

## **SEASONAL ABUNDANCE OF APHIDS, *Nezara viridula* L. AND ASSOCIATED NATURAL ENEMIES IN WHEAT FIELDS AT KAFR EL-SHEIKH GOVERNORATE**

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### **ABSTRACT**

Field experiments were conducted at Farm of Sakha Agricultural Research Station, Kafr El-Sheikh A. R. of Egypt during 2005/06 and 2006/07 seasons to study the population abundance of *Aphis* spp. , *Nezara viridula* L. and the common associated natural enemies on wheat plants.

The obtained data indicated that, the population density of aphids, *N. viridula* and the common predators on wheat plants were significantly higher in the first season than in the second one. Also, maximum number of these insects took place during March. The associated predators with the two insects ( aphids and the green stink bug ) appeared earlier than the parasitism especially in the second season. The common predators were true spiders ; *Syrphus* sp.; *Chrysoperla carnea* Steph.; *Paederus alferii* Koch. and *Scymnus* spp. The first species was the most dominant. The rate of parasitism on aphids and *N. viridula* eggs did not differ significantly in the two study seasons and the high rate of parasitism was observed during March coinciding with the highest period of two insects infestation during the two seasons.

Thus, these results on the seasonal abundance of the two insects and the natural enemies in wheat fields will be useful in developing pest management programs.

### **INTRODUCTION**

Wheat, *Triticum aestivum* L. is one of the most economic field crops all over the world. Aphids are the most important insect pests attacking wheat plants causing considerable reduction in the yield and the grain quality (El-Heneidy *et al.*, 1991; Abd El-Aleim, 1992; Zhang *et al.*, 1995 and Nassef *et al.*, 2002). Also, the green stink bug, *Nezara viridula* L. caused significant reduction in germination when it infests wheat plants at milky stage (Viator, *et al.*, 1983).

The damage of the two mentioned insects to wheat is a result of sucking the plant sap, producing honey dew on which the sooty molds grow and the availability of transmission plant virus diseases (Jones and Jones, 1974).

However, the population densities of the insects and the corresponding injury for the plants fluctuate greatly from season to another and within the same season depending on the abundance of the associated natural enemies and / or the prevailing weather conditions (Picard, 1987).

Thus, the insect fluctuations are important in the integrated pest management programs to minimize use insecticides for control these insects in wheat fields.

Therefore, the present study was conducted during two successive wheat seasons (2005/06 and 2006/07) to shed light on the population

dynamic of aphids, *Nezara viridula* L. and the common natural enemies on wheat plants at Kafr El-Sheikh Governorate.

#### Materials and methods

The experiment was carried out at Sakha Agric. Res. Station Farm, Kafr El-Sheikh during two successive wheat growing seasons 2005/06 and 2006/07 to study the changes in the population abundance of aphids and green stink bug, *Nezara viridula* L. as well as the related predators and parasitoids on wheat variety Sakha 93.

An area about 1/6 fed. was divided into four plots each of one kerat ( ca. 175 m<sup>2</sup> ). The seeds were sown during 20<sup>th</sup> November in the two studied seasons and the normal agricultural practices were adopted without any insecticidal treatments.

To assess the population density of aphids and green stink bug, weekly sample of 20 wheat tillers was randomly selected from each plot. The number of aphids (nymphs and adults) and *N. viridula* (nymphs & adults) as well as the common associated predators were directly counted in the field. Sampling started from late December to half April. Samples of infested wheat plants with aphids were collected weekly and transferred to the laboratory for determination the rate of parasitism according to El- Heneidy *et al.* (2004).

Also, egg- masses of green stinkbug, *N. viridula* were weekly collected and transferred to the lab. till hatching according to Kalafalla *et al.*, (2005 b).

Weekly mean numbers of aphids, green stinkbug, predators and rate of parasitism throughout the whole season were counted. Statistical analysis of the obtained data were performed by using the least significant difference (L.S.D) method according to Snedecor and Cochran (1980).

