

## HOST PREFERENCE OF THE ECTOPARASITOID, *EPYRIS QUINQUECARINATUS* KIEFFER (BETHYLIDAE: HYMENOPTERA) ON CERTAIN MAIZE LEPIDOPTEROUS LARVAE

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### ABSTRACT

The present study was carried out in Plant Protection Department laboratory, Fac. of Agric., Fayoum Univ. and conducted under the optimum laboratory conditions of  $27 \pm 1^\circ\text{C}$  and  $57.7 \pm 5\%$  R.H. The parasitoid, *Epyris quinquecarinatus* Kieffer was reared on larvae of each of *Pyroderces simplex* Wlsm., *Cryptoplabe gnidiella* Mill., *Gymnoscelis pumilata* Hb. and *Sesamia cretica* Led.. This bethylid parasitoid preferred larvae of *P. simplex* then *G. pumilata* larvae, while the larvae of *C. gnidiella* and *S. cretica* appeared as unsuitable hosts.

**Keywords:** Insect pests of maize, *Biological studies*, *Epyris quinquecarinatus*, and host preference.

### INTRODUCTION

Maize (*zea mays* L.) is an important grain crops in Egypt, where it conforms to wheat in the economic importance. Such crop is cultivated in multiplantations thorough out along a period extending from March to October and attacked with several insect pests (Mostafa, 1981; Mostafa *et al.*, 1986 and Davis and Pedigo, 1991 )

As far as the authors are aware, no records are available in the literatures concerning biology of this bethylid parasitoid *Epyris quinquecarinatus* Kieffer. Only Abd-Elgayed (1995) recorded this parasitoid and its host, *Pyroderces simplex* Wlsm. He found the optimum conditions for rearing this parasitoid on larvae of *P. simplex* were  $27 \pm 1^\circ\text{C}$  and  $57.7 \pm 5\%$  R.H. The longest periods of oviposition (44.6 days) and adult longevity (48.8 days for female & 15.8 days for male ) were coincided with the highest counts of egg deposition / female (129.8) and rate of deposition / ♀/ day (2.92 eggs). Also, Lanes and Azevedo (2004) recorded sixty species from Bethylidae in Florida and the same authors (2008) recorded some species belong to sub family (Epyrinae) in Denmark Azevedo and Alencar (2010) recorded *Melanepyrus asiaticus* Kieffer in Brazil

Although conventional pesticides application has been effective for the majority of the pests, many of these toxic chemicals are expensive and may be persistent in the environment. Therefore, it was necessary to apply biological pest management using natural enemies that have been registered to be ecologically safe and risk free ( Fayad *et al.*, 1984; El- Sherif, *et al.*, 1987 and Abd-Ella, 1990).

However, studies on natural enemies associated with maize insect pest in Egypt are still in lack. Therefore, the present experiment was concerned to study the following aspects: Host preference of the parasitoid, *E. quinquecarinatus* Kieffer on some maize insect pests under the optimum laboratory condition.

## **MATERIALS AND METHODS**

To study the host preference of *E. quinquecarinatus* on some lepidopterous larvae for maize insect pests, its biological aspects were conducted under the optimum laboratory conditions of  $27 \pm 1^\circ\text{C}$  and  $57.7 \pm 5\%$  R.H. in Plant Protection Department, Fac. of Agric., Fayoum Univ. The relative humidity was maintained by using saturated solution of sodium bromide hydrated (Soliman, 1940)

### **A. Stock culture:**

#### **1-Hosts:**

The biological aspects were experimented on four species of lepidopterous larvae as shown in Table (1).

**Table (1): The hosts and larval instars were used for rearing *E. quinquecarinatus*.**

<b>Host</b>	<b>Family</b>	<b>Instar</b>
<i>Cryptoplabe gnidiella</i> Mill.	Pyralidae	fourth
<i>Gymnoscelis pumilata</i> Hb.	Geometridae	
<i>Pyroderces simplex</i> Wlsm.	Cosmopterigidae	
<i>Sesamia cretica</i> Led.	Noctuidae	second

Mature larvae of each species were collected from the infested young plants (for *S. cretica*) or ears by using a fine hair brush. Such species were introduced in plastic cages of 15x10x8 cm, provided with small pieces of young corn ear. Such cages were observed daily until the adult emergence. Pairs of newly moths (each one male + one female) were confined in chimney glasses (9 cm diameter + 14 cm height) covered with muslin. Each cage was provided with small pieces of maize ear (as an oviposition site) and wetted cotton piece for providing humidity and adult nourishment. These cages were inspected daily for renewing the pieces of maize ears and transferred into Petri dishes (10cm) as needed until pupation.

