

EVALUATION OF *Coccinella undecimpunctata* L. AGAINST *Brevicoryne brassicae* (Linnaeus) ON DILL PLANTS

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ABSTRACT

Field experiment was conducted at El-Fayoum Governorate during two successive seasons 2007 and 2008 to study the population fluctuation of *Brevicoryne brassicae* (Linnaeus) and *Coccinella undecimpunctata* L. and evaluation of *C. undecimpunctata* against *B. brassicae*. Moreover, to evaluate the effect of certain weather factors (daily mean temperature, daily mean R.H.) on the pest and predator on Dill plant. The obtained data revealed that, the mean number of aphid species individuals began to appear on January and population increased to reach the maximum average on April during 2007 season. In the second season, the infestation of the individuals started to appear at the last week of December. The mean number increased gradually to record two highly peaks on March and April. The correlation between population fluctuation of aphid species and means of weekly (max., min. and mean Temps.) was positive and significant during 2006/2007 and 2007/2008 seasons. In addition, the correlation between insect infestation and mean of relative humidity was negative significant correlation during 2006/2007 and 2007/2008 seasons. Generally, mean of the total number of *C. undecimpunctata* was higher in the second season than the first one. Releasing of *C. undecimpunctata* at rate 6 adult/ 2 m² gave the best reduction of aphid individuals recording general mean reduction percentage 93.14%. Followed by the second level (4 adult / 2 m²) this suppressed the population by 85.62% and the low level (2 adult / 2 m²) with 81.86%, respectively.

INTRODUCTION

Dill (*Anethum graveolens* L.) is medicinal plant considered as important crops in our agricultural production for human health. Aphids are the major pests on a number of greenhouses and field - grown food and medicinal crops, Pons and Iumbierres (2004). The common predators are Coccinellidae, Syrphidae, and Chrysopidae. Aphids are important insects; some aphids are annual pests that are liable to cause serious damage by hindering the growth of their host plants Hesler *et al.* (2004). Others only occasionally occur in large numbers to check the growth of their host plants. Probably the most important consequences of aphids attacking ornamental plants are transmission of virus diseases- about 200 species of aphids recorded as vectors of plant viruses. This study conducted to evaluation of *C. undecimpunctata* against *B. brassicae* on Dill plant.

MATERIALS AND METHODS

Population of aphid was determined for two successive seasons (2006/2007 and 2007/2008). An area of 1/8 feddan was cultivated with dill plants on Nov. 15th at El-Fayoum Governorate during 2007 and 2008 seasons. The plants received all normal recommended agricultural practices with the absence of any insecticidal application. The first inspection for dill plants started at the end of November. Periodic samples were randomly collected at two weeks intervals. Estimation of *B. brassicae* and *C. undecimpunctata* population were based on counting the number of immature and adults including all the plant of dill plants.

The records of meteorological data, weekly mean of maximum minimum, mean temperature and daily mean relative humidity, were obtained from the meteorological records of Central Laboratory of Agriculture Climate, Agriculture Research Center at Dokki, The weekly records of these factors were recalculated to get the two weeks average.

Releasing study was conducted on dill plants, in greenhouse (9X60 m²) located in the farm of Plant Protection Research Institute, Giza Governorate during April 2008 year. The selected plants for the present investigation were away from any pesticide contamination. The dill plants were infested with *B. brassicae*.

The adult stage of *C. undecimpunctata* was released, Petri-dish was used for transporting the predator. Three levels of *C. undecimpunctata* were released (female + male) 2, 4 and 6 individuals/2m² (one time) to reduce the infestation by *B. brassicae* by the beginning of April 2008 year. The greenhouse was divided into 12 replicates, three for each level and other three were selected to be as a check plot. *C. undecimpunctata* released including the accurate numbers of predator near from the infestation, each treatment was separated with fine plastic net from the other treatments. Samples were randomly taken (10 plants to each level) and the count containing the all plant after 4, 8, 12, 16, 20 and 24 days. All stages of aphid were counted.

