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Effect of Different Types of Preys on the Bioactivity of the Predator *Sympherobius amicus* Navas (Neuroptera: Hemerobiidae)

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ABSTRACT

The hemerobiid predator *Sympherobius amicus* Navas was recorded in Afrotropical regions in East and Southeast Africa. The predator was also recorded in Palestine in 1943 preying on the citrus mealybug, *Pseudococcus citri* Risso, However, in Egypt there is no record or information about this species. The present work deals with the effect of different types of preys on the bioactivity of this predator under the laboratory conditions of 22.5±° C and 40±6% RH. Results indicated an average progeny of 409.1, 309.7, 203.7 and 162 eggs/ female when reared on the respective preys: the citrus mealybug *P. citri*; flour moth *Ephestia kuehniella* eggs with either a semi artificial diet, or with honey and the aphid *Schizaphis graminum* Rond. Longevity of female was prolonged (41.2 days) when fed on *Ephestia eggs* with semi artificial diet and was shortened (32.6 days) on *P. citri.* Average total developmental periods of male and female of *S. amicus* was significantly shorter (32.9, 33.8 days) on *P. citri* and longer (44.7, 46.6 days) on *S. graminum. P. citri* was the favorite prey of *S. amicus*. Further studies under field conditions are needed to be reliable candidate in programs of integrated pest management against the mealybug, in citrus groves and grape vineyards.

Key Words: *Sympherobius amicus*, *Planococcus citri*, *Ephestia eggs*, *Schizaphis graminum*, Biology.

INTRODUCTION

Sympherobius amicus Navas is a hemerobiid predator recorded in Afrotropical region in East and Southeast Africa (Tjeder, 1961). The predator was recorded in Palestine in 1943 preying on the citrus mealybug, *Pseudococcus citri* Risso, However, in Egypt there is no record or information about this species.

The brown lacewing, *Sympherobius amicus* Navas (Neuroptera: Hemerobiidae) was reared in large numbers and liberated in citrus groves by Bodenheimer and Guttfeld, 1929. The authors reported extremely successful results of rearing this predator in the laboratory. After some tests in the groves, which seemed also to be successful, rearing laboratory for this insect was recommended. Rivnay 1939 liberated *S. amicus* in large numbers to control *Pseudococcus comstocki* Kuw. but the outcome of this attempt was not satisfactory. In 1943, Rivnay studied also the factors in the grove, which do not exist in the laboratory, and hindered the development and reproduction of the predator. The author found that a high mortality of eggs took place when they were exposed to a temperature above 35° C. At 30° C, a mortality of 80% occurred among the larvae of this predator. At a temperature of 35° C, most of the pupae matured but all were wingless and died immediately after molting. Moreover, during the summer months of late June, July and August, the climatic conditions in Palestine were more favorable for the predator to be liberated and reproduce. However, there were some technical difficulties for rearing the predator; first, the regular method of rearing the host (*Pseudococcus citri*) on potato sprouts at certain times of the year is very difficult and second, in order to attain a noticeable benefit from this predator, it must be liberated in large numbers, not less than 100 per tree (Rivnay, 1943).

In this study, *S. amicus* was recorded for the first time in Egypt on infested croton plant; (Gold star), *Codiaeum variegatum* (L.) (Fam. Euphorbiaceae) with the citrus mealybug, *Planococcus citri* (Risso) at Giza region. The present study aimed to shed light on the effect of different types of preys on certain bioactivities of this predator hoping to mass-rear it in the laboratory to be utilized as a bio- control agent.

MATERIALS AND METHODS

Initial sources of the mealybug, *P. citri* and its associated predatory larvae *S. amicus* were obtained from infested croton ornamental plants; at Giza region. *P. citri* and *S. amicus* were cultured on sprouting potato tubers until emergence of predator adults under laboratory conditions of 22.5±1° C and 40±6% RH.

