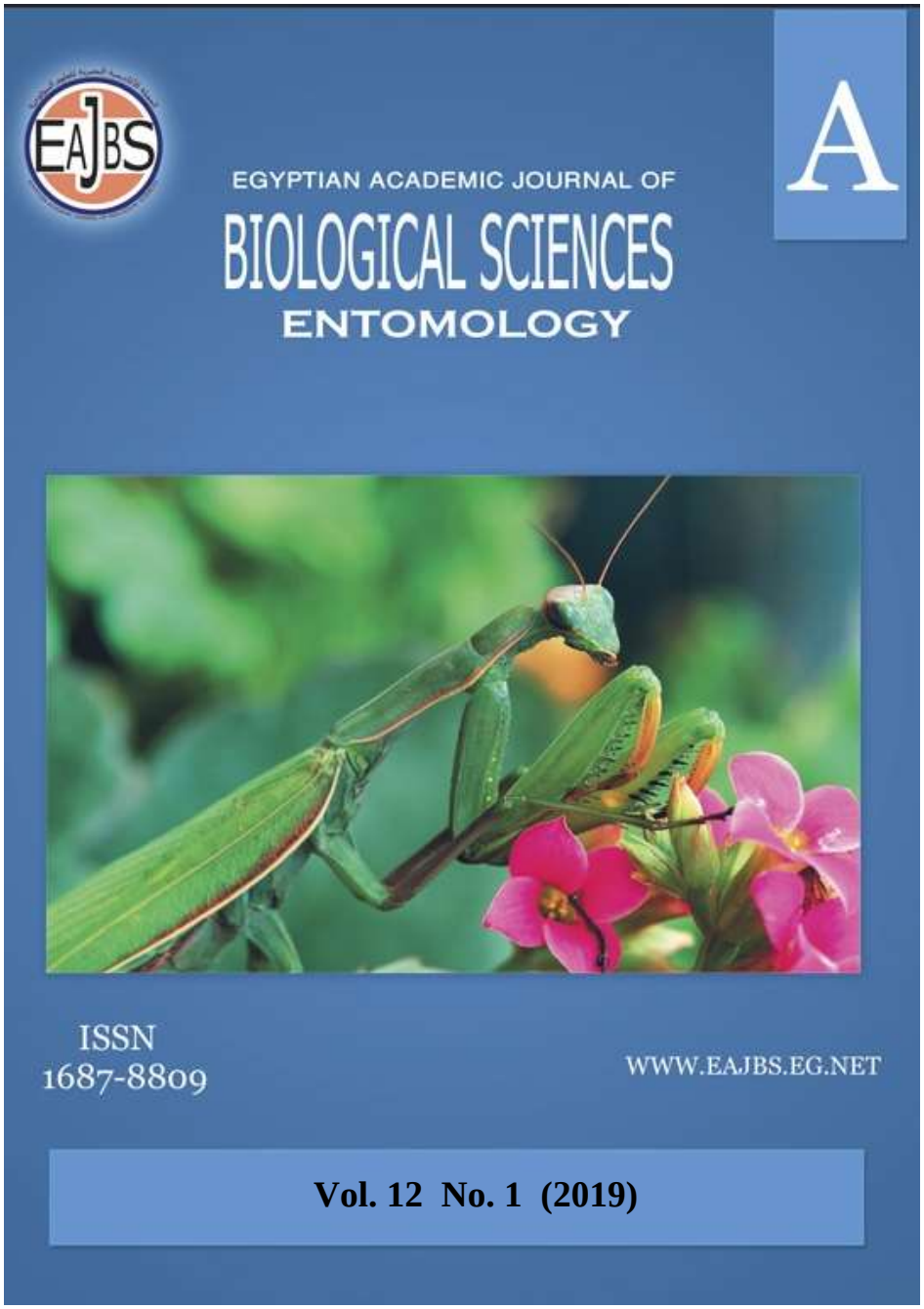


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# Comparative Study on the Effect of Insect Infestation by Aphid and Thrips on some Morphological Characteristics of Tulip Flowers under Glasshouse Conditions

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**ABSTRACT**

Experiments were carried out to study the comparison between the effects of insect infestation by the aphid, *Myzus persicae* (Sulz.) (Homoptera : Aphididae) and thrips, *Thrips tabaci* Lind. (Thysanoptera: Thripidae) on some morphological characteristics of tulip (*Tulipa sp*. Fam. Liliaceae) flowers under glasshouse conditions at two locations (governorates) Cairo Governorate and Giza Governorate throughout 2017-2018 seasons. Morphological characteristics which studied were: color of the flower, number of the petals per flower, the flower diameter, the weight of the flower, the stem length, vase life and annual production. Results showed that the infestation by aphid and thrips affected all morphological characteristics except the color of the flowers. And the effect of infestation by aphid was more than the effect of infestation by thrips, this is compared to control (tulip flowers which did not infest by the two studied insects). Also, the present study showed that the effect of aphid and thrips infestation concentration on the vascular bundles of the flowers petals, and with the increase in the infestation by the two insects the damage in the vascular bundles increases.

