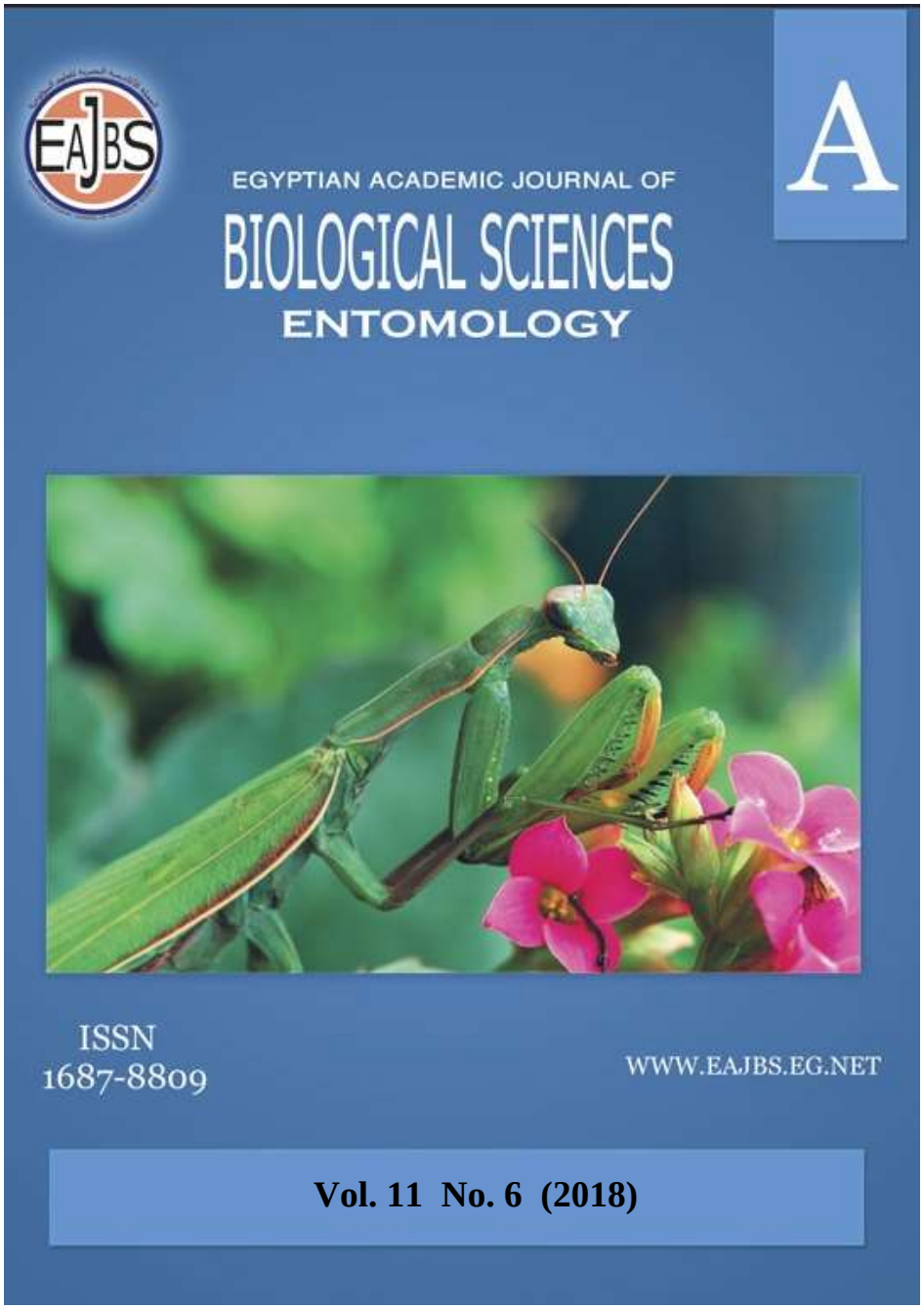

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Effect of Chrysanthemum Flowers Color on the Infestation by Chrysanthemum Aphid, *Macrosiphoniella sanborni* (Gillette) under Glasshouse Conditions

