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ECOLOGICAL AND TOXICOLOGICAL STUDIES ON THE GREEN PEACH APHID, *Myzus persicae* (Sulzer) ASSOCIATED WITH SOYBEAN CROP.

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ABSTRACT

The population of aphid, Myzus persicae appeared with fluctuated number during growing seasons 2012 and 2013 of soybean crop. The high number of aphid appeared with 408 and 780 individual / 30 leaflet during two seasons 2012 and 2013, respectively and the infestation and damage were high in vegetative stage of soybean growing stage. The infestation was the highest in vegetative stage 69.16% and 65.23% during the two seasons 2012 and 2013, respectively. Infestation was 9.52 and 15.42 aphid individual / leaflet during two seasons in vegetative stages. Three bio-pesticides, Challengar, Tracer and Biovar were used for controlling aphid, Myzus persicae under laboratory and field condition. Challengar was the most effective bio-pesticides followed by Tracer and Biovar where the LC_{50} values 0.43, 3.57 and 61.53, respectively. The bio-pesticides descending according of mean percent reduction, 76.46, 66.75 and 57.10% for Challengar , Tracer and Biovar, respectively.

Key words: Soybean crop, Myzus persicae, Bio-pesticides.

INTRODUCTION

Soybean, *Glycine max* (L.) considered now one of the most important cash crops in many countries. It is one of the summer legume crops; with great nutritive value, containing relatively high percentage of oil and proteins with many essential amino acids. It is used for feeding human and animals and its remains used as fertilizer for enrich the soil. Many insect pests infesting soybean crop especially, piercing sucking insects were the major insect pests attacking this crop in the field causing severe damages.

(El-Kifl *et al*., 1974; Metwally, 1998; Awadallah *et al*., 1991 and El-Khouly *et al*., 1998). Aphids play an important role as vector of plant viruses and produce honeydew (Kasperovich, 2002 and Cao *et al*., 2008). Also, aphids are serious pest of cultivated crops all over the world. There are about 92 species of aphids in Pakistan (Irslad, 2001).Their infestation can lead to severe economic loses as a result of crop yield reduction. Direct damage occurs due to sucking plant sap from succulent parts of plant and heavy infestations lead to leaf fall, lack of fruits maturity and death of plant. The excretions of ample amounts of honeydew encourage the growth of sooty mould, thus inhibiting photosynthesis. The aphid, *Myzus persicae* (Sulzer) is a key pest of cruciferous vegetables, particularly cauliflower, broccoli and cabbage in tropical regions, reducing stand and vigor of young plants, ultimately affecting product quality (Harrewijn minks 1989, Harrington and Van Emden, 2007). The indiscriminate use of pesticides for controling *Myzus persicae* aphid has lead to serious problems, such as the appearance of resistant strains, resurgence of secondary infestation parts due to the elimination of their natural enemies, intoxicant of farm workers, environmental damage and risks to consumer's health (Foster *et al*.,2000). Bio-pesticides are among the most of biocontrol agent for management of many sucking insects especially when pesticides are not allowed as in organic cropping.

Therefore, the present study was conducted to study the population fluctuation of *Myzus persicae* in relation to ecological factors and compare the efficacy of different bio-pesticides against aphid pest.

MATERIALS AND METHODS

1. Ecological studies:

1.2. Population fluctuation of Aphid, Myzus persica on Soybean during the two seasons 2012 and 2013:

An area of about 1/2 Fedden in Zagazig district at Sharkia Governorate was cultivated by soybean plants (Giza 111 variety) sowing in 10 May to evaluate the population dynamic of aphid during two successive seasons 2012 and 2013. This area was divided into three replicates distributed randomly. Sampling started when the infestation aphid appeared. Weekly samples of 30 leaflets were taken from different levels representing

the plant and taken randomly from every replicate then placed in paper pages and transferred to the laboratory for examination aphid, *Myzus persicae*. Number of individuals of each stage was calculated by hand lens.

