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Study the Effect of Treated Strawberry Seedlings by Triacontanol Hormone (TRIA) on the Infestation by *Myzus persicae* (Sulzer) under Glasshouse Conditions

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ABSTRACT

This study was carried out to study the effect of treated strawberry plants, *Fragaria ananassa* (L.) by Triacontanol Hormone (TRIA) "three concentrations" on the infestation by *Myzus persicae* (Sulzer) under glasshouse conditions. Experiments were done in two locations (Governorates), Nobariya (Behera Governorate) and Perlash (Giza Governorate) during season 2019/2020. Three treatments (concentrations) of Triacontanol Hormone were done in both two locations, small concentration (35ppm), medium concentration (50ppm) and high concentration (65ppm), besides the fourth treatment which did not treat with any hormone (control).

Strawberry plants were treated with small concentration of (TRIA) (35ppm) were lower infestation by *M. persicae* comparing to control. While strawberry plants which treated with medium concentration of (TRIA) (50ppm) had no clear effect on the infestation by *M. persicae* comparing to control. On the other hand, strawberry plants which treated with high concentration of (TRIA) (65ppm) were higher infestation by the same insect comparing to control.

INTRODUCTION

Strawberry plants *Fragaria ananassa* (L.) consider one of the most important vegetable plants in Egypt and all over the world which is cultivated in the open field and under glasshouse conditions. Also, its cultivated area increased gradually during the last years, especially in the newly reclaimed areas for purposes of local consumption and exportation to the foreign markets. Francisco, *et al.* (2011)

Egypt is considered one of the largest producers and exporters of strawberry (seedlings and fruits) all over the world where it ranks fifth in the world in the production and export of strawberry (seedlings and fruits), The area of the plantation with strawberry seedlings both fresh seedlings and freezing seedlings in Egypt is about 21573 fed. It is divided into about 16459 feds (fresh planting) and about 5113 feds (cooled planting). Food and Agriculture Organization (F.A.O), 2017

Strawberry plants infested by a large scale of insects belong to many orders and families. Green Peach Aphid, *Myzus persicae* (Sulzer) (Hemiptera: Aphididae) has one of the most important insects infesting strawberry seedlings. *M. persicae* recently become a

major insect pest of strawberries in Southern California and causes numerous damages in both quantity and quality for the crop directly by plant juice to loosen or indirectly by plant disease-transmitting John, *et al.* (2005). Also, Jian and Nick (2009) in California found that the Green Peach Aphid, *M. persicae* has emerged as a major insect pest of many horticultural crops such as strawberry in California.

Triacantanol Hormone (TRIA) considers one of the famous, important and more growth regulators hormones. There are more studies that show the important role of this hormone for growth regulators plants. And its role for change morphological and physiological plant adjectives when used by many concentrations. Srivastava and Srikant (1990) in India studied the effect of Triacantanol Hormone on photosynthesis, alkaloid, and other parameters in *Papaver somniferum* L. and studied the influence of the different foliar application of Triacantanol Hormone (TRIA) on growth, CO₂, exchange rate, total chlorophyll, plant height and weight and fresh and dry weight of the leaves and shoots. This study was carried out in glasshouse conditions.

This study was carried out to study the effect of treated strawberry plants *F. ananassa* by Triacantanol Hormone (TRIA) in different concentrations on the infestation by *M. persicae* under glasshouse conditions.

MATERIALS AND METHODS

Experimental Design:

This study was conducted on strawberry plants *Fragaria ananassa* (L.) in two locations (Governorates), Nobariya (Behera Governorate) and Perakash (Giza Governorate) during season 2019/2020 under glasshouse conditions. Plants were cultivated in both two locations at the same time in a timely manner for the cultivation of strawberry plants in mid of September 2019 season. In the two locations we used 100 seedlings in every location divided into four treatments, each treatment contains 25 seedlings. First treatment we immersion 25 seedlings in a low concentration of (TRIA) 35ppm for a period of 24 hours before cultivated. Second treatment we immersion 25 seedlings in a medium concentration of (TRIA) 50ppm for a period of 24 hours before cultivated. In the third treatment we immersion 25 seedlings in a high concentration of (TRIA) 60ppm for a period of 24 hours before cultivated. Lastly, in the fourth treatment, we did not immersion these seedlings (25 seedlings) in any hormone before cultivated this treatment used as control. These seedlings cultivated under glasshouse conditions in boss the two locations. In every location, the area is divided into four big plots, one plot for each treatment, and the fourth plot for control. The area of each plot was 4x6m, this area was completely isolated in boss the two locations. Then was conducted all agricultural operations in a manner quite similar in boss the two locations. The normal and recommended agricultural practices were applied, also no chemical control against insects was used during the whole experimental period.

