J. of Plant Protection and Pathology, Mansoura Univ., Vol 12 (1):37 - 42, 2021

Journal of Plant Protection and Pathology

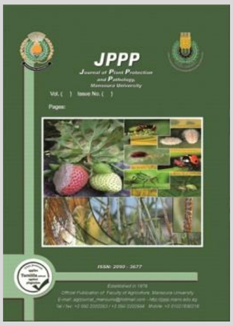
Journal homepage: www.jppp.mans.edu.eg
Available online at: www.jppp.journals.ekb.eg

Influences of Some Insect Pests as Prays on Biology and Consumption Rate of Predator, *Oruis albidipennis* (Reuter) (Hemiptera, Anthocoridae) under Laboratory Conditions

Cross Mark

Marwa E. S. Amer ; Soad I. Abdel-Razak* and Hanan F. El-Sobky

Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt.



ABSTRACT

Results clarified that, prey-type profound effects on measured performance traits. Lowest eggs incubation period recorded for predators fed on *A. craccivora* nymphs, while highest observed for those fed on *P. citri* nymphs. Shortest total nymphal developmental period recorded for nymphs fed on *A. craccivora* nymphs, while longest for those fed on *P. citri* nymphs. Highest survival rate observed for predator that fed on eggs of *E. kuehniella*, while shortest recorded for those fed on *P. citri* nymphs. Daily female ovipositional rate was high in predator culture reared on *E. kuehniella* eggs comparing with those fed on *P. citri* nymphs. Fecundity was high for predator fed on *E. kuehniella* eggs, while low when fed on *P citri* nymphs. Adult females and males fed on *A. craccivora* nymphs had significantly longer life spans compared with those fed on others. Sex-ratio (%female) was significantly high when predator fed on *A. craccivora* nymphs. During the nymphal period, *O. albidipennis* consumed significantly more eggs of *E. kuehniella* than other-types, whereas lowest were *P citri* nymphs. Adult females consumed significantly more *E. kuehniella* eggs than other-types, while Adult males preferred to consume *A. craccivora* nymphs. Data obtained suggested that *O. albidipennis* biology and consumption rate influenced by three tested preys. *E. kuehniella* eggs and *A. craccivora* nymphs were most favorable diet for predator. Although, *P citri* nymphs were less suitable for predator, but *O. albidipennis* could survive and reproduce feeding on it which considered as an important advantage attributed as a biological control agent.

Keywords: Biological control, consumption rate, *Oruis albidipennis, Ephestia kuehniella, Aphis craccivora, Planococcus citri.*

INTRODUCTION

Insect pest considers one of the main problems causing extent damage to the economy due to its impact on agricultural economic crops, reducing its quantity and quality. When controlling, insecticide control programs could lead to several problems such as, pesticide residual, pest resistance, secondary pest outbreaks. Absence or inefficient natural enemies could be one of the challenges facing the integrated control of insect pests. The predator, *Orius albidipennis* (Reuter) is a common predator in Mediterranean region which has been shown to have a potential as a biological control agent under field and greenhouse conditions (Dehghani Zahedani *et al.*, 2011). *O. albidipennis* is an ideal choose for mass rearing for biological control programs in subtropical and tropical zones because of its capability to tolerate high temperatures and the lack of photoperiod-induced diapauses (Sobhy *et al.*, 2010). It could attack eggs and immature stages of various arthropods, or numerous important agricultural pest species (Bush *et al*. 1993; Riudavets 1995; Lee *et al*. 1996; Reitz *et al*. 2006 and Butler & O'Neil 2007). In Egypt, *O. abidipennis* is very common throughout much of the country, south to Wadi Halfa, in the desert, and in cultivated areas, especially in corn and cotton fields. It is usually found in flowers of plants infested with thrips, lepidopteran eggs or other small arthropods (Tawfik and Ata 1973 and Zaki, 1989).

However, little is known of the effects of different economical pest prey on the development and reproduction of *O. albidipennis* compared with other species of *Orius*. Therefore, the present investigation compared the effects of different insect pest prey on the biological characteristics of *O. albidipennis* under laboratory conditions. The suitability of different diets for Orius spp. could be evaluated by comparing their development time, survival and fecundity (Safae *et al*., 2016)

The parameters examined were: eggs incubation period, nymphal period, survival rate (%), ovipositional rate, fecundity, longevity and sex ratio as well as the consumption of the predator stages. The predator reared on three selected economically pest preys, the first prey; eggs of the Mediterranean flour moth, *Ephestia kuehniella* Zeller (Lepidoptera: Pyralidae) which is a common pest of cereal grains, especially flour. This moth is found throughout the world, especially in countries with warm temperate climates. The flour mills have a particular problem with the Mediterranean flour moth because the caterpillars spin silk that clogs machinery (Wikipedia, 2020).

