

ECOLOGICAL AND BIOLOGICAL STUDIES ON THE ICHNEUMONID LARVAL PARASITOID, *Sinophorus xanthostomus* GRAV. AS A NEW RECORD IN EGYPT ON THE LARVAE OF CABBAGE BUTTERFLY, *Pieris rapae* L.

Awadalla, S.S.¹; L.M. Shanab¹; M.E. El-Nagar² and Samia M. Abo Zeid²

1- Economic Entomology Dept., Fac. of Agric., Mansoura Univ.

2- Plant Protection Institute. Dokki, Giza.

ABSTRACT

During an ecological and biological study on the cabbage butterfly, *Pieris rapae* L., an ichneumonid parasitoid (*Sinophorus xanthostomus* Grav.) was found parasitizing in the larva of the insect on the tested cruciferous plants (cabbage-cauliflower and canola). This finding is a first record in Egypt for this parasitoid on the target insect (*P. rapae*).

The larval parasitoid was found from December to February. The percentage of parasitism in the first season of study reached 40, 44 and 20 % at the 25th of January 2005 on cabbage, cauliflower and canola, respectively, while in the second season of study the peak of this parasitoid in the host larvae on 13th of January 2006 was 48, 44 and 30 %, on the same host plants, respectively.

Some biological aspects of this parasitoid were also studied under laboratory conditions (20±2 C° and 75±5 % R.H.). The egg larval stage duration was 20.5±0.45 days, the pupal stage duration 10.75±0.25 days, the mating duration lasted 15.80±0.24 minutes, male longevity 18.25±0.31 days, female longevity 17.26±0.27 days and sex ratio was 2.90±0.19 : 1 female / male.

INTRODUCTION

The cauliflower crops, Cabbage, Cauliflower and Canola are cultivated with the aim of using leaves of the first, the flower buds of the second or the seeds as a human foods of the third during the various seasons. The small cabbage white butterfly, *Pieris rapae* L. is one of the most serious insect pests which infests cruciferous vegetables (Abo- Aiana, 1985).

The larval parasitoid, *Sinophorus xanthostomus* Grav. was recorded parasitizing on the larvae of the cabbage butterfly *P. rapae* for the first time in Egypt.

Several authors in different countries have studied the role of other species of genus *Sinophorus* attacking the insect pests such as Kolk (1982) in Poland, *S. ramidulus* and *S. crassifemur* on *Rhyaciona buoliana*; Martinek (1988) in Czechoslovakia, *S. crassifemur* on *Cephalica abietis*; Pavuk and Stinner (1991) in USA, *S. alipalus* on *Ostrinia nubilalis*; Tsankov and Stalev (1993) in Bulgaria, *S. alipalus* on *R. buoliana*; Kuppusany and Kannan (1994), *S. psycheae* on *Eumeta cramerii*; Cagan and Bokor (1998) in Slovakia Czech Republic, *S. turionus* on *O. nubilalis*.

The aim of the present work is to study the seasonal activity (percentage of parasitism) of this parasitoid in different cruciferous crops and to throw some light on the biological aspects on this larval parasitoid *S. xanthostomus*.

MATERIALS AND METHODS

The present experiments were carried out during 2004/05 and 2005/06 growing seasons in Kom – Sherek district, Kom – Hamada, EL-Behera governorate, to study the seasonal activity (percentage of parasitism) on its host (the larvae of *Pieris rapae*) on cabbage (*Brassica oleraceae* L.), cauliflower (*Brassica caulifolia* L.) and Canola (*Brassica napus* L.). About one fourth feddan was divided to three plots about 350 m² each. The plot was subdivided to five replicates, 70 m² each and the host plants were planted in the third week of September in the two years of study. Normal agricultural practices were followed and the chemical control was neglected. Samples were taken weekly and started one week after planting .

Seasonal activity of the parasitoid (parasitism percentage):

The larvae of *P. rapae* collected weekly from cabbage and canola fields were transferred to the laboratory. Twenty five larvae were collected randomly from cabbage and cauliflower fields but ten larvae only were collected from canola because of the low population on this host plant. Larvae were distributed into Petri dishes (15 cm in diameter), where each one contained five larvae that fed daily on fresh leaves of the tested host plants (cabbage, cauliflower and canola). Larvae were inspected daily, supplied with fresh food and any larvae exhibited any sign of being parasitized or seemed to be abnormal were isolated in a sterilized glass tube and provided with food until the discovery of the responsible factor. The emerged parasitoids were identified, counted and the percentages of parasitism were calculated.

