

## HOST PLANT PREFERENCE OF THE CABBAGE BUTTERFLY *Pieris rapae* L ON DIFFERENT CRUCIFEROUS VEGETABLES , IN KAFR EL-SHEIKH REGION.

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### ABSTRACT

The experiment was carried out at the experimental farm of the Plant Protection Dep. Sakha Agric. Res. Station, Kafr El-Sheikh, during two successive vegetable growing seasons, 2011/ 12 on Cabbage , Cauliflower and Canola plants. Cabbage plants harboured the highest average number of eggs during the two successive seasons 2011/12 and represented by  $59.2 \pm 3.8$  and  $56.6 \pm 3.5$  eggs/50 plants followed by cauliflower plants  $56.9 \pm 4.6$  and  $43.8 \pm 2.0$  eggs /50 plants while, canola plants recorded the last category and represented by  $24.5 \pm 2.8$  and  $35.8 \pm 3.1$  eggs /50 plants , respectively . Moreover , there was a highly significant difference between the number of egg-laying on different cruciferous plants during the two successive seasons.

Cabbage plants recorded the highest average number of larvae during the two successive seasons 2011 /12 and represented by  $46.8 \pm 5.7$  and  $45.9 \pm 5.3$  larvae/50 plants followed by cauliflower plants  $39.9 \pm 5.4$  and  $36.9 \pm 2.9$  larvae/50 plants while, canola plants recorded the last category and represented by  $17.9 \pm 2.5$  and  $20 \pm 2.9$  larvae/50 plants ,respectively .Moreover, there were a highly significant differences between the number of larvae on different cruciferous plants during the two successive seasons. Cabbage plants recorded the highest average number of pupa during the two successive seasons 2011/12 and represented by  $36.3 \pm 6.2$  and  $37.2 \pm 4.5$  pupa/50 plants followed by cauliflower plants  $32.9 \pm 5$  and  $31.2 \pm 4.8$  pupa/50 plants while, canola plants recorded the last category and represented by  $17.3 \pm 2.6$  and  $16.3 \pm 2.5$  pupa/50 plants respectively. Moreover, there was a highly significant difference between the number of pupa on different cruciferous plants during the two successive seasons..

### INTRODUCTION

Cabbage, cauliflower and Canola are the cultivated with the aim of using leaves of the first , the flower buds of the second and the seeds of the third as human food during the various seasons .In Egypt these cruciferous crops are liable to be attacked under field condition (El-Shamy,1990). 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). Feeding injury caused by this caterpillar may reduce production to zero (Abdel-Razek *et al.*, 2006).Some authors studied the influence of different host plants on *Pieris*

*rapae*. Cabbage and cauliflower are attacked with numerous insect pests in the field (Ali *et al.*, 1984 and Ibrahim *et al.* 1996). *Pieris rapae* is a major insect on cabbage and cauliflower and the highest average larvae was recorded in the first week of November (Younas *et al.*, 2004).

The present study aimed to study the host plant preferences of the cabbage butterfly *Pieris rapae* on different cruciferous vegetables.

## **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 on cabbage (*Brassica oleracea* var. *capitata* L.), cauliflower (*Brassica oleracea* var. *botrytis* L.), and Canola rape (*Brassica napus* var. *oleifera* L.). Three field crops, cabbage, cauliflower and canola were examined to detect the host plant preference of *P. rapae* (immature stage). About one feddan was divided into three plots. Individual plots consisted of single rows, 40-cm row spacing, each 4.5-m in length, arranged in a randomized complete block. The plots were divided into three replicates. Weekly sampling at farm plots was started two weeks after transplanting. Each of 50 randomly selected plants was examined for insect pests. Samples of cabbage, cauliflower and canola leaves were backed gently in plastic bags labeled and transferred to examination. In each sampling date starting from September till December. The number of the insect stages (egg, larvae and pupae) on the three host plants were counted weekly during the two successive seasons in Kafr El-Sheikh region.

### **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**

Host plant preference for female egg-laying:-

Data arranged in Table(1) showed the highest average of monthly number of eggs for female egg-laying during the first season 2011 was found on cabbage ( $79.2 \pm 0.57$  eggs /50 plants) and followed by cauliflower ( $78.6 \pm 0.11$  eggs /50 plants) in November. and on Canola ( $41.5 \pm 0.28$ ) in December 2011, while the lowest average number of eggs were recorded in September and represented ( $27.2 \pm 0.46$ ), ( $23.8 \pm 0.46$ ) and ( $14.1 \pm 0.05$ ) eggs/50 plants on Cabbage, Cauliflower and Canola plants, respectively.