The second prey, nymphs of the black bean Aphid, *Aphis craccivora* Koch. (Hemiptera: Aphididae). Aphids are one of the insect groups whose economic importance increases with the development of agriculture. All species of aphids nearly reproduce parthenogenetically. Aphids

* **Corresponding author.**
E-mail address: soadramadan@hotmail.com
DOI: 10.21608/jppp.2021.149519

damage the plants roughly through; loss of sap by sucking, reaction of plant tissues stimulated by aphid's saliva, excreting viscous honeydew on them sooty-molds usually develop and finally transmission of viral diseases to plants. Cereal aphids are the serious pests attacking cereal crops, particularly wheat, barley and maize (El-Heneidy and Adly 2012).

The third prey; the citrus mealybug, Planococcus citri (Risso) (Hemiptera: Pseudococcidae) is an important pest attacking several crops. Biotic and abiotic factors, as well as the substrate they feed on influence its population (Correa *et al*., 2008). The citrus mealy bug infested 65 plant species belonging to 56 genera in 36 families and distributed in Egypt. P. citri prefers citrus followed by guava and grape (Ahmed & Abd-Rabou 2010).

The chosen preys consider as important pests for many economical crops, vegetables, fruit trees and cereal grains in Egypt. According to (ScaleNet, 2020) the predator *Orius albidipennis* never recorded before as a biocontrol agent of the citrus mealybug, *Planococcus citri* and no data available on its effects on the biology and consumption rate on the studied predator (Amer and Elsahn, 2020).

The aim of this work is to apply rearing *of O. albidipennis* in biological control programs in Egypt in order to reduce the chemical application which would improve the food safety and reduce the environmental pollution.

MATERIALS AND METHODS

The predatory bug *Orius albidipennis* (Reuter) (Hemiptera: Anthocoridae) is considered as a biological control agent for many insect pests in Egypt. Effects of different preys on the biology and consumption rate is compared when the predator fed on eggs of *Ephestia kuehniella* Zeller, nymphs of *Aphis craccivora,* Koch. and *Planococcus citri* (Risso). The parameters examined were the predator eggs incubation period, nymphal period, total nymphal development period, survival rate (%), ovipositional rate, fecundity, longevity, sex ratio and prey consumption. All experiments conducted under laboratory conditions of 28 ±2 °C, 60 ± 5 % RH and 18L: 6D photoperiod. Individuals were reared from the neonate stage until death on each one of the three prey types.

Rearing of the predator, *Oruis albidipennis* (Rauter).

The rearing of the predator, *O. albidipennis* was carried out under laboratory conditions at 28 ±2 °C, 60 ± 5 % RH and L18:D6 photoperiod. The adults were obtained from unsprayed Alfalfa plants, *Medicag sativa* (Fabaceae) in Benha region, Qalyubiya governorate, Egypt. Adults and nymphs of *O. albidipennis* were collected by using insect net and kept in plastic containers of (10 cm ×20 cm) enclosed with muslin. In order to decrease cannibalism between stages, mini foam balls and one gm of frozen *Ephestia kuehniella* Zeller (Lepidoptera: Pyralidae) eggs were add in each jar. *E. kuehniella* frozen eggs were obtained from faculty of agriculture, Benha University as a food source to *O. albidipennis*. In order to allow females of *O. albidipennis* laying eggs, a piece of small (3cm) bean pod, *Phaseolus vulgaris* and a piece of cotton soaked in sugar water (1:1) were add in all jars (Isenhor and Yeargan, 1981 a). Bean pods which contains laid eggs were kept in new plastic containers which observed daily until hatching. Newly emerged nymphs were moved to plastic containers feeding by frozen eggs of *E. kuehniella*. The predator, *O. albidipennis* had been reared for several generations under laboratory conditions using the methods described by (Isenhor and Yeargan 1981a&b; Alauzet *et al*., 1994 and Cocuzza *et al*., 1997).

Rearing of the black bean Aphid, *Aphis craccivora* Koch. (Hemiptera: Aphididae)

Aphis craccivora Koch., was collected from the broad bean *Vicia fabae* L. (Fabaceae) orchards in Benha district, Qalyubiya governorate, Egypt, which reared on *Vicia faba* leaves planted from seeds in plastic plates (25 cm * 35 cm *15 cm). After one week from cultivation, the newly broad bean leaves injured to be infest with *A. craccivora.* The nymphs of *A. craccivora* used as a prey for the predator, *O. albidipennis. A. craccivora* colonies were reared under laboratory conditions (28 ± 2 °C and 60% ± 10% RH) on broad beans which described by (Amer *et al*., 2018).

