International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 23-05-2022, Accepted: 08-06-2022, Published: 25-06-2022
Volume 7, Issue 6, 2022, Page No. 166-171

Effect of the insect infestation by Jasmine Thrips, *Thrips orientalis* on the quantitative and qualitative adjectives of jasmine flowers and jasmine oil

Emam A S*, Marwa M Mousa, Elmesawy M G, Heba A Alghnam
Plant Protection Research Institute, A.R.C, Dokki, Giza, Egypt

Abstract
This study was carried out to study effect of the insect infestation by Jasmine Thrips, *Thrips orientalis* (Bagnall) (Thysanoptera: Thripidae) at three levels of the infestation (low infestation, medium infestation and high infestation) on the quantitative and qualitative adjectives of jasmine flowers, *Jasminum grandiflorum* (Fam. Oleaceae) and jasmine oil. Experiments were carried out under plastic greenhouses at two locations (Governorates), El-Orman Garden (Giza Governorate) and The International Garden (Alexandria Governorate) during season 2021. This study was divided into three parts, the first part studied the population fluctuations of the successive insect *T. orientalis* (adults and nymphs) on jasmine plants (leaves and flowers), and classification this infestation to three levels (low infestation, medium infestation and high infestation). The second part of this study studied effect of this insect infestation by *T. orientalis* at the three levels of the infestation on the quantitative and qualitative adjectives of jasmine flowers. And the third part of this study studied effect of this insect infestation by the same insect at the three levels of the infestation on the quantitative and qualitative adjectives of jasmine oil. The obtained results indicated to the population fluctuations of the successive insect *T. orientalis* (adults and nymphs) during the season on both leaves and flowers of jasmine plants with notice that the general mean of the insect population on the flowers was relatively higher than on the leaves at both of the two successive locations. The obtained results also indicated to the clear effect of the insect infestation by *T. orientalis* (at three levels of the infestation) on all the quantitative and qualitative adjectives of jasmine flowers except color of the flower which did not change after infestation by *T. orientalis*. Lastly, the obtained results also indicated to the clear effect of the insect infestation by *T. orientalis* (at three levels of the infestation) on most quantitative and qualitative adjectives of jasmine oil.

Keywords: *Thrips orientalis, jasminum grandiflorum*, quantitative adjectives, qualitative adjectives, jasmine flowers, jasmine oil, greenhouses

Introduction
Jasmine, *Jasminum grandiflorum* is known as the "Queen of fragrance" which belongs to the family Oleaceae considers one of the oldest, traditional, fragrant and beautiful flowers grown in India and all over the world, Kiran *et al.* (2017) [7]. Jasmines are commercially cultivated for their unique fragrant, beautiful flowers and essential oil production. Man' s love for jasmine flowers is due to their sweet and intelligent scent, wonderful shapes and tolerant different weather conditions, Meral (2020) [10]. Adnan *et al.* (2011) [1] who reported that jasmine essential oil is one of the most expensive oils that was used in cosmetics, the pharmaceutical industry, perfumery and aromatherapy. Winal and Vorasith (2013) [17] found that Jasmine oil is widely used as preferred odor in aromatherapy and there are many effects of jasmine oil on the nervous system, authors also referred to the effects of jasmine oil inhalation on the function of central nervous system and mood responses. Jasmine Thrips, *Thrips orientalis* (Bagnall) (Thysanoptera: Thripidae) consider one of the most serious insects infesting jasmine plants (leaves and flowers) both in open fields and under greenhouses, Gonzalez and Suris (2005) [5] in Cuba found as a result of their work searching insects belonging to the order Thysanoptera that *T. orientalis* was a serious pest on jasmine flowers. Also, Kiran *et al.* (2017) [7] indicated to that *T. orientalis* was a dangerous pest infesting jasmine flowers; it feeds mainly on the recent flowers and causes a serious damage to it, also *T. orientalis* is a dangerous pest in transmitting virus diseases, Reddy *et al.* (2004) [12] who indicated to that serious pest *T. orientalis* transmitting Jasminum Chlorotic Spot Virus disease (JCSV) on jasminum spp. This study was carried out to study effect of the insect infestation by Jasmine Thrips, *T. orientalis* at three levels of the infestation (low infestation, medium infestation and high infestation) on the quantitative and qualitative adjectives of jasmine flowers and jasmine oil.