All the isolated parasitoids were identified in the Department of Insect Classification & Identification (Agric. Res. Center), Egypt.

The percentage of parasitism (Par. %) was calculated as follows :-

$$\text{Par. \%} = \frac{\text{Np}}{\text{T}} \times 100$$

Where Np = Number of parasitized larvae.

T = Total number of larvae.

-Some biological aspects of the parasitoid :-

The tested parasitoid *S. xanthostomus* was collected from the *P. rapae* larvae found on cabbage leaves. The parasitized larvae were kept in Petri dishes (10 cm diameter) under laboratory conditions of 20 ± 2C° and 75 ± 5 % R.H. till the emergence of the adult parasitoid.

A Culture of the parasitoid was started by introducing newly emerged pairs of parasitoid adults (male and female) into Petri dishes contained larvae of *P. rapae* (in the third instar). The insect larvae provided with fresh leaves of cabbage as source of food and a piece of cotton wool moistened with 10 % honey solution was put in every Petri dish to serve as a parasitoid food. Ten pairs of the parasitoid were used as replicates. The exposed larvae were examined by using a binocular microscope. Every 24h., the larvae were

removed and renewed by fresh larvae of the host until the death of the parasitoid adults . Egg – larval stage was recorded, pupal stage were also calculated. The longevities of males and females of the parasitoid were determined. Mating time and sex ratios were also estimated.

RESULTS AND DISCUSSION

-Seasonal activity of the parasitoid (percentage of parasitism) :-

Results obtained in this study indicated that *P. rapae* larvae were attacked under field conditions by the Ichneumonid parasitoid, *S. xanthostomus*. which considers a first record in Egypt on this insect host larvae:-

The seasonal activity of this parasitoid (the percentage of parasitism) was illustrated in Fig. (1), in the first season 2004 / 05 on different cruciferous plants. This parasitoid started to appear in larvae of *P. rapae* on the tested host plants on the 28th of December 2004. The percentage of parasitism increased gradually to reach its peak (44, 40 and 20 %) on the 25th of January 2005, on cabbage, cauliflower and canola respectively.

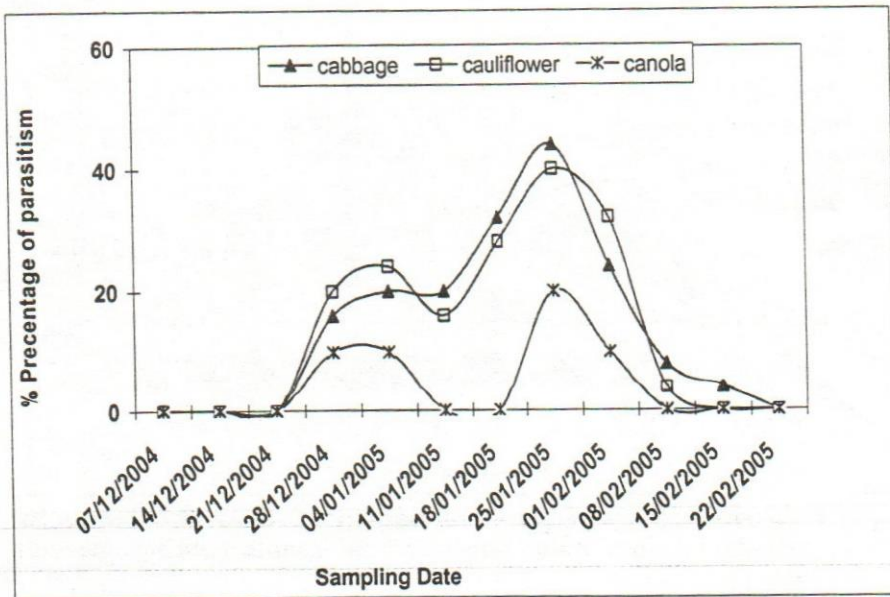


Fig (1): Seasonal activity of the larval parasitoid, *S. xanthostomus* (% parasitism) on some cruciferous plants during season 2004/05.

Data presented in (Table, 1) showed the monthly percentage of parasitism of the larval parasitoid on different host plants during season 2004 / 05. It can be noticed that the highest percentages of parasitism were 29.0 ± 10.0 , 27.0 ± 8.7 and 7.5 ± 8.3 % in January 2005 on cabbage, cauliflower and canola, respectively.