Rearing of Citrus mealybugs, *Planococcus citri* (Risso) (Hemiptera: Pseudococcidae).

The citrus mealybugs, *Planococcus citri* was collected from infested pomegranate, *Punica granatum* L. (Lythraceae) leaves and fruits from an orchard in Nubariya district, Behira governorate, Egypt. The mealybug reared on potato sprouts which described by (Mahmoud, *et al*., 2017). The crawlers emerged out and started feeding and developed to adults. The small nymphs of the citrus mealybug used as a prey for the predator, *O. albidipennis.*

Effects of different prey on the biological characteristics of *O. albidipennis.*

In order to study effects of the different selected prey on the biological characteristics of *O. albidipennis,* the parameters examined were: eggs incubation period, nymphal period, total nymphal development period, survival rate (%), ovipositional rate, fecundity, longevity and Sex ratio. Experiments were conducted using three types of prey: non hatched eggs of *E. kuehniella*, nymphs of *A. craccivora* and of *P. citri*. A total of 10 replicates per treatment (type of prey) were placed in order to study its effect on the studied biological characteristics of *O. albidipennis*. Eggs of *E. kuehniella* replicates were put in Petri dishes which placed inside plastic jars with a piece of cotton moister with honey water (1:1) placed in small glass flask (5 mL). Nymphs of *A. craccivora* and *P. citri* as treatments were presented to the predator on small leaf discs of broad bean leaves. Each replicates were observed daily using the stereoscopic binocular microscope. In order to study the developing of the predator's immature stage. New prey was daily provided until the predator completed its growth or died (Sobhy *et al*., 2006). In the experiments to study ovipositional rate, fecundity, longevity and sex ratio of the predator, newly emerged adults of *O. albidipennis* (one female and one male) were replicated 10 times and exposed to the different preys. Treatments were separated in Petri dishes (9 cm (diameter) * 1.5 cm (height)) for mating. To stimulate mating, no prey was added at this time. Twelve hours later, males were removed and separated to other Petri dishes to determine the adults prey consumption. The females were daily provided with nymphs of *A. craccivora* and *P. citri* on broad bean leaves and paper discs for *E. kuehniella* as well as bean pods to lay eggs until death. Adult males were provided with new preys as mentioned with adult females. The numbers of consumed preys were counted every day by using a binocular microscope. After adult eclosion, the sex ratio of the predator was determined and

Consumption of different stages of *O. albidipennis* reared on the three selected preys.

In order to study the consumption of prey (eggs of *E. kuehniella* and nymphs of *A. craccivora* and *P. citri)* for the nymphal instar of the predator, *O. albidipennis*, each treatment was examined with 10 replicates of the above preys. Observation were made daily, counting the Daily and total Prey consumption of the 4th and 5th nymphal instar as well as males and females by adding fresh preys (treatments) retrieved from the rearing prey stocks (Sobhy *et al*., 2010).

Statistical Analysis.

Significance of the impact of various preys on developing of immature stages and adults as well as, prey consumption was determined by one – way ANOVA (analysis of variance). The mean values were compared using Tukey's test at the ($P < 0.05$, LSD) level of significance. Adult prey consumption and adult longevity were analyzed by two-way ANOVA. Statistical analyses were run in SPSS for Windows version 16.

RESULTS AND DISCUSSIONS

1- Effects of different prey on the biological characteristics of *O. albidipennis*.

Data presented in (Table1) showed that the predator, *O. albidipennis* was capable to complete its nymphal instar feeding in all different prey (*E. kuehniella* eggs and nymphs of *A. craccivora* and *P. citri*). Type of prey had a different effect on the developmental time of eggs embryonic (incubation) period, the nymphal instars period, the total nymphal developmental time and the survival rate (%) of the predator.

a. Effect of different prey on the embryonic (incubation) period of the predator, *O. albidipennis*.

Data obtained and arranged in (Table1) suggested that the type of prey had profound effects on the duration of the embryonic period of *O. albidipennis*. Total embryonic time was significantly faster for *O. albidipennis* that fed on *E. kuehniella* eggs or *A. craccivora* nymphs compared with those fed on nymphs of the citrus mealybug, *P. citri.* It was 2.30±0.89, 2.76±1.21days in the case of *E. kuehniella* eggs or *A. craccivora* nymphs respectively without any significance different between them. While Total embryonic time was significantly slower in case of feeding the predator on nymphs of the citrus mealybug, *P. citri* which reached 6.12±1.44 days. (Table1). Data obtained agree with (Cocuzza *et al*., 1997) who concluded that Di*et al*so strongly affected the length of ovipositional period in *O. albidipennis*.

b. Effect of different prey on the development of nymphal stages period and total nymphal instars period of the predator, *O. albidipennis*.

