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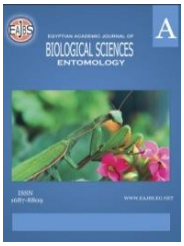

# Effect Color of Jasmine Flowers on The Infestation by *Macrosiphum rosae* and *Tetranychus urticae* under Glasshouse Conditions

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## ABSTRACT

This study was carried out to study the effect color of Jasmine flowers (*Jasmine spp*. Fam. Oleaceae) on the infestation by *Macrosiphum rosae* (L.) (Homoptera: Aphididae) and *Tetranychus urticae* Koch (Acari: Tetranychidae) using four varieties (colors) of Jasmine plants similar in the horticulture characters but different in the color of the flower only, (yellow, red, blue and white). Experiments were done in two locations (governorates), El-Orman Garden (Giza Governorate) and International Garden (Alexandria Governorate) throughout 2019 /2020 season under glasshouse conditions.

Results obtained showed that the infestation with both *M. rosae* and *T. urticae* began to appear on the 1st February 2020 season and recorded the activity peak during mid of April month then decreased until the beginning of August at the same season. Results obtained showed also that flower colors of jasmine arrange for the attracted both the two pests as follows: yellow, red, blue and white, respectively.

Results obtained also showed that both the total sugar and total protein arranged to descend in the jasmine flowers color as follows: yellow, red, blue and white).

Statistical analysis showed that there were highly significant differences between the four flowers' color (varieties) of jasmine on the attraction of both the two pests. And Statistical analysis showed also that was highly significant differences between the four flowers color (varieties) of jasmine on the content of both total sugar and total protein.

## INTRODUCTION

Jasmine flowers (*Jasmine spp*. Fam. Oleaceae) consider one of the most important and popular cut flowers in Egypt and all over the world which cultivated in the open field and under greenhouse conditions. A jasmine flower is a very popular flower around the world especially in the tropics because of its unique fragrance. 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, besides its uses in different medicinal purposes. Humans love jasmine flowers due to their beautiful colors, style of flowers, smiles, and tolerance to the inferable weather factors. Fishman *et al*. (2016).

Jasmine flowers infested with a large scale of insects belong to many orders and

families such as *Macrosiphum rosae* L. (Homoptera: Aphididae) and *Tetranychus urticae* Koch (Acari: Tetranychidae) which are considered important pests of jasmine flowers and many other flowers. The strong infestation by *M. rosae* causes the deformation of stems, leaves and flowers of jasmine plants, Jaskiewicz (2013). The serious infestation by *M. rosae* and *T. urticae* on jasmine flowers feed mainly on the young leaves and developing flower-buds of jasmine flowers, Derek (2017) in Australia

This study was carried out to study the effect of jasmine flower color on the infestation by *A. nerii* and *T. urticae* using four varieties (colors) of jasmine plants similar in the horticulture characters but different in the color of the flowers only, (yellow, red, blue and white).

## MATERIALS AND METHODS

**Experimental Design:**

This study was conducted on four varieties (colors) of jasmine flowers (yellow, red, blue and white) which grown in El-Orman Garden (Giza Governorate) and International Garden (Alexandria Governorate) during 2019/2020 season. Jasmine varieties (colors) were cultivated at the same time in a timely manner for the cultivation of jasmine seedlings in October month in glasshouse conditions. Each glasshouse had 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 to 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 a note, the infestation degree of jasmine plants with *Macrosiphum rosae* (L.) and *Tetranychus urticae* Koch in various stages of plants. It is proven accurate observations of the infestation with the two pests 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 remarkable difference in the infestation with the two pests. Directly counting was done weekly during the duration of the presence of flowers from February until August.

It observed that the weekly counting and monthly averages the two pest's preference of the colors on the following order: yellow, red, blue, and white.

**Determination of Protein Banding Pattern:**

**Total protein Extraction:**

Total proteins were extracted from 0.5 kg fresh tissue. The tissues were ground in liquid nitrogen with a mortar and pestle. Then few mls of tris buffer extraction were added (1:2, tissue: buffer). The medium of extraction contained tris-HCL buffer (0.1mM tris, pH 7.5, 4mM B-mercaptoethanol, 0.1mM EDTA-$Na_2$, 10mM KCl and 10mM $MgCl_2$). The crude homogenate was centrifuged at 10.000xg for 20min. The supernatant was used for gel analysis by SDS-polyacrylamide gel electrophoresis (SDS-PAGE) according to the method of Laemmli (1970).