## RESULTS AND DISCUSSION

### 1- Seasonal abundance of aphids and *Nezara viridula* L. on wheat plants:-

During this course of study, four species of aphids were observed on wheat plants; *Rhopalosiphum padi* (L.); *Schizaphis graminum* (Rond); *Rhopalosiphum maidis* (Fitch) and *Sitobion avenae* (Fab.). The first species was the most dominant during the two seasons of study (2005/06 and 2006/07). The total of aphid species was taken into consideration. This observation is in agreement with the findings of El- Heneidy (1991); El- Heneidy *et al.*, (1991); Nassef *et al.*, (2002) and El- Heneidy *et al.*, (2004).

Data presented in Table (1) show weekly population of aphids and the green stink bug, *Nezara viridula* L. on wheat plants during seasons of 2005/06 and 2006/07. In the first season, aphids started to appear with low numbers (7.75 insects/ 20 tillers) in late December. Then, the population began to increase recording its peak on 6<sup>th</sup> of March (1765.00 insects/ 20 tillers). After that, the population decreased gradually to record the lowest number (16.00 insects/ 20 tillers) in the last week of April.

**Table (1): Mean number of aphids and *Nezara viridula* L./ 20 wheat tillers during 2005/06 and 2006/07 seasons at Kafr El-Sheikh Governorate.**

Sampling date	Season of 2005/06		Sampling date	Season of 2006/07	
	Mean No. of aphids	Mean No. of <i>N. viridula</i>		Mean No. of aphids	Mean No. of <i>N. viridula</i>
Dec.26, 2005	7.75	1.50	Dec.29,2006	5.75	1.00
Jan. 2, 2006	19.75	2.0	Jan. 5, 2007	12	1.50
9	53.75	2.75	12	12.50	2.00
16	55.00	3.25	19	21.50	2.50
23	169.50	2.75	26	27.00	3.25
30	204.50	2.75	Feb.2	25.50	3.50
Feb.6	442.50	3.0	9	66.75	3.00
13	450.00	5.0	16	137.00	3.50
20	816.25	7.0	23	149.50	4.75
27	1267.50	8.50	March, 2	194.75	6.50
March 6	1765.00	17.00	9	309.25	7.75
13	695.00	23.50	16	403.00	9.50
20	255.75	24.75	23	269.25	9.50
27	137.75	18.00	30	136.00	8.75
April,3	48.00	15.75	April,6	81.50	15.25
10	32.50	9.75	13	31.00	20.00
17	16.00	8.25	-	-	-
Seasonal mean	378.62±	9.15 ±	Seasonal mean	117.64 ±	6.39 ±
+SE*	6.92	056	+SE	2.16	0.33

SE\* means standard error

In the second season, aphids started firstly in low numbers (5.75 insects/ 20 tillers) in late December. Then, the population began to increase recording its peak on 16<sup>th</sup> of March (403.00 insects/ 20 tillers). After that, the population decreased gradually to record the lowest number (31.00 insects/ 20 tillers) in late April.

However, the decline in aphid population at the end of the season may be due to aphid migration from mature plants in which their food supply was reduced and increase of the associated predators or/ and the prevailing weather factors became unsuitable as mentioned by Attia & Abdel- Rahim (1989) and Nassef *et al.*, (2002).

As for *Nezara viridula* L., the results indicated that in the first season (2005/06), the population began to appear in low number (1.50 insects/ 20 tillers) in late December. The population then fluctuated to reach its peak of 24.75 insects / 20 tillers on 20<sup>th</sup> March. After that, the population declined gradually till the end of the season.

In the second season, the insect appeared in low numbers (1.00 insects/ 20 tillers) on 29<sup>th</sup> December. After that, the population increased gradually to record the highest number by 20.0 insects/ 20 tillers at the end of the season (13<sup>th</sup> April). However, the high number of *N. viridula* during March and early April was due to the suitable weather factors for activity of the insect and resuming insect activity after hibernation (Khattab, 2003 and Kalafalla *et al.*, 2005a).

## **2- Seasonal abundance of the common natural enemies in wheat fields:-**

The common predators and parasitoids were only the biological control agents taken into consideration during the present study.