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ABSTRACT

This study was carried out to study the effect of Chrysanthemum flowers color on the infestation with Chrysanthemum aphid, *Macrosiphoniella sanborni* (Gillette) (Aphididae, Hemiptera) under glasshouse conditions. Using six colors (varieties) of Chrysanthemum plants similar in the horticulture characters but different in the flowers color only (yellow, green, red, orange, violet and white). Experiments were done in two locations (governorates) Giza Governorate and Qaluobiya Governorate under glasshouse conditions throughout 2017 season.

Obtained results showed that were a convergence of results at both the two locations (governorates), also at both adults of *M. sanborni* and its nymphs. Whereas the percentage of infestation by adults in Giza Governorate at the six colors of chrysanthemum flowers (yellow, green, red, orange, violet and white) were 24.5, 20.8, 17.6, 14.6, 12.5 and 9.8%, respectively. While the percentage of infestation by nymphs in the same governorate at the six colors were 23.9, 21.2, 17.9, 15.4, 12.4 and 9.1%, respectively.

As the same trend, in Qaluobiya Governorate whereas the percentage of infestation by adults at the six colors of chrysanthemum flowers (yellow, green, red, orange, violet and white) were 24.6, 21.7, 18.3, 14.8, 12.0 and 8.5%, respectively. While the percentage of infestation by nymphs in the same governorate at the six colors were 24.5, 21.7, 17.7, 14.8, 11.9 and 9.0%, respectively.

Statistical analysis showed that highly significant differences between the six flowers color (varieties) of chrysanthemum on the attraction of adults and nymphs of the chrysanthemum aphid, *M. sanborni* at both the two locations.

INTRODUCTION

Chrysanthemum flowers consider one of the important cut flowers in Egypt and around all over the world. It is called (The Autumn flower), and sometimes called (The Autumn king). This because its flowers appear during autumn months (October- November- December). It's found from oldest countries, it became one of the most popular flowers for people all over the world. This is due to their beautiful colors, style of flowers, tolerant the inferable weather factors and possibility cultivation it in different conditions both in open field and under greenhouse conditions.

Chrysanthemum flowers infested with a large scale of insects such as aphids insects and other insects groups. *Macrosiphoniella sanborni* (Gillette) consider one of the most dangerous insects which infested chrysanthemum flowers both in open field and under glasshouse conditions, Sumei, *et al*. (2014) reported that aphids and especially Chrysanthemum aphid *M. sanborni* have caused great damage to chrysanthemum production and affected seriously on the flowers both in quantity and quality under glasshouse conditions. Yanming, *et al.* (2010) found that Chrysanthemum aphid, *M. sanborni* represent the most destructive of chrysanthemum pests to cultivation and caused many damages to the flowers. Wang *et al.* (2014) reported that aphids have caused great damage to chrysanthemum production.

The aim of this work is studying the effect of six colors of chrysanthemum flowers (yellow, green, red, orange, violet and white) on the attraction of adults and nymphs of Chrysanthemum aphid, *M. sanborni*

MATERIALS AND METHODS

The present investigation includes the effect of flowers color of chrysanthemum, *Chrysanthemum morifolium* Fam. Compositae on the attraction of Chrysanthemum aphid, *Macrosiphoniella sanborni* (Gillette) during season 2017 in two locations Giza Governorate and Qaluobiya Governorate under glasshouse conditions.

Experimental Design:

This study was conducted on six varieties (colors) of chrysanthemum (yellow, green, red, orange, violet and white) which grown in Giza Governorate and Qaluobiya Governorate during 2017 season under glasshouse conditions. Chrysanthemum varieties (colors) were cultivated at the same time in a timely manner for the cultivation of chrysanthemum seedlings in August. And in the same area, which was three plots for each variety (color). The area of each plot was 3x5m, this area was completely isolated in the two parks. Then it was conducted all agricultural operations in a manner quite similar in the two parks. The normal and recommended agricultural practices were applied, also no chemical control against insects was used during the whole experimental period.

