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Population Fluctuation of the Green Peach Aphid, *Myzus persicae* (SULZ.) (Homoptera: Aphididae) infesting Canola Plants at Assiut Area

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ABSTRACT

Population fluctuation of the green peach aphid were conducted at Assiut area. Results showed that the activity of the green peach aphid was first recorded on 22 December 2016 and 2017 (3.24 and 6.20 aphids / plant) and reached its peaks during the first week of February and last week of January (33.62 and 48.76 aphids / plant) toward bud and flowering stages. Population model using the meteorological data indicated that plant age and parasitoids were important biotic factors in the population development of *M. persicae*, followed by minimum air temperature and maximum relative humidity.

Keywords: Myzus persicae, canola, population fluctuation, Assiut

INTRODUCTION

Canola plantations in Egypt are usually infested with various insect pests, which threaten the yield. Canola is usually attacked by complex of aphid species including cabbage aphid, *Brevicorynae brassicae* L; turnip aphid, *Lipaphis erysimi* Kattenbach and green peach aphid, *Myzus persicae* Sulzer. They cause a problem in the field and cause economic losses (Ahmed 1980, and El-Kadi, 1980). A little work was conducted on the green peach aphid attack canola plants at Assiut area.

The green peach aphid, *Myzus persicae* is one of the most injurious insect pests of canola. The pest is very active at the time of flowering adversely affecting both the yield and viability of the seeds (Martin and Johanston, 1982; Royer *et al*., 1997 El-Fatih 2000 and 2006).

Therefore, the present study was carried out to elucidate the seasonal abundance of the green peach aphid infesting canola and their natural enemies at Assiut area.

MATERIALS AND METHODS

The present studies were conducted throughout the period from 2015-2016 and 2016-2017 growing seasons

The study was carried out at the Experimental Farm of Assiut University throughout two successive canola-growing seasons, 2015-2016 and 2016-2017. An area of about half feddan (2100m^2) was cultivated with canola plants (cultivar Pactol). Plants were normally planted at first half of November. Regular conventional agricultural practices were normally performed, and no chemical control was used during the study period. Weeds were removed by hand.

Regular samples consisted of 50 plants of canola were randomly collected in transparent polyethylene bag and transferred to the laboratory for counting aphid species and their natural enemies. Samples were taken weekly when the migration of aphids on to the crops from overwintering sites began and continued through the time till when aphid population and their natural enemies declined to low or undetectable levels. The number of aphids (nymphs and adults) and the associated natural enemies within each species was counted and recorded at each inspection date.

Temperature (maximum and minimum) and relative humidity (maximum and minimum) were obtained from a meteorological station located at 100 m away from the experimental site in the field.

Multiple regressions were used to study the relationship [between the aphid populations and factors (biotic and abiotic).

RESULTS AND DISCUSSION

1- Aphid population

Data on the population densities of the aphid species expressed in terms weekly numbers / plant are summarized in Table (1).

In 2016 season, the green peach aphid began to appear on canola plants on 3rd week of December with few numbers (3.24 aphids / plant in average), when the plants were in the seedling stage. Afterwards, the population of aphids increased gradually to reach a peak of abundance (33.62 / aphids / plant in average) during the first week of February. Then the number of aphids began to decline until the third week of March to reach 1-2 aphid / plant in average.

In 2017 season, infestation of canola with the green peach aphid followed nearly the same trend of the 2016 season. Aphids began to infest canola plants during the 3rd week of December with few numbers (6.20 aphids / plant

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in average). There are two swarming peaks were recorded 1st during 2nd week of January (52.96 aphids / plant in average) and the second (48.76 aphids / plant in average) on the last week of January. Then the population started to decline and disappeared from the field during the third week of March when the plants reached the ripening growth stage.