As for the predators, five species were observed in wheat fields during the two seasons of study. True spiders were the most abundant species on wheat plants followed by *Syrphus* sp.; *Chrysoperla carnea* Steph.; *Paederus alferii* Koch, while *Scymnus* spp. were the least one. The total number of the predatory species was taken into consideration.

The results in Table (2) clear the population density of the total count of the common predators and rate of parasitism on aphids and *N. viridula* eggs on wheat plants during 2005/06 and 2006/07 seasons.

In the first season, the predatory species began to appear in low numbers (2.0 individuals/ 20 tillers) on 26<sup>th</sup> December, 2005. Then, the population increased gradually to reach the first peak of 31.0 individuals/ 20 tillers on 6<sup>th</sup> March and this coincided with the maximum numbers of aphids. After that, the population fluctuated up and down recording the highest peak of abundance (45.50 individuals/ 20 tillers) on 3<sup>rd</sup> April and deceased gradually till the end of season.

In the second season, the population started with low numbers (2.0 individuals/ 20 tillers) on 29<sup>th</sup> December, 2006. the population then, increased gradually to reach its peak of 16.0 individuals/ 20 tillers on 16<sup>th</sup> March. After that, gradual decrease in the population was observed till the end of the season.

**Table (2): Mean number of the common predators/ 20tillers and percentage of parasitism on aphids and *N. viridula* eggs in wheat fields during 2005/06 and 2006/07 seasons at Kafr El-Sheikh Governorate.**

Sampling date	Season of 2005/06			Sampling date	Season of 2006/07		
	Predators	% parasitism on			Predators	% parasitism on	
		Aphids	<i>N. viridula</i>			Aphids	<i>N. viridula</i>
Dec. 26, 2005	2.00	-	-	Dec. 29, 2006	2.00	-	-
Jan. 2, 2006	3.50	-	-	Jan. 5, 2007	2.00	-	-
9	7.50	-	-	12	4.50	-	-
16	11.00	-	-	19	3.50	-	-
23	15.00	2	-	26	4.00	-	-
30	14.00	2	-	Feb.2	5.50	-	-
Feb.6	18.50	3	-	9	7.00	-	-
13	19.00	3	-	16	7.00	1	0
20	20.50	7	1.0	23	8.00	3	0
27	26.00	12	2.5	March, 2	10.00	4	0
March 6	31.00	17	4.5	9	13.00	10	0.50
13	22.50	35	15.0	16	16.00	18	1.50
20	36.00	24	10.0	23	10.00	24	2.75
27	39.00	11	2.0	30	11.00	35	4.25
April,3	45.50	5	0	April,6	10.00	30	12.00
10	30.00	1	0	13	7.50	12	5.00
17	18.00	0	0	-	-	-	-
Seasonal mean +SE*	21.12+ 1.94	7.18+ 0.49	2.06+ 0.04	Seasonal mean +SE	7.56+ 0.23	8.56+ 0.46	1.63+ 0.17

SE\* means standard error

The obtained results are in agreement with those of Abou- Elhagag & Abdel- Hafez (1998) and El- Heneidy *et al.*, (2004) who stated that the most important predators attacking wheat aphids were Coccinellids, Chrysopids and Staphylinids.

As for the parasitism on aphids, the results indicated that in the first season, the parasitism appeared four weeks later of aphids appearance with low rate (2%) and then, increased to record the highest rate (35%) on 13<sup>th</sup> March. After that, it declined to disappear completely at the end of the season. In the second season, the parasitism appeared after seven weeks of aphid appearance with rate of 1%. Then, it increased gradually to reach the highest rate of 35% at the end of March. The rate of parasitism decreased at the end of the season (12%). The present results coincided with those of Abou- Elhagag and Abdel- Hafez(1998); Nassef *et al.*, (2002) and El-Heneidy *et al* (2004) who showed that the peak of parasitoids occurred during March. Concerning the parasitism on *Nezara viridula* L. eggs, the results indicated that in the first season, the parasitism appeared with low rate of 1% on 20<sup>th</sup> February and increased gradually to record the highest rate by 15% on 13<sup>th</sup> March. Then, it declined to disappear completely in early April. During the second season, the first appearance of parasitism was on 9<sup>th</sup> March with rate of 0.5% and increased gradually to reach its maximum rate (12%) in the first week of April.

