

NOTE

**FEEDING BEHAVIOR OF
PHAROSCYMNUS OVOIDEUS SICARD
(COL.: COCCINELLIDAE), A PREDATOR OF
DATE PALM SCALE,
PARLATORIA BLANCHARDI TARG.
(Hom.: Diaspididae)¹**

J. HAJIZADEH AND A.A. AHMADI²

Department of Plant Protection, College of Agriculture, Shiraz University,
Shiraz, Iran.

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ABSTRACT

Starvation longevity, young larval survivorship and probability of larval stages becoming pupae with food scarcity or with an abundant number of eggs of their own of *Pharoscymnus ovoideus* Sicard, a predator of date palm scale, were studied under laboratory condition. With the advancement of larval stages the starvation survival also increased and it was higher in adult. The survivorship of young larva increased when exposed to a limited number of their own eggs. Under food scarcity condition, the rate of development and mortality of larvae increased and length of adults decreased and larva developed to pupa with an abundant of natural food and eggs of their own alternately. Eighty per cent of larvae feeding on eggs alone developed into pupae.

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2. Former Graduate Student and Associate Professor, respectively.

رفتار تغذیه‌ای کفشدوزک *Pharoscymnus ovoideus* Sicard (Col: Coccinellidae)

شکارچی شپشک معمولی خرما *Parlatoria blanchardi* Targ. (Hom: Diaspididae)

جلیل حاجی زاده و علی اصغر احمدی

به ترتیب دانشجوی سابق کارشناسی ارشد حشره‌شناسی کشاورزی و دانشیار بخش گیاهپزشکی، دانشکده کشاورزی دانشگاه شیراز، شیراز، ایران.

چکیده

مدت زمان گرسنگی، بقاء لاروهای سنین پائین و احتمال شفیره شدن مراحل مختلف لاروی در شرایط محدودیت غذا و یا با مقدار زیادی از تخم خود در کفشدوزک *Pharoscymnus ovoideus* Sicard، شکارچی شپشک معمولی خرما، تحت شرایط آزمایشگاه مورد مطالعه قرار گرفت. نتایج نشان داد که با افزایش سنین لاروی، مدت زمان تحمل گرسنگی زیادتر شده و در حشره کامل به حداکثر می‌رسد. بقاء لاروهای سن پائین وقتی از تعداد محدودی از تخم خود تغذیه کردند، بیشتر شد. میزان مرگ و میر و میزان رشد در شرایط محدودیت غذا زیادتر و طول حشرات کامل کمتر گردید. وقتی که لاروها با مقدار کافی از غذای طبیعی و تخمهای خود بطور متناوب تغذیه کردند تماماً به شفیره تبدیل شدند، در صورتیکه تنها هشتاد درصد لاروهایی که فقط از تخمهای خود تغذیه نمودند به شفیره تبدیل گردیدند.

INTRODUCTION

Pharoscymnus ovoideus Sicard is one of the most abundant predator species of the date palm scale *Parlatoria blanchardi* Targ. in southern parts of Iran (6, 16). It has been considered as an effective predator of date palm scale in North Africa (9, 15). In Israel, the phenology of *Pharoscymnus* species including *P. ovoideus* was

studied by Kehat (11). Although information on the predation potential and cannibalistic behavior of other coccinellids are readily available (4, 5, 11, 13), the information on *P. ovoideus* is lacking in the literature. Therefore, this study was undertaken to evaluate the starvation longevity and survivorship of immature stages of the predator under food scarcity or food abundance conditions.

MATERIALS AND METHODS

The coccinellid was collected in Jahrom by shaking date palm leaves over a white tray, from which they were gathered by an aspirator, and also by direct picking from tree branches. The beetles were reared on palm leaves contaminated with *Parlatoria* scales in a 30×18×8 cm plastic box with a screened hole in the lid for ventilation.

To study the starvation longevity of larvae and predatory adults, the individuals were caged singly in glass vials (20 mm diameter and 20 mm length) having holes on the lid for ventilation. For survival of 1st and 2nd instar larvae, a limited number of eggs (0-7) was placed in each cage.