With note the degree of infestation of flowers with Chrysanthemum aphid, *M. sanborni* in various stages of plants. It is proven accurate observations of the infestation with aphid of chrysanthemum plants and there are very slight differences and ineffective in vegetative growth stages of plants, all in the two localities of the study, but when it seemed the appearance of flowers of different colors seemed a remarkable difference in the infestation with aphid. Directly counting was done weekly during the duration of the presence of flowers during the period (October-November- December).

Statistical Analysis:

This study was carried out to study the effect of flowers color of chrysanthemum on the attraction of individuals of the Chrysanthemum aphid, *M. sanborni* , data were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS program (SAS Institute, 1988).

RESULTS AND DISCUSSION

This study was carried out to study the effect of flowers color of chrysanthemum, *Chrysanthemum morifolium* Fam. Compositae on the attraction of individuals of the Chrysanthemum aphid, *Macrosiphoniella sanborni* (Gillette) at two locations (governorates) Giza Governorate and Qaluobiya Governorate during 2017 season under glasshouse conditions. In this study, six flowers colors (varieties) of chrysanthemum (yellow, green, red, orange, violet and white) were tested for study the effect of flowers color on the attraction of adults and nymphs of the Chrysanthemum aphid, *M. sanborn*

In both the two locations seedlings of chrysanthemum were cultivated in the glasshouses at the same time in a timely manner for the cultivation of chrysanthemum seedlings in August. The infestation with the chrysanthemum aphid, *M. sanborn*i adults and nymphs began to appear on the 1st September and increased gradually on the leaves during vegetable growth in a similar manner at all chrysanthemum varieties, but mean numbers of *M. sanborni* began to different on chrysanthemum varieties when flowers appeared in the Autumn period (October-November- December).

Giza Governorate:

data tabulated in table (1) and figure (1) show that the mean numbers of Chrysanthemum aphid *M. sanborni* (adults) which infested different chrysanthemum flowers colors (yellow, green, red, orange, violet and white) were 15.5, 13.1, 11.1, 9.2, 7.9 and 6.2 adult /flower respectively.

Whereas the percentage of infestation with that insect (adults) for different colors were 24.5, 20.8, 17.6, 14.6, 12.5 and 9.8% respectively.

It can be arranging the flowers color of chrysanthemum for attracting of the Chrysanthemum aphid (adults) as follows: yellow, green, red, orange, violet and white.

Statistical analysis in (Table 1) showed that highly significant differences between the six flowers color (varieties) of chrysanthemum on attraction adults of the Chrysanthemum aphid, *M. sanborni* whereas ($F_{0.05}$ = 367.9& L.S.D. 0.05= 1.93).

In case aphid nymphs, data tabulated in table (1) and figure (1) show that the mean numbers of Chrysanthemum aphid *M. sanborni* (nymphs) which infested different chrysanthemum flowers colors (yellow, green, red, orange, violet and white) were 31.0, 27.4, 23.1, 19.9, 16.0 and 11.8 nymph /flower respectively. Whereas the percentage of infestation with that insect (nymphs) for different colors were 23.9, 21.2, 17.9, 15.4, 12.4 and 9.1% respectively.

It can be arranging the flowers color of chrysanthemum for attracting of the Chrysanthemum aphid (nymphs) as follows: yellow, green, red, orange, violet and white.

Statistical analysis in (Table 1) showed that highly significant differences between the six flowers color (varieties) of chrysanthemum on attraction nymphs of the Chrysanthemum aphid, *M. sanborni* whereas ($F_{0.05}$ = 164.32& L.S.D. 0.05= 5.54).

Table (1): The mean numbers of adults and nymphs of the Chrysanthemum aphid, *M. sanborni* attraction with different flowers color of chrysanthemum in Giza Governorate during 2017 season.