**Loading on A Gel:**

**Gel Preparation:**

Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) was performed using 12.5% acrylamide and 0.8% bis-acrylamide running gel consisting of 0.375 M Tris-HCl (pH 8.8) and 0.1% SDS. Stacking gel (10 mm) was made using 4.5% acrylamide containing 0.8% bis-acrylamide in 0.125 M Tris–HCl (pH6.8) and 0.1% SDS. The electrophoresis buffer contained 0.025 M Tris-HCl, 0.19 glycine and 0.1% SDS. The samples were homogenized in 0.12M Tris-HCl (pH 6.8), 0.4 SDS, 10 B-mercaptoethanol,

0.02% bromophenol blue and 20% glycerol. The samples were then heated for 3min. in a boiling water bath before centrifugation. The gel was run under cooling at 90v for the first 15min, then 120v for the next 0.5 hr and finally 150v for the remaining 1.5hr. Sheri, *et al*. (2000).

**Sample Loading:**

A known volume of protein sample was applied to each well by micropipette. Control wells were loaded with standard protein markers.

**Electrophoresis Conditions:**

The running buffer was poured into a pre-cooled (4°C) running tank. The running buffer was added to the upper tank just before running so that the gel was completely covered. The electrodes were connected to a power supply adjusted at 100 v until the bromophenol blue dye entered the resolving gel and then increased to 250v until the bromophenol blue dye reaches the bottom of the resolving gel.

**Gel Staining and Distaining:**

After the completion of the run, the gel was placed in a staining solution consisting of 1g of Coomassie Brilliant bule–R-250; 455 ml methanol; 90ml glacial acetic acid and completed to 1L with deionized distilled water. The gel was distained with 200ml distaining solution (100ml glacial acetic acid, 400ml methanol and completed to 1L by distilled water) and agitated gently on the shaker. The disdaining solution was changed several times until the gel background was clear.

**Gel Analysis:**

Gels were photographed using a Bio-Rad gel documentation system. Data analysis was obtained by Bio-Rad Quantity one Software version 4.0.3

**Statistical Analysis:**

In these experiments, the effect of four flower colors (varieties) of jasmine on the attraction of individuals of M. *rosae* and *T. urticae* 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 color of jasmine flowers (*Jasmine spp*. Fam. Oleaceae) on the infestation by *Macrosiphum rosae* (L.) (Homoptera: Aphididae) and *Tetranychus urticae* Koch (Acari: Tetranychidae). Using four varieties (colors) of jasmine plants similar in the horticulture characters but different in the color of the flowers only, (yellow, red, blue and white). Experiments were done in two locations (governorates), El-Orman Garden (Giza Governorate) and International Garden (Alexandria Governorate) throughout 2019 /2020 season under glasshouse conditions.

**Giza Governorate**:

Data tabulated in Table (1) and Fig. (1) showed that the infestation with the boss the two pests *M. rosae* and *T.urticae* were arranged to descend as follows: yellow, red, blue and white, respectively. Whereas the mean numbers of *M. rosae* and *T.urticae* which infesting jasmine flowers were ( 33.6, 19.6), (25.8, 14.7), (21.5, 10.7) and (18.3,7.5) pest/flower for the four varieties (colors) of jasmine yellow, red, blue and white, respectively.

Statistical analysis showed that highly significant differences between the four colors (varieties) of jasmine (yellow, red, blue and white) on the attraction of boss the two pests *M. rosae* and *T.urticae* whereas $F_{0.05}$ value and LSD value were (735.75, 1.025), (642.35, 1.032) for the two pests respectively.