After three weeks of cultivation and with the first leaves of the plants began to appear, an artificial infestation with *M. persicae* was done at the same time in the two locations. It is proven accurate observations of the infestation with aphid numbers in all plants biweekly. Directly counting was done biweekly during the seasons in the two locations all over all plants.

Weather Factors:

Effects of weather factors on the population of *M. persicae*, daily mean temperature (D.M.T.) and daily mean relative humidity (D.M. R.H.) were studies. Records of the weather factors of Behera and Giza Governorates were obtained from the Central Laboratory for Agriculture Meteorology, Agricultural Research Center, Ministry

of Agriculture. The daily records of each weather factor were grouped into biweekly averages according to the sampling dates. These averages were assumed to represent the field experimental records at sampling times.

Statistical Analysis:

In these experiments, the effect of different concentrations of (TRIA) on the infestation strawberry plants by *M. persicae* also was 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 treated strawberry plants *Fragaria ananassa* (L.) by Triacantanol Hormone (TRIA) on the infestation by *Myzus persicae* (Sulzer) under glasshouses conditions.

Experiments were done in two locations (Governorates), Nobariya (Behera Governorate) and Perkash (Giza Governorate) during season 2019/2020. Three treatments (concentrations) of Triacantanol Hormone were done in both two locations, small concentration (35ppm), medium concentration (50ppm) and high concentration (65ppm), besides the fourth treatment which did not treat with any hormone (control).

Nobariya (Behera Governorate):

Data tabulated in Table (1) show the population fluctuation of *M. persicae* at Nobariya, Behera Governorate indicated by half monthly count during 2019/2020 season on the strawberry plants in the control and the three treatments (concentrations) of triacantanol hormone 35 ppm, 50ppm and 65ppm, respectively.

Table 1: Population fluctuations of *M. persicae* on strawberry plants which treated by different concentrations of TRIA at Nobariya, Behera Governorate during 2019/2020 season

Date	35%	50%	65%	Control	Temp.	Hum. %
1/11/2019	5.7	16.7	19.5	17.5	21.5	59
15/11/2019	7.5	18.5	22.6	19.3	20.7	62
1/12/2019	9.8	19.3	24.8	20.5	18.5	65
15/12/2019	10.5	21.5	26.3	22.7	16.7	67
1/1/2020	12.4	22.3	28.5	24.5	14.5	73
15/1/2020	13.9	24.5	30.6	26.8	12.8	75
1/2/2020	15.3	25.3	32.5	27.3	14.5	76
15/2/2020	17.2	26.5	34.2	29.7	17.3	78
1/3/2020	18.3	28.7	36.8	31.4	19.8	75
15/3/2020	20.5	30.5	38.5	33.8	22.5	72
1/4/2020	21.7	32.8	40.7	35.2	24.6	69
15/4/2020	22.5	34.6	42.9	37.5	25.3	67
Total	175.3	301.2	377.9	326.2	-	-
Mean	14.6	25.1	31.5	27.2	-	-
F 0.05	375.22					
L.S. D	1.75					

Means within columns bearing different subscripts are significantly different (P< 0.05)

Data show that the population of *M. persicae* was different between the control and the three treatments. Whereas the mean number of aphids in control was (27.2 aphid/leaf) it was (14.6 aphid/leaf) in the first treatment, the low concentration of

triacontanol hormone 35ppm. And (25.1 aphid/leaf) in the second treatment, the medium concentration of triacontanol hormone 50ppm. And (31.5aphid/leaf) in the third treatment, the high concentration of triacontanol hormone 65ppm.