Date	Yellow		Green		Red		Orange		Violet		White	
	A	N	A	N	A	N	A	N	A	N	A	N
1/10/2017	7.6	14.3	6.1	12.7	5.6	10.3	3.7	8.4	2.8	6.1	1.9	4.3
8/10/2017	9.3	22.4	8.8	17.7	6.8	13.5	5.1	10.9	4.5	8.1	2.7	6.7
15/10/2017	11.6	25.1	10.1	22.4	8.7	17.8	7.5	14.7	6.6	10.8	4.1	7.9
22/10/2017	12.3	29.8	11.9	25.5	9.5	20.3	8.7	17.4	7.1	13.1	5.8	10.1
29/10/2017	14.6	33.4	12.2	27.1	11.3	23.2	9.4	20.1	8.1	16.2	6.1	12.3
5/11/2017	13.7	29.5	11.6	23.4	8.9	20.8	7.8	17.4	6.6	12.8	4.8	9.4
12/11/2017	15.9	31.4	12.8	27.1	10.3	23.4	8.2	19.7	7.1	15.6	5.2	11.3
19/11/2017	16.1	33.5	13.7	30.5	11.7	25.6	9.5	21.2	8.3	16.7	6.1	12.2
26/11/2017	17.3	34.8	14.5	32.7	12.2	27.2	10.2	24.7	9.8	18.1	8.8	13.8
3/12/2017	18.6	36.1	15.2	33.4	13.7	29.7	11.4	25.7	10.2	21.5	9.1	15.1
10/12/2017	19.1	37.8	16.1	34.3	14.5	30.2	12.7	26.9	11.8	23.9	10.3	17.5
17/12/2017	18.7	34.7	14.4	30.2	12.3	26.6	10.9	22.6	8.6	19.1	6.5	12.9
24/12/2017	20.5	35.4	17.1	32.9	14.4	27.1	11.6	23.8	9.2	20.6	7.3	15.5
31/12/2017	21.4	36.3	19.2	33.4	15.4	28.3	12.7	24.9	10.9	21.4	8.5	16.2
Total	**216.7**	**434.5**	**183.7**	**383.3**	**155.3**	**324.0**	**129.4**	**278.4**	**111.6**	**224.0**	**87.2**	**165.2**
Mean	**15.5**	**31.0**	**13.1**	**27.4**	**11.1**	**23.1**	**9.2**	**19.9**	**7.9**	**16.0**	**6.2**	**11.8**
%	**24.5**	**23.9**	**20.8**	**21.2**	**17.6**	**17.9**	**14.6**	**15.4**	**12.5**	**12.4**	**9.8**	**9.1**
	$F_{0.05}$: Adult (367.9) Nymph (164.32) **LSD** : Adult (1.93) Nymph (5.54)											