To study the effect of prey species; *P. citri*, *Ephestia* eggs and the aphid; *Schizaphis graminum* on the durations of immature stages of the predator, newly emerged adults were confined in glass tubes (15 cm long and 3 cm diameter), covered with black fine muslin for mating and egg deposition. Isolated eggs were

confined separately in similar glass tubes and the newly hatched larvae were provided with sufficient amount of one of the three investigated preys till emergence of adults. Twenty replicates were used for each feeding case.

To study the effect of prey species on the number of deposited eggs, periods for deposition and adult longevity, each couple of the newly emerged predator was confined in the glass tubes with a sufficient amount of the investigated preys; *P.citri, S. graminum, Ephestia* eggs with droplets of honey and *Ephestia* eggs with semi artificial diet (The semi artificial diet was prepared and descried by El Arnaouty *et al.* 2001).

Each couple of the predator was transferred three times per week to a new tube, provided with a sufficient amount of tested preys till death. Deposited eggs were counted in each case of feeding. Ovipsntional periods and longevity of males and females were estimated. Ten replicates were used for each feeding case.

Statistical analysis: One way ANOVA was performed to analyze obtained data.

RESULTS AND DISCUSSION

1. Effect of prey species on the duration of immature stages:

1-a. Egg stage:

Mated females lay non stalked eggs, usually singly or in small groups of 2 to 20 eggs/cluster. Colour of eggs was affected by the type of prey; eggs were white in case of the preys *P. citri* and *Ephestia* eggs (Fig. 1A), while they were yellow in case of the aphid *S. graminum* (Fig.1B). Incubation period in the rearing room ranged from 7.0±0.40 to 7.3±0.64 days (Tables 1& 2).

1-b. Larval stage:

The predator had three larval instars; the first instar was active and run fast; moving the head from side to side when it moves. Smith (1923) came to similar information.

Data, (Table 1 and 2) show that, the male and female larval durations were affected by different types of preys. The shortest duration periods 12.6±1.91 and 12.7±0.09 days, were reported for males and females associated with the prey, *P. citri*; respectively. However, the longest corresponding periods 22.3±1.63 and 23.2±1.17 days were reported with the aphid, *S. graminum*;. Statistical analysis showed highly significant differences among the larval durations at the different types of preys.

1-c. Pre- and pupal stage:

Durations of male pre-and pupal stages combined (Table 1) were 13.1±2.43, 15.2±0.87 and 15.3±1.1 days on the respective preys; *P.citri, Ephestia* eggs and *S. graminum*. Statistical analysis showed insignificant differences among records of *S. graminum* (15.3±1.1 days) and *Ephistia* eggs (15.2±0.87 days), but there was significant difference between records reported for *P. citri* (13.1±2.43 days) and both of the previous two preys. On the other hand, the durations of female pre- and pupal stages combined (Table 2) were 13.8±1.89, 14.8±0.87 and

Table (1): Effect of the type of prey on the durations of the male developmental stage of *Sympherobius amicus* at 22.5±°C and 40±6% RH.

	Duration of developmental stages of *S. amicus*	Type of prey			F-value	LSD 5%
		Schizaphis graminum	*Ephestia* eggs	*Planococcus citri*		
Male	Incubation period of eggs	7.0±0.63[a]	7.2±0.4[a]	7.0±0.63[a]	0.38	0.55
	Larval duration	22.3±1.63[a]	15.2±1.6[b]	12.6±1.91[c]	79.06**	1.64
	Pre and Pupal durations	15.3±1.1[a]	15.2±0.87[a]	13.1±2.43[b]	5.3*	1.57
	Total developmental period	44.7±1.19[a]	37.5±1.86[b]	32.9±3.45[c]	57.02**	2.29

Means have the same letters in the row are not significantly different at 0.05 % prob.

Table (2): Effect of the type of prey on the duration of the female developmental stage of *Sympherobius amicus* at 22.5±°C and 40±6% RH.