Table (1) : Monthly percentages of parasitism of the larval parasitoid, *S. xanthostomus* on different cruciferous host plants during season 2004/ 05.

Date	% Parasitism		
	Cabbage	Cauliflower	Canola
Dec.2004	4.0±6.9	5.0±8.7	2.5±4.3
Jan. 2005	29.0±10.0	27.0±8.7	7.5±8.3
Feb.	9.0±9.1	9.0±13.4	2.5±4.3
Mean ± SD	14.0±10.8	13.7±9.7	4.2±4.2

The seasonal activity of this parasitoid (the percentage of parasitism) was illustrated in Fig. (2), in the second season 2005 / 06 on the same cruciferous host plants. This parasitoid started to appear in larvae on the tested plants on the 14th of December 2005. The percentage of parasitism increased gradually and reached its peak (48, 44 and 30 %) on cabbage, cauliflower and canola respectively on the 18th of January 2006.

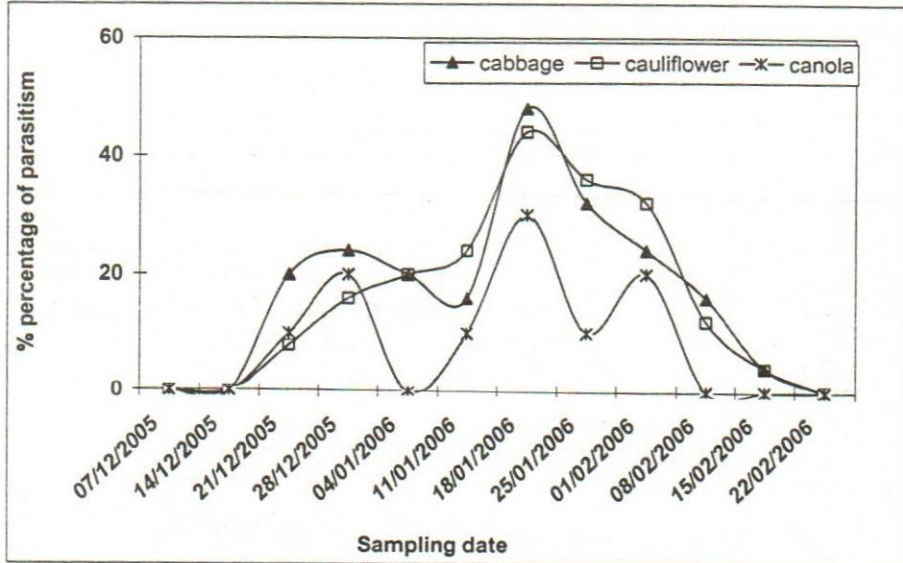


Fig. (2): Seasonal activity of the larval parasitoid, *S. xanthostomus* (% parasitism) on some cruciferous plants during season 2005/06.

Data presented in (Table,2) showed the monthly percentages of parasitism of the larval parasitoid on different host plants during season 2005 /06.

It can be noticed that the highest percentages of parasitism were 29.0±12.5, 31.0±9.5 and 12.5±1.9 % in January 2006 on cabbage cauliflower and canola, respectively.

The highest average percentage of parasitism in the second season was 17.0±8.5% on cabbage followed by 16.3±10.7% on cauliflower and 8.3±3.1% on canola.

Table (2) : Monthly percentages of parasitism of the larval parasitoid, *S. xanthostomus* on different cruciferous host plants during season 2005/ 06.

Date	% Parasitism		
	Cabbage	Cauliflower	Canola
Dec.2005	11.0±11.1	6.0±6.6	7.5±8.3
Jan. 2006	29.0±12.5	31.0±9.5	12.5±10.9
Feb.2006	11.0±9.5	12.0±12.3	5.0±7.8
Average	17.0±8.5	16.3±10.7	8.3±3.1

As a conclusion, the percentage of parasitism of the larval parasitoid *S. xanthostomus* reached its maximum (44,40 and 20%) on the 25th of January 2005 in the first season and (48,44 and 30 %) on 18th of January 2006 in the second season on cabbage, cauliflower and canola (Figs 1 and 2), respectively. The highest average percentages of parasitism were (14.0±10.8 and 17.0±8.5%) on cabbage followed by (13.7±9.7 and 16.3±10.7 %) on cauliflower and (4.2±4.2 and 8.3±3.1 %) on canola during the first and the second seasons (Tables 1 and 2), respectively.