The present results in Table 1 indicate that the numbers of aphids were significantly higher in the second (2017) season (243.76 individuals / plant in average) than that of the first (2016) season (119.68 individuals / plant in average). The differences in levels of infesting between the two seasons might be attributed to the difference in weather factors and / or the effect of the common natural enemies. The general means of temperature ranged from 16.51 to 22.70°C and from 10.87 to 20.19°C and for relative humidity ranged from 45.86 to 56.43% and 41.29 to 48.14%, during the first and second seasons, respectively. It could be generally concluded that the population of the pest appeared with a few numbers during the third week of December. Where the plants were in the seedling stage coincided with a plant age of 45 days, temperature ranged from 7.57 to 28.43°C and relative humidity ranged from 15 to 84%. Predators were recorded in low numbers during this phase. The initial infestation with aphids was correlated with few numbers of mummies. The data revealed also that the population of aphid increased markedly by the progress of canola plant growth toward rosette and bud stages.

There are two swarming peaks were recorded 1st during 2nd week of January and the second on the first week of March. The maximum population densities of the green peach aphid occurred when the plants were in the rosette and bud stages. In this point plant age was ranged from 66 to 80 days. This period (second half of January and the beginning of February) however, coincided with a maximum temperature ranged from 19.71 to 27.93°C, maximum RH ranged from 75.00 to 83.43%. These conditions seem favorable for the reproduction and multiplication of the green peach aphid. However, the rapid increase in the population of aphid in this period might be related to suitability of the host plant. The data however showed a decline in the aphid population from the beginning of February and vanished from canola from the end of February. This period coincided with the end of flowering and ripening growth stages of canola plants. The prevailing maximum temperature during February ranged from 21.86 to 30.29°C, the relative humidity ranged from 73.71 to 86.86%, however, the number of predators and mummified aphids progressively attained their peak as the aphid populations declined. However, the eventual decline of aphid populations later in the growing season results from a combination of rapid drop in the suitability of the crop in this time, accompanied by much alate emigration and the action of the natural enemies of aphids.

Table 1. Population fluctuation of *M. persicae* infesting canola plants, Assiut, 2015-2016 and 2016-2017 seasons.

Sampling date	Growth stage	Mean no individuals / plant		
		2016	2017	Average
Dec. 22	Seedling	3.24	6.20	4.72
28	Seedling	7.44	8.44	7.94
Jan. 4	Seedling	8.24	21.50	14.87
12	Rosette	10.52	52.96	31.74
19	Rosette	9.82	32.52	21.17
26	Bud	13.26	48.76	31.01
Feb. 5	Bud	33.62	24.20	28.91
12	Flower	15.42	16.92	16.17
23	Flower	7.62	14.66	11.14
March 1	Ripening	6.20	8.20	7.20
10	Ripening	3.10	6.20	4.65
19	Ripening	1.20	3.20	2.26

2- Multi-correlation analysis of some factors affecting the population of *M. persicae*

The relationship between incidence of the green peach aphid infesting canola plants and selected abiotic and biotic factors were statistically analyzed using multiple regression analysis. The selected abiotic factors were air temperatures and relative humidity; and three biotic factors i.e. plant age (in days), number of predators and mummified in relation to the population of *M. persicae* during 2015-2016 and 2016-2017 growing seasons.

In general, regardless of the growing seasons, data showed that the infestation of canola plants by the green peach aphid appeared with few numbers during about third week of December when the plant age reached about 45 days. It recorded 3.24 and 6.20 individuals / plant of 2016 and 2017 (tables 2 and 3). In this time the canola plants were in the seedling stage. Predators were recorded in few numbers during this phase of development (2016 and 2017).

Table 2. Population of *M. persicae* aphid infesting canola in relation to some abiotic and biotic factors Assiut, 2016.

Sampling date	Mean no aphids / plant	Plant age (days)	Temp. (°C)			R.H. (%)			Natural enemies	
			Max.	Min.	Avg.	Max.	Min.	Avg.	Paras.[1]	Pred.[2]
Dec. 22	3.24	45	28.43	13.14	20.79	84.00	19.57	52.00	0.34	0.02
28	7.44	52	25.21	11.79	18.37	80.29	31.00	56.43	0.52	0.04
Jan. 4	8.24	59	22.57	10.43	16.51	86.29	22.29	54.43	0.98	0.10
12	10.52	66	26.14	8.93	17.54	87.29	19.57	53.57	1.90	0.14
19	9.82	73	27.93	11.79	19.87	83.43	24.71	55.00	0.98	0.22
26	13.26	80	26.71	11.86	19.29	83.14	25.43	54.57	4.24	0.38
Feb. 5	33.62	87	29.00	11.50	20.26	79.86	21.43	51.00	15.78	0.84
12	15.42	94	30.29	10.79	20.50	86.86	19.29	53.43	6.50	1.04
23	7.62	101	29.14	11.21	19.77	73.71	17.57	45.86	5.62	1.44
March 1	6.20	108	27.00	11.00	19.01	76.43	20.14	48.71	5.30	0.88
10	3.10	115	25.57	10.50	18.01	80.71	22.57	51.14	12.48	0.40
19	1.20	122	31.79	13.57	22.70	78.29	19.57	48.43	1.24	0.16