## INTRODUCTION

Tulip flowers consider one of the important cut flowers in Egypt and around all over the world. 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. Tulip bulbs contain about 150 species around all over the world and the manner time for cultivated its bulbs during last of summer months or during Autumn months and its flowers blooming during spring months.

Tulip flowers infested with a large scale of insects such as aphids, especially *Myzuz persicae* (Sulz.) which consider one of the most dangerous insects which infested tulip flowers both in open field and under glasshouse conditions**.** Mokenny, H. (1931) found that *M. persicae* one of the most dangerous insects which infested tulip flowers under glasshouse conditions. Pham, K. *et al.* (2008) referred to that aphid is a serious pest at tulip bulbs and flowers and reported that the virus which transmission by aphids causes millions Euro's damage in the flower bulb

sector annually. Also thrips insects such as *Thrips tabaci* Lind. which also infested tulip flowers both in open field and under glasshouse conditions too. Candica *et al.* (1985) reported that thrips insects cause damage to tulip flowers which growth under glasshouse conditions. Carl, C. and Diann, S. (1995) studied the injury to various plant tissues by ovipositing thrips and feeding injuries by thrips species to pollen, flowers, fruit and leaves are characterized for different economic plants. Murugan and Jagadish (2004) in India reported that *chilli thrips* and *Scirtothrips dorsalis* has become a serious pest on rose flowers in India in recent times. It feeds all stages of rose flowers by remaining concealed between the petals. This studied included four stages of rose flowers, unopened buds, opened young buds, harvestable flowers and fully opened flowers

The aim of this work is to study the comparison between effects of insect infestation by aphid *M. persica*e and thrips, *T. tabaci* on some morphological characteristics of tulip (*Tulipa sp*.) flowers under glasshouse conditions at two locations (governorates) Cairo Governorate and Giza Governorate throughout 2017-2018 seasons.

## MATERIALS AND METHODS

This study was carried out to study the comparison between the effects of insect infestation by the aphid, *Myzus persica*e (Sulz.) and thrips, *Thrips tabaci* Lind. on some morphological characteristics of tulip (*Tulipa sp*.) flowers under glasshouse conditions at two locations (governorates) Cairo Governorate and Giza Governorate throughout 2017-2018 seasons.

**Experimental Design:**

The present study was conducted on four tulip varieties (colors) (red, yellow, pink and white) .The morphological characteristics including the color of the flower, number of the petals per flower, the flower diameter, the weight of the flower, the stem length, vase life and annual production.

The experiments were carried out in both the two locations under glasshouse conditions. Each experiment divided into three treatments. The first treatment was infested artificially with aphids, the second was infested artificially with thrips and the third was left as a control. Each treatment was isolated from the other one and all the experiment was isolated from the other trees in the garden.

Each treatment at the two places was divided into 12 plots (3 x 5 $m^2$ each) 3 plots for each color, each plot contains 25 plants.

**Statistical Analysis:**

The effect of the insect infestation by aphid and thrips on the morphological characteristics of certain tulip varieties (colors) were subjected to analysis of variance (ANOVA) and the means were compared by LSD test at 0.05 level, using SAS program (SAS Institute, 1988).

## RESULTS AND DISCUSSION

This study was carried out to study the comparison between the effects of insect infestation by aphid *Myzus persica*e (Sulz.) and thrips, *Thrips tabaci* Lind. on some morphological characteristics of tulip, *Tulipa* sp. flowers under glasshouse conditions at two locations (governorates) Cairo Governorate and Giza Governorate throughout 2017-2018 seasons.

Data in the table (1) show the effect of insect infestation by the aphid, *M.*

*persicae* and thrips, *T. tabaci* on some morphological characteristics of tulip flowers for different varieties (colors) compared to control which non infested by these insects. Morphological characteristics which studied were: the flower color, the flower diameter, the weight of the flower, number of petals per flowers, the stem length, vase life and the annual production. And recorded the data by means of all these characteristics at both the two locations.