The obtained data in Table (1) showed that, The highest average number of eggs in the second seasons 2012 recorded in November and represented by  $85.3 \pm 2$  and followed by  $62.5 \pm 2.7$  and  $59.1 \pm 0.5$  eggs /50

plants on cabbage , cauliflower and canola plants respectively . Meanwhile , the lowest average number were recorded in September and represented by 26.3,18and 12.2 eggs /50 plants on the three host plants respectively.

As conclusion, data in Table (1) revealed that, cabbage plants harboured the highest average number of eggs during the two successive seasons 2011/12 and represented by  $59.2 \pm 3.8$  and  $56.6 \pm 3.5$  eggs/50 plants followed by cauliflower plants  $56.9 \pm 4.6$  and  $43.8 \pm 2.0$  eggs/50 plants while, canola plants recorded the last category and represented by  $24.5 \pm 2.8$  and  $35.8 \pm 3.0$  eggs/50 plants ,respectively .Moreover, there was highly significant difference between the number of egg-laying on different cruciferous plants during the two successive seasons.

**Table (1): Host plant preference for egg-laying by *Pieris rapae* females on different cruciferous plants during seasons 2011 and 2012 in Kafr EL-sheikh region.**

Months	2011			2012		
	Cabbage	Cauliflower	Canola	Cabbage	cauliflower	Canola
September	$27.2 \pm 0.46$	$23.8 \pm 0.46$	$14.1 \pm 0.05$	$26.3 \pm 0.4$	$18 \pm 0.28$	$12.2 \pm 0.46$
October	$58 \pm 0.57$	$50.3 \pm 0.88$	$35.5 \pm 0.28$	$53.5 \pm 1.15$	$44.7 \pm 0.46$	$33.9 \pm 0.75$
November	$79.2 \pm 0.57$	$78.6 \pm 0.11$	$6.8 \pm 0.11$	$85.3 \pm 0.17$	$62.5 \pm 2.7$	$59.1 \pm 0.5$
December	$71.8 \pm 0.57$	$75.2 \pm 0.11$	$41.5 \pm 0.28$	$61.1 \pm 6.40$	$50 \pm 0.28$	$38 \pm 0.57$
Mean	$59.2 \pm 3.8^a$	$56.9 \pm 4.6^b$	$24.5 \pm 2.8^c$	$56.6 \pm 3.5^a$	$43.8 \pm 2^b$	$35.8 \pm 3^c$

Means of among columns of each season followed by the same letter are not significantly different at the 5% level according to Duncan 's Multiple Range Test.

#### **Host plant preference for larvae rearing:-**

Data presented in Table (2) showed the monthly average number of larvae of *p.rapae* during the first and the second seasons of the study 2011and 2012. In the first seasons the highest average number of larvae was found on cabbage ( $85 \pm 0.85$  larvae/50 plants) followed by cauliflower ( $74.3 \pm 0.12$  larvae/50plants)in November 2011and on canola ( $35.1 \pm 0.14$  larvae/50plants) in December 2011 .While, the lowest average numbers of larvae were recorded in September and represented by ( $8.7 \pm 0.4, 5 \pm 0.58$  and  $3.1 \pm 0.58$  larvae/50 plants)on cabbage ,cauliflower and canola.

In the second seasons data in Table (2) illustrated that the highest average number of larvae was found on cabbage ( $78.5 \pm 0.29$ ) in November followed by cauliflower ( $71.4 \pm 0.67$ )in December. The lowest average number recorded in September month and represented by ( $8.1 \pm 0.4$  ,  $4.5 \pm 0.29$  and  $1.9 \pm 0.51$  larvae /50 plants) on cabbage ,cauliflower and canola respectively.

**Table (2) Host plant preference for larval stage of *pieris rapae* on different cruciferous plants during seasons 2011 and 2012 in Kafr EL-sheikh region.**

Months	2011			2012		
	Cabbage	Cauliflower	Canola	Cabbage	Cauliflower	Canola
September	8.7±0.4	5±0.58	3.1±0.58	8.1±0.40	4.5±0.29	1.9±0.51
October	29±0.58	21±0.58	8.3±0.58	32.2±0.12	17.6±1.3	8.8±0.46
November	85±0.58	74.3±0.12	24.8±0.17	78.5±0.29	71.4±0.67	38.4±0.0
December	64.5±0.28	59.3±0.12	35.2±0.	64.9±0.22	54.2±0.11	30.9±0.41
Mean	46.8±5.7a	39.9±5.4b	17.9±2.5c	45.9±5.3a	36.9±5.2b	20±2.9c

Means of among columns of each season followed by the same letter are not significantly different at the 5% level according to Duncan 's Multiple Range Test.

As conclusion, data in Table (2) investigated that, cabbage plants harboured the highest average number of larvae during the two successive seasons 2011 and 2012 and represented by 46.8±5.7 and 45.9±5.3 larvae/50 plants followed by cauliflower plants 39.9±5.4 and 36.9±2.9 larvae/50 plants. While, canola plants recorded the last category and represented by 17.9±2.5 and 20±2.9 larvae/50 plants, respectively. Moreover there were a highly significant differences between the number of larvae on different cruciferous plants during the two successive seasons.