It appeared that in the predator 1st nymphal instar the developmental time was significantly shorter in the case of feeding on *A. craccivora* nymphs 2.12±0.04 compared to insects allowed to feed on *E. kuehniella* eggs 3.04±0.19 or *P. citri* nymphs 3.51±0.45 with significant difference between all treatment. (Table1).

For the 2nd nymphal instar the developmental time was significantly shorter in the case of feeding on *A. craccivora* nymphs 1.46±0.77 and *E. kuehniella* eggs 2.14±0.27 without any significant different between them compared to insects allowed to feed on *P. citri* nymphs the developmental period increased to 3.96±1.18 (Table1).

Data obtained for the 3rd nymphal instar developmental time showed that it was significantly shorter in the case of feeding on *A. craccivora* nymphs 2.06±0.27 compared to insects allowed to feed on *E. kuehniella* eggs 2.66±0.32 or *P. citri* nymphs 3.48±0.46 with significant difference between all treatment.

For the 4th nymphal instar the developmental time was significantly shorter in the case of feeding on *A. craccivora* nymphs 1.58±1.10 and *E. kuehniella* eggs 2.28±1.27 without any significant different between them compared to insects allowed to feed on *P. citri* nymphs the developmental period increased to 3.946±1.36 (Table1).

In the predator 5th nymphal instar the developmental time was significantly shorter in the case of feeding on *A. craccivora* nymphs 2.46±0.21 compared to insects allowed to feed on *E. kuehniella* eggs 2.40±0.35 or *P. citri* nymphs 3.56±0.54 with significant difference between all treatments (Table1).

Table 1. Effect of three different preys on immature stages of *O. albidipennis.*

Preys	No. of replicates	Eggs incubation (Days)	Nymphal period (days) Mean ± SE 1st	2nd	3rd	4th	5th	Total nymphal stages in (Days)	Survival rate (%) Mean ± SE	F-value	P
A. craccivora	10	2.30± 0.89 a	2.12± 0.04a	1.46± 0.77a	2.06± 0.27 a	1.58± 1.10 a	2.46± 0.21a	11.98± 0.64a	60.74± 0.08a	22.56	< 0.001
E. khunellia	10	2.76± 1.21 a	3.04± 0.19 b	2.14± 0.27a	2.66± 0.32 b	2.28± 1.27a	2.40± 0.35b	15.28± 0.85a	72.36± 0.09a	7.85	< 0.001
P. citri	10	6.12± 1.44 b	3.51± 0.45c	3.96± 1.18 b	3.48± 0.46 c	3.94± 1.36 b	3.56± 0.54 c	18.45± 1.16 b	50.90± 0.1 2 c	12.26	< 0.001

***The means followed by same letters in each column are not significantly different based on Tukey's test with ($P < 0.05$, LSD).**

Concerning the total developmental nymphal instars period of the predator, *O. albidipennis* data obtained reviled that, it was significantly shorter in the case of feeding on *A. craccivora* nymphs 11.98±0.64 compared to insects allowed to feed on *E. kuehniella* eggs 15.28±0.85 or *P. citri* nymphs 18.45±1.16 with significant difference between all preys (Table1).

Data obtained by (Sobhy *et al*., 2010). Clarified that, the type of prey had profound effects on the duration of all nymphal instars of *O. albidipennis*. Total developmental time was significantly faster for *O.*

albidipennis that fed on *E. kuehniella* eggs or *Gynaikothrips ficorum* larvae compared with the other investigated prey.

Safaei *et al*., 2016, concluded that Nymphal developmental time of the bug on different diets varied because of different preys. They mentioned that, the best diet which shorten the nymphal developmental time was the diet of *E. kuehniella* + sunflower pollen Which could of great benefit in mass rearing for the predator.

c. Effect of different prey on the survival rate (%) of the predator, *O. albidipennis*.

Results clarified that, the lowest overall survival rates to adulthood were recorded for nymphs that fed on *P. citri* nymphs 50.90±0.12 while the highest survival rate 72.36±0.09 was recorded for those fed on *E. kuehniella* eggs. Intermediate rates for survivorship were reported for those fed on *A. craccivora* nymphs 60.74±0.08 with significant different between all preys. (Table1). Data agreed with that obtained by (Sobhy *et al.*, 2010) which concluded that the highest survival rate of the predator *O. albidipennis* was recorded for those fed on *E. kuehniella* eggs. (87.75%) comparing with those fed on *Gynaikothrips ficorum* (72.91%), *Trialeurodes vaporariorum* eggs (51.06%) and *Tetranychus urticae* eggs (59.57%).