Survivorship, development and feeding of 4th instar larvae under food scarcity conditions were evaluated using 2, 3, 4, 5, 15 or 30 adult date palm scales in each cage. For probability of larval stages becoming pupae, food, consisting of coccinellid eggs and adult scales, was used in four alternating treatments.

All experiments were carried out at 25±1°C, 40% R.H. and a 16 h photoperiod. Ten individuals of each stage were examined in each experiment.

RESULTS AND DISCUSSION

Starvation longevity increased with age of larvae, and adults showed higher survival rate than 4th instar larvae under starvation (Table 1). This finding is in contrast to what has been found for *P. numidicus* in which the 4th instars survived better than adults (11). Starvation longevity is different among different species and is negatively correlated with

Table 1. Mean starvation longevity (\pm SD) (days) of larval and adult stages of *P. ovoideus*.

Stages	min	max	mean \pm SD
1st larval	1	4	2.70 \pm 0.90
2nd larval	5	8	6.50 \pm 1.00
3rd larval	7	9	7.30 \pm 0.10
4th larval	8	11	8.12 \pm 0.84
Adult	9	12	11.00 \pm 1.22

temperature (11). The ability of a predator to feed on alternative foods increases the chance of its survival under natural food scarcity conditions. Dixon (4) and Shah (14) reported that egg cannibalism was carried out mainly by newly hatched 1st instar larvae. Basedow (3) indicated that in *Coccinella septempunctata*, only infertile eggs were attacked and thus by providing the 1st food for young larvae this cannibalism could be beneficial when prey density is low. In our experiment 1st instar larvae could survive and moult to the 2nd instar after feeding only on 2 to 4 eggs, but died afterward. With 5 to 7 eggs, the 2nd instar larvae survived for several days longer (Table 2).

Table 2. Survivorship of 1st and 2nd instar larvae (days) of *P. ovoideus*, feeding on limited number of their own egg.

Eggs offered	Eggs used by 1st instar larva	Duration of 1st instar larva	First moult completed	Eggs used by 2nd instar larva	Duration of 2nd instar larva	Duration of 1st and 2nd instar larva combined
0	0	3.4	-	0	0	3.2
1	1	6.2	-	0	0	6.2
2	2	5.7	+	0	2	7.7
3	3	5.5	+	0	2.2	7.7
4	4	5.5	+	0	2.3	7.8
5	4-5	5.2	+	0-1	3	8.2
6	4-5	4	+	1-2	5.5	9.5
7	5	4	+	2	5	9

Banks (1) found that the consumption of just a single egg nearly doubled the time a larva could survive. Studies by Banks (2) and Mills (13) revealed that eggs were attacked by all larval stages and adults. Our findings are in agreement with their observations, where all stages cannibalized the eggs. Minimum food requirement for development of coccinellid beetles has been investigated by many workers (7, 8, 10). In our experiment, when 4th stage larvae offered 1/8 food requirement, only 30% developed to adult stages, and with 1/2 food requirement, 90% became adult. When the prey was more than the requirements, the larvae consumed considerably more than the minimum number required for their development (Table 3).

Table 3. Development and feeding of fourth instar larvae of *P. ovoideus* under different quantities of food.

Daily number of scales offered.	Total number of scales consumed	Survivorship (%)	Total days for development
2	11.3	30	11.50
3	19.7	50	7.50
4	26.2	60	6.60
5	33.0	90	6.30
15	67.5	100	5.93
30	83.5	100	5.31

Probability of survival increased when the larvae fed on an abundant number of eggs and adult scales alternately, or on the eggs alone. Similar results have been obtained for *C. septempunctata* (12). In our study 100 per cent of larvae feeding alternately on eggs of their own and date palm adult scales pupated, but 80% pupated when larvae fed only on their eggs. The inability of some larvae to pupate when feeding on an abundant number of

eggs may be due to nutritional deficiency. In contrast *P. numidicus*, larvae developed to the 4th instar with an abundant number of eggs, but they did not pupate (11).

The present study revealed that the starvation longevity and cannibalism can be considered as having a selective value for *P. ovoideus* by increasing the chances of survival of the larvae when there is a very low density of prey.

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