This data refers to that the infestation by *M. persicae* on strawberry plants was low when we treated strawberry plants with a low concentration of triacontanol hormone (35ppm) comparing to control. While when we treated strawberry plants with a medium concentration of triacontanol hormone (50 ppm) was had no clear effect on the infestation by *M. persicae* comparing to control. On the other hand, when we treated strawberry plants with a high concentration of triacontanol hormone (65 ppm) the infestation by *M. persicae* was high comparing to control.

Perkash (Giza governorate):

Data tabulated in Table (2) show the population fluctuation of *M. persicae* at Perkash, Giza Governorate indicated by half monthly count during 2019/2020 season on the strawberry plants in the control and the three treatments (concentrations) of triacontanol hormone 35 ppm, 50ppm and 65ppm, respectively.

Data show that the population of *M. persicae* was different between the control and the three treatments. Whereas the mean number of aphids in control was (24.8 aphid/leaf) it was (12.4 aphid/leaf) in the first treatment, the low concentration of triacontanol hormone 35ppm. And (22.0 aphid/leaf) in the second treatment, the medium concentration of triacontanol hormone 50ppm. And (29.3aphid/leaf) in the third treatment, the high concentration of triacontanol hormone 65ppm.

Table 2: Population fluctuations of *M. persicae* on strawberry plants which treated by different concentrations of TRIA at Perkash, Giza Governorate during 2019/2020 season.

Date	35%	50%	65%	Control	Temp.	Hum. %
1/11/2019	3.5	13.5	18.5	15.8	22.3	57
15/11/2019	5.2	14.7	20.6	17.5	21.5	61
1/12/2019	6.8	16.5	22.8	19.6	19.2	64
15/12/2019	8.7	18.2	25.3	20.7	17.8	65
1/1/2020	10.3	19.6	27.5	22.3	15.3	72
15/1/2020	11.5	21.5	29.3	23.5	13.8	74
1/2/2020	13.4	22.7	30.5	25.3	15.2	75
15/2/2020	14.8	24.5	32.2	27.5	16.7	77
1/3/2020	16.5	25.8	34.8	28.9	18.5	73
15/3/2020	17.8	27.5	35.5	30.8	22.9	72
1/4/2020	19.5	29.3	36.4	32.5	25.6	68
15/4/2020	20.8	30.6	38.2	33.7	26.5	66
Total	148.8	264.4	351.6	298.1	-	-
Mean	12.4	22.0	29.3	24.8	-	-
F 0.05	375.22					
L.S. D	1.75					

Means within columns bearing different subscripts are significantly different ($P < 0.05$)

This data refers to that the infestation by *M. persicae* on strawberry plants was low when we treated strawberry plants with a low concentration of triacontanol hormone (35ppm) comparing to control. While when we treated strawberry plants with a medium concentration of triacontanol hormone (50 ppm) was had no clear effect on the infestation

by *M. peasicae* comparing to control. On the other hand, when we treated strawberry plants by high concentration of triacontanol hormone (65 ppm) the infestation by *M. peasicae* was high comparing to control.

So, we can recommend that treat strawberry plants with low concentration of triacontanol hormone (TRIA) to decrease the infestation by *M. peasicae*. And we can use this hormone in the programs of Integrated Pest Management (I.P.M).

These results agree with those obtained by Heba (2013) in Egypt who reported that the plants (*Zea mays*) which treatment with a low concentration of triacontanol hormone (35 ppm.) was low infestation with *Euprepocnemis plorans* comparing to control. And the plants treated with a high concentration of the same hormone (50 ppm.) were high infestation with the same insect comparing to control. Also, Gupta *et al.* (2009) reported the role of TRIA (triacontanol hormone) in pest control and reported that plants were treated with lower concentrations of (TRIA) were less infestation with insects than control plants. Singh and Bhattacharya (2001) recorded an efficient role of TRIA in the reduction of survivorship and developmental parameters of larvae of *Spilarctia oblique* Walker upon feeding on diets containing TRIA, Referring to the insecticidal activity of TRIA. From all the last, it was suggested the incorporation of TRIA in the Integrated Pest Management (IPM) modules for pest control.

Effect of Triacontanol Hormone (TRIA) on the Morphological and Physiological Characterizes of Strawberry Plants:

Data tabulated in table (3) show the effect of treated strawberry plants, *Fragaria ananassa* (L.) with triacontanol hormone (TRIA) in different concentrations on the important morphological and physiological characterizes of these plants.