Influence of different host plant on the pupa:-

Data presented in Table (3) showed the monthly average number of pupa of *p. rapae* during the first and the second seasons of the study 2011 and 2012. In the first seasons the highest average number of pupa was found on cabbage (72±0.57 pupa/50 plants) followed by cauliflower (66.5±0.28 pupa/50 plants) in November 2011. While the lowest average number recorded on September and represented by (7.2±0.11, 1.8±0.05 and 0.8±0.57 pupa/50 plants) on cabbage, cauliflower and canola respectively.

In the second seasons the highest average number of pupa was (65.5±4.1 pupae/50 plants) on cabbage plants and followed by (65±4.9 pupae/50 plants) on cauliflower in November and 33 pupa/50 plants and the lowest average number of pupa was found on cabbage (5.8±0.7 pupa/50 plants) followed by cauliflower (1.6±0.3 pupa/50 plants) and canola (0.6±0.1 pupa/50 plants) respectively in September.

As conclusion data in Table (3) indicated that, cabbage plants recorded the highest average number of pupa during the two successive seasons 2011 /12 and represented by (36.3±6.2 and 37.2±4.5 pupa /50 plants) on cabbage followed by cauliflower plants 32.9±5 and 31.2±4.8 pupa/50 plants) while, canola plants recorded the last category and represented by 17.3±2.6 and 16.3±2.5 pupa/50 plants), respectively. Moreover, there was a highly significant difference between the number of pupa on different cruciferous plants during the two successive seasons..

**Table (3): Influence of different host plants on the average number of *P.rapae* for pupa of the cabbage butterfly during seasons 2011 and 2012 in Kafr EL-sheikh region.**

Months	2011			2012		
	Cabbage	Cauliflower	Canola	Cabbage	Cauliflower	Canola
September	7.2±0.11	1.8±0.05	0.8±0.57	5.8±0.05	1.6±0.05	0.6±0.05
October	1.5±0.05	14.5±0.28	7.25±0.14	24.8±0.11	13.3±0.17	6.5±0.28
November	72±0.57	66.5±0.28	34±0.57	65.5±0.28	65±0.57	33±0.57
December	64.5±0.28	48.6±0.11	27.2±0.11	52.6±0.57	45±0.57	25.2±0.46
Mean	36.3±6.2 <sup>a</sup>	32.9±5 <sup>p</sup>	17.3±2.6 <sup>c</sup>	37.2±4.5 <sup>a</sup>	31.2±4.8 <sup>p</sup>	16.3±2.5 <sup>c</sup>

Means of each row for each season followed by the same letter are not significantly different at the 5% level according to Duncan 's Multiple Range Test.

Some authors stated that cabbage Butterfly, *P.rapae* is found that all over the whole country where cabbage ,Cauliflower and Canola and cruciferous vegetables are cultivated and also where cruciferous weeds are found EL-Sufty *et al*(1983). These results is agreement with Hill(1987)reported that the large White butterfly is a cosmopolitan insect , and is found wherever cruciferous plants are grown ,Kamel(1989)stated that the highest average numbers of eggs ,larvae and pupa recorded in October , November and December on cabbage and cauliflower. Abo –Aiana (1985) remembered that In summer plantation ,the population density of the full grown larvae was gradually increased to form the first peak on the 15<sup>th</sup> of July and represented by the average of 9.9 and 10 larvae /100 plants .The second peak on the 15<sup>th</sup> of September and represented by the average of 31.7 and 37.3 larvae /100 plants in winter plantation. The number of larvae decreased gradually until they disappeared by early February in 1981 and mid-February in 1982 .

Abo -Zaid (2006) reported that the larval duration of *P. rapae* was the shortest when the larvae reared on cabbage followed by cauliflower, turnip, radish and finally on canola .