Statistical analysis:

Under field conditions, the reduction percentages of infestation by compounds and by predators were calculated according to the equation of Henderson and Tilton (1955). To get idea about the effects of climatic factors and its correlation with the insects, simple correlation and partial regression were carried out by using a computer software package, "Costat" a product of cohort software in C., Barkeley, California, U.S.A.

RESULTS

Data in Table (1) Revealed that, the mean number of aphid species recorded zero nymphs in the first three inspections. The insect population increased to reach the maximum average 368.3 nymphs / plant on Apr. 29th of season 2006/2007. Then, the population decreased to record 42.3 nymphs /plant on May 29th.

In the second season infestation by the individual nymphs on dill plants not appeared in first two inspections. The infestation of the individuals started to appear at the last week of Dec. 30th recording 0.8 nymphs /plant. The mean number increased gradually to record two highly peaks 226.7 and 289.3 nymphs / plant on Mar. 30th and Apr.14th, 18, and 20 weeks following planting, respectively. The infestation declined in followed inspections to give 27.3 nymphs / plant at the end of inspection.

Table (1): Mean number of aphid species on dill plants during the two successive seasons 2007 and 2008 at El- Fayoum Governorate.

Sampling date	1 st season 2006/2007					2 nd Season 2007/2008				
	Mean no. of Imm.+ adults /plant	Weather factors				Mean no. of Imm.+ adults /plant	Weather factors			
		Max temp.	Min temp.	Mean temp.	RH%		Max temp.	Min temp.	Mean temp.	RH%
30-Nov.	0.00	20.90	12.10	16.20	56.80	0.00	20.10	10.80	15.10	56.10
15-Dec.	0.00	16.10	7.80	12.10	56.40	0.00	19.40	9.60	14.40	59.80
30-Dec.	0.00	17.30	10.90	14.30	53.40	0.80	13.60	6.70	10.20	56.40
14-Jan.	0.50	20.40	10.60	15.40	56.60	13.50	16.60	7.80	12.50	56.50
29-Jan.	0.90	18.70	10.10	14.50	55.40	34.30	19.70	10.30	14.90	54.20
13-Feb.	33.40	19.00	7.80	13.60	54.40	52.30	18.20	8.60	13.80	53.60
28-Feb.	56.60	24.40	12.20	18.50	53.60	85.60	23.20	12.40	17.70	49.60
15-Mar.	99.40	27.10	15.70	20.90	49.10	178.40	24.90	13.50	19.20	47.30
30-Mar.	164.60	28.20	15.30	21.50	46.10	226.70	27.80	14.10	21.40	47.10
14-Apr.	324.10	32.00	18.70	25.60	44.90	289.30	25.40	12.90	18.90	41.70
29-Apr.	368.30	28.90	17.50	22.90	38.80	145.40	23.70	12.50	17.90	53.60
14-May	165.30	33.20	18.80	26.10	36.20	45.50	30.40	19.20	24.80	45.70
29-May	42.30	33.70	20.10	27.30	37.90	27.30	341.00	20.60	27.30	38.30
Total	1255.4	319.90	177.40	248.90	639.60	1099.1	604.00	159.00	228.10	659.90
Mean	96.56	24.61	13.64	19.14	49.20	84.54	46.46	12.23	17.55	50.76
Correlation r =		Max	Min	Mean	RH	Correlation r =	Max	Min	Mean	RH
					-		0.628	0.630		-0.532
Partial reg. =		3.180	1.881	4.756	5.333	Partial reg. =	5.075	2.948	7.292	4.693
E.V. % =	73.5					E.V. % =	74.2			

Generally, results of the two seasons of 2006/2007 and 2007/2008 showed that mean of the total number of aphid species was 96.56 and 84.54 nymphs / plant respectively.