2. Bioassay:

2.1. Bio-pesticides:

A. Trade name: Challengar 36 %Sc.
Commen name: Chlorofenapayer

B. Trade name: Biovar 23×10^6 spore/gm.
Common name: *Beauvaria bassiana*

C. Trade name: Tracer 24% SC
Common name: Spinosad

2.2. Laboratory study:

2.2.1. Rearing of aphid, Myzus persicae:

Myzus persicae reared on Cabbage plant in potted. All the potted plants were maintained in plastic cages (25 x 25 x 20 cm^3) under laboratory condition. This experiment was conducted in plant protection institute.

2.2.2. Bioassay procedure:

The efficacy of bio-pesticides, Challengar, Tracer and Biovar was determined by using spray technique. Total number of 80 individuals (apterous) were bio-assayed in four replicates of 20 apterous each. All replicate placed on faba bean. Serial concentrations, 1, 0.5 , 0.1 and 0.01ppm from Challengar 30 , 10, 5 and 2ppm from Tracer and 100, 50, 25 and 10 ppm from Biovar were appeared. All replicates of aphid sprayed with the concentrations of above bio-pesticides. Mortality of aphid was recorded by Abbott's formula, 1925).

2.3. Field study:

The efficiency of bio-pesticides against *Myzus persicae* was carried out at Zagazig city (El-Zahraa village) on Soybean (Giza 111 variety) during season 2013 under field condition. Bio-pesticides experiment were cited at a randomly block design an area about 12 kirates was divided into 4 plots (3 plot as treatments; Challengar, Tracer and Biovar in addition to control). Knapsack motor was used to spray the tested bio-pesticides. The recommended concentration of bio-pesticides was used.

Samples from each treatment were collected randomly by taken 30 leaflets from three different leaves of plant and potted in paper bags and transferred to laboratory after 3,7,10 and 14 days and examined directly by hand lens. The individuals of *Myzus persicae* were counted pre and post treatment. The reduction % were calculated after 3, 7, 10 and 14 day of treatment by using Hinderson and Tillton formula (1955).

RESULTS AND DISCUSSION

Data in Table (1) revealed that, infestation of soybean by *Myzus persicae* appeared after 35 days from sowing during season 2012. The population of insects found with fluctuated number to reached the maximum number by 408 individual aphid/ 30 leaflet at the end of first week from August 2012. The population fluctuated during growing season and decreased at the end of the season. During season 2013 the infestation of aphid appeared early compared with the first season 2012 which appeared with 90 individual/ 30 leaflet at 20 of May then increased and decreased weekly *Myzsus persicae* population appeared by 3 peaks first one 210 individual/ 30 leaflet at 27 days of May while second one was highly 780 individual / 30 leaflet at the beginning of July and the last one was 450 individual / 30 leaflet at end of July.

The correlation between *Myzus persicae* population and weather factor (Temperature and relative humidity) cleared with (r) values where were positive correlation between population of aphid and weather, where (r) value of temperature 0.81 and 0.87 and R.H.% values were 0.59 and 0.44 for 2012 and 2013, respectively.

The obtained results are in agreement with the results of Farghali *et al.*, (1996) Who found that the aphid population increased gradually from the second week of June, recording the highest number at mid July on mung bean. Quimio and Calilung (1993) indicated that aphid, *Myzus persicae* population on Soybean was presented at the seedling stage and peaked at the late vegetative to pre-flowering stages. The population was composed mainly of nymphs.

Table (1). Population fluctuation of *Myzus persicae* during two seasons 2012 and 2013 at Sharkia Governorate.