Data obtained by (Safaei *et al*., 2016) showed that, the nymph and adult survival and consumption rate were not significantly affected by the dietary treatments. Because of a more rapid development with food containing eggs of *E. kuehniella*, they are the best nymphal diets for mass rearing of *O. albidipennis.*

d. Effect of different prey on the female ovipositional rate (%) per day of the predator, *O. albidipennis*.

Data obtained in Table 2, cleared that, most females were able to continue laying egg until death. Highest daily ovipositional rate occurred for females fed on *E. kuehniella* eggs, these females laying a total mean of 8.18±0.08 eggs per day. Females fed on *A. craccivora* and *P. citri* nymphs laid a total of 5.24±1.10 and 3.06±0.06 eggs daily per female respectively with a significant different between the three preys.

Table 2. Effect of three different preys on longevity and female fecundity of *O. albidipennis.*

Preys	No. of replicates	ovipositional rate (eggs/female/day)	Fecundity (eggs/female)	Longevity (Days) Mean ± SE		Sex ratio (% female)	F- value	p
				♀Female	♂Male			
A. craccivora	10	5.24± 1.10b	96.04± 1.09 a	25.98 ± 0.05a	10.65± 0.19a	63.15± 1.02a	28.43	< 0.001
E. khunellia	10	8.18± 0.08a	112.7± 1.45a	20.50± 0.09a	7.11± 0.28a	56.20± 0.08b	21.80	< 0.0001
P. citri	10	3.06± 0.06c	55.42± 2.18b	16.55± 0.15b	5.01± 0.36b	41.57± 1.31c	13.56	< 0.0001

***The means followed by same letters in each column are not significantly different based on Tukey's test with (P < 0.05, LSD).**

e. Effect of different prey on the fecundity of the predator, *O. albidipennis*.

Results showed that, prey species had a significant effect on the fecundity of the predator, *O. albidipennis*. The highest lifetime fecundity 112.7±1.45 eggs/female were recorded for females fed *E. kuehniella* eggs (Table 2) without any significant different of those fed on *A. craccivora* nymphs 96.04±1.09. When females fed on *P. citri* nymphs, fecundity dropped significantly to 55.42±2.18 eggs/female.

f. Effect of different prey on the longevity of the predator, *O. albidipennis* males and females.

Data illustrated in (Table 2) showed that, the longevity of *O. insidiosus* females and males fed on *A. craccivora* nymphs 25.98±0.05♀&10.65±0.19♂day respectively, was larger than that when the predator were fed on eggs *E. kuehniella* 20.50±0.09♀&7.11±0.28♂days without any significant different between them. While the predator male and female longevity terns short 16.55±0.15♀&5.01±0.36♂days when it fed on *P. citri* nymphs.

g. Effect of different prey on the sex ratio(%female) of the predator, *O. albidipennis*.

The obtained results revealed that after the predator adult eclosion the sex ratio were varied depending on the three prey types. Sex ratio was determined and expressed as a percentage of females were 63.15±1.02 in predators reared on *A. craccivora* nymphs while it was 56.20±0.08 and 41.57±1.31 in the culture of the predator reared on *E. kuehniella* eggs and *P. citri* nymphs respectively with significant differences between all treatments (Table2).

The above mentioned results agree with (Sobhy *et al.*, 2010) who said that, *Orius albidipennis* females showed the highest fecundity when fed on *E. kuehniella* eggs, and the lowest when fed on *Trialeurodes vaporariorum* eggs. Adult females and males that fed on *Gynaikothrips ficorum* larvae had significantly longer life spans compared with those fed other prey. Because of their relatively rapid development and high fecundity, *O. albidipennis* fed *E. kuehniella* eggs had a significantly higher reproductive rate and intrinsic rate of increase than *O. albidipennis* fed other prey types. He also concluded that, longevity of adult *O. albidipennis* was dependent on both prey type and predator sex, with females living considerably longer than males. There was a significant interaction between prey type and predator sex.

(Mendes *et al*., 2002) stated that, fecundity of adult *O. insidiosus* was increased with the consumption of eggs of *A. kuehniella* when compared to feeding on the other prey.

2- Consumption of *O. albidipennis* stages reared on the three selected preys.

The type of prey had a significant effect on the number of prey daily and total mean consumed by the predator, *O. albidipennis* 4th, 5th nymphal instar, females and males (Table 3).