	Duration of developmental stages of *S. amicus*	Type of prey			F-value	LSD 5%
		Schizaphis graminum	*Ephestia* eggs	*Planococcus citri*		
Female	Incubation period of eggs	7.2±0.75[a]	7.2± 0.4[a]	7.3±0.64[a]	0.08	0.6
	Larval duration	23.2±1.17[a]	14±1.79[b]	12.7±0.09[c]	164.73**	1.29
	Pre and Pupal durations	16.2± 0.87[a]	14.8±0.87[b]	13.8±1.89[b]	7.72*	1.26
	Total developmental period	46.6±1.2[a]	36.0±2.49[b]	33.8±2.23[c]	100.37**	1.98

Means have the same letters in the row are not significantly different at 0.05 % prob.

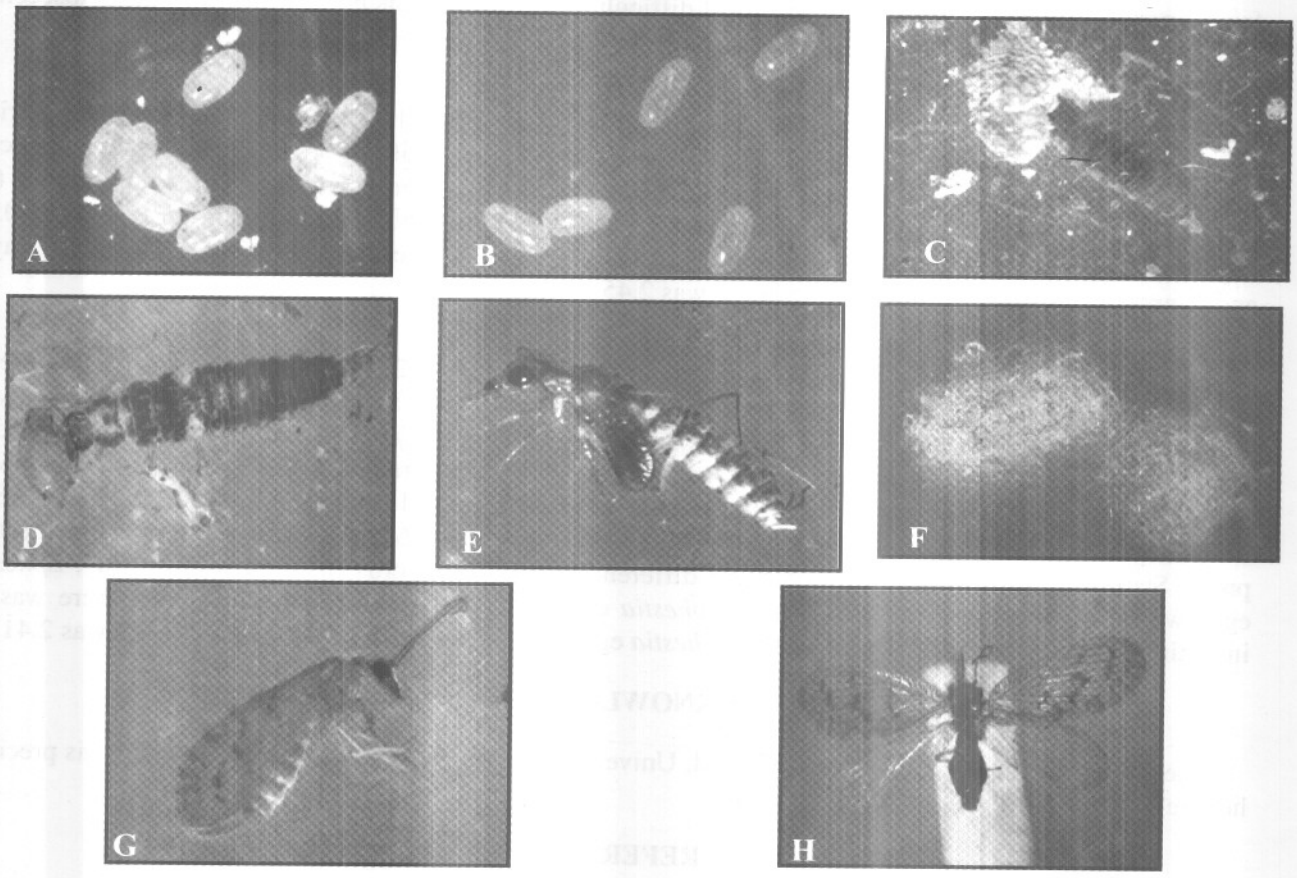

Fig.(1): The predator *Sympherobius amicus*; **A**- Deposited white eggs with the prey *P. citri*, **B**- Deposited yellow eggs with the prey *S. graminum*, **C**- Larva feeds on *P. citri*, **D**- Larva attacks and feeds on the aphid (*S. graminum*), **E**- Mature pupa, **F**- A prepupa in its cocoon, **G** and **H**- Female of the predator.