Season 2012				Season 2013			
Date of inspection	**Mean number of *Myzus persicae* / 30 leaflet**	**Mean Temp.°C**	**Mean R.H.%**	**Date of inspection**	**Mean number of *Myzus persicae* / 30 leaflet**	**Mean Temp. °C**	**Mean R.H.%**
22-5	0	28.56	51.9	**13-5**	0	26.62	49.36
29-5	0	27.89	57.15	**20-5**	90	26.91	56
05-6	181	27.19	53	**27-5**	210	27.5	56.22
12-6	176	28.18	57	**03-6**	180	28.33	54.13
19-6	220	28.3	54	**10-6**	330	28.51	51.06
26-6	235	28.14	59	**17-6**	570	29.11	51.44
03-7	272	27.71	50.28	**24-6**	660	31.69	53.13
10-7	250	28.71	52.71	**01-7**	780	30.53	56.12
17-7	256	31.14	49.57	**08-7**	420	32.15	59.25
24-7	284	30	57.42	**15-7**	270	33.21	57.13
31-7	361	32.28	57.7	**22-7**	210	32.76	60.21
07-8	408	30.85	57	**29-7**	450	30.11	53.29
14-8	325	31.42	52.7	**05-8**	270	29.12	55.13
21-8	231	29.7	54	**12-8**	60	32.31	49.31
28-8	170	29.28	54.14	**19-8**	0	30.26	56.22
04-9	82	28.71	60	**26-8**	0	31.1	58.63
11-9	0	28.56	51.9				
r		**0.81**	**0.59**			**0.87**	**0.44**

(r): Correlation coefficient

Data in Table (2) showed, the infestation percent and damage (number of individual aphid/ leaflet) during growing stage of soybean crop. Infestation was highly in the vegetation stage 69.16% ; followed by 43.33% in the flowering and fruiting stage then the least infestation on germination stage 34.16% during season 2012. The damage was highly in the vegetative stage, number of aphid per leaflet 9.52 followed by fruiting and flowering stage 5.38 and 2.97 individual / leaflet for germination stage. For season

Table (2) : The infestation and damage of *Myzus persicae* at different growing stages of soybean crop during the two seasons 2012 and 2013 at Sharkia Governorate.

Growing stage	Damage (No.of individual aphid/ leaflet)		Infestation %	
	2012	2013	2012	2013
Germination	2.97 c	4.00 b	34.16 c	35.83 b
Vegetation	9.52 a	15.42 a	69.16 a	65.23 a
Fruiting and Flowering	5.38 b	5.20 b	43.33 b	31.99 b

Means in columns followed by the same latter are not significantly different at p=5% according to Duncan's multiple range test (Duncan, 1955).

2013 infestation % and damage was highly at vegetative stage compared with other growing stages.

***Bioassay of tested bio-pesticides*:**

The efficacy of bio-pesticides Challengar, Tracer and Biovar against *Myzus persicae* studied under laboratory condition. Data in Table (3) cleared that Challengar was the most effective bio-pesticides followed by Tracer and Biovar. LC_{50} values were 0.43, 3.57 and 61.53 ppm for Challengar, Tracer and Biovar, respectively. LC_{90} values were 8.78, 7.19 and 70.57 ppm at the same trend above. Considering the toxicity index at LC_{50} was 100% for Challengar, 12.1% for Tracer and 0.7% for Biovar. These results near similar to Liu *et al*., (1999) who tested *Beauveria bassiana* against *Myzus persicae* where was highly effective.

Table (3): Comparative toxicity of some bio-pesticides against *Myzus persicae.*

Bio-pesticides	LC_{50} (ppm)	LC_{90} (ppm)	Toxicity index %		Confidence limite of Lc_{50}	
			LC_{50}	LC_{90}	Upper	Lower
Challengar	0.43	8.78	100	100	0.56	0.178
Tracer	3.57	7.19	12.10	10.84	5.22	1.96
Biovar	61.53	70.57	0.70	1.10	86.60	41.18

Data in Table (4) showed that there is highly significant difference among means of reduction percentages in the bio-pesticides against *Myzus persicae* under field condition. Challengar was most effective one followed by Tracer and Biovar where, reduction percentages were 76.46, 66.75 and 57.10%. These result agree with **Perez *et al.*,(1999)** they found that, *Beauveria bassiana* showed high virulence against *Myzus persicae*.

Table (4): Reduction percentages (R.%) of aphid green peach, *Myzus persicae* after 14 days when soybean was treated with some biopesticides.