For the predator 4th and 5th nymphal instar the daily consumption was significantly high when it fed on the prey *E. kuehniella* eggs reached 6.87±0.98 daily consumption, decreased to 5.78±1.19 and 3.99±1.27 when it fed on *A. craccivora* and *P. citri* nymphs respectively. Data in (Table 3) also revealed that the total mean consumption increased to 60.61±0.71 and 55.06±0.53 in the culture reared on the prey *E. kuehniella* eggs and *A. craccivora* nymphs respectively without any significant different between them. While the total mean consumption decreased in the prey culture fed on *P. citri* nymphs reached 41.47±1.01. Concerning the predator adult females and males number of prey daily and total mean consumption, data obtained suggested that the predator adult females recorded high daily and total fed consuming comparing with adult males on the three diets treatments. The greatest total females prey consumption was 166.51±0.06 eggs of *E. kuehniella* followed by nymphs of *A. craccivora* 134.2±0.09 while the lowest was 85.35±0.18 nymphs of *P. citri*.

Table 3. Consumption of different developmental stages of *O. albidipennis* reared on three preys.

Preys	4^{th} and 5^{th} Nymphal instars		♀ Female		♂ Male	
	Daily prey consumption	Mean Prey consumption	Mean Daily prey consumption	Mean Prey consumption	Mean Daily prey consumption	Mean Prey consumption
A. craccivora	5.78±1.19b	55.06±0.53a	12.42±1.24b	134.2±0.09b	7.41± 0.24b	70.74±2.54a
E. khunellia	6.87±0.98a	60.61±0.71a	17.73±1.03a	166.51±0.06a	8.17± 0.11a	63.57±1.54b
P. citri	3.99±1.27c	41.47±1.01b	6.56±1.58c	85.35±0.18c	5.01± 0.33c	46.16± 3.06c
F- value	17.28		36.85		24.34	
P	<0.001		<0.001		<0.001	

***The means followed by same letters in each column are not significantly different based on Tukey's test with (P < 0.05, LSD).**

While the greatest total males prey consumption was 70.74±2.54 nymphs of *A. craccivora* followed by eggs of *E. kuehniella* 63.57±1.54 while the lowest was 46.16±3.06 nymphs of *P. citri* (Table 3). daily predation of female rates (prey/day) were higher with the *E. kuehniella* eggs 17.73±1.03 as the prey than for the other types of prey. *O. albidipennis* males daily prey consumption ranged from 8.17±0.11 feeding on *E. kuehniella* eggs, 7.41±0.24 on the culture of *A. craccivora* nymphs and ending with a lost mean daily consumption of 5.01±0.33 of the prey *P. citri* nymphs. It could be concluded that, the prey consumption increased notably in *O. albidipennis* adult females comparing with adult males as well as in adult stages generally comparing with the predator 4^{th} and 5^{th} nymphal instars (Table 3).

Sobhy *et al.*, 2010, stated that, prey type had a significant effect on prey consumption by *O. albidipennis* adults. There was a significant prey type by predator sex interaction for total prey consumption, but overall, female predators did consume significantly more total prey than male predators. Part of this difference is attributable to differences in longevity between males and females. Although females did consume more eggs of *E. kuehniella* comparing with other tested preys

CONCLUSION

It could be concluded that, *O. albidipennis* biology and consumption rate influences by the three tested preys. Eggs of *E. kuehniella* and *A. craccivora* nymphs were the most suitable diet for the predator. Although, *P citri* nymphs were less suitably for the predator, but it could survive and reproduce feeding on which is conceder as an important advantage attribute as a biological control agent. The present work could be applied for mass rearing of *O. albidipennis* in biological control programs in Egypt in order to reduce the chemical application which would improve the food safety and reduce the environmental pollution.

REFERENCES

Ahmed, N. H. and S. M. Abd-RAbuu (2010). Host plants, geographical distribution, natural enemies and biological studies of the citrus mealybug, Placoccus citri (Risso) (Hemiptera: Pseudococcidae). Egyptian Acad. J. Bio.l.Sci., 3: 39- 47.

Alauzet, C., Dargagnon, D. and Malausa, J. C. 1994. Bionomics of polyphagous predator: *Orius laevigatus* (Heteroptera: Anthocoridae). Entomophaga, 39:33-40.

Amer, M. E. S. and Elsahn, O.M.N. (2020). Functional response and predation efficiency of the flower bug, *Oruis albidipennis* (Reuter) (Hemiptera, Anthocoridae) to different densities of the cotton mealybug, phenococcus solanepsis (Hemiptera, Pseudococcidae) under laboratory conditions. Egypt. J. Plant Prot. Res. Inst. (2020), 3 (3): 906 - 916

Amer, M. E. S., Fu, Yueguan and Niu, Liming. 2018. Biological Aspects of the *Orius similis* Zheng reared on two preys at three constant temperatures. Journal of Agricultural Science and Technology. A 8 (2018) 334-346.