**Table 1:** Mean numbers of *M. rosae* and *T. urticae* attraction with different flowers colors of jasmine in Giza Governorate during 2019/2020 season

| Date | *M. rosae* | | | | | | *T. urticae* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Y | R | B | W | $F_{0.05}$ | LSD | Y | R | B | W | $F_{0.05}$ | LSD |
| 1/2/2020 | 20.5 | 18.7 | 15.4 | 13.5 | | | 15.7 | 11.3 | 7.3 | 5.9 | | |
| 15/2/2020 | 28.9 | 20.5 | 17.9 | 15.9 | | | 18.3 | 13.5 | 9.4 | 7.8 | | |
| 1/3/2020 | 35.1 | 27.8 | 21.7 | 18.8 | | | 20.5 | 14.6 | 11.3 | 9.3 | | |
| 15/3/2020 | 41.8 | 33.5 | 25.4 | 21.5 | | | 22.7 | 16.8 | 12.5 | 10.2 | | |
| 1/4/2020 | 45.4 | 35.7 | 29.1 | 25.8 | | | 23.5 | 18.2 | 14.7 | 11.4 | | |
| 15/4/2020 | 50.8 | 40.5 | 35.4 | 30.5 | | | 25.6 | 20.4 | 16.2 | 13.5 | | |
| 1/5/2020 | 45.4 | 35.9 | 31.7 | 26.6 | **735.75** | **1.025** | 24.5 | 18.3 | 13.7 | 11.2 | **642.35** | **1.032** |
| 15/5/2020 | 41.5 | 32.5 | 25.2 | 21.7 | | | 22.7 | 17.5 | 12.5 | 10.5 | | |
| 1/6/2020 | 35.8 | 25.7 | 21.7 | 18.1 | | | 20.3 | 15.6 | 10.8 | 8.3 | | |
| 15/6/2020 | 30.1 | 20.4 | 17.5 | 14.5 | | | 19.3 | 13.7 | 9.6 | 5.9 | | |
| 1/7/2020 | 25.8 | 17.8 | 15.9 | 12.9 | | | 16.2 | 12.8 | 8.5 | 3.7 | | |
| 15/7/2020 | 20.7 | 14.5 | 12.6 | 10.5 | | | 14.3 | 10.3 | 7.2 | - | | |
| 1/8/2020 | 15.4 | 11.9 | 9.8 | 7.6 | | | 11.8 | 7.6 | 5.8 | - | | |
| **Total** | **437.2** | **335.4** | **279.3** | **237.9** | | | **255.4** | **190.6** | **139.5** | **97.7** | | |
| **Mean** | **33.6** | **25.8** | **21.5** | **18.3** | | | **19.6** | **14.7** | **10.7** | **7.5** | | |

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

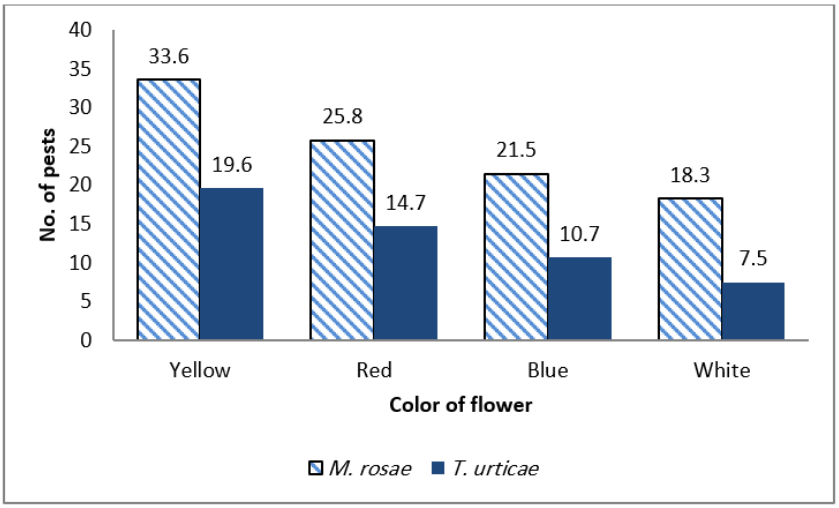


**Fig. 1**: Mean numbers of *M. rosae* and *T. urticae* attraction with different flowers colors of jasmine in Giza Governorate during 2019/2020 season.