A: Adult N: Nymph

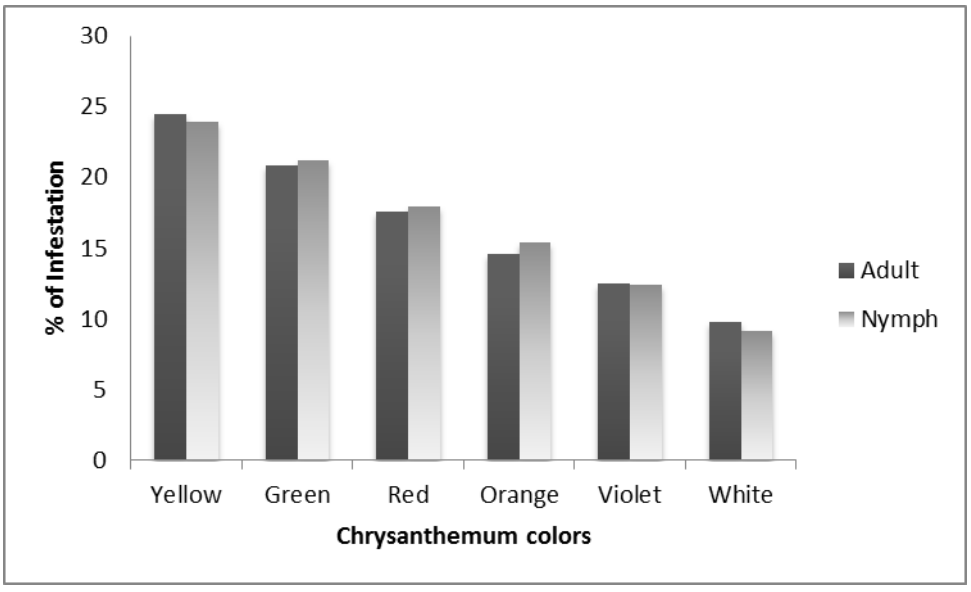

Fig.(1):The efficiency of various flowers colors of chrysanthemum for attracting adults and nymphs of the Chrysanthemum aphid, *M. sanborni* in Giza Governorate during 2017 season.

Qaluobiya Governorate:

data tabulated in table (2) and figure (2) show that the mean numbers of Chrysanthemum aphid *M. sanborni* (adults) which infested different chrysanthemum flowers colors (yellow, green, red, orange, violet and white) were 14.3, 12.6, 10.6, 8.6, 6.9 and 4.9 adult /flower respectively.

Whereas the percentage of infestation with that insect (adults) for different colors were 24.6, 21.7, 18.3, 14.8, 12.0 and 8.5% respectively.

Table (2): The mean numbers of adults and nymphs of the Chrysanthemum aphid, *M. sanborni* attraction with different flowers color of chrysanthemum in Qaluobiya Governorate during 2017 season

Date	Yellow		Green		Red		Orange		Violet		White	
	A	N	A	N	A	N	A	N	A	N	A	N
1/10/2017	6.4	12.5	5.3	10.5	4.3	7.3	3.4	5.4	2.3	4.3	.9	3.1
8/10/2017	7.8	19.4	6.4	14.3	5.3	9.5	4.6	7.9	3.5	5.5	1.2	4.7
15/10/2017	9.6	22.3	7.3	17.4	6.5	11.8	5.5	9.7	4.3	7.3	2.3	5.2
22/10/2017	10.2	25.7	9.5	21.3	7.3	15.7	6.7	11.5	5.4	9.5	3.2	7.3
29/10/2017	12.3	29.5	10.9	25.2	8.5	18.2	7.4	15.3	6.4	11.6	4.7	9.3
5/11/2017	13.2	30.5	11.5	27.4	9.3	20.5	7.6	17.2	6.5	12.9	4.8	10.2
12/11/2017	14.3	31.8	12.9	28.2	10.5	23.3	8.5	19.5	7.3	14.3	5.3	11.3
19/11/2017	15.2	33.4	13.5	30.2	11.8	25.2	9.8	20.2	7.5	15.7	5.9	12.4
26/11/2017	17.4	34.5	15.5	31.5	12.5	27.4	9.2	23.5	8.7	18.3	6.2	13.5
3/12/2017	17.6	36.7	16.2	33.6	14.5	29.3	10.4	25.6	9.2	21.6	7.1	15.6
10/12/2017	19.3	37.5	17.3	34.2	15.5	30.2	12.7	26.7	10.2	22.5	8.3	17.5
17/12/2017	18.2	33.5	15.6	30.1	12.5	26.4	10.6	22.3	8.2	18.2	5.5	12.5
24/12/2017	19.3	34.2	17.4	32.2	14.3	27.5	11.5	23.5	9.3	20.3	6.3	14.3
31/12/2017	19.5	35.3	17.5	32.4	15.7	28.6	12.3	24.1	9.1	21.2	7.2	15.2
Total	**200.3**	**416.8**	**176.8**	**368.5**	**148.5**	**300.9**	**120.2**	**252.4**	**97.9**	**203.2**	**68.9**	**152.1**
Mean	**14.3**	**29.7**	**12.6**	**26.3**	**10.6**	**21.5**	**8.6**	**18.0**	**6.9**	**14.5**	**4.9**	**10.9**
%	**24.6**	**24.5**	**21.7**	**21.7**	**18.3**	**17.7**	**14.8**	**14.8**	**12.0**	**11.9**	**8.5**	**9.0**
	$F_{0.05}$: Adult (436.5) Nymph (175.42) **LSD** : Adult (1.83) Nymph (5.63)											