16.2±0.87 days on the respective preys; *P. citri*, *Ephestia eggs* and *S. graminum*. Statistical analysis showed insignificant differences between records reported for the preys *P.citri* and *Ephestia* eggs while, there was a significant difference between records of *S. graminum* and each of the two previous preys.

1-d. Total developmental period:

Data, in table (1) show that, the average total developmental periods of males were 44.7±1.19, 37.5±1.89 and 32.9±3.45 days in association with the preys; *S. graminum*, *Ephestia* eggs and *P. citri*. Statistical analysis showed highly significant differences among records reported for the different preys.

For females (Table 2), the same results were obtained; the longest duration (46.6±1.2 days) was recorded for the prey *S. graminum* while the shortest period (33.8±2.23 days) was reported for *P. citri*. In this concern, Smith (1923) mentioned that, the life history of *Sympherobius amiculus* Fitch. was 9.15 days for eggs, 22.2 days for larva and 10.01 days for pre- and pupal stage under the laboratory conditions. The total developmental period was 40 days. Laboratory conditions were not mentioned in his research.

2. Effect of prey species on the number of deposited eggs:

Data, showed an obvious effect of the type of preys on the mean number of deposited eggs of the predator female. At the four tested types of preys; *P. citri, Ephestia* with semi artificial diet, *Ephestia* eggs with honey and *S. graminum*, the average mean numbers of deposited eggs were in respective 409.1±83.68, 309.7±73.53, 203.7±18.46 and 162 v 31.66 eggs per female. Statistical analysis showed highly significant differences among records (LSD 0.5% was 56.06), except between *Ephestia* eggs with honey and *S. graminum*.

Data indicated that the mean numbers of deposited eggs increased by adding droplets of semi artificial diet to *Ephestia* eggs compared to *Ephestia* eggs with honey. Thus, for rearing this predator in the laboratory, and in case of the scarcity of the preferable prey *P. citri*, *Ephestia* eggs with semi artificial diet could be recommended for feeding the adults of *S. amicus*.

Rivnay, 1943 studied the efficacy of *S. amicus* for controlling *P. citri* on citrus in Palestine and mentioned that during the summer months of late June, July and August, the climatic conditions were more favorable

for the predator, but there were some technical difficulties for rearing this predator, owing to the absecence of the laboratory host, potato sprouts at that time of the year

3. Effect of the type of preys on ovipositional periods:

Data showed that, the average ovipositional period was affected by the type of prey. The shortest period was recorded by *P. citri* (28.8± 3.82 days) while the longest one was with *Ephestia* eggs with semi artificial diet (37.2 ±2.86 days). Statistical analysis showed insignificant differences among records reported for the preys; *Ephestia* eggs with semi artificial diet (37.2 ±2.86 days) and *Ephestia* eggs with honey (32.6 ± 0.92 days), but there was significant differences between each of them and each of *P. citri* (28.8 ± 3.82 days) and *S. graminum* (31.8 ± 0.92 days) (LSD 5% was 2.45).

