS SEXMACULATUS* FAB. ON APHID SPECIES

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ABSTRACT: The experiments were conducted in laboratory conditions at the Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University, Tandojam. The results revealed that the above predator reared on aphid species, *Lipaphis erysimi* and *Myzus persicae* to determine the voracity and biomass consumption of larval (grub) as well as adult stages of *Menochilus sexmaculatus*. It has four larval instars and the third and fourth instars have the ability to consume a great number of *M. persicae* than the first and second instars as compare to *L. erysimi*. Among adults the females can consume a maximum number of aphid, *M. persicae*, as compared to males. The adult male and female feeding rate were higher in middle age (11-20 days) than the early or old age. It was observed that has the maximum weight gain in all larval (grub) instars and adults on *M. persicae* as compare to *L. erysimi*. The analysis of data indicated that the voracity rate and biomass consumption and daily weight gain of all larval (grubs) instars and adults were significantly different from each other ($P < 0.01$).

KEYWORDS: voracity, biomass consumption, weight gain, *L. erysimi*, *M. persicae*, *M. sexmaculatus*.

INTRODUCTION

Biological control approach is the main part of Integrated pest management program that comprises the natural enemies (predators, parasitoids, and pathogen) of arthropod pests. Many coccinellid predators play a vital role as a biological control agent against a variety of phytophagous pests, i.e. whitefly, mealy bugs, aphids, thrip, mites and scale insects [1, 2, and 3]. Among these lady beetles, *Mecochilus sexmaculatus* (Fabricius) found active on aphids. This beetle has commonly disseminated aphid feeder species in Pakistan, Jawa, India, Borneo, U.K. Indonesia, Philippines, Sumatra, France, and South Africa [4]. Mostly, aphids were found as vector insect pests in the tropical and temperate regions of the world [5]. The zigzag beetle, *C. sexmaculata* (Fabricius), is key predator of arthropod pests in Asia [6]. Numerous aphid species are labeled as noxious pests of vegetable as well as field crops, i.e. wheat aphid, safflower aphid, mustard aphid, and Berseem aphids etc. These species are wingless and reproduce parthenogenetically. The population of aphid species might be enhanced quickly under favorable natural conditions. Although, aphid populations could not increase well as these soft-bodied insects become prey by coccinellid predatory beetles [7]. So, keeping the above facts, this study planned to determine the voracious feeding efficiency and check the arthropod pest population not exceeding the economic threshold limit.

MATERIALS AND METHODS:

Larval (grub) instars: Newly emerged larvae (grub) transferred into Petri dishes (9 cm. dia.) with the help of camel hair brush. For feeding efficiency, a single larva was provided with a known number of aphids along with the leaves of the respective crop on which the aphids were collected and replicated five times. This was repeated in 1st, 2nd, 3rd, and 4th instars larvae. The biomass consumption of

each larval instars of each predator was recorded at 24 hrs daily till larvae transformed into the next development stage. Given a number of aphids were weight and weight of predators before and after prey consumption recorded. After consumption, the larvae also weight to check the daily weighty gained.

Adults: From pupal culture newly emerged adults male and female of *M. sexmaculatus* were obtained and both adults were weight separately before consumption. The adults were kept separate in Petri dishes and known number of aphids was also weight before providing to each adult beetle. The biomass consumption of aphids was observed after 24 hrs daily by weight of alive aphids. After consumption, the adults also weight to check the daily weighty gained. The experiment was repeated five times.

RESULTS:

Larval instars: The results given in Fig. 1 indicate the comparative feeding potential and development period (days) of different larval instars and adults of *M. sexmaculatus* fed on aphid species, *Lipaphis erysimi* and *Myzus persicae* under laboratory conditions. The data reveals that the feeding behavior of larval instars was significantly different from each other. There was a highly significant correlation between instar age and feeding rate of aphids/day ($P < 0.01$). The highest number of *M. persicae* (aphid) was consumed by fourth instar larva (71.4 ± 0.86 per day/ larva) followed by third instar (66.5 ± 0.98) second instar (26.2 ± 0.71) and first instar (18.2 ± 0.21). The result depicted in Fig. II. showed that same number of aphid were weight and provided 1st to 4th instars larvae consumed (15.04mg/day), (18.07 mg/day), (51.06 mg/day) and (53.1 mg/day/ larva) reared on *M. persicae*, respectively.

However, Fig.III indicated that daily weight gained per larva the fourth instar was observed (10.65 mg/day/ larva) followed by third instar (10.01 mg/day) second instar (3.96 mg/day) and first instar (3.01mg/day). The third and fourth instar larvae were voracious feeders and they devoured significantly a number of aphids/day/larva and gained more weight daily as compared to rest of instars reared on *M. persicae*. Similarly, the larvae of *M. sexmaculatus* fed on *L. erysimi* showed in Fig.1 that the feeding behavior of larval instars was significantly different from each other. There was a highly significant correlation between instar age and feeding rate of aphids/day ($P < 0.05$).