Bush, L., Kring, T. J. and Ruberson, J. R. 1993. Suitability of green bugs,

Butler, C. D. and O'Neil, R. J. 2007. Life history characteristics of *Orius insidiosus* (Say) fed *Aphis glycines* Matsumura. Biol Control 40:333–338.

Cocuzza, G. E., De Clercq, P., Lizzio, S., Van de Veire, M., Tirry, L., Degheele, D. and Vacante, V. 1997. Life tables and predation activity of *Orius laevigatus* and O. *albidipennis* at three constant temperatures. Entomol Exp Appl 85:189–198.

Correa, L. R. B.; Santa-Cecilia, L. V. C.; Souza, B. and Cividanes, F. J. (2008): Heat requirements of the white mealybug Planococcus citri, (Risso, 1813) (Hemiptera: Pseudococcidae) on coffee plants. Arquivos-do-Instituto- Biologico-Sao-Paulo, 75(1): 053-058.cotton aphids and *Heliothis virescens* eggs for development and reproduction of *Orius insidiosus*. Entomol. Exp. Appl. 67:217–222.

Dehghani Zahedani, M., Sarafrazi, A., Ostovan, H. and Mardi, M. 2011. Population variation of predatory bug *Orius albidipennis* (Het: Anthocoridae) in different regions of Iran. Journal of Food Agriculture and Environment 9, 469-473.

El-Heneidy, A. H. and D. Adly 2012. Cereal Aphids and their Biological Control Agents in Egypt. Scientific Essay201418 Pages.

Isenhor, D. J. and Yeargan, K. V. 1981a. Effect of Temperature on the Development of *Orius insidiosus* with notes on laboratory rearing. Ann. Entomol. Soc.Am. 74 (1): 114-6.

Isenhour, D. J. and Yeargan, K. V. 1981b. Predation by *Orius insidiosus* on the Soybean thrips, *Sericothrips varialilis*: Effect of prey stage and density. Environ. Entomol. 10: 496-500.

Lee, G.H., Choi M. Y. and Kim D. H. 1996. Predatory characteristic of *Orius sauteri* on two prey species of *Myzus persicae* and *Tetranychus urticae.* RDA J Agric Sci Crop 38:501–506.

Mahmoud, H. T., Nabil, H. A., Shahein, A. A. and Mohamed, Z. A. 2017. Biological studies on the citrus mealybug, *Planococcus citri* (Risso) (Hemiptera: Pseudococcidae) under laboratory conditions. Zagazig J. Agric. Res., Vol. 44 No. (3) 2017.

Mendes, S. M., Bueno, V. H. P., Argolo, V. M. and Silveira, L. C. P. 2002.Type of prey influences biology and consumption rate of *Orius insidiosus* (Say) (Hemiptera: Anthocoridae). Rev Bras Entomol 46:99–103.

Reitz S. R., Funderburk, J. E. and Waring, S. M. 2006. Differential predation by the generalist predator *Orius insidiosus* on congeneric species of thrips that vary in size and behaviour. Entomol Exp Appl 119:179–188.

Riudavets, J. 1995. Predators of *Frankliniella occidentalis* (Per.) and *Thrips tabaci* Lind.: a review. Wageningen Agric Univ Pap 95:43–87.

Safaei, N., Rajabpour, A. and Seraj, A. A. 2016. Evaluation of various diets and oviposition substrates for rearing *Orius albidipennis* Reuter. Journal of Entomological Society of Iran. 2016, 35(4): 29-37.

Scale net (2020). The database of the scale insects on the net. http://scalenet.info/catalogue/ Planococcus%20citri/

Sobhy, I. S., Sarhan, A. A., Shoukery, A. A., El-Kady, G. A. and Mandour, N. S.,2010 Development, consumption rates and reproductive biology of *Orius albidipennis* reared on various prey • Stuart R. Reitz BioControl (2010) 55:753–765.

Sobhy, I.S., Sarhan, A.A., Shoukery, A.A., El-Kady, G.A. and Mandour, N.S. 2006. Effects of different temperature levels on the biological attributes of *Orius albidipennis* (Reuter) (Hemiptera: Anthocoridae). J Agric Res Suez Canal Univ 6:213–216

Tawfik, M. F. S. and Ata, A. M. 1973. The life history of *Orius albidipennis* (Reut.) (Hemiptera: Anthocoridae). Bull Entomol Soc Egypt 57:117–126.

Wikipedia(2020).https://en.wikipedia.org/wiki/Mediterranean_flour_moth2020

Zaki, F. N. 1989. Rearing of two predators. *Orius albidipennis* (Reut.) and *Orius laevigatus* (Fieber) on some insect larvae.J Appl Entomol 107:107–109.