For (Red flowers), the color not changed after infestation by the two insects. The number of petals per flower decreased from 20-25 petals / flower in control to 13-15 and 15-17 petals / flower after infestation by aphid and thrips, respectively. The flower diameter changed from 9-11 cm in control to 5-6 and 6-7 cm after infestation by aphid and thrips, respectively. The weight of the flower also decreased from 18-20 gram in control to 15-16 and 16-17 gram after infestation by aphid and thrips, respectively. The stem length decreased from 40-60 cm in control to 27-30 and 30-33 cm after infestation by aphid and thrips, respectively. The vase life decreased from 9-12 days in control to 5-6 and 6-7 days after infestation by aphid and thrips, respectively, finally, the annual production reached to 115-120 flower/$m^2$/year in control, but decreased to 75-80 and 90-95 flower/$m^2$/year after infestation by aphid and thrips, respectively.

Table 1: Effect of infestation by aphid and thrips on the morphological characteristics of tulip flowers.

| Adjective | Red | | | SA | Yellow | | | SA | Pink | | | SA | White | | | SA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control | Aphid | Thrips | | Control | Aphid | Thrips | | Control | Aphid | Thrips | | Control | Aphid | Thrips | |
| Colour | Red | Red | Red | ns | yellow | yellow | yellow | ns | pink | pink | pink | ns | White | White | white | ns |
| No. of Petals/flower | 20-25 | 13-15 | 15-17 | F =2.72[ns] LSD= 6.08 | 23-28 | 15-20 | 17-22 | F =13.07** LSD =6.02 | 24-30 | 16-19 | 17-21 | F =6.08* LSD =7.32 | 27-32 | 18-22 | 20-25 | F= 17.61** LSD= 6.13 |
| Flower diameter/cm | 9-11 | 5-6 | 6-7 | F = 13.01** LSD =1.29 | 8-10 | 5-6 | 6-7 | F =16.00** LSD =1.26 | 10-12 | 6-8 | 7-9 | F =14.01** LSD =2.03 | 9-11 | 5-7 | 6-8 | F= 12.01** LSD= 1.43 |
| Weight/g | 18-20 | 15-16 | 16-17 | F = 13.01** LSD = 1.98 | 19-21 | 15-17 | 16-18 | F =7.05* LSD =1.99 | 18-20 | 14-15 | 15-16 | F =12.01** LSD =1.97 | 19-20 | 14-15 | 15-17 | F= 12.01** LSD= 1.88 |
| Stem length/cm | 40-60 | 27-30 | 30-33 | F =32.24*** LSD =7.66 | 38-40 | 27-29 | 28-31 | F =6.41* LSD =7.82 | 42-45 | 33-35 | 35-37 | F =13.00** LSD =8.78 | 40-42 | 30-32 | 33-35 | F =13.0** LSD= 8.79 |
| Vase life/day | 9-12 | 5-6 | 6-7 | F =12.36* LSD =2.36 | 10-12 | 5-7 | 6-8 | F =12.01** LSD =2.36 | 9-11 | 5-6 | 6-7 | F =8.03* LSD =1.58 | 10-11 | 6-7 | 7-9 | F =8.4* LSD =1.57 |
| Annual production flower/$m^2$/year | 115-120 | 75-80 | 90-95 | F =63.03*** LSD =6.09 | 117-122 | 85-90 | 95-100 | F =32.74** LSD =12.31 | 100-110 | 77-80 | 86-90 | F =32.6*** LSD =13.18 | 112-118 | 80-90 | 90-110 | F= 14.01** LSD= 18.36 |

**SA = Statistical analysis**
**ns - non significant**
*** - significant**
**** - significant**
***** - high significant**

For (Yellow flowers), the color not changed after infestation by the two insects. The number of petals per flower decreased from 23-28 petals / flower in control to 15-20 and 17-22 petals / flower after infestation by aphid and thrips, respectively. The flower diameter changed from 8-10 cm in control to 5-6 and 6-7 cm after infestation by aphid and thrips, respectively. The weight of the flower also decreased from 19-21 gram in control to 15-17 and 16-18 gram after infestation by aphid and thrips, respectively. The stem length decreased from 38-40 cm in control to 27-29 and 28-31 cm after infestation by aphid and thrips, respectively. The vase life decreased from 10-12 days in control to 5-7 and 6-8 days after infestation by aphid and thrips, respectively, finally, the annual production reached to 117-122 flower/$m^2$/year in control, but decreased to 85-90 and 95-100 flower/$m^2$/year after infestation by aphid and thrips, respectively.