Compound Name	No. of aphid	3 days	7 days	10 days	14 days	Mean R.%
Challengar	**No. before**	402.47	402.47	402.47	402.47	
	No. after	96.25	85.75	98	121.25	
	R.%	76.14	79.59	77.32	72.82	76.46
Tracer	**No. before**	448	448	448	448	
	No. after	153.25	143.75	159.75	173.25	
	R.%	65.87	69.26	66.78	65.11	66.76
Biovar	**No. before**	401.75	401.75	401.75	401.75	
	No. after	217.5	173.5	173.5	135	
	R.%	45.98	52.97	59.77	69.68	57.10
Control	**No. before**	431	431431	431	431	
	No. after	432	450	462.75	477.75	
	R.%					

No: Number of aphid after and before treatment

Conclusively, it could be conducted that, aphid, *Myzus persicae* is the major pest in soybean crop. Effect of main weather factory on aphid, there were positive relationship between aphids population and (temperature and relative humidity). The population of aphid affected with different soybean growing stages (Germination, Vegetation and Fruiting and flowering stage). Bio-pesticides used in this study showed possibility for control the high increase of aphids population on soybean crop.

Recommendation:

According to previous results it is recommended that, Monitoring aphid on soybean crops during different growing stages to known the high population of aphid and use one of bio-pesticides as mentioned above.

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دراسات بيئيه وسميه على من الخوخ الاخضر *Myzus persicae* المرتبط بمحصول فول الصويا

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يعتبر المن خاصة النوع *Myzus persicae* من أهم الأفات الحشريه التى تصيب محصول فول الصويا في جميع مراحل نموة لذا اشتملت الدراسه على دراسه تذبذب تعداد أفراد المن خلال موسمي النمو ٢٠١٢ و ٢٠١٣ على محصول فول الصويا بالإضافه إلى إستخدام بعض المبيدات الحيويه فى مكافحة هذة الآفة.

- اوضحت الدراسه حشرة المن تتواجد بثلاث ذروات على محصول فول الصويا خلال موسمى النمو ٢٠١٢ و ٢٠١٣. وقد سجلت اعلاها ٤٠٨ و ٧٨٠ فرد / ٣٠

وريقه خلال عام ٢٠١٢ و ٢٠١٣ على التوالى . كما وجد ان هناك علاقة بين عمر النبات ونسبة الاصابة وشدتها حيث كانت مرحلة النمو الخضري اكثر عرضه للاصابه حيث بلغت نسبة الاصابة والضرر ٦٩,١٦ % و ٩,٥٢فرد /وريقه للموسم الاول بينما كان ٦٥,٢٣% و ١٥,٤٢ فرد /وريقه للموسم الثانى.

- تم أختبار ثلاث مركبات حيوية وهى الشالنجر ؛ التريسر و البيوفار وكان الشالنجر اشد هذه المركبات فاعليه حيث بلغ التركيز النصف قاتل له ٠,٤٣ حزء فى المليون متبوعا بالتريسر والبيوفار حيث كان التركيز النصف قاتل لهم ضد حشرة المن ٣,٥٧ و ٦١,٥٣ جزء فى المليون على التوالى.

- أستخدمت المركبات السابقه تحت ظروف الحقل وكان متوسط نسب الخفض فى تعداد حشره المن ٤٦ ,٧٦ و ٦٦,٧٥ %و ٥٧,١٠ % لكل من الشالنجر ؛ التريسر و البيوفار على التولى.

التوصية: من النتائج السابقة انه يمكن ل Myzus بيرسيكا هو الآفة الكبرى في محصول فول الصويا. تأثير مصنع الطقس الرئيسي على المن، كانت هناك علاقة إيجابية بين سكان المن و(درجة الحرارة والرطوبة النسبية). سكان المن تتأثر مع مراحل النمو فول الصويا مختلفة (الإنبات والغطاء النباتي والاثمار ومرحلة ازدهار). وأظهرت الحيوي المبيدات المستخدمة في هذه الدراسة إمكانية للسيطرة على الزيادة الكبيرة في عدد السكان المن على محصول فول الصويا.