

## THE SEASONAL ACTIVITY OF THE MAIN INSECT PARASITIDS ATTACKING PUPAL STAGE OF THE CABBAGE BUTTERFLY *Pieris rapae* L. ON DIFFERENT HOST PLANTS.

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### ABSTRACT

The experiment was carried out at the experimental farm of the Plant Protection Department Sakha Agriculture Research Station, Kafr El-Sheikh, during three successive vegetable growing seasons, 2011/12 and 2012/13 on cabbage (*Brassica oleracea* var. *capitata* L.), cauliflower (*B. oleracea* var. *botrytis* L.), and Canola rape (*Brassica napu. oleifera* L.).

Cabbage plants harboured the highest average percentage of the pupal parasitoids *Brachymeria femorata* parasitoid during three successive seasons 2011, 2012 and 2013 represented by 17.5 and 18.3% followed by cauliflower plants 13.9 and 14.9%. While, canola plants recorded the last category and represented by 11.6 and 13.9%, respectively. Moreover, there was a highly significant differences between the percentage of *B. femorata* parasitoids on different cruciferous plants during the two successive seasons. The cabbage plants harboured the highest average percentage of *Pteromalus puparum* during the three successive seasons 2011/12 and 2012/13 represented by 30.8% and 31.5% followed by cauliflower plants 24.4 and 26.6% while, canola plants recorded the last category and represented by 19.6% and 14.7%, respectively. Moreover there were a highly significant differences between the percentage of *P. puparum* on different cruciferous plants during the two successive seasons. Cabbage plants harboured the highest average percentage of *Phryxe vulgaris* during three successive seasons 2011/12 and 2012/13 and represented by 8.9% and 8.1% followed by cauliflower plants 5.8 and 6.8% while, canola plants recorded the last category and represented by 3.5% and 2.9%, respectively. Moreover, there were a highly significant differences between the percentage of *P. vulgaris* on different cruciferous plants during the two successive seasons.

### INTRODUCTION

The small cabbage white butterfly, *Pieris rapae* L. (Lepidoptera: Pieridae) which synonyms with *Artogeia rapae* (Ibrahim *et al.*, 1996) and considered one of the most serious insect pests which infests cruciferous vegetables (Del *et al.*, 2005) and causing considerable damage especially to cabbage and cauliflower was determined by (Jankowska, 2005). Parasitoids play an important role in reducing the population density of *P. brassicae*. Moreover, eggs and larvae are attacked by generalist predators such as spiders, chrysopids, staphylinids and carabids (Pfiffner *et al.* 2009). Feeding injury caused by this caterpillar may reduce production to zero (Abdel-Razek

et al., 2006). The pupal parasitoid, *Pteromalus puparum* (Hymenoptera : Pteromalidae ) was the most important parasitoid as being “accidentally-introduced” in the late 1800s, presumably after the invasion by *P. rapae* in 1860 . The activity of that parasitoid was recorded by many authors (Barron, 2007). *Brachymeria femorata* (Hymenoptera: Chalcididae), the 2<sup>nd</sup> pupal parasitoid of *P. rapae* was recorded by ( Abbas , 1985 ) and Patriche, 2004) . In addition , the tachinid, *Phryxe vulgaris* was recorded against *P. rapae* pupa (Uzun, 1987 and Patriche, 2004). Other pupal parasitoids were recorded, i.e. the ichneumonid *Pimpla instigator* (Uzun, 1987), and *Compsilura concinnata* (Patriche, 2004).

The aim of this study was to study seasonal activity of the main insect parasitoids attacking pupal stage of the cabbage butterfly *P. rapae* on different host plants.

## **MATERIALS AND METHODS**

The experiment was carried out at the experimental farm of the Plant Protection Department Sakha Agriculture Research Station, Kafr El-Sheikh, during two successive vegetable growing seasons, 2011/12 and 2012/13 on cabbage (*Brassica oleracea* var. *capitata* L.), cauliflower (*B. oleracea* var. *botrytis* L.), and Canola rape (*Brassica napus oleifera* L.).