These results are in agreement with those of Jones *et al.*, (1996) who reported that the parasitism of *N. viridula* eggs ranged between 0 -11% from July to August, 1975 and recorded 50% during August, 1976. Shepard *et al.*, (1994) mentioned that the rate of parasitism of *N. viridula* eggs in the field was variable among years and crops. Also, Khalafalla *et al.*, (2005 b) reported that the highest rate of parasitism of *N. viridula* was synchronized with an increase of the temperature.

Based on the seasonal mean of aphids, *N. viridula* and the common predators and rate of parasitism throughout the whole season (Table 3), it appears that aphids, *N. viridula* and the predatory species were significantly higher in the first season than that of the second one. On the other hand, the rate of parasitism on aphids and *N. viridula* eggs did not significantly differ in the two seasons, where the seasonal mean was 7.18% & 8.56% for aphids and 2.06 % & 1.63% for *N. viridula*. This might be due to the differences in the prevailing weather factors or/ and the natural enemies.

**Table (3): Seasonal mean of aphids, *N. viridula* and common predators/ 20 tillers and percentage of parasitism on wheat plants during 2005/06 and 2006/07 seasons.**

Seasons	Seasonal mean/20 tillers		% parasitism on		Mean number of total predators
	Aphids	<i>N. viridula</i>	Aphids	<i>N. viridula</i>	
2005/06	378.62	9.15	7.18	2.06	21.23
2006/07	117.64	6.39	8.56	1.63	7.56
LSD* (5%)	16.752	1.275	2.595	0.621	5.948

LSD\* means Least significant difference.

From the foregoing results, it can be concluded that the population density of aphids, *N. viridula* and the common predators varied from one season to another on wheat plants as it was higher in the first season than in the second one. Also, the highest number of the two insects coincided with the high rate of parasitism and it was later than of the predators. This might be due to the fact that the parasitoids have specific and much correlated characters with their hosts than the predators.

Thus, this might reduce the role of the predators as a biocontrol agent in wheat field. Thus, these results on seasonal abundance of the two insects and the natural enemies in wheat fields will be useful in developing pest management programs.

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الوفرة الموسمية للمن والبقعة الخضراء والأعداء الطبيعية المصاحبة لها في حقول القمح بمحافظة كفر الشيخ  
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أجريت تجربة حقلية في مزرعة محطة البحوث الزراعية بسخا خلال موسمي ٢٠٠٥/٢٠٠٦، ٢٠٠٦/٢٠٠٧م لدراسة الوفرة الموسمية لعشائر المن والبقعة الخضراء وكذا الأعداء الطبيعية المصاحبة لها على نباتات القمح. أظهرت النتائج المتحصل عليها أن:

الكثافة العددية للمن والبقعة الخضراء والمفترسات الشائعة كانت أعلى وبدرجة معنوية في الموسم الأول عنها في الموسم الثاني، وأن أعلى تعداد سجل خلال شهر مارس في كلا الموسمين. كما أظهرت النتائج تواجد المفترسات المصاحبة مبكراً مع بداية الفحص الحشري في حين ظهر التطفل متأخراً على كل من المن وبيض البقعة الخضراء خاصة في الموسم الثاني. وكان أكثر المفترسات شيوعاً العناكب الحقيقية يليها ذبابة السرفس وأسد المن والحشرة الرواغة والاسكمنس - وكانت العناكب الحقيقية أكثرهم سيادة - وجد أيضاً أن أعلى معدل للتطفل كان خلال شهر مارس مترامناً مع أعلى تعداد لكلا الحشريتين، ولم تظهر نتائج التحليل الاحصائي أية فروق معنوية للتطفل خلال موسمي الدراسة.

وبصفة عامة فإن هذه النتائج تمثل أهمية كبيرة في الإدارة المتكاملة للحشرات في حقول

القمح.