#### **2- The parasitoid, *E. quinquecarinatus***

A stock culture of this parasitoid, was begun with collected immature stages associated with larvae of *P. simplex* from maize fields. Parasitized hosts were introduced in Petri dishes of 10 cm diameter and incubated until emergence of the parasitoid adults. Such adults were confined as couples in Petri dishes of 5 cm diameter, provided with corrugated filter papers and 10 host larvae in 4<sup>th</sup> instars. These dishes were inspected daily and transferred the parasitized larvae in another dishes and then were incubated as before.

### **B. Biological aspects on the hosts :**

To study the host preference of *E. quinquecarinatus*, 10 couples of newly emerged adults collected from the stock culture, were confined in a Petri dish of 5 cm diameter, provided with 4 larvae ( for each host ) and droplets of a 10 % sugar solution for adult feeding, this unit represented one replicate. The fourth larval instar was used with, *P. simplex*, *C. ginidella*, and *G. pumilatta* while, the second instar was used with *S. cretica*. Ten replicates were used and examined daily for renewing parasitized hosts. Periods of pre-oviposition, oviposition, post oviposition and adult longevity were recorded in addition to deposited eggs/ female were daily counted. Parasitized larvae were transferred to another dishes then kept under the same laboratory condition in order to determine durations of the immature stages, mortality percentages and sex ratio.

### **C. Statistical analysis:**

The obtained data in all previous experiments were statistically analyzed by New L.S.D. and calculated the standard error for biological studies according to Senedecor and Cochran (1980 ).

## **RESULTS AND DISCUSSION**

### **A. Biological aspects:**

The pethylid parasitoid, *E. quinquecarinatus* was recorded as an ectoparasitoid on several caterpillar pests in maize field including, *P. simplex* Wlsm., *C. ginidella* Mill., *G. pumilatta* Hb. and *S. cretica* Led.. However, few available reviews were recorded about the biology of this parasitoid. Therefore, the present study was initiated to evaluate its host preference on different lepidopterous larvae.

#### **1. Immature stages:**

Data summarized in table (2) indicated that, the incubation period of *E. quinquecarinatus* eggs not affected by hosts and ranged 1-2 with an average between 1.3 to 1.4 days with insignificant differences then. Percentages of hatching recorded 96.1, 95.2, 95.2, and 90.2 on; *P. simplex*, *C. ginidella*, *G. pumilatta* and *S. cretica*, respectively.

The larval duration showed significant differences between the hosts. Therefore, the lowest period was 3.2 days on *P. simplex* larvae but, the longest periods were 4.2, 4.1 and 4.1 days on, *C. ginidella*, *G. pumilatta* and *S. cretica* larvae respectively, . The mortalities in the parasitoid larvae increased gradually to 13.2, 16.3, 18.3, and 20.2 % related with *P. simplex*, *G. pumilatta*, *C. ginidella*, and *S. cretica* as insect hosts, respectively (Table 2).

Data represented in table (2) indicated that, the periods of pupal stage ranged 4-6 days and averaged 4.3 days (*P. simplex*) and 5.2 days (*S. cretica*). The percentages of mortalities had a similar, 5.1 % with *P. simplex* (lowest value) and 29.9 % with *S. cretica* (highest value) with significant differences.

**Table (2): Durations (days) of *E. quinquecarinatus* immature stages recorded on different hosts of lepidopterous larvae.**

Stage	Insect hosts				New L.S.D.
	<i>P. simplex</i>	<i>G. pumilatta</i>	<i>C. ginidella</i>	<i>S. cretica</i>	
Incubation period	1-2	1-2	1-2	1.2	0.4
	1.4 ± 0.2 a	1.4 ± 0.1 a	1.3 ± 0.1 a	1.4 ± 0.1 a	
% Mortality	3.9	4.8	4.8	9.8	
% Hatching	96.1	95.2	95.2	90.2	
Larval stage	3-4	4-5	4-6	4-5	0.5
	3.2 ± 0.1 a	4.1 ± 0.1 b	4.2 ± 0.2 b	4.1 ± 0.1 b	
% Mortality	13.2	16.3	18.3	20.2	
pupal stage	4-5	4-6	4-5	4-5	0.2
	4.3 ± 0.2 a	5.2 ± 0.1 c	5.0 ± 0.1 b	5.2 ± 0.2 c	
% Mortality	5.1	17.2	22.2	29.9	
Total immature stages	8-11	9-11	9-12	9-12	0.7
	8.9 ± 0.3 a	10.7 ± 0.3 b	10.4 ± 0.2 b	11.8 ± 0.1 c	
% Mortality	19.2	37.2	44.7	59.1	
Sex ratio (♀:♂)	1 : 1.5	1 : 1.5	1 : 2.3	1 : 2.5	