1, paras.: Mean no. of mummified aphids

2, Pred.: Mean no. of *Coccinella undecimpunctata* L., *Chrysoperla carnea* (Stephens), *Paederus alfierii* Koch., *Orius* sp.

Table 3. Population of *M. persicae* aphid infesting canola in relation to some abiotic and biotic factors Assiut, 2017.

Sampling date	Mean no aphids / plant	Plant age (days)	Temp. (°C)			R.H. (%)			Natural enemies	
			Max.	Min.	Avg.	Max.	Min.	Avg.	Paras.[1]	Pred.[2]
Dec. 22	6.20	45	23.71	7.57	15.64	71.86	15.00	43.57	0.26	0.04
28	8.44	52	23.14	9.57	16.36	76.86	19.29	48.14	0.34	0.08
Jan. 4	21.50	59	21.86	5.57	13.71	74.57	17.57	46.29	0.64	0.12
12	52.96	66	25.00	5.71	15.36	76.43	17.29	47.71	3.12	0.16
19	32.52	73	22.86	7.57	15.21	75.71	14.86	45.00	3.42	0.26
26	48.76	80	19.71	6.27	13.00	75.00	26.00	51.00	9.60	0.42
Feb. 5	24.20	87	21.86	4.43	13.86	74.14	22.29	45.86	19.20	0.72
12	16.92	94	17.50	4.21	10.87	70.57	13.00	41.86	20.42	0.88
23	14.66	101	25.50	8.14	16.83	70.57	11.71	41.29	24.64	1.30
March 1	8.20	108	28.57	11.71	20.19	75.57	13.57	44.71	16.90	0.74
10	6.20	115	22.14	8.29	15.21	66.86	19.57	43.29	12.46	0.44
19	3.20	122	28.29	8.86	18.57	73.57	13.14	43.43	1.44	0.30

1, paras.: Mean no. of mummified aphids

2, Pred.: Mean no. of *Coccinella undecimpunctata* L., *Chrysoperla carnea* (Stephens), *Paederus alfierii* Koch., *Orius* sp.

The initial records of the pest were followed with few numbers of predators and parasitoids. The data revealed also that the population of the pest increased markedly with the progress of canola growth toward rosette and bud stages. The maximum population of *M. persicae* occurred when canola plants reached to bud and beginning flowering stages (tables 2 and 3). This period (end of January and the beginning of February). However, coincided with a maximum temperature ranged from 18.71 to 30.42ºC, maximum RH% ranged from 68.14 to 74.85% (tables 3 and 5). The data also showed a decline in the pest population from the second week of March where minimum numbers were recorded at the end of March

Biotic factors

Plant age

Data in Table 4 and 5 showed that plant age has a coefficient of determination of about 32.21% out of 86.48% in 2016 and 22.15% out of the total efficiency 71.83% in 2017. This evidence indicated that about 32.21% and 22.15% of the variability of the infestation was due to plant age under the studied variables (7 variables). Tables (4 & 5) shows that the rating sort of the plant age came in number one.

Table 4. Multi-factors affecting population of *M. persicae* infesting canola plants during 2015-2016 growing season.

Factors			Simple correlation	Relative efficiency	Rating
Biotic	Plant age (days)		0.64*	32.21	1
	Predators		0.61 *	7.82	5
	Parasitoids		0.87*	16.30	2
Abiotic	Air temp. (ºC)	Max.	0.65*	6.24	6
		Min.	0.55*	11.25	3
	R. H (%)	Max.	0.91*	9.04	4
		Min.	0.42	3.62	7
Co-efficient				86.48	

Table 5. Multi-factors affecting population of *M. persicae* infesting canola plants during 2016-2017 growing season.