A: Adult N: Nymph

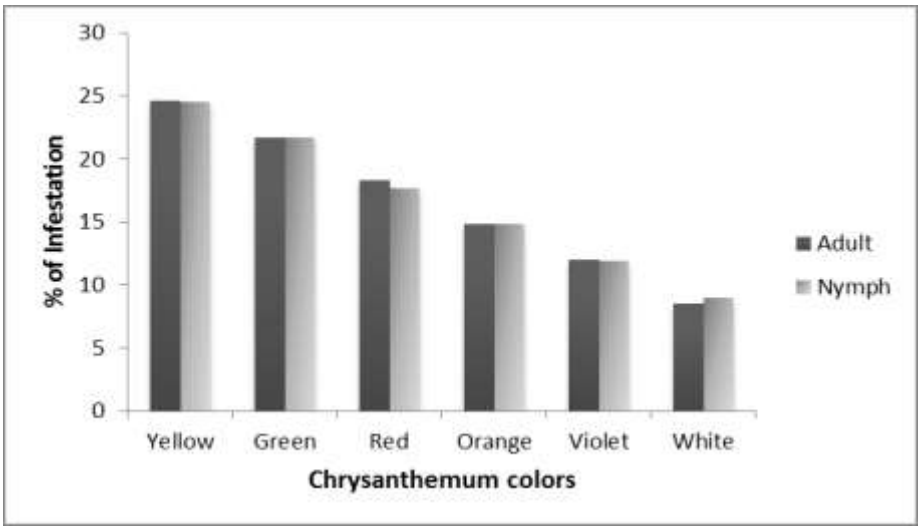

Fig.(2):The efficiency of various flowers colors of chrysanthemum for attracting adults and nymphs of the Chrysanthemum aphid, *M. sanborni* in Qaluobiya Governorate during 2017 season.

It can be arranging the flowers color of chrysanthemum for attracting of the Chrysanthemum aphid (adults) as follows: yellow, green red, orange, violet and white.

Statistical analysis in (Table 2) showed that highly significant differences between the six flowers color (varieties) of chrysanthemum on attraction adults of the Chrysanthemum aphid, *M. sanborni* whereas ($F_{0.05}$ = 436.5& L.S.D. 0.05= 1.83).

In case aphid nymphs, data tabulated in table (2) and figure (2) show that the mean numbers of Chrysanthemum aphid *M. sanborni* (nymphs) which infested different chrysanthemum flowers colors (yellow, green, red, orange, violet and white) were 29.7, 26.3, 21.5, 18.0, 14.5 and 10.9 nymph /flower respectively. Whereas the percentage of infestation with that insect (nymphs) for different colors were 24.5, 21.7, 17.7, 14.8, 11.9 and 9.0% respectively.

It can be arranging the flowers color of chrysanthemum for attracting of the Chrysanthemum aphid (nymphs) as follows: yellow, green, red, orange, violet and white.

Statistical analysis in (Table 2) showed that highly significant differences between the six flowers color (varieties) of chrysanthemum on attraction nymphs of the Chrysanthemum aphid, *M. sanborni* whereas ($F_{0.05}$ = 175.42& L.S.D. 0.05= 5.63).