The correlation between population fluctuation of aphid species and mean of weekly (max., min. and mean temps.) was positive and significant ($r = 0.677, 0.675 \text{ \& } 0.672$) during 2005/2006 season, respectively. While "r" recorded ($0.628, 0.630 \text{ \& } 0.613$) during 2006/2007 season, respectively. In addition, the correlation between insect infestation and mean of relative humidity was negative significant correlation ($r = - 0.689$) during 2006/2007 season and ($r = - 0.532$) during 2007/2008 season Table (1).

The partial regression values of (max., mean temps. and R.H. means) were (b.reg. = 3.180, 4.759 & 5.333) during 2006/2007 season respectively. The previous results indicated that, a significant positive effect was confirmed between means of (max., mean temps. & R.H.) and aphid species abundance except mean of min. temp. where, its effect was positive and insignificant (b.reg. = 1.881).

As the same previously mentioned Table, The partial regression demonstrated a significant positive effect between means of (max., min., mean temps. and R.H.) and population of this insect during 2007/2008 season, where, (b.reg. = 5.075, 2.948, 7,292 and 4.693), respectively. The combined effect of some weather factors on the abundance of aphid species was, 73.5 % during first season 2006/ 2007 and 74.2.6% during second season 2007/2008. These results are in agreement with those of Harrington and Cheng (1984) ; Verma et al. (1988) ; Ramadan (1988) ; Nakata (1995) and Hamouda et al. (2001) .

Table (2): Mean numbers of *coccinella undecimpunctata* on dill plants at El-Fayoum Governorate.

Sampling date	1 st season 2006/2007					2 nd Season 2007/2008				
	Mean no. of Imm.+ adults /plant	Weather factors				Mean no. of Imm.+ adults /plant	Weather factors			
		Max temp	Min temp	Mean temp	RH%		Max temp	Min temp	Mean temp	RH%
30-Nov	0.00	20.90	12.10	16.20	56.80	0.00	20.10	10.80	15.10	56.10
15-Dec	0.00	16.10	7.80	12.10	56.40	0.00	19.40	9.60	14.40	59.80
30-Dec	0.0	17.30	10.90	14.30	53.40	0.0	13.60	6.70	10.20	56.40
14-Jan.	0.0	20.40	10.60	15.40	56.60	0.2	16.60	7.80	12.50	56.50
29-Jan	0.0	18.70	10.10	14.50	55.40	0.20	19.70	10.30	14.90	54.20
13-Feb	0.0	19.00	7.60	13.80	54.40	0.40	18.20	8.60	13.80	53.60
28-Feb	0.02	24.40	12.20	18.50	53.60	1.80	23.20	12.40	17.70	49.60
15-Mar	0.20	27.10	15.70	20.90	49.10	1.20	24.90	13.50	19.20	47.30
30-Mar	0.30	28.20	15.30	21.50	46.10	3.30	27.80	14.10	21.40	47.10
14-Apr	0.40	32.00	18.70	25.60	44.90	3.80	25.40	12.90	18.90	41.70
29-Apr	3.60	28.90	17.50	22.90	38.80	16.11	23.70	12.50	17.90	53.80
14-May	11.60	33.20	18.80	26.10	36.20	20.70	30.40	19.20	24.80	45.70
29-May	8.40	33.70	20.10	27.30	37.90	2.30	34.10	20.60	27.30	38.30
Total	24.52	319.90	177.40	248.90	639.60	49.61	297.10	159.00	228.10	659.90
Mean	1.88	24.61	13.64	19.14	49.20	3.80	22.85	12.23	17.55	50.76
Correlation r =		Max	Min	Mean	RH	Correlation r =	Max	Min	Mean	RH
		0.723	0.740	0.748	-0.867		0.631	0.620	0.635	-0.501
Partial Regr. =		2.436	9.619	3.149	3.985	Partial Regr. =	4.302	2.581	1.913	5.687
EV% =	69.9					EV% =	57.4			

Data in Table (2) Showed that, the mean number of *C. undecimpunctata* was absent at the first three inspections in the second season (2007/2008). The mean number began to increase gradually to record the first small summit on April The mean number of *C. undecimpunctata* observed an increase to reach the two maximum peaks on

April and May. Another decline was appeared in the population by the end of the season.