The total developmental period, averaged; 8.9, 10.4, 10.7 and 11.8 days on the larvae of *P. simplex*, *C. ginidella*, *G. pumilatta* and *S. cretica*, respectively. Also, the mortality percentages values increased gradually from 19.2 % with *P. simplex* to 59.1 % with *S. cretica* larvae as insect hosts.

Generally, the lowest periods of immature stages, coincided with the lowest mortality were recorded at *P. simplex*, then *G. pumilatta* and *C. ginidell*. On the other hand the highest periods and mortalities were recorded at larvae of *S. cretica*

( table, 2).

At all tested hosts, males outnumbered females. These values recorded 1 : 1.5 for *P. simplex* and *G. pumilatta* and (1: 2.3 & 1: 2.5) in the other two hosts.

## 2. Adult stage:

As shown in table (3), at all the tested hosts, *E. quinquecarinatus* female passed through an obvious pre-oviposition period and averaged between 2.2 – 4.1 days. On the other hand, the longest oviposition period was 41.6 days in case of *P. simplex* with significantly different about the different hosts.

Data illustrated in table (3) showed that, the adult longevity of female ranged between 40.9 and 45.7 days with insignificant differences in *P. simplex* and *G. pumilatta* and decreased from 18.3 to 17.1 days with *C. ginidella* and *S. cretica*, respectively.

Also, the male adult longevity showed the same trend with the different hosts and averaged between 5.1 and 14.2 days.

At all hosts, the females were survived about two weeks and laying eggs. The females that reared on larvae of *P. simplex* were survived about 7 weeks and laying an average of 113.7 eggs / female, then *G. pumilatta* (about 6 weeks), 81.35 eggs / female. But, female of the parasitoid were died after the 14.0 days in *C. ginidella* and after about 12 days only association with *S. cretica* larvae.

**Table (3): Effect of different hosts on the ovipositional periods and egg laying activity of *E. quinquecarinatus*.**

Duration (days)	Insect hosts				New L.S.D.
	<i>P. simplex</i>	<i>G. pumilatta</i>	<i>C. ginidella</i>	<i>S. cretica</i>	
Pre-oviposition	2-4	2-3	3-6	3-5	
	2.2 ±0.4 a	3.1 ±0.1 b	4.1 ±0.2 c	4.1 ± 0.2 c	0.9
Oviposition	34-49	30-36	13-22	10-13	
	4.6 ±1.0 c	35.1 ± 0.1 b	15.3 ±0.8 a	12.2 ±0.1 a	6.5
Post oviposition	1-3	1-2	0-1	0-1	
	1.7 ±0.3 b	1.3 ±0.1 b	0.3 ±0.1 a	0.2 ±0.7 a	0.4
Adult longevity ♂	40-53	38-50	17-20	15-18	
	45.5 ±1.0 b	39.5 ±1.0 b	19.7 ± 0.5 a	16.5±0.2 a	5.2
Adult longevity ♀	14-21	11-16	5-7	5-6	
	14.2 ±1.0 b	11.6 ± 0.6 b	6.1 ±0.1 a	5.1 ±0.1 a	3.2
Total eggs /♀	111-123	61-92	8-23	11-13	
	113.6 ±2.2 c	81.3 ±5.1 b	19.0 ± 2.8 a	12.2 ±0.2 a	9.2
Eggs / ♀ /day	2.2-2.9	2.3-2.3	0.4-1.9	0.9-1.1	
	2.7 ± 0.1 c	2.3 ± 0.1 b	1.2 ± 0.2 a	1.0 ± 0.1 a	0.3

As mentioned data in table (3), the bethylid parasitoid preferred larvae of *P. simplex* then *G. pumilatta* larvae, but the larvae of *C. ginidella* and *S. cretica* were unsuitable hosts for this parasitoid.