**Alexandria Governorate:**

Data tabulated in Table (2) and Fig. (2) showed also that the infestation with the both the two pests *M. rosae* and *T.urticae* were arranged to descend as follows: yellow, red, blue and white, respectively. Whereas the mean numbers of *M. rosae* and *T.urticae* which infesting jasmine flowers were (24.6, 15.1), (20.4, 11.4), (17.3, 8.1) and (14.8, 5.7) pest/flower for the four varieties (colors) of jasmine: yellow, red, blue and white, respectively.

Statistical analysis showed that highly significant differences between the four colors (varieties) of jasmine (yellow, red, blue and white) on the attraction of both the two pests *M. rosae* and *T.urticae* whereas $F_{0.05}$ value and LSD value were (815.25, 1.065), (742.33, 1.015) for the two pests respectively.

These results agree with those obtained by Mirab (2017) in Iran who reported that were several species of aphid are associated with flowers of jasmine flowers especially yellow and red flowers, and they cause serious damages to the flowering stage. Jaskiewicz (2009) in Poland who reported the effect of the Rose aphid, *M. rosae* feeding on jasmine flowers and reported that *M. rosae* when found in greater numbers caused deformation of

the leaf blades, shorting of shoots and petioles, as well as deformation of the flowers, and also found that insect prefers yellow, red and blue flower color respectively. Also, Hoback *et al.* (2008) studied the effect of color (yellow or blue) and placement (exposed or shaded) of sticky traps on aphids on some flowers and diversity estimates. The results showed that more aphids were collected on shaded traps and yellow color was more suitable for trapping. Derek (2017) 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 fewer numbers of the abundant species only. Whereas Fereres *et al.* (2009) found that *T. urticae* and *Rhopalo siphummaidis* (Fitch) preferred alighting on intensely yellow than on green or blue (soil-like) ceramic tiles, and expressed no preference for landing on leaves infected with soybean mosaic virus (SMV). And Vasiliu *et al*. (2015) studied preference colors to *T. urticae* and found these colors arranged to ascend as follows: yellow, red and green respectively.

**Table 2:** Mean numbers of *M. rosae* and *T. urticae* attraction with different flowers colors of jasmine in Alexandria Governorate during 2019/2020 season

| Date | *M. rosae* | | | | | | *T. urticae* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Y | R | B | W | $F_{0.05}$ | LSD | Y | R | B | W | $F_{0.05}$ | LSD |
| **1/2/2020** | 17.5 | 15.7 | 12.4 | 10.5 | | | 13.5 | 10.7 | 6.3 | 4.9 | | |
| **15/2/2020** | 20.9 | 17.5 | 14.9 | 12.9 | | | 15.2 | 11.5 | 8.5 | 5.6 | | |
| **1/3/2020** | 25.1 | 20.8 | 17.7 | 14.8 | | | 16.4 | 12.4 | 9.7 | 7.3 | | |
| **15/3/2020** | 31.8 | 24.5 | 20.4 | 17.5 | | | 18.2 | 14.5 | 11.9 | 8.5 | | |
| **1/4/2020** | 35.4 | 29.7 | 25.1 | 20.8 | | | 20.5 | 16.3 | 14.5 | 10.3 | | |
| **15/4/2020** | 40.8 | 31.5 | 27.4 | 25.5 | | | 22.1 | 17.4 | 15.3 | 12.5 | | |
| **1/5/2020** | 35.4 | 29.9 | 25.7 | 22.6 | **815.25** | **1.065** | 18.5 | 15.3 | 11.6 | 9.2 | **742.33** | **1.015** |
| **15/5/2020** | 31.5 | 27.5 | 22.2 | 19.7 | | | 17.4 | 13.5 | 9.5 | 7.8 | | |
| **1/6/2020** | 25.8 | 22.7 | 18.7 | 16.1 | | | 15.3 | 12.6 | 7.8 | 5.3 | | |
| **15/6/2020** | 20.1 | 17.4 | 15.5 | 13.5 | | | 13.7 | 10.4 | 5.3 | 2.6 | | |
| **1/7/2020** | 15.8 | 12.8 | 10.9 | 8.9 | | | 10.2 | 7.8 | 3.5 | - | | |
| **15/7/2020** | 11.7 | 8.5 | 7.6 | 5.5 | | | 8.3 | 4.5 | 1.2 | - | | |
| **1/8/2020** | 8.4 | 6.9 | 5.8 | 4.6 | | | 7.5 | 1.8 | - | - | | |
| **Total** | **320.2** | **265.4** | **224.3** | **192.9** | | | **196.8** | **148.7** | **105.1** | **74.0** | | |
| **Mean** | **24.6** | **20.4** | **17.3** | **14.8** | | | **15.1** | **11.4** | **8.1** | **5.7** | | |