Three field crops, cabbage, cauliflower and Canola were examined to detect seasonal activity of the main insect parasitoids attacking pupal stage of the cabbage butterfly *P. rapae* on different host plants. i.e. , the pupal parasitoid *Pteromalus puparum* L. , (Pteromalidae); *Brachymeria femorata* Panzer, (Chalcididae) and *Phryxe vulgaris* Fallen, (Tachinidae). Two successive seasons were examined for each crops, cabbage , cauliflower and Canola during seasons 2011/ 12 and 2012/13 with growing period from September to December and May to August and January to April .*P. rapae* pupa were counted weekly in the field during the two tested seasons .Samples were taken randomly from cardinal directions of area about one Fadden divided for three crops for each host plant. Pupae of *P. rapae* counted weekly/50 plants/crop. These pupae were transferred to the laboratory and kept under laboratory conditions in Petri dishes. The emergency of butterflies or any parasitoid adults were counted and the percentage of parasitoids were done .

### **Statistical analysis :**

Data were statistically analyzed by one-way ANOVA, using the general linear model procedure (SAS, 1986). Test of significance for differences among treatments were done according to Duncan (1955).

## **RESULTS AND DISCUSSION**

Data in Table (1) showed that the percentage of the parasitoids *B. femorata* Panzer were recorded in the first seasons 2011/12. The results

indicated that the first appearance of solitary parasitoid, *B. femorata* on cabbage plants was recorded in September with(16.7%). The highest average percentage of *B. femorata* recorded on cabbage (36.2%) in October and on cauliflower (27.6%) in December and on canola (25%) in November and December while the lowest percentage of parasitism recorded on cabbage (12%)in February and (11.1%)on cauliflower in September and followed by canola(4.5%) in October.

The obtained data in Table(1)showed that ,the highest average percentage of *B.femorata* during the second seasons 2012/13 recorded (44.4%) on cabbage at April and followed by ( 39.6%)on cauliflower plants at October and (28.3%) on Canola plants at November .Meanwhile ,the lowest average percentage were recorded in July (13.6%) on Cabbage plants and (12.5%) on cauliflower at September and on canola represented by (10.0%) and the parasitoids disappeared during January in three crops.

As conclusion , data in Table (1) revealed that, cabbage plants harboured the highest average percentage of the pupal parasitoids *B. femorata* parasitoid during the two successive seasons 2011 , 2012 and 2013 represented by 17.5 and 18.3% followed by cauliflower plants 13.9and 14.9 %. While , canola plants recorded the last category and represented by 11.6and 13.9%,respectively .Moreover there were a highly significant differences between the percentage of *B.femorata* parasitoids on different cruciferous plants during the two successive seasons .

**Table (1) The seasonal activity of of the parasitoid *Brachimerya femorata* parasitized pupae on different cruciferous crops during seasons 2011/12 and 2012/13.**

Months	2011/2012			2012 / 2013		
	Cabbage	Cauliflower	Canola	Cabbage	Cauliflower	Canola
Sep	16.7	11.1	0.0	24.1	12.5	0.0
Oct.	36.2	25.2	4.5	44.4	39.6	23.75
Nov.	23.4	21.1	25	23.4	21.2	28.6
Dec.	25.3	27.6	24.9	23.6	21.2	28.3
Jan.	0.0	0.0	25	0.0	0.0	0.0
Feb.	12	16.7	20	0.0	0.0	12.5
Mar.	30	25	17.6	0.0	0.0	12.5
Apr.	21.4	18.2	0.0	14.4	11.3	9.2
May	27	22.9	20.0	23.5	21.0	0.0
Jun.	23.3	20.3	17.5	24.4	22.2	10.0
Jul.	24.7	20.8	15.0	13.6	15.4	20.0
Aug.	25	15	0.0	26.3	0.0	0.0
Mean±SE	17.5±0.29 <sup>a</sup>	13.9±0.35 <sup>b</sup>	11.6±0.58 <sup>c</sup>	18.3±0.38 <sup>a</sup>	14.9±0.57 <sup>b</sup>	13.9±0.23 <sup>c</sup>