تأثير بعض الآفات الحشرية كفرائس على بيولوجيا ومعدل استهلاك المفترس ***Oruis albidipennis* (Reuter) (Hemiptera:Anthocoridae)** تحت الظروف المعملية

مروة عامر ، سعاد عبد الرزاق و حنان السبكي

معهد بحوث وقاية النبات - مركز البحوث الزراعية – دقى – جيزه - مصر

يعتبر المفترس الحشري *Orius albidipennis* (Reuter) (Hemiptera: Anthocoridae) عاملاً للمكافحة البيولوجية للعديد من الآفات الحشرية في مصر. تم مقارنة تأثير الفرائس المختلفة على بيولوجيا ومعدل أستهلاك المفترس عند تغذيتة على بيض *Ephestia kuehniella* Zeller وحوريات *Aphis craccivora* Koch. و *Planococcus citri* (Risso). العوامل التي تم دراستها للمفترس هي فترة حضانة البيض ، فترة الحوريات ، معدل فترة النمو الكلية للحوريات ، معدل البقاء (٪) ، معدل وضع البيض ، الخصوبة ، طول العمر ، النسبة الجنسية ومعدل استهلاك الفرائس. أجريت جميع التجارب تحت ظروف معملية تبلغ 28 ± 2 درجة مئوية ، 60 ± 5٪ رطوبة نسبية و 18 أضائة: 6 ظلام. تمت تربية االمفترس من مرحلة حديثي الفقس حتى الموت على أحد أنواع الفرائس الثلاثة. أوضحت النتائج المتحصل عليها أن نوع الفريسة كان له تأثير معنوي على جميع العوامل موضع الدراسة. تم تسجيل أقل فترة حضانة لبيض المفترس الذي تم تغذيته على حوريات *A. craccivora* ، بينما لوحظ أن أعلى فترة حضانة للبيض هو للذي تم تغذيته على حوريات *P. citri*. تم تسجيل أقل فترة تطور للحوريات التي تغذت على حوريات *A. craccivora* ، بينما تم تسجيل أطول فترة تطور للحوريات التي تتغذى على حوريات *P. citri*. لوحظ أعلى معدل البقاء كان لأفراد المفترس الذي تم تغذيتهم على بيض *E. kuehniella* بينما تم تسجيل أقصر معدل بقاء لتلك التي تغذت على حوريات *P. citri*. كان معدل وضع أناث المفترس اليومي للبيض مرتفعا في حالة تربية المفترس على بيض *E. kuehniella* مقارنة مع تلك التي تغذت على حوريات *P. citri*. النتائج المتحصل عليها أوضحت ان الخصوبة كانت عالية جدًا لأفراد المفترس التي تتغذت على بيض *E. kuehniella* ، بينما كانت أقل عندما تغذت على حوريات *P citri*. لوحظ أن الإناث والذكور البالغة التي تغذت على حوريات *A. craccivora* كان لها عمر أطول بشكل ملحوظ مقارنة مع أولئك الذين تغذوا على الفرائس الأخرى. كانت النسبة الجنسية (٪ إناث) مرتفعة بشكل معنوي عند تغذية المفترس على حوريات *A. craccivora* *خلال* فترة الدراسة ، استهلك المفترس *O. albidipennis* بشكل معنوي بيض حشرة *E. kuehniella*مقارنة بأنواع الفرائس الأخرى ، بينما كان أقل عدد من الفرائس المستهلكة هو لحوريات حشرة بق الموالح الدقيقى *p. citri* *الإناث*! البالغة يستهلكن بشكل ملحوظ بيض *E. kuehniella* أكثر من أنواع الفرائس الأخرى ، بينما يفضل الذكورالبالغة التغذية على حوريات *A. craccivora*. ، وتشير النتائج المتحصل عليها إلى أن بيولوجيا *O. albidipennis* يتأثر بمعدل أستهلاكة من الفرائس الحشرية الثلاثة التي تم أختبارها. أوضحت النتائج أن بيض *E. kuehniella* وحوريات *A. craccivora* هو الغذاء الأكثر تفضيلاً للمفترس. على الرغم من أن حوريات حشرة *P. citri* كانت أقل أفضلية للمفترس ، إلا أنه أستطاع أن يكمل دورة حياتة وتكاثرة وتتغذيته عليها والذى يعتبر من السمات الهامة كعامل للمكافحة البيولوجية. يمكن تطبيق النتائج المتحصل عليها لتربية المفترس *O. albidipennis* بصورة كبيرة لأستخدامة فى برامج المكافحة البيولوجية في مصر من أجل تقليل أستخدام المركبات الكيميائية والذي من شأنه أن يؤدى الى سلامة الغذاء وتقليل التلوث البيئي.