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

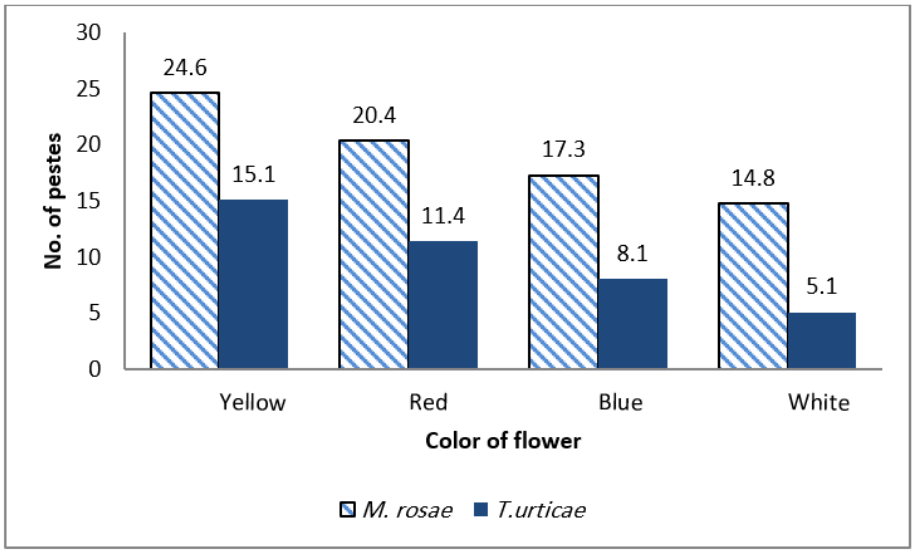


**Fig.2:** Mean numbers of *M. rosae* and *T. urticae* attraction with different flowers colors of jasmine in Alexandria Governorate during 2019/2020 season

**Determination of the Internal Components of Jasmine Flowers (total sugar – total protein):**

Data in Table (3) show the total soluble sugar and total protein content in different varieties (colors) of jasmine flowers. Whereas the total soluble sugar content at the four varieties of jasmine flowers (yellow, red, blue and white) were 25.45, 22.15, 19.65 and 14.72 (mg/g) respectively, while the total protein content at the four varieties of jasmine flowers was 35.56, 32.65, 29.25 and 23.45 (mg/g), respectively.

**Table 3**: Determination of total soluble sugar and total protein (mg/g) in different colors of jasmine flowers

| Color | Determination of internal components (mg/g) | |
|---|---|---|
| | Total sugar | Total protein |
| Yellow | $25.45^{a}$ | $35.56^{a}$ |
| Red | $22.15^{b}$ | $32.65^{b}$ |
| Blue | $18.65^{c}$ | $27.25^{c}$ |
| White | $14.72^{d}$ | $23.45^{a}$ |
| $F_{0.05}$ | 915.23 | 825.67 |
| LSD | 1.065 | 1.074 |

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

Generally, the infestation by both the two pests *M. rosae* and *T.urticae* reduced whereas the total soluble sugar and total protein were reduced in all varieties of jasmine flowers. And in the other side, the infestation by both the two pests increased whereas the total soluble sugar and total protein increased in all varieties of jasmine flowers.

Statistical analysis in (Table 3) shows high significant differences between the total sugar and total protein in different jasmine flowers color whereas $F_{0.05}$ value and LSD value were (915.23, 1.065), (825.67, 1.074) for the total sugar and total protein, respectively in jasmine flowers color (varieties).