As all, when we treated strawberry plants with a small concentration of (TRIA) 35ppm this improved morphological adjectives of treated plants such as (root length, shoot length and plant height) and physiological adjectives such as (protein, total sugars, starch, amino acids and total phenols) comparing to control.

When we treated strawberry plants with a medium concentration of (TRIA) 50ppm this had no clear effect on the morphological and physiological adjectives of treated plants comparing to control. On the other hand when we treated strawberry plants with a high concentration of (TRIA) 65ppm. morphological and physiological adjectives of treated plants were worse than comparing to control.

Table (3): Effect of Triacontanol Hormone (TRIA) on the morphological and physiological characterizes of Strawberry plants:

Adjective	35ppm	50ppm	65ppm	Control
Root length (cm)	18.32 c	16.37 a	12.65 c	15.25 a
Shoot length (cm)	64.25 c	55.45 b	43.98 b	50.42 a
Plant height (cm)	82.57 c	71.82 a	56.63 c	65.67 a
Protein (mg/g)	1.98 b	1.89 b	1.25 c	1.85 a
Total sugars (mg/g)	32.85 c	28.35 a	22.45 b	25.75 a
Carbohydrate (mg/g)	12.65 c	9.46 b	6.78 b	8.86 a
Amino acids (mg/g)	5.33 c	4.65 a	2.63 c	3.25 a
Total phenol (mg/g)	12.65 c	10.21 b	7.35 c	8.85 a

Means within columns bearing different subscripts are significantly different (P< 0.05).

These results agree with those obtained by Kumaravelu *et al.* (2000) in India who reported that the morphological adjectives (root length, shoot length, plant height and other morphological adjectives) and physiological adjectives (protein, total sugars, starch, total phenol and other physiological adjectives) were improved when we treated plants with small and medium concentrations of triacontanol hormone (TRIA) and became better than control. And these adjectives were worse than control when we treated plants with a high concentration of (TRIA), Shukla *et al.* (1992) in Netherlands studied the effect of triacontanol (TRIA) at lower concentrations on growth, plant hormones and artemisinin yield in *Artemisia annua* L. and found when treated plants with (TRIA) produced a statistically significant positive effect on artemisinin level as well as on plant height, leaf and herbage yield, but these adjectives decreased when treated plants with higher concentrations of (TRIA). Also, these results agreements with those obtained by Eriksen *et al.* (1981) in Oslo (Nerweg) who reported that when treated tomato and maize plants with triacontanol (TRIA) caused a significant increase in the dry weight of the tomato plants, leaf area and dry weight measurements of tomato leaves at different stages of development. And Richard and Stanley (1981) in Michigan – United States reported that triacontanol (TRIA) increased fresh and dry weight and total reducible nitrogen (total N) of rice (*Oryza sativa* L.) seedlings.

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ARABIC SUMMARY

دراسة تأثير معاملة شتلات الفراولة بهرمون تراي أكونتانول (TRIA) على درجة الإصابة بحشرة من الخوخ الأخضر *Myzus persicae* تحت ظروف الصوب الزجاجية

أشرف صلاح إمام، سامية منذر أبو زيد، مروة محمد موسى وسميرة محمد نبيل عبد الواحد
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة - مصر

الهدف من إجراء الدراسة هو معرفة تأثير معاملة شتلات الفراولة (*Fragaria ananassa* (L.) بهرمون تراي أكونتانول بتركيزات مختلفة على درجة الإصابة بحشرة من الخوخ الأخضر *Myzus persicae* (Sulzer). أجريت التجربة في منطقتين (محافظتين) مختلفتين منطقة النوبارية بمحافظة البحيرة ومنطقة برقاش بمحافظة الجيزة خلال عام 2019/2020.

توصلت النتائج المتحصل عليها إلى تباين متوسط تعداد حشرات المن التي تصيب نباتات الفراولة وذلك تبعاً لتركيز هرمون تراي أكونتانول الذي تم معاملة الشتلات به. حيث كانت نباتات الفراولة التي عوملت بتركيز منخفض من هرمون تراي أكونتانول (35 جزء في المليون) كانت أقل في متوسط الإصابة بحشرة المن مقارنة بالكنترول. كما أن النباتات التي عوملت بتركيز متوسط من الهرمون (50 جزء في المليون) لم يكن له تأثير معنوي على درجة الإصابة بحشرة المن مقارنة بالكنترول. وأخيراً فإن النباتات التي عوملت بتركيز مرتفع من الهرمون (65 جزء في المليون) كانت أعلى في متوسط الإصابة بحشرة المن مقارنة بالكنترول.