4. Effect of the type of prey on longevity of adults:

Longevity of adult male was 32±3.69, 36.2±6.48, 35.2±2.4 and 36.2±1.89 days on the respective preys; *P citri*, *Ephestia* eggs with semi artificial diet, *Ephestia* eggs with hony and *S. graminum*. Statistical analysis showed significant differences among records of *P. citri* and each of *Ephestia eggs* with semi artificial diet and *S. graminum*. There was an insignificant difference between records of *P.citri* and *Ephestia eggs* with hony and also between *Ephestia* eggs with semi artificial diet and *S. graminum* (LSD5% was 3.85). Longevity of adult female was 32.6±3.58, 41.2±2.86, 36.6±0.92 and 36.2±1.89 days on the same respective preys. Statistical analysis showed significant differences between records reported with *P. citri*, *Ephestia* eggs with semi artificial diet and each of *Ephestia* eggs with hony and *S. graminum*, but, there was an insignificant difference between records of *Ephestia* eggs with hony and *S. graminum* (LSD 5% was 2.41).

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REFERENCES

Bodenheimer, F. S. and Guttfeld, M. 1929. Über die Möglichkeiten einer biologishen Bekämpfung von *Pseudococcus citri* Risso in Palestine. Zeitsch. f. ang. Ent., pp. 67-136.

Rivnay, E. 1939. Studies on the biology and control of *Pseudococcus comstocki* on Citrus in Palestine. Hadar., 12, 7.

Rivnay, E. 1943. A study of the efficiency of *Sympherobius amicus* Navas for controlling *Pseudococcus citri* Risso on citrus in Palestine. Bull. Soc. Fouad 1er Ent., 27, 57-77.

El-Arnaouty, S. A.; Neven M. A. Gaber and Tawfik, M. F. S. 2001. Development and fecundity of *Chrysoperla carnea* (Chrysopidae: Nuroptera) in relation to feeding on different diets. J. Agric. Sci. Mansoura Univ., 26(7): 4567– 4573.

Smith, R. C. 1923.The life histories and stages of some hemerobiids, and allied species. Ann. Ent. Soc. America, 16, 129-151.

Tjeder, B. 1961. The Lace-wings of Southern Africa. 4 family Hemerobiidae. South African Animal Life, 8, 26-48.

الملخص العربى

تأثير الفرائس المختلفة على الانشطة الحيوية للمفترس *Sympherobius amicus* Navas (Neuroptera: Hemerobiidae)

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سُجل تواجد المفترس *Sympherobius amicus* فى الشرق والجنوب الشرقى من افريقيا كما سجل كمفترس على بق الموالح الدقيقي فى فلسطين بينما لم يسجل هذا المفترس فى مصر من قبل ولايوجد اى دراسات سابقة عليه. اهتم البحث بدراسة تأثير الفرائس المختلفة على الأنشطة الحيوية لهذا المفترس تحت الظروف المعملية على درجة الحرارة ٢٢,٥ ± ١° م والرطوبة النسبية ٤٠ ± ٦%. وقد اوضحت النتائج تأثير نوع الفريسة على عدد البيض الذى تضعة الأنثى حيث قدرت بـ ٤٠٩,١ ، ٣٠٩,٧ ، ٢٠٣,٧ و ١٦٢ بيضة للأنثى عندما تغذت على الفرائس الأتية بالترتيب: بق الموالح الدقيقى، بيض الافستيا مضاف لة نقط من بيئة نصف صناعية ، بيض الافيستيا مضاف لة نقط من عسل النحل و مَنّ القمح. تأثر طول عمر الأنثى بنوع الفريسة حيث طال عمر الأنثى (٤١,٢ يوم) عندما تغذت على بيض الافيستيا مضاف اليه البيئة نصف الصناعية وقصر (٣٢,٦ يوم) عندما تغذت على بق الموالح الدقيقى. تأثر ت فترة النمو الكلية من البيضة الى خروج الحشرة الكاملة بنوع الفريسة فسجلت أقصر فترة (٣٣,٨ يوم) على بق الموالح الدقيقى في حين سجلت أطول فتره (٤٦,٦ يوم) على المَنّ. يتضح من نتائج هذا البحث ان بق الموالح الدقيقى يعتبر من الفرائس المثلى المفضله لتربية المفترس بأعداد كبيرة معمليا وإمكانية استخدامه في برامج المكافحة المتكاملة لمكافحة بق الموالح الدقيقى فى مزارع الموالح وبق العنب الدقيقى في مزارع العنب.