Factors			Simple correlation	Relative efficiency	Rating
Biotic	Plant age (days)		0.67*	22.15	1
	Predator		0.65*	10.24	3
	Parasitoids		0.55*	13.25	2
Abiotic	Air temp. (ºC)	Max.	0.71*	9.32	4
		Min.	0.52	5.31	6
	R. H (%)	Max.	0.72*	7.22	5
		Min.	0.49	4.34	7
Co-efficient				71.83	

Predators

Data in Tables (4 and 5) showed that predators seemed to be responsible for about 7.82% during 2016 season and 10.24 during 2017 season in the changes of *M. persicae* population. Predators came in the rating sort in number five and three.

Abiotic factors

Air temperature and humidity

It was found that the effect of maximum and minimum temperature on the infestaion of canola plants by *M. persicae* has a coefficient of determination of about 6.24% and 11.25% out of 86.48% during 2015-2016 season and 9.32 and 5.31% out of 71.83% during 2016-2017 season of the total efficiency (7 variables). The rating sort of the maximum and minimum temperature came in number six and three (2016) and four and six (2017) (Tables 4 & 5).

The maximum and minimum relative humidity was found to be responsible for 9.04% and 3.62% during 2016 and 7.22 and 4.34 during 2017 seasons of the variability of number of green peach aphid infesting canola, respectively.

Canola is one of the newly introduced oil crops in Egypt to contribute in reducing oil shortage; especially it could be cultivated in salinity soil. Rape seed has a bright future in Egypt because of its ability to grow in the new reclaimed lands under wide soil variation of drought and salinity (Kandil, 1996). The pests inhabiting canola plants in certain countries of the world i. e. India, Pakistan, USSR, China, Italy, Canada, Poland, Bulgaria, UK, Australia, Turkia, Germany, Barazil, North America, USA, Denmark, Estonia, South Africa and Egypt, belonging to different orders (Lamb., 1989). Various authors in certain parts of the world i. e. Huhges 1963, Beg 1982, Harvir-Singh *et al.* 1983, Ali and Munir 1984, Osipov 1985, Bakhetia 1986, Zong *et al.* 1986, Ballenger 1987, Albertini *et al.* 1988, Madder and Stemeroff 1988, Alford *et al.* 1991, Kismir 1992, Boyed and Lentz 1999, Warner *et al.* 2000, Carcamo *et al.* 2001, Mosiane *et al.* 2003, Hansen 2004 and Pontoppidan *et al.* 2005, discussed pests inhabiting canola from an economic view point.

The green peach aphid, *M. persica* is considered a pest of many cruciferous crops throughout all the temperate and warm temperate regions of the world. This aphid damaged cabbage crops (Theunissen, 1989). *M. persicae* caused direct damage, resulting from searching for food, which may induce plant deformation (Ibbotson, 1953; Oatman and Platner, 1969), and indirect damage caused either by honeydew or by transmission of viruses. The green peach aphid is a vector of 20 virus diseases in a large range of plants (Chan *et al.*, 1991).

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التذبذب العددي لمن الخوخ الأخضر *Myzus persicae* (Sulz.) (Homoptera: Aphididae) التي يصيب نباتات الكانولا في منطقة أسيوط

إيمان فاروق محمد طلبة

قسم وقاية النبات ـ كلية الزراعة ـ جامعة الوادي الجديد

تم دراسة التذبذب العددي لمن الخوخ الاخضر في منطقة أسيوط. أظهرت الدراسة ان من الخوخ الأخضر ظهر لاول مرة في 22 ديسمبر 2016 و 2017 (3,24 و 6,20 فرد / بنات). ثم وصل الي اعلي مستوي لة خلال الاسبوع الأول من فبراير و الاسبوع الاخير من يناير (33,62 و 48,76 فرد / نبات) خلال طوري التبرعم والازهار . النموذج التعدادي باستخدام بيانات الارصاد الجوية أظهر ان عمر النبات والطفيليات الحشرية هي أهم العوامل الحيوية لزيادة تعداد من الخوخ الاخضر يليها درجة الحرارة الصغري ثم الرطوبة النسبية العظمي.