These results are in agreement with Abd-Elgyed (1995), found the periods of *E. quinquecarinatus* immature stages were 1.40, 3.20, and 4.80 days for eggs, larvae and pupa, at 27 ± 1°C and 57.7 ± 5 % R.H., respectively, association with the lowest percentages of mortality and sex ratio 1: 1.50. The respective oviposition period, female longevity, and total deposited eggs were 44.60, 48.80 days and 129.80 egg/female, respectively.

## REFERENCES

- Abd-El-Gayed, A. A. (1995). Studies on some maize insect pests and their natural enemies, M.Sc. Thesis, Fayoum Fac. of Agric., Cairo Univ., pp.105-117.
- Abd-Ella, M.M.H. (1990). Effect of different temperatures and hosts on certain biological aspects of *Bracon brevicornis* Wesm. (Hymenoptera: Braconidae), Fayoum, J. Agric. Res. & Dev., 4(1): 89-102.
- Azevedo, C.O. and Alencar, I.D.C.C. (2010). Rediscovery of *Melanepyrus* (Hymenoptera: Bethliidae) a new synonym of *Egyris*, *Zoologia* 27(3):403-407.
- Davis, P.M. and Pedigo L.P. (1991). Injury profiles and yield responses of seedling corn attacked by stalk borer (Lepidoptera: Noctuidae) *J. Econ Entomol.*, 84(1): 294-299.

- El-Sherif, S.I.; Mostafa, F.F.; Zaki, F.N. and Saleh M.E. (1987). Biocontrol studies on corn borers in Egypt: 2-parasitism on *Ostrinia nubilalis* Hbn. (Pyraustidae: Lepidoptera) in maize field, Bull. Fac. of Agric., Cairo Univ., 38(2): 551-557.
- Fayad, Y.H.; Amira A. Ibrahim and Lutfallah, A.f (1984). *Bracon brevicornis* abraconid parasite on European corn borer, *Ostrinia nubilalis* Hbn., Agric., Res. Rev., 62(1):355-360.
- Lanes, G.O. and Azevedo, C.O. (2008). Phylogeny and taxonomy of sclerodermini (Hymenoptera: Bethliidae: Epyrinae), Insect Systematic and Evolution, 39(1): 55-86.
- Lanes, G.O. and Azevedo, C.O. (2008). Report on a collection of Bethylidae (Hymenoptera) from central Florida USA, with description of a new species of lepidosternopsis Ogloblin, J of Hymenopter research, 13(1):57-63.
- Mostafa, F.F. (1981). Biological and ecological studies on the pink borer, *Sesamia cretica* Led. (Noctuidae: Lepidoptera) Ph.D. Thesis, Fac. of Agric., Cairo Univ.
- Mostafa, F.F. and Kirillos, J.Y.(1986). Host preference and biological aspects of the looper worm, *Gymnoscelis pumilata* Huebner (Geometridae: Lepidoptera), Fabis Newsletter, 16: 29-31.
- Senedecor, G.W. and Cochran, W. G.(1980). Statistical methods, 7<sup>th</sup> Ed. 570 pp., Iowa Stat., Univ. Press., Ames, Iowa, USA.
- Soliman, H.S.(1940). Studies on the biology of *Microbracon hebetor* Say. (Hymenoptera: Braconidae), Bull. Soc. Fouad 1<sup>st</sup> ent., 24: 215-247.

**التفضيل العوائلى للطفيل الخارجى ايبيرس كونكيوكورناتس ( غشائية الأجنحة : بزيليدى ) على بعض يرقات الذرة الحرشفية.**

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تم إجراء هذه الدراسة لدراسة التفضيل العوائلى والملاحظات البيولوجية لطفيل الايبيرس كونكيوكورناتس فى معمل وقاية النبات بكلية الزراعة جامعة الفيوم . تحت الظروف المثلى وهى درجات حرارة  $27 \pm 1$  م° و  $57.7 \pm 5$ % رطوبة نسبية وتم تربية الطفيل على يرقات اربعة افات حشرية من رتبة حرشفية الاجنحة وهى : دودة الكربتوبلابس و دودة الذرة القياسة و دودة الذرة القرنفلية و دودة القصب الكبيرة ولقد اظهرت النتائج التى تم الحصول عليها الاتى .  
أن هذا الطفيل يفضل يرقات العمر الرابع لكل من دودة الذرة القرنفلية و دودة الذرة القياسة على التوالى بينما لايفضل يرقات كلا من دودة القصب الكبيرة ودودة الكربتوبلابس.

**قام بتحكيم البحث**

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