Data in Table (2)showed that gregarious parasitoid, *P. puparum* was observed in the field parasitizing *P. rapae* pupae and recorded for the first time in September plantation and after three weeks from survey recorded the highest percentage(54.1%) during November Data arranged in Table(2) showed the highest average of monthly number of parasitoids *P.puparum* during the first season 2011/2012was found on cabbage(54.1%)and followed by cauliflower(42.1%)on November. and on Canola(35%)in November

2011, while the lowest average percentage of parasitoids were recorded in September and represented 5.5% in September on cabbage 20% in March on Cauliflower and 14% in February on Canola plants, respectively

The obtained data in Table (2) showed that. The highest average percentage of *P. puparum* in the second seasons 2012/13 recorded in November and represented by 52.5% on cabbage and followed by 43.3% in June on cauliflower and 28% in April on canola plants, respectively. Meanwhile, the lowest average percentages were recorded in September and represented by 10.3% on cabbage and 23.3% in December on cauliflower and 13% in June on canola plants respectively.

As conclusion, data in Table (2) revealed that, The cabbage plants harboured the highest average percentage of *P. puparum* during the three successive seasons 2011/12 and 2012/13 represented by 30.8% and 31.5% followed by cauliflower plants 24.4% and 26.6% while, canola plants recorded the last category and represented by 19.6% and 14.7%, respectively. Moreover, there were a highly significant differences between the percentage of *P. puparum* on different cruciferous plants during the two successive seasons.

**Table(2)The seasonal activity of the parasitoid *Pteromalus puparum* parasitized pupae on different cruciferous crops during seasons 2011/12 and 2012/13.**

Months	2011/2012			2012 / 2013		
	Cabbage	Cauliflower	Canola	Cabbage	Cauliflower	Canola
Sep.	5.5	0	0.0	10.3	0.0	0.0
Oct.	37.1	34.5	30	33.3	39.6	25
Nov.	54.1	42.1	35	52.5	34.5	25.1
Dec.	38.1	32.2	30.4	36.1	23.3	21.9
Jan.	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	33.2	23.3	14	0.0	0.0	0.0
Mar.	30	20	25.3	33.0	28.6	25.0
Apr.	42.9	36.4	28.3	44.4	37.1	28
May	38	28.9	16	43.5	41.7	18
Jun.	34.9	28.5	22	43.5	43.3	13
Jul.	31	23	20	40.3	41.2	20
Aug.	25	24	15	41.6	30	0.0
Mean±SE	30.8±0.45 <sup>a</sup>	24.4±0.28 <sup>b</sup>	19.6±0.15 <sup>c</sup>	31.5±0.85 <sup>a</sup>	26.6±0.58 <sup>b</sup>	14.7±0.14 <sup>c</sup>

Data arranged in Table (3) showed Third parasitoid *P. vulgaris* the highest average of monthly percentage of parasitoids *P. vulgaris* during the first season 2011/2012 was found on cabbage (25.6%) in June and followed by cauliflower (18.2%) in April. and on Canola (25%) in October 2011, while were disappeared in September, May, June and February and the lowest average percentage of parasitoids represented by (0.01, 1.5 and 1.0%) on Cabbage, Cauliflower and Canola plants, in November month respectively.

The obtained data in Table (3) showed that, . The highest average percentage of *P. vulgaris* in the second seasons 2012/2013 recorded by 31.2, 25 in May on cabbage and cauliflower and 10.3% on canola plants in April respectively. Meanwhile, *P. vulgaris* were disappeared in September and the lowest average of the percentage represented by 0.38 in November and

December on cabbage and 1.5 in November on cauliflower and 1.1% in May on canola plants respectively.

As conclusion, data in Table (3) revealed that, Cabbage plants harboured the highest average percentage of *P. vulgaris* during the two successive seasons 2011/12 and 2012/13 and represented by 8.9% and 8.1% followed by cauliflower plants 5.8 and 6.8% while, canola plants recorded the last category and represented by 3.5% and 2.9%, respectively. Moreover, there was a highly significant difference between the percentage of *P. vulgaris* on different cruciferous plants during the two successive seasons.

