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Biology of *Coranus fuscipennis* Reuter (Heteroptera: Reduviidae) on two preys species, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) and *Ostrinia furnacalis* (Guenee) (Lepidoptera: Crambidae) in the laboratory

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ABSTRACT: The knowledge on the bioecology of any predator is essential to explore its biocontrol potential. In laboratory conditions (Temperature: 30°C; Humidity: 75%), the assassin bug *Coranus fuscipennis* Reuter (Heteroptera: Reduviidae) were studied on two types of prey species (larvae of rice meal moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) and the Asian Corn Borer, *Ostrinia furnacalis* (Guenee) (Lepidoptera: Crambidae). The development stage of egg was 6.04 ± 0.52 days when fed with *C. cephalonica* and 5.05 ± 0.21 days when fed with *O. furnacalis.* The development stage of I, II, III, IV and V nymphal instars (male and female) were 5,42 ± 0,25, 5,60 ±0,27, 6,43 ±0,32, 7,63 ±0,37, 8,78 ± 0,46 and 9,25 ±0,90 days when fed with *C. cephalonica* and 4,21 ± 0,21, 4,56 ± 0,25, 5,51± 0,31, 6,44±0,36, 7,95 ± 0,38 and 8,40 ±0,79 days when fed with *O. furnacalis*. The preoviposition period was (6.06 ± 0.35 days) in *O. furnacalis* fed group in *C. cephalonica* fed group (7.23 ± 0.48 days). The number of eggs laid (egg/female) was (80.12 ± 4.29 eggs/female) in *C. cephalonica* fed group, in *O. furnacalis* fed group (92.80 ± 5.72 eggs/female). The life cycle were 47.60 ± 3.73 days and 40.23 ± 2.21 days in *C. cephalonica* and *O. furnacalis* fed predators. The longevities of male and female adults fed with *C. cephalonica* were shorter (33.15 ± 3.11 days, 70.64± 3.34 days) than those fed with *O. furnacalis* (63.07 ± 5.28 days, 95.67 ± 8.74 days).

Key words: Biology, assassin bug, *Coranus fuscipennis*, rice meal moth, *Corcyra cephalonica*, Asian Corn Borer, *Ostrinia furnacalis.*

INTRODUCTION

The species of the assassin bugs of family Reduviidae under Order Heteroptera (Insecta: Rhynchota) is not only one of the most abundant groups but also showing significant economics and high scientific value. In the world, the family Reduviidae is documented with approximately 7000 species that come from 29 subfamilies (Weirauch, 2008). They are present in all ecosystems and even the near human. Many species play an important role in the food chain of animals and plants, as well as the ecological balance. Besides that, many species are either known as predators of many dangerous pests or their indicative role for forest habitats. The species *Coranus fuscipennis* Reuter is a common reduviid predator found in some crops in agricultural ecosystems such as cotton, soybean, corn and vegetables in Vietnam**.** The *Coranus fuscipennis* is a polyphagous predator and its prey recorded includes on several important pests such as *Helicoverpa armigera*, *Spodoptera litura*, *Hedylepta indicata*, *Achaea janata* and *Plutella xylostella*, (Ambrose, 1999, 2003). However, the knowledge on the development of species assassin bug *Coranus fuscipennis* on laboratory, rearing techniques this species for biocontrol agents with suitable prey, as well as mass rearing for use in integrated pest management programme are very little or no conducted in Vietnam.

Therefore, the present study was undertaken to study the biology of *Coranus fuscipennis* on laboratory with preys are the larvae of rice meal moth, *Corcyra cephalonica* (Stainton) and its natural prey in corn, the Asian Corn Borer, *Ostrinia furnacalis* to understand the impact of preys on the biological characteristics of assassin bug *Coranus fuscipennis.*

MATERIALS AND METHODS

The adults of *C. fuscipennis* collected from corn field in Ea Kar District, Dak Lak Province and Cu Jut District, Dak Nong Province in Central Highlands of Vietnam were reared in the laboratory under optimal condition (temperature 30±2ºC; humidity 75±5%; photoperiod 12±1h) by larvae of rice meal moth *Corcyra cephalonica* from May to October, 2016. The rice meal moth *C. cephalonica* were mass reared in laboratory by artificial diet (1 kg rice bran mash with 0.5 kg corn meal).