As shown in results a significant positive correlation was found between mean of the predatory insect, *C. undecimpunctata* density and means of weather factors (max., min. and mean temps.) while it was negative significant relation between the predator and mean of R. H.

Generally, mean of the total number of *C. undecimpunctata* was higher in the second season than the first one.

During the first season (2006/2007) the mean number of *C. undecimpunctata* began to appear on February The mean number fluctuated ups and downs to reach its maximum numbers on April and May. The population number of *C.undecimpunctata* decreased until absent at the end of the inspection. As shown in results a significant positive correlation was found between mean of the predatory insect, *C. undecimpunctata* density and means of weather factors (max., min. and mean temps.) while it was negative significant relation between the predator and mean of R. H.

These results are in agreement with according to Hassanein *et al.* (1969). ; Metwally *et al.* (1979). Abdel-Galil (1980) Ghattas (1999); Tahla (2001) and Hammad (2006).

Data in Table (3) indicated that, the reduction of the mean number of aphid individuals was clearly observed after four days from release which decreased from the pre-count to 63.4, 56.83&33.05 individuals / plant for the three levels, respectively. The corresponding reductions after four days from release were 63.33, 69.97 and 79.95%, respectively. The reductions rate after eight days from release increased to record 82.68, 82.93 and 91.53 % for the three levels, respectively. 16 days following release, the third level observed the highest reduction value recording 100 %, while the highest reduction values for the first and second levels were observed after 20 and 24 days from release recording 88.5 and 92.12%, respectively.

The mean number of aphid individuals started to increase again after 24 days from release to record 25.9, 14.06&10.8) individuals /plant thus, the corresponding reduction percentages decreased to reach (84.23, 92.12&92.98%) for the three levels, respectively.

The general mean numbers of aphid individuals were (32.12, 27.5 and 11.39) individuals /plant, the corresponding general reduction recorded (81.86, 85.62 and 93.14%) for the three levels, respectively.

The mean number of the predatory stages reached its maximum 4.7, 7.4 and 10.4 individuals /plant after 20 and 16 days, for the three different levels 2, 4 and 6 adults /2 m²), respectively.

These results are in agreement with Xiong and Dong (1991) ; Singh and Bali (1993); Bracamontes *et al.* (1995) and Dreist and Flint (1996)

Table (3): Efficiency of *Coccinella undecimpunctata* adults, in suppressing aphid population on dill plants.

Inspection data		Pre- release	Days after release						Mean of reduction %	Mean no.	F value	
			4	8	12	16	20	24				
2 adults / plant	M	165.9	63.4	33.4	23.09	26.3	20.6	25.9		32.12	2.82	
	R %		63.33	82.68	86.77	85.7	88.5	84.23	81.86b			
Mean no. of <i>C. undecimpunctata</i> / plant			0.1	1.3	2.6	4.1	4.7	3.6		2.73		
4 adults / plant	M	180.4	56.83	35.8	22.33	20.9	15.6	14.06		27.5		
	R %		69.97	82.93	88.24	89.5	91	92.12	85.62ab			
Mean no. of <i>C. undecimpunctata</i> / plant			0.3	2.6	3.8	5.8	7.4	5.3		4.2		
6 adults / plant	M	155.5	33.05	15.3	9.2	0	0	10.8		11.39		
	R %		79.95	91.53	94.4	100	100	92.98	93.14a			
Mean no. of <i>C. undecimpunctata</i> / plant			3.2	5.4	8.4	10.4	8.6	6.2		7.03		
Control		190.3	198.4	220.1	200.8	210.2	204.1	188.3		203.65		
M :	Mean number of aphid individuals.											
R % :	Reduction percentage of aphids.											