**Table (3): The seasonal activity of the parasitoid *Phryxe vulgaris* parasitized pupae on different cruciferous crops during seasons 2011/12 and 2012/13**

Months	2011/2012			2012 / 2013		
	Cabbage	Cauliflower	Canola	Cabbage	Cauliflower	Canola
Sep.	0.0	0.0	0.0	0.0	0.0	0.0
Oct.	2.9	5.2	25	4.0	5.7	3.1
Nov.	0.01	1.5	1.0	0.38	1.5	9.5
Dec.	0.33	1.6	2.0	0.38	1.8	1.4
Jan.	0.0	0.0	3.3	0.0	0.0	0.0
Feb.	0.0	0.0	4.0	0.0	0.0	0.0
Mar.	1	0.0	2.5	0.0	0.0	0.0
Apr.	14.3	18.2	0.0	11.1	10.3	10.3
May	20	11.1	0.0	31.2	25	1.1
Jun.	25.6	15.4	0.0	22.0	19.4	5
Jul.	17.6	17.4	4.25	18.18	17.5	4.25
Aug.	25	0.0	0.0	10.5	0.0	0.0
Mean±SE	8.9±0.29 <sup>a</sup>	5.8±0.57 <sup>b</sup>	3.5±0.05 <sup>c</sup>	8.1±0.64 <sup>a</sup>	6.8±0.32 <sup>b</sup>	2.9±0.17 <sup>c</sup>

These results are agreement with the findings of Ragab (1992) studied the parasitoids of *P. rapae* in winter cabbage fields in season 1989/90; *P. puparum* emerged from pupa where the percentage of parasitism was 32.86%. Thus, *P. puparum* was the common parasitoid recorded, its maximum percentages of parasitism (50% and 52%) were noticed on December, 6<sup>th</sup> and 26<sup>th</sup> respectively, then it sharply decreased with the beginning of January. Abo-Zaid(2006) stated that, gregarious pupal ectoparasitoid, *P. puparum* occurred in the field from the middle of October to the end of January and found that the highest percentage of parasitism on pupae cabbage was 20% on the 14th of December 2004 but on the cauliflower the highest rate was 25% on 21st December 2004.

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النشاط الموسمي للطفيليات الحشرية التي تهاجم عذارى ابو دقيق الكرنب على العوائل  
النباتية المختلفة

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اجريت هذه التجربة في المزرعة البحثية لمحطة البحوث الزراعية بسخا كفر الشيخ خلال  
موسمي الزراعة ٢٠١١/١٢ و ٢٠١٢/١٣م على نبات الكرنب، والقرنبيط، والكانولا لدراسة النشاط  
الموسمي للطفيليات الحشرية التي تهاجم عذارى ابو دقيق الكرنب على العوائل النباتية المختلفة . لوحظ اعلى  
نسبة تطفل لطفيل *Brachemeria femorata* علي نبات الكرنب وتتمثل في (17.5 و 18.3%)  
على التوالي و يليه نبات القرنبيط ( 13.9 و 14.9%) بينما الكانولا سجلت (11.6 و 13.9%) ولوحظ  
فروق عالية المعنوية في نسبة التطفل بين الثلاث نباتات خلال الموسمين على التوالي .  
كما لوحظ اعلى نسبة تطفل لطفيل *Pteromalus puparum* علي نبات الكرنب وتتمثل  
في (30.8، 31.5%) على التوالي و يليه نبات القرنبيط ( 24.4 و 26.6%) بينما الكانولا سجلت  
(19.6 و 14.7%) ولوحظ فروق عالية المعنوية في نسبة التطفل بين الثلاث نباتات خلال الموسمين على  
التوالي . لوحظ اعلى نسبة تطفل لطفيل *Phryxe vulgaris* علي نبات الكرنب وتتمثل في (8.9،  
8.1%) على التوالي و يليه نبات القرنبيط ( 5.8 و 6.8%) بينما الكانولا سجلت (3.5 و 2.9%) ولوحظ  
فروق عالية المعنوية في نسبة التطفل بين الثلاث نباتات خلال الموسمين على التوالي .

قام بتحكيم البحث

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