The *Ostrinia furnacalis* (Guenee) collected from corn field in Ea Kar District, Dak Lak Province and Cu Jut District, Dak Nong Province. After that, the species *O. furnacalis* were mass reared in laboratory by artificial diet. The artificial diet of *O. furnacalis* will be prepared as below: Place all the weighed ingredients in the osterizer or blender and then pour 350 ml of distilled water. Add two drops of Vitamin E or until half of the amount of the capsule is consumed. Blend all the ingredients thoroughly. While blending, boil 350 ml of distilled water. When the water is boiling, place the shredded gulaman bars until all the shredded pieces are dissolved. Once dissolved, the liquefied gulaman is poured onto the osterizer containing the blended ingredients. Then, thoroughly blend all the ingredients. After mixing for a minute, the mixture is carefully placed in the rearing pans. Leave the cooked diet as it solidifies. Let the diet cool for several minutes before covering the container with the lid. Insert a piece of tissue paper on the lid for absorbing moisture from the artificial diet.

The eggs of *C. fuscipennis* laid in the laboratory were allowed to hatch separately in plastic containers (D=10,∅= 10) with wet cotton swabs for maintaining optimum humidity. The cotton swabs were changed periodically in order to prevent fungal attack. The males and females are paired in plastic containers (5×5.5cm). Mated females were maintained individually in order to record the number of batches of eggs and number of eggs in each batch for each predator. Each batch of eggs was allowed to hatch in individual plastic containers (5×5.5cm). The nymphs hatched from egg were reared in plastic containers and reared as two sets of prey (*C. cephalonica* larva and *O. furnacalis*) separately in the laboratory under optimal condition (temperature 30±2ºC; humidity 75±5%; photoperiod 12±1h). The biological characteristics of assassin bug *C. fuscipennis* such as preoviposition period, fecundity, hatchability, development stage of egg, development stage of I, II, III, IV and V nymphal instars, life cycle, nymphal mortality and longevity of the predators were observed and compared.

RESULTS AND DISCUSSION

In the laboratory under optimal condition (temperature 30±2ºC; humidity 75±5%; photoperiod 12±1h), the biological parameters of egg and nymph species *C. fuscipennis* observed for the test individuals reared on two types of prey, *C. cephalonica* and *O. furnacalis* are given in Table 1. The development stage of egg was significantly ($p< 0.05$) shorter (5.05 ± 0.21 days) in *O. furnacalis* fed group than in *C. cephalonica* fed group (6.04 ± 0.52 days). The development stage minimum of egg and maximum of egg were significantly ($p< 0.05$) longer in *O. furnacalis* fed group (3 and 9 days) than in *C. cephalonica* fed group (4 and 8 days). The Hatchability of egg was significantly higher (87.31 ± 6.55 %) in *O. furnacalis* fed group compared to that of *C. cephalonica* fed group (76.68 ± 4.13%). George *et al*. (1998) reported higher fecundity in other reduviids fed on their preferred prey.

Table 1: The biological parameters of assassin bug *C. fuscipennis* reared on two types of prey *Corcyra cephalonica* and *Ostrinia furnacalis.*
(Temperature 30 ±2ºC; Humidity 75 ±5%; Photoperiod 12 ±1h)

The biological parameters	*Corcyra cephalonica*	*Ostrinia furnacalis*
Development stage of egg (day) (n= 147)		
Min-Max	4 - 8	3 - 9
Average	6,04 ± 0,52 a	5,05 ± 0,21 b
Hatchability of egg (%) (n= 135)		
Min-Max	63,09 - 86,49	58,33 - 90,33
Average	76,68 ± 4,13 a	87,31 ± 6,55b
Development stage of nymph (day) (n=35)		
I-instar	5,42 ±0,25 a	4,21 ±0,21 b
II-instar	5,60 ±0,27 a	4,56 ±0,25 b
III-instar	6,43 ±0,32 a	5,51 ±0,31 b
IV-instar	7,63 ±0,37 a	6,44 ±0,36 b
V-instar (male)	8,78 ±0,46 a	7,95 ±0,38 b
V-instar (female)	9,25 ±0,90 a	8,40 ±0,79 b
Nymphal mortality (%)(n=35)		
I-instar	22.86	14.29
II-instar	22.86	14.29
III-instar	17.14	11.43
IV-instar	14.29	8.57
V-instar	11.43	5.71
Nymphs (V-instar) develop into adults (%)	68.25	70.35