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تقدير كفاءة المفترس الحشري أبو العيد لحدى عشر نقطة *Brevicoryne* ضد حشرة المن *Coccinella undecimpunctata* على نبات الثبث *brassic*

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مقدمة:

يعتبر نبات الثبث من النباتات الطبية والعطرية للصحة الانسان حشرة المن حشرة تهاجم النباتات الطبية والعطرية في الصوب والحقل ومن أهم المائلات المفترسة لحشرة المن عائلة *Coccinellidae*, *Syrphidae* و *Chrysopidae* حشرة المن حشرة تهاجم النباتات الطبية والعطرية وتقتل أكثر من 200 مرض فيروسى مشكلة للبحث: تحديد وقت ظهور الحشرة على النبات ومفترسها وارتباطها بدرجة الحرارة والرطوبة وتحديد نسبة المفترس

الهدف من البحث: تقدير كفاءة المفترس الحشري ضد حشرة المن على نبات الثبث
الملخص: أوضحت الدراسة أن نبات الثبث يصاب بهذا النوع ابتداء من شهر يناير بمتوسط تعداد 0,5 فرد للنبات وذلك خلال الموسم الأول 2007. وقد ازدادت الأعداد تدريجيا إلى أن وصلت إلى أعلى قمة لها خلال شهر إبريل بمتوسط تعداد 328,3 فرد للنبات ثم قللت بعد ذلك تدريجيا حتى نهاية الموسم. بدأ ظهور الآفة في الموسم الثاني ابتداء من نهاية شهر ديسمبر بمتوسط تعداد 0,8 فرد للنبات وقد ازدادت الأعداد تدريجيا إلى أن وصلت إلى أعلى ذروة لها خلال شهر إبريل بمتوسط تعداد 289,3 فرد للنبات ثم قللت بعد ذلك تدريجيا حتى نهاية الموسم. كما أظهرت الدراسة وجود استجابة معنوية موجبة لهذا التعداد مع متوسط درجات الحرارة (الصغرى والعظمى والمتوسطة)، بينما كانت هذه الاستجابة سالبة مع الرطوبة النسبية. وبصفة عامة فإن تعداد الآفة في الموسم الأول كان أكبر منه في الموسم الثاني كان أول ظهور لهذا المفترس في نهاية شهر فبراير بمتوسط تعداد 0,2 فرد للنبات خلال موسم 2007. ولأخذ فسي الزيادة تدريجيا حتى وصل إلى أعلى ذروة له في منتصف شهر مايو 11,6 فرد للنبات ثم انخفض التعداد في نهاية الموسم. كان بداية ظهور المفترس خلال الموسم الثاني 2007 في منتصف شهر يناير بمتوسط تعداد 0,2 فرد للنبات ولأخذ التعداد في الزيادة في أن وصل إلى أعلى قمة له في منتصف شهر مايو 2007 فرد للنبات ثم انخفض التعداد في نهاية الموسم. كانت الاستجابة معنوية موجبة لهذا التعداد مع متوسط درجات الحرارة (الصغرى والعظمى والمتوسطة)، بينما كانت هذه الاستجابة سالبة مع الرطوبة النسبية. وبصفة عامة فإن تعداد الآفة في الموسم الثاني كان أكبر منه في الموسم الأول. وأظهرت النتائج أن:

- اطلاق المفترس الحشري *Coccinella undecimpunctata* ضد حشرة المن *Brevicoryne brassicae* على نبات الثبث أن يطلق الأفراد الكاملة لحشرة أبو العيد بمعدل 6 أفراد / م² أعطت أفضل نسبة خفض المعاملات حيث كانت متوسط نسبة الخفض 93,14 % بينما أدى الإطلاق بنسبة 4 فرد / م² إلى نسبة خفض أقل 80,86 % وكانت نسبة الخفض 81,86 % للمستوى الأول 2 فرد / م². وبصفة عامة فإن الإطلاق بمعدل 6 أفراد / م² كان أفضل مستوى.