The obtained results are agreed with those recorded by Ibrahim (1997), who found that sticky yellow trap catching the highest number of aphids on potato and dominated the corresponding number captured of aphids by water pan trap. Labonne *et al.* (1989) compared three kinds of traps for catching alate aphids flying near the canopy of grassland, 55000 individuals representing 93 species (or species groups) were taken. Samples taken in sticky thread traps and suction traps were very similar, but those in yellow water pan traps gave more numbers of the abundant species only. Fereres *et al.* (1999) found that *Myzus persicae* (Sulzer) and *Rhopalo siphummaidis* (Fitch) preferred alighting on intensely (highly saturated) yellow than on green (plant-like) or brown (soil-like) ceramic tiles, and expressed no preference for landing on leaves infected with soybean mosaic virus (SMV) or on chlorophyll-deficient soybean leaves. Allan and John (2007) found that Cotton aphid, Aphis gossypii Glover (Homoptera: Aphididae) populations were attracted less to white than to other trap colors. Yudin, L. *et al.* (1987) found in their experiments which were conducted to determine color preference of thrips, aphids and leafminers in lettuce farms at Kula, Hawaii that white traps caught thrips and aphids less significantly than the 14 other colors tested.

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ARABIC SUMMERY

تأثير لون أزهار الكريزانثيمم على درجة الاصابة بحشرة من الكريزانثيمم *Macrosiphoniella sanborni* (Gillette) تحت ظروف الصوب الزجاجية

أشرف صلاح إمام ، هيام مصطفى سعد و إيناس مصطفى يحيي
معهد بحوث وقاية النباتات - مركز البحوث الزراعية – الدقى – الجيزة – مصر

أجريت هذه الدراسة بغرض دراسة تأثير لون أزهار الكريزانثيمم على درجة الإصابة بحشرة من الكريزانثيمم *Macrosiphoniella sanborni* (Gillette) تحت ظروف الصوب الزجاجية فى محافظتي الجيزة والقليوبية خلال عام ٢٠١٧

حيث تم دراسة تأثير ٦ (ستة) ألوان مختلفة لأزهار الكريزانثيمم على درجة الإصابة بحشرة من الكريزانثيمم وهم : الأصفر، الأخضر، الأحمر، البرتقالى، البنفسجى و الأبيض وذلك سواء بالنسبة للحشرات الكاملة أو للحوريات.

وتوصلت النتائج إلى تقارب النتائج فى كلتا المحافظتين سواء بالنسبة للحشرات الكاملة أو للحوريات حيث تراوحت النسبة المئوية للإصابة بالحشرات الكاملة لأزهار الكريزانثيمم محل الدراسة (الأصفر، الأخضر، الأحمر، البرتقالى، البنفسجى و الأبيض) كما يلى: ٢٤،٥ - ٢٠،٨- ١٧،٦- ١٤،٦- ١٢،٥- ٩،٨% على الترتيب وذلك بمحافظة الجيزة . بينما تراوحت النسبة المئوية للإصابة بحوريات الحشرة فى نفس المحافظة للألوان المختلفة كما يلى : ٢٣،٩- ٢١،٢- ١٧،٩- ١٥،٤- ١٢،٤- ٩،١% على الترتيب.

على نفس المنوال كانت النتائج فى محافظة القليوبية سواء بالنسبة للحشرات الكاملة أو للحوريات حيث تراوحت النسبة المئوية للإصابة بالحشرات الكاملة لأزهار الكريزانثيمم محل الدراسة (الأصفر، الأخضر، الأحمر، البرتقالى، البنفسجى و الأبيض) كما يلى: ٢٤،٦ - ٢١،٧- ١٨،٣- ١٤،٨- ١٢،٠- ٨،٥% على الترتيب وكانت النسبة المئوية للإصابة بحوريات الحشرة فى نفس المحافظة للألوان المختلفة كما يلى : ٢٤،٥- ٢١،٧- ١٧،٧- ١٤،٨- ١١،٩- ٩،٠% على الترتيب.

التحليل الإحصائى أوضح وجود فروق معنوية عالية بين النسبة المئوية للإصابة بحشرة من الكريزانثيمم للألوان المختلفة من أزهار الكريزانثيمم محل الدراسة سواء بالنسبة للحشرات الكاملة أوبالنسبة للحوريات. و ذلك فى كلا الموقعين محل الدراسة.