Noted : n- The number of eggs (or nymphals); The values followed by the same alphabet in the rows are not significantly different at P<0.05 (ANOVA test)

The development stage of I-instar, II-instar, III-instar, IV-instar, V-instar (male) and V-instar (female) of *C. fuscipennis* reared on *O. furnacalis* were significantly ($p<0.05$) shorter (4,21 ±0,21, 4,56 ±0,25, 5,51 ±0,31, 6,44 ±0,36, 7,95 ±0,38 and 8,40 ±0,79 days respectively) than those reared on *C. cephalonica* (5,42 ±0,25, 5,60 ±0,27, 6,43 ±0,32, 7,63 ±0,37, 8,78 ±0,46 and 9,25 ±0,90 days respectively). The nymphal mortalities of I-instar, II-instar, III-instar, IV-instar, V-instar were lesser (14.29, 14.29, 11.43, 8.57 and 5.71 % respectively) in *O. furnacalis* fed ones, than those observed in *C. cephalonica* fed nymphal instars (22.86, 22.86, 17.14, 14.29 and 11.43 % respectively). The mortality was higher in the early stages of nymphal instars especially in the first and second nymphal instars of both groups. The percentage of nymphs (V-instar) succeeded to develop into adults was 70.35% in *O. furnacalis* fed group while it was only 68.25 % in *C. cephalonica* fed group.

Table 2: The preoviposition period, number of eggs laid and longevity of adult of *C. fuscipennis* reared on two types of prey *Corcyra cephalonica* and *Ostrinia furnacalis.* (Temperature 30 ±2ºC; Humidity 75 ±5%; Photoperiod 12 ±1h)

The biological parameters	*Corcyra cephalonica*	*Ostrinia furnacalis*
Preoviposition period (day) (n= 25)		
Min-Max	5 - 9	4 - 8
Average	7.23 ± 0.48 a	6.06 ± 0.35 b
Number of eggs laid (egg/female) (n= 25)		
Min-Max	71 - 102	6 - 129
Average	80.12 ± 4.29 a	92.80 ± 5.72 b
Longevity of adult (day) (n=25)		
Male		
Min-Max	23 - 47	36 - 88
Average	33.15 ± 3.11 a	63.07 ± 5.28 b
Female		
Min-Max	51 – 99	60 – 118
Average	70.64± 3.34 a	95.67 ± 8.74 b
Life cycle (day)(n=25)	47.60 ± 3.73	40.23 ± 2.21
Sex ratio (M: F)	0.68:1	0.90:1

Noted : n- The number of adult; The values followed by the same alphabet in the rows are not significantly different at $P<0.05$ (ANOVA test)

The preoviposition period of *C. fuscipennis* was significantly ($p< 0.05$) shorter (6.06 ± 0.35 days) in *O. furnacalis* fed group than in *C. cephalonica* fed group (7.23 ± 0.48 days). The number of eggs laid (egg/female) was lesser (80.12 ± 4.29 eggs/female) in *C. cephalonica* fed group than in *O. furnacalis* fed group (92.80 ± 5.72 eggs/female). The adult longevities of males and females *C. fuscipennis* (63.07 ± 5.28 days, 95.67 ± 8.74 days) reared on *O. furnacalis* were significantly ($p<0.05$) fed group longer than in *C. cephalonica* fed group (33.15 ± 3.11 days, 70.64± 3.34 days). The life cycle of *C. fuscipennis* was significantly ($p< 0.05$) shorter (40.23 ± 2.21 days) in *O. furnacalis* fed group than in *C. cephalonica* fed group (47.60 ± 3.73 days) and sex ratio (M: F) was 0.68:1 (*C. cephalonica)* and 0.90:1 (*O. furnacalis*) (Table 2).