For (Pink flowers), the color not changed after infestation by the two insects. The number of petals per flower decreased from 24-30 petals / flower in control to 16-19 and 17-21 petals / flower after infestation by aphid and thrips, respectively. The flower diameter changed from 10-12 cm in control to 6-8 and 7-9 cm after infestation by aphid and thrips, respectively. The weight of the flower also decreased from 18-20 gram in control to 14-15 and 15-16 gram after infestation by aphid and thrips, respectively. The stem length decreased from 42-45cm in control to 33-35 and 35-37 cm after infestation by aphid and thrips, respectively. The vase life decreased from 9-11 days in control to 5-6 and 6-7 days after infestation by aphid and thrips, respectively, finally, the annual production reached to 100-110 flower/$m^2$/year in control, but decreased to 77-80 and 86-90 flower/$m^2$/year after infestation by aphid and thrips, respectively.

For (White flowers), the color not changed after infestation by the two insects. The number of petals per flower decreased from 27-32 petals / flower in control to 18-22 and 20-25 petals / flower after infestation by aphid and thrips, respectively. The flower diameter changed from 9-11 cm in control to 5-7 and 6-8 cm after infestation by aphid and thrips, respectively. The weight of the flower also decreased from 19-20 gram in control to 14-15 and 15-17 gram after infestation by aphid and thrips, respectively. The stem length decreased from 40-42 cm in control to 30-32 and 33-35 cm after infestation by aphid and thrips, respectively. The vase life decreased from 10-11 days in control to 6-7 and 7-9 days after infestation by aphid and thrips, respectively, finally, the annual production reached to 112-118 flower/$m^2$/year in control, but decreased to 80-90 and 90-110 flower/$m^2$/year after infestation by aphid and thrips, respectively.

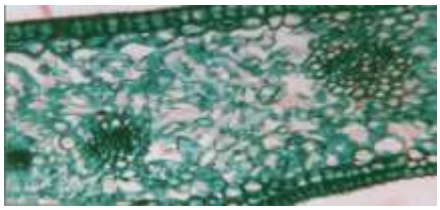
The obtained results are agreement with those obtained by Jaskiewicz (2006) in Poland who studied the effect of feeding of Rose aphids *Macrosiphum rosae* L. on the flowering of roses and reported that the Rose aphid *M. rosae,* when found in greater numbers caused deformation of the leaf blades, the shorting of shoots and flowers petioles, as well as deformation of the flowers. Also Suttern (2005) in Netherlands who studied the effect of *Frankliniella occidentalis* on rose plants, and stated that flower damage caused by *F. occidentalis* depends on the season and number of thrips on the flower and conducted a study to determine the relationship among silver damage on the leaves and flower damage, and Sauer (1997) in Germany reported that petal damage could not always be attributed to thrips infestation (number of thrips) only but also attributed to the time of the infestation, total infestation percentages depending on the average colonization /week. On the other side, Gary *et al.* (2000) found that the aphid has not only direct effect on tulip flowers but also has an indirect effect on these flowers through transmitted virus diseases of tulip bulb crop. Also, Mokenny, H. (1931) agreement with this opinion that the effect of aphid insects not only the direct effect on flowers but also the most effect on tulip flowers through as a vector of virus "breaking" which transmitted it to tulip flowers.

**Effect of Infestation by Aphid and Thrips on the Vascular Bundles:**

The present study showed that the effect of aphid, *M. persicae* and thrips, *T. tabaci* concentrated on the vascular bundles in the tissue of the petals of tulip flowers which consider the factory of the food in the plant. And the damage in these vascular bundles increase with the high infestation by the two insects and decrease with the low infestation by them. This is show clearly from figure (1) which show cross - sections for petals of tulip flowers and show the effect of infestation by aphid and thrips concentration on the vascular bundles (bundle sheath, xylem vessels and

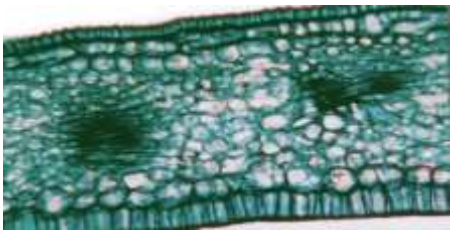
phloem), which make an important role in transporting water and nutrient from soil to plants and from leaves to all parts of rose plant. As shown as in this figure, by increase infestation with the two insects the damage in vascular bundles increase and so more bad, also morphological and physiological effects will occur due to deficient in water and important dissolved salts.