It could be concluded that a considerable of limiting the cabbage butterfly population, as resulted from the present study was played by this larval parasitoid.

These results are in agreement with those of Pavuk *et al.* (1995) on *Sinophorus teratis* as a parasitoid of *Plathypena scabra* in USA, Lyons (1999) on *S. megalodontis* as larval parasitoid on *Acantholyda erthrocephala* in Canada, Zeki *et al.* (2000) on *S. geniculatus* as a parasitoid on the larvae of *Depressari dacivorella* in Turkey, Keszthelyi (2004) on *S. alkae* as a parasitoid on the larvae of *Ostrinia nubilalis* Hbn in Hungary and Sertkaya *et al.* (2004) on *S. xanthostomus* as a larval parasitoid on *Spodoptera exigua* in Turkey.

Some biological aspects on the parasitoid:-

Data presented in Table (3), showed the egg – larval stage (days) pupal stage (days), mating duration (minutes), male and female longevity (days) and sex ratio.

Table (3): Some biological aspects of the larval parasitoid, *S. xanthostomus* under laboratory conditions (20±2 C° and 75±5 % R.H.).

Biological aspects	Range	Mean
Egg – larval stage (days)	20-21	20.50±0.45
pupal stage (days)	10.5-11	10.75±0.25
Mating duration (minuites)	15-16	15.80±0.24
Longevity(days)		
Male	18-18.5	18.25±0.31
Female	17-17.5	17.26±0.27
Sex ratio (Female / Male)	3.1-2.7 : 1	2.90±0.19 : 1

The duration of the egg – larval stage was 20.5 ± 0.45 days, while that of the pupal stage lasted 10.75 ± 0.25 days, the mating duration was 15.80 ± 0.24 minutes, longevity duration was 18.25 ± 0.31 days in male and 17.26 ± 0.27 days in female, and the female / male sex ratio was 2.90 : 1.

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دراسات ايكولوجية وبيولوجية على طفيل اليرقات *Sinophorus xanthostomus* Grav. كتسجيل لأول مرة في مصر على يرقات حشرة ابو

دقيق الكرنب

سمير صالح عوض الله^١، لبيب محمود شنب^١، محمود السيد النجار^٢ و
سامية منذر ابو زيد^٢

١ - قسم الحشرات الإقتصادية - كلية الزراعة - جامعة المنصورة

٢ - معهد بحوث وقاية النبات - الدقي - جيزة

إن حشرة أبي دقيق الكرنب *Pieris rapae* L. واحدة من أهم الآفات التي تصيب نباتات العائلة الصليبية و هذه النباتات مثل الكرنب، القرنبيط و الكانولا مسببة أضرار مختلفة في بعض المناطق.

في هذه الدراسة تم تسجيل الطفيل *Sinophorus xanthostomus* Grav. الذي يتبع عائلة Ichneumonidae و هو طفيل فردي و ذلك لأول مرة في مصر على يرقات هذه الحشرة (أبي دقيق الكرنب) و ذلك على نباتات الكرنب، القرنبيط و الكانولا. و كان هذا الطفيل متواجد خلال أشهر ديسمبر، يناير و فبراير لكل من موسمي الدراسة. و كانت أعلى نسبة للتطفل على اليرقات بهذا الطفيل ٤٠%، ٤٤% و ٢٠% على الكرنب، القرنبيط و الكانولا على التوالي في ٢٥ من يناير ٢٠٠٥ خلال الموسم الأول من الدراسة أما خلال الموسم الثاني من الدراسة كانت أعلى نسبة للتطفل هي ٤٨%، ٤٤% و ٣٠% على نفس العوائل النباتية و على التوالي في ١٣ يناير ٢٠٠٦.

تم دراسة بعض النواحي البيولوجية لهذا الطفيل حيث تم دراسة وملاحظة فترة البيضة واليرقة و التي كانت (٢٠,٥٠±٠,٤٥ يوم)، طور العذراء (١٠,٧٥±٠,٢٥ يوم)، فترة التزاوج (١٥,٨±٠,٢٤ دقيقة)، فترة حياة الأنثى (١٧,٢٦±٠,٢٧ يوم)، فترة حياة الذكر (١٨,٢٥±٠,٣١) والنسبة الجنسية حيث كانت ١,٩٠±٠,١٩ أنثى : ١ ذكر.