In the laboratory under optimal condition (Temperature*:* 26,1 - 30,8 ˚C*;* Humidity*:* 75,6 - 80,5 %), the testing the predatory capacity of nymphal II-instar, III-instar, IV-instar, V-instar and adult of *C. fuscipennis* with preys that are the larvae of 7 species pest insects of order Lepidoptera shows that Table 3. The average predatory capacity of nymph IV-instar, V-instar of *C. fuscipennis* were higher than nymph II-instar, III-instar, and highest was adult. The predatory capacity of nymph (individual/day) in *Anomis flava* (lavae II- instar) fed group of nymph II-instar, III-instar, IV-instar, V-instar, female adult and male adult were 1.39±0.05, 1.45±0.07, 2.53±0.16, 3.00±0.48, 5.37±0.28 and 4.37±0.2.1 individual/day respectively; *Helicoverpa armigera* (Lavae I,II- instar) were 1.68±0.05, 2.45±0.09, 3.63±0.26, 4.34±0.34, 6.1±0.31 and 5.1±0.2.6 individual/day respectively; *Spodoptera litura* (Lavae I,II- instar) were 1.22±0.04, 1.35±0.06, 2.13±0.11, 3.25±0.23, 5.57 ±0.28 and 4.95±0.25 individual/day respectively; *Pieris rapae* (Lavae I,II-instar) were 2.16±0.08, 3.15 ±0.1, 4.03±0.32, 4.57±0.58, 6.34 ±0.34 and 5.91±0.45 individual/day respectively, *Plutella xylostella* were 2.12±0.05, 2.55±0.06, 3.03±0.15, 4.37±0.23, 7.50 ±0.42 and 6.07±0.35 individual/day respectively, *Hedylepta indicata* were 1.09±0.06, 1.56±0.08, 2.01±0.11, 3.30±0.52, 5.30 ±0.28 and 4.36± 0.26 individual/day respectively, *Ostrinia furnacalis* (Lavae I,II- instar) were 1,69 ±0,06, 2,02 ±0,12, 2,47±0,14, 3,75±0,19, 5,91±0,25 and 4.99 ±0.21 individual/day respectively.

Table 3. The predatory capacity of nymphal instars and adult *of C. Fuscipennis.* (Temperature: 26,1 - 30,8 °C; Humidity: 75,6 - 80,5 %)

Preys	Predatory capacity of nymph and adult (individual/day)					
	II-instar	III-instar	IV-instar	V-instar	Adult	
					Female	Male
Anomis flava (Lavae II- instar)	1.39±0.05	1.45±0.07	2.53±0.16	3.00±0.48	5.37±0.28	4.37±0.2.1
Helicoverpa armigera (Lavae I,II instar)	1.68±0.05	2.45±0.09	3.63±0.26	4.34±0.34	6.1±0.31	5.1±0.2.6
Spodoptera litura (Lavae I,II instar)	1.22±0.04	1.35±0.06	2.13±0.11	3.25±0.23	5.57 ±0.28	4.95±0.25
Pieris rapae (Lavae I,II instar)	2.16±0.08	3.15 ±0.1	4.03±0.32	4.57±0.58	6.34 ±0.34	5.91±0.45
Plutella xylostella	2.12±0.05	2.55±0.06	3.03±0.15	4.37±0.23	7.50 ±0.42	6.07±0.35
Hedylepta indicata	1.09±0.06	1.56±0.08	2.01±0.11	3.30±0.52	5.30 ±0.28	4.36± 0.26
Ostrinia furnacalis (Lavae I,II instar)	1,69 ±0,06	2,02 ±0,12	2,47±0,14	3,75±0,19	5,91±0,25	4.99 ±0.21

Noted : The number of nymphal instars n=25

CONCLUSION

In the laboratory under optimal condition (temperature 30±2ºC; humidity 75±5%; photoperiod 12±1h), *C. fuscipennis* reared on *O. furnacalis* developed faster and had longer survival, higher hatchability, lower nymphal mortality, male biased sex ratio and longer adult longevity than in *C. cephalonica* fed group. It suggests that, in mass rearing of *C. fuscipennis* for integrated pest management programmes considerable attention should be given to select the appropriate prey species and *O. furnacalis* could be preferred over *C. cephalonica*

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REFERENCES

Ambrose, D.P. (1999). Assassin Bugs. Science Publishers, Incorporation Enfield, New Hampshire, USA., and Oxford & IBH Publishing Company Private Limited, New Delhi, India, pp. 337.

Ambrose, D.P. (2003). Biological potential of assassin bugs (Hemiptera: Reduviidae). *Journal of Experimental Zoology*, India, **6**(1): 1-44.

George, P.J.E., Seenivasagan, R. and Kannan, S. (1998). Biology and life table studies of Acanthaspis pedestrisStål (Heteroptera: Reduviidae) population on three Lepidoptera insect pest. *Journal of Biological Control*, **12**(1): 1-6.

Weirauch C., (2008). Cladistic analysis of Reduviidae (Heteroptera: Cimicomorpha) based on morphological characters. *Systematic Entomology*, **33**: 229–274.