أيضاً تم دراسة تأثير معاملة شتلات الفراولة بتركيزات مختلفة من هرمون تراي أكونتانول على أهم الصفات المورفولوجية وكذلك الفسيولوجية للنباتات المعاملة. حيث إتضح من إجراء القياسات المورفولوجية لكلاً من النباتات المعاملة بالهرمون وكذلك الكنترول أن استخدام تركيز منخفض من الهرمون أدى إلى تحسن الصفات المورفولوجية للنباتات المعاملة مقارنة بالكنترول مثل طول المجموع الجذري، طول المجموع الخضري وأيضاً الارتفاع الكلى للنبات. بينما استخدام تركيز متوسط من الهرمون لم يكن له تأثير معنوي على هذه الصفات المورفولوجية للنباتات المعاملة مقارنة بالكنترول. على النقيض فإن استخدام هرمون تراي أكونتانول بتركيز مرتفع أدى إلى انخفاض مستوى الصفات المورفولوجية السابق ذكرها للنباتات المعاملة مقارنة بالكنترول.

كذلك تم دراسة تأثير معاملة شتلات الفراولة بتركيزات مختلفة من هرمون التراي أكونتانول على أهم الصفات الفسيولوجية للنباتات المعاملة بالهرمون مثل (البروتين - إجمالى السكريات- الكربوهيدرات - الأحماض الأمينية وكذلك الفينولات) ومقارنتها بالكنترول وإتضح من إجراء التحاليل الفسيولوجية للنباتات المعاملة بالهرمون وكذلك الكنترول أن استخدام هرمون التراي أكونتانول بتركيز منخفض أدى إلى تحسن فى هذه الصفات الفسيولوجية للنباتات المعاملة. بينما استخدام تركيز متوسط من الهرمون لم يكن له تأثير معنوي على هذه الصفات الفسيولوجية للنباتات المعاملة مقارنة بالكنترول. على النقيض فإن استخدام هرمون تراي أكونتانول بتركيز مرتفع أدى إلى انخفاض مستوى الصفات الفسيولوجية السابق ذكرها للنباتات المعاملة بالهرمون وذلك بالمقارنة بالكنترول.

وبالرابط بين النتائج السابقة المتحصل عليها سواء من التجارب الحقلية أو المعملية يمكن إيجاز مايلى: أنه عند معاملة النباتات بتركيز منخفض من هرمون تراي أكونتانول (35 جزء في المليون) يؤدي إلى تحسن فى الصفات المورفولوجية وأيضاً الفسيولوجية للنباتات المعاملة مقارنة بالكنترول مما يؤدي بالتالى إلى انخفاض درجة الإصابة بحشرة المن فى النباتات المعاملة عن الكنترول. وعند معاملة النباتات بتركيز متوسط من الهرمون (50 جزء في المليون) لم يؤدي إلى تغيير معنوي فى الصفات المورفولوجية وكذلك الفسيولوجية للنباتات المعاملة بالمقارنة

بالكنترول وبالتالي لم يؤدي إلى تغيير معنوي في درجة الإصابة بالحشرة موضع الدراسة مقارنة بالكنترول. وعند معاملة النباتات بتركيز مرتفع من الهرمون (65 جزء في المليون) أدى إلى إنخفاض في مستوى الصفات المورفولوجية وكذلك الفسيولوجية للنباتات المعاملة عن الكنترول مما أدى إلى زيادة درجة الإصابة بالحشرة موضع الدراسة في النباتات المعاملة مقارنة بالكنترول. ونستخلص من هذه الدراسة أنه يمكن التوصية بإستخدام هرمون تراي أكونتانول ليس فقط كمحفز لنمو النباتات وتحسين صفاتها المورفولوجية والفسيولوجية فقط وإنما يمكن كذلك إدراجه في برامج المكافحة المتكاملة للحشرات (I.P.M) وذلك بالجرعات الموصى بها في هذه الدراسة.