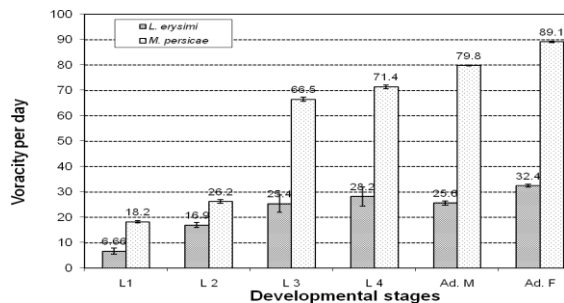


Fig. I. Mean voracity per day on *Lipaphis erysimi* and *Myzus persicae*

The highest significant feeding rate was observed in the fourth instars larvae, they were more voracious feeder and devoured (28.2 ± 1.02) aphid (per larva/day) followed by third instar (25.4 ± 1.06 aphid / larva/day), second instar (16.9 ± 0.98 aphid /larva/day), and first instars (6.66 ± 0.99 aphids/larva/day). Fig. II showed that the same number of aphid were weight and provided, 1st to 4th instars larvae consumed (8.19 mg/day), (13.01 mg/day), (35.06 mg/day) and (35.74 mg/day/ larva) respectively. However in Fig. III. daily weight gained per larva the fourth instar was observed (7.88 mg/day/ larva) followed by third instar (7.03 mg/day) second instar (2.71 mg/day) and first instar (1.78 mg/day). The observations indicated that *M. persicae* was similar in size, however, the larvae of *M. sexmaculatus* fed voraciously on *M. persicae* and their larval life was also short as compared to other prey species. Due to the choice of food and their preference to the diet they entered in pupal stage early. Whereas, *L. erysimi* aphid is bigger in size than *M. persicae* aphid. Biomass consumption weight and daily weight gain also different in both prey species. The analysis of data indicated that the feeding rate of male adults and female adults was significantly different from each other ($P < 0.01$).

Adults: The data in Fig. I also indicated that consumption of *M. persicae* was higher as compared to other aphids. The male adults consumed 79.1 ± 0.10 aphids/day/beetle as compared to female adults 89.1 ± 0.16 aphid/day/beetle. However, Fig. II further revealed that the same number of aphid was weighted and provided to adults male and female consumed (55.05 mg/day; 65.5 mg/day) and the daily weight gained (4.28 mg/day; 5.14 mg/day) respectively. Similarly, Fig. I further indicated that the male and female of *M. sexmaculatus* devoured *L. erysimi* aphid (25.6 ± 0.21

aphids/days; 32.4 ± 0.32 aphid/day) respectively. Similarly, Fig. II & II indicated that the same number of aphid were weight and provided to adults male and female consumed (31.04 mg/day; 40.56 mg/day) and the daily weight gained (2.67 mg/day; 3.21 mg/day) respectively. The results indicate

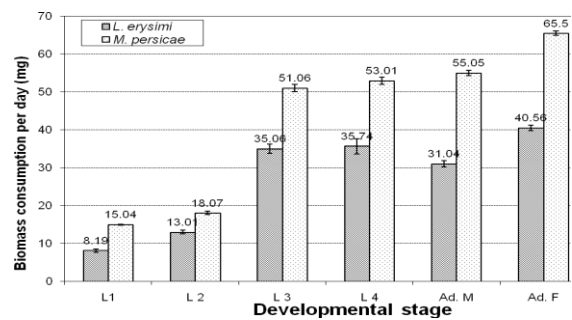


Fig. II. Mean biomass consumption per day (mg) on *Lipaphis erysimi* and *Myzus persicae*

that female adults devoured more number of aphids than males on both prey species. The analysis of data indicated that the feeding rate of male adults and female adults was significantly different from each other ($P < 0.01$).

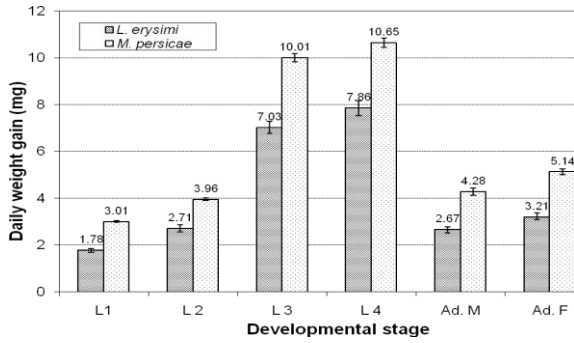
DISCUSSIONS:

The findings of present results have partial agreements with those of [8]. Who reported that fourth instar larva of *C. septempunctata* devoured maximum aphids of *L. erysimi*. the further revealed that *C. septempunctata* voracious feeding efficiency as compare to *C. sexmaculata* on *L. erysimi*. The overall feeding performance of adult predators was recorded significantly greater on *A. craccivora*, *A. gossypii* as well as *L. erysimi* as compare to grubs. This investigation also supported with the judgment of [9,10,11,12]. Others[12], have also reported that the fourth instar grubs significantly devoured maximum number aphids as compared to rest of instars per day. Same findings have been also made by [10] and [11] on *C. sexmaculata* and *C. septempunctata* respectively. Therefore, [12] also reported that *A. gossypii* was found most preferred prey by both grubs as well as adults than the *Rhopalosiphum maidis* and *L. erysimi*. Similarly, [10] reported the feeding performance of *C. sexmaculata*, voracity of the predator have increased with the increase of age of grubs. A similar study was conducted by [12] on *A. gossypii* and *L. erysimi*. he also reported the predator reared on *A. craccivora* found faster development. [2] investigated influence of temperature on the growth of *C. transversalis*. [12] found the lowest life span of male as well as female *C. sexmaculata* on *L. erysimi* than the *A. gossypii*. Consequently, In this study it is also seen that *A. craccivora* is preferred and suitable aphid for *C. sexmaculata* than *A. gossypii* and *L. erysimi*.

CONCLUSION:

It concluded that the predatory beetle, *M. sexmaculatus* preferred the *M. persicae*, due to its higher consumption efficiency as compared to *L. erysimi*, Among the larval instars third and fourth were found more voracious, however, in the adult stages female devoured more numbers as

compare to male. The maximum weight gain in all larval (grub) instars and adults on *M. persicae* as compare to *L.*



erysimi.

Fig. III. Mean daily weight gain (mg) on *Lipaphis erysimi* and *Myzus persicae*

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