## REFERENCES

- Abo-Aiana, R.A.D.(1985). Studies on cabbage white butterfly, *Pieris rapae* L. M.Sc. Thesis, Fac. Agric., Tanta Univ., pp107.
- Abdel-Razek , A.S.; M.H. Abbas; M. El-Khouly and A. Abdel- Rahman (2006). Potential of microbial control of diamondback moth, *Plutella xylostella* L., (Lepidoptera: Plutellidae) on two cabbage cultivars under different fertilization treatments: J. Appl. Sci. Res., 2(11): 942-948.
- Abo-Zaid, M.S. (2006). Biological and ecological studies on cabbage butterfly *Pieris rapae* L. and its natural enemies: M. Sc. Thesis, Fac. gric., Mansoura Univ.,pp103.
- Ali, M .A . ; A.S. El-Khouly and H.A. Helal (1984). Population density of some lepidopterous cabbage and cauliflower fields: Al-Azhar J. Agric. Res., 1:73-78
- Del, M.L. ; C.I. Miles and J.A. Renwick (2005). Behavioral and chemosensory responses to a host recognition due by larvae of *Pieris rapae* : J. Comparative physiol.: A sensory neutral and behavioral physiology, 191(2):147-155
- Duncan, B.D. (1955). Multiple range and Multiple F.Test .Biometrics, 11: 1-42 .
- El. Sufty , R .; S.M. Metwallny; R. Saleh and R. Abo-Aiana (1983). Population dynamics of the cabbage white butterfly, *Pieris rapae* at Kafr El-sheikh, Egypt. Proc. 5th Arab pesticide Conf. Tanta Univ., IV (3):128-135.
- EL-Shamy, I.A. (1990) . Studies of some insect pests of cabbage . M.Sc. Thesis, Fac. Agric., Menofia Univ., pp 108.
- Jankowska,B.(2005).Predatory syrphids (Diptera,Syrphidae) occurring in the cabbage aphid (*Brevicoryne brassicae* L.) colonies on different cabbage vegetables. J. Plant Prot. Res., 45(1):10-16.
- Hill, D.S. (1987). Agricultural insect pests of temperate regions and their control . Oxford press, 659 pp
- Ibrahim , A.M.; K.T. Awadallahn; M.S. Abbas and Shoeb, A. M. (1996). On the parasitoids of Artogeia (*Pieris rapae* L.). Egypt. J. Biol. Pest Control), 6 (1).
- Kamel, M.H. (1989). Ecological and biological studies on the cabbageworm *Pieris rapae* L.: M. Sc. Thesis, Fac. Agric., Cairo Univ., pp106.
- SAS INSTITUTE (1986). SAS/STAT Guide for personal Computers. Version (6 Cary, Nc, SAS institute). 59-468
- Younas , M. ; M. Naeem; A. Raqib and S. Masud (2004). Population dynamics of cabbage butterfly (*Pieris brassicae*) and cabbage aphids (*Brevicoryne brassicae*) on five cultivars of cauliflower at Peshawar. Asian J. Plant Sci., 3: 391-393.

## تفضيل العوائل النباتية لحشرة ابو دقيق الكرنب من العائلة الصليبية في منطقة كفر الشيخ

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اجريت هذه التجربة في المزرعة البحثية لمحطة البحوث الزراعية بسخا كفر الشيخ خلال موسمي الزراعة 2012 و 2012م على نبات الكرنب، والقرنبيط، والكانولا، وتم فحص النباتات ومعرفة العلاقة بين العائل النباتي ووضع البيض، وعدد اليرقات، والعذارى، وسُجل أعلى تعداد للحشرات في الموسمين في شهر نوفمبر على نبات الكرنب، والقرنبيط، والكانولا. وسُجل أعلى متوسط ( $8,3 \pm 59,2$  و  $3,5 \pm 56,6$  بيضة/ 50 نبات) لوضع البيض على نبات الكرنب ويلييه نبات القرنبيط ( $4,6 \pm 56,9$  و  $2 \pm 43,84$  بيضة / 50 نبات )، و يليه نبات الكانولا ( $2,8 \pm 24,5$  و  $35,8 \pm 35,8$  بيضة / 50 نبات ) في الموسم الاول والثاني ولوحظ فروق عالية المعنوية في عدد البيض بين الثلاث نباتات خلال الموسمين على التوالي. وقد تبين أن أعلى متوسط لليرقات (  $5,7 \pm 46,8$  و  $5,3 \pm 45,9$  يرقة / 50 نبات ) على نبات الكرنب، ويلييه نبات القرنبيط ( $5,4 \pm 39,9$  و  $2,9 \pm 36,9$  يرقة / 50 نبات )، و يليه ( $2,5 \pm 17,9$  و  $2,9 \pm 20$  يرقة / 50 نبات ) الكانولا في الموسم الاول والثاني ولوحظ فروق عالية المعنوية في عدد اليرقات بين الثلاث نباتات خلال الموسمين على التوالي .

وسجل أعلى متوسط للعذارى في عام 2011/ 2012 على نبات الكرنب ( $6,2 \pm 36,3$  و  $37,2 \pm 4,5$  عذراء / 50 نبات) ويلييه نبات القرنبيط ( $0,5 \pm 32,9$  و  $4,8 \pm 31,2$  عذراء/ 50 نبات) و يليه نبات الكانولا ( $2,6 \pm 17,3$  و  $2,5 \pm 16,3$  عذراء / 50 نبات) ولوحظ فروق عالية المعنوية في عدد العذارى بين الثلاث نباتات خلال الموسمين على التوالي .

قام بتحكيم البحث

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