The obtained results are in agreement with those obtained by Pankovetskii and Tyutyunnik (2003) in Russia who determined starch and sugar contents in the leaves, sepals and petals of the jasmine varieties during bud formation and flowering. They found that during bud formation the sugar content rise in all organs but most of all in the petals (up to 30%). During flowering starch content decreased in the petals, sepals and leaves by 72 – 96, 56 – 80 and 40 – 60 % respectively, and the sugar content rise rapidly by the same ratio in the petals, Decheva *et al.* (2008) in Bulgaria investigated the changes in the sugar, starch, free amino acid and protein from August to March in buds of flowers of carnation plants, total sugar (glucose, fructose, and sucrose) content varied until February and was maximal before bud break. The level of the 12 free amino acids identified decreased during dormancy, and then rise rapidly at bud swelling in March. In dry weather, sugar, starch and free amino acid contents were higher in buds of the flower-bearing plants, Peng and Miles (2014) in Australia stated that tissue sap of jasmine became more acceptable to the *Macrosiphum rosae* as a result of oxidation. When *M. rosae* fed on stems of semi-dormant miniature jasmine bushes and flowers catechin and protein content were high level in that period, but these components were at a low level when that insect had been removed.

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## ARABIC SUMMARY

**تأثير لون أزهار الياسمين *Jasmine spp.* علي الإصابة بآفتى من الورد *Macrosiphum rosae***
**والعنكبوت الأحمر *Tetranychus urticae***
**تحت ظروف الصوب الزجاجية**

**جميلة عبد الرحمن محمد هيكل، خالد عبد العزيز عياد، إيناس عادل عبد اللطيف ومرفت قاسم جبر الشربينى**

معهد بحوث وقاية النباتات - مركز البحوث الزراعية- الدقي – الجيزة – 12618 مصر

تم إجراء التجارب بغرض دراسة تأثير الألوان المختلفة لأزهار الياسمين *Jasmine spp.* (الصفراء، الحمراء، الزرقاء والبيضاء) علي جذب والإصابة بآفتى من الورد *Macrosiphum rosae* (L.) والعنكبوت الأحمر *Tetranychus urticae* حيث تم اجراء هذه الاختبارات بموقعين مختلفين: حديقة الأورمان (محافظة الجيزة) والحديقة الدولية (محافظة الإسكندرية) على مدار الموسم الزراعي لعام 2019 - 2020 تحت ظروف الصوب الزجاجية.

وأشارت النتائج إلى أنه في كل من حديقة الأورمان بمحافظة الجيزة والحديقة الدولية بمحافظة الإسكندرية أن الإصابة بالحشرات الكاملة والحوريات لكلتا الآفتين بدأت في الظهور بداية من زراعة الشتلات فى شهر أكتوبر على المجموع الخضرى وذلك بصورة متقاربة إلى حد كبير بين الألوان (الأصناف) المختلفة. ولكن بداية من ظهور الأزهار فى شهر فبرايرظهر الإختلاف بوضوح فى درجة أو شدة الإصابة بين الألوان (الأصناف) المختلفة. ويمكن ترتيب إنجذاب الأفراد الكاملة والحوريات لكلتا الآفتين علي حسب لون الأزهار تنازليا كالآتي: الأزهار الصفراء، الحمراء، والزرقاء ثم البيضاء، على الترتيب. كما أوضح التحليل الإحصائي للنتائج وجود فروق معنوية عالية بين الألوان المختلفة لأزهار الياسمين في جذبها لكلتا الآفتين.

كما شملت الدراسة كذلك تحليل المكونات الداخلية لأزهارالياسمين وبخاصة إجمالى السكريات الذائبة وكذلك إجمالى البروتين. حيث ظهر من الدراسة وجود إرتباط معنوى بين إجمالى السكريات الذائبة وكذلك إجمالى البروتين ومستوى الإصابة بكلتا الآفتين محل الدراسة. حيث ثبت أنه كلما زاد محتوى أزهار الياسمين من إجمالى السكريات وإجمالى البروتين كلما زادت الإصابة بكلتا الآفتين محل الدراسة . وبالعكس كلما إنخفض محتوى أزهار الياسمين من هذه المحتويات الداخلية كلما قلت الإصابة بهاتين الآفتين محل الدراسة. وهذا ينعكس بصورة واضحة على مستويات الإصابة بكلتا الآفتين على كل من أصناف (ألوان) الياسمين محل الدراسة وذلك لإختلاف محتواها من هذه المكونات الداخلية (إجمالى السكريات و إجمالى البروتين).