**Control**



**Low infestation**

**Low infestation**



**High infestation**

**High infestation**

***M. persicae*** ***T. tabaci***

**Fig. (1):** The damage symptoms of tulip flowers tissues (vascular bundles) after infestation by *M. persicae* and *T. tabaci*

The obtained results are agreement with those obtained by Pollard, D. (1971) who studied the feeding penetration of *Myzus persicae* (Sulz.) nymphs into tulip leaf epidermis, as shown by a study of stylets and tracks, may be intercellular, or stomatal with the former predominating, and reported also that the contact between the stylet sheath or track and cell cytoplasm is at a maximum during intracellular entry but occurs to a limited extent during intercellular penetration due to partial rupture of the epidermal end walls, in the mesophyll the stylet path is intercellular but a few cells were penetrated by tracks.

Also, the obtained results are agreement with those obtained by Peng and Miles (1991) in Australia**,** detected that *M. rosae*. feeding on the rose flowers that occurs and concentration in the parenchymal and vascular tissues of the rose. And the aphids will feed on tissues and on aqueous diets containing low concn. of catechin. Davidson, J. (1923) reported that the plant exhibits many pathological

features as a result of aphid attack, the food of aphids is the cell sap of plants derived from various cells of the plant tissues, especially the vascular bundles. On the other hand, Zuniga, G. *et al.* (1988) studied the effect of gramine on the feeding behavior of the aphids *Schizaphis graminum* and *Rhopalosiphum padi* and found that gramine found only in the vascular bundles, and it is suggested that gramine content and location may affect the feeding behavior of aphids in these plants. Kindt, F. *et al.* (2003) studied the characterization of the feeding behavior of Western flower thrips (Ornamental plants thirps) *Frankliniella occidentalis* (Pergande) and found that insect causes damage to plants when it is feeding, also this thrips species transmits *Tomato spotted* Wilt virus (TSWV) during styles penetration. And also investigated that the penetration behavior (probing) of thirps on leaves causes more damage on vascular bundles.

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## ARABIC SUMMERY

### دراسة مقارنة لتأثير الإصابة بحشرتى المن والتربس على بعض الصفات المورفولوجية لأزهار التيوليب تحت ظروف الصوب الزجاجية

**عبلة فوزى عبد السلام سعد**

معهد بحوث وقاية النباتات - مركز البحوث الزراعية – الدقى – الجيزة – مصر

أجريت هذه الدراسة بغرض دراسة تأثير كلا من حشرتى المن *Myzus persica*e (Sulz.) والتربس *Thrips tabaci* Lind. على بعض الصفات المورفولوجية لأزهار التيوليب *Tulipa sp*. تحت ظروف الصوب الزجاجية. وذلك فى محافظتى القاهرة والجيزة خلال موسمى ٢٠١٧، ٢٠١٨

شملت الدراسة بعض الصفات المورفولوجية الهامة لأزهار التيوليب مثل : لون الزهرة ،عدد البتلات التى تحتويها الزهرة ، طول قطر الزهرة ، وزن الزهرة ، طول عنق الزهرة ، طول فترة حياة الزهرة بعد القطف ، متوسط الانتاج الموسمى للأزهار. وذلك عن طريق المقارنة بين هذه الصفات المورفولوجية لأزهار التيوليب المصابة بحشرات المن وأيضا الأزهار المصابة بحشرات التربس ومقارنتهما بأزهار التيوليب المنتجة الخالية من الإصابة بكلتا الحشرتين.

أشارت النتائج المتحصل عليها إلى تأثر الصفات المورفولوجية لأزهار التيوليب (باستثناء لون الزهرة فقط) بالإصابة الحشرية بكلا من حشرة المن *M. persica*e و التربس *T. tabaci* وكان تأثير الإصابة بحشرة المن أكثر وضوحا من التربس وذلك بالمقارنة بأزهار التيوليب السليمة الخالية من الإصابة الحشرية.

كما أشارت الدراسة إلى تركز الإصابة بكلتا الحشرتين المن والتربس على منطقة الحزم الوعائية الموجودة فى أنسجة بتلات أزهار التيوليب وظهر ذلك واضحا عند عمل قطاعات عرضية فى بتلات أزهار التيوليب حيث ظهر من هذه القطاعات تركز الإصابة بكلتا الحشرتين على منطقة الحزم الوعائية كما ظهرمنها أيضا أنه كلما إزدادت درجة الإصابة بأى من الحشرتين كلما كان التأثير أكثر وضوحا على الحزم الوعائية .