Materials and Methods
Experimental design
Population fluctuations of Jasmine Thrips, *Thrips orientalis*
These experiments were conducted on jasmine plants, *Jasminum grandiflorum* (Fam. Oleaceae) under plastic greenhouses at two locations (Governorates), El-Orman Garden (Giza Governorate) and The International

Garden (Alexandria Governorate) during season 2021. Jasmine seedlings were prepared and cultivated in the beginning of February month 2021 (the timely manner for the cultivation of jasmine seedlings) at both of the two successive locations. Each location (garden) had one plastic greenhouse with an area 15x20 m^2 was divided into four parts isolated from each other with fine plastic wire (0.5 mm), each part contained five plots with an area 3x5m^2 for each one. All jasmine seedlings were cultivated at the same time at both of the two tested locations. With beginning of the appearance of the first leaves of jasmine plants at both the two tested locations an artificial infestation by the successive insect *T. orientalis* was done at both of three parts of this area and the fourth part left free of the infestation (control). It is proven accurate observations of the infestation by *T. orientalis* numbers (adults and nymphs) in random samples of the plants biweekly. Directly counting was done biweekly during the period from beginning of March month until end of September month (harvest time of jasmine flowers). After picking all jasmine flowers at both of the two tested locations, flowers were carried to the laboratory (the plant physiology lab., Faculty of Science, Ain Shams University) to apply laboratory designs. Data analyses were carried out and classified the infestation to three levels (low infestation, medium infestation and high infestation) according to the mean number of *T. orientalis* infesting jasmine plants (leaves and flowers).

Laboratory designs

Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine flowers

Laboratory designs were carried out on jasmine flowers after picking and also after classified the insect infestation by *T. orientalis* into three levels of infestation (low, medium and high infestation). The jasmine flower parameters were tested; (number of flowers/m^2/year, weight of flowers Kg/m^2/year and weight of flowers Kg/Feddan/year) were determined at the three levels of the infestation to show effect of insect infestation by *T. orientalis* on the quantitative adjectives of Jasmine flowers. And also the jasmine flower parameters were tested; (color of the flower, number of petals/flower, length of the flower diameter /cm, length of the flower stem /cm, weight of the flower /gm and the vase life period of the flower /days) were determined at the three levels of the infestation to show effect of insect infestation by *T. orientalis* on the qualitative adjectives of jasmine flowers. Laboratory designs on jasmine flowers were carried out in the plant physiology lab., Faculty of Science, Ain Shams University.

Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine oil

Laboratory designs were carried out on jasmine flowers after picking and also after classified the insect infestation by *T. orientalis* into three levels of infestation. Jasmine flowers at the three levels of the infestation were collected separated and carried to the laboratory. Jasmine oil was extracted from 1.0 kg fresh tissue of jasmine flowers at each level of the infestation. The flower tissues were ground in liquid nitrogen with a mortar and pestle according to the method of Laemmli (1970). The jasmine oil parameters were tested; (weight of jasmine oil gm/kgm and weight of jasmine oil kgm/ton) were determined at the three levels of the infestation to show effect of insect infestation by *T. orientalis* on the quantitative adjectives of Jasmine oil. And also the jasmine oil parameters were tested (odour, texture, color, solubility/alcohol, volatilization, specific gravity, relative density, optical rotation, refractive index and freezing degree) were determined at the three levels of the infestation to show effect of insect infestation by *T. orientalis* on the qualitative adjectives of jasmine oil. Laboratory designs on jasmine oil also were carried out in the plant physiology lab., Faculty of Science, Ain Shams University

Statistical analysis

In this study population fluctuation of Jasmine Thrips, *T. orientalis* and effect of the insect infestation by the same insect on the quantitative and qualitative adjectives of jasmine flowers and jasmine oil 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) [13].

Results and Discussion

Population fluctuations of Jasmine Thrips, *Thrips orientalis* (adults and nymphs) on jasmine plants (leaves and flowers)

The obtained data tabulated in Table (1) show population fluctuations of Jasmine Thrips, *T. orientalis* (adults and nymphs) on jasmine plants (leaves and flowers) at both of the two successive locations Giza Governorate and Alexandria Governorate during season 2021

Table 1: Population fluctuations of Jasmine Thrips, *T. orientalis* on jasmine plants at both of the two successive locations during season 2021

Date	Giza Governorate			Alexandria Governorate		
	leaf	flower	plant	leaf	flower	plant
1/3/2021	5	-	5	7	-	7
15/3/2021	7	-	7	8	-	8

1/4/2021	8	7	15	10	9	19
15/4/2021	10	9	19	11	12	23
1/5/2021	12	13	25	13	16	29
15/5/2021	13	16	29	15	19	34
1/6/2021	15	18	32	17	21	38
15/6/2021	17	20	37	19	23	42
1/7/2021	19	22	41	20	25	45
15/7/2021	20	24	44	22	27	49
1/8/2021	17	23	40	20	25	45
15/8/2021	15	20	35	18	24	43
1/9/2021	13	17	30	16	22	38
15/9/2021	10	15	25	14	20	34
Total	181	204	384	210	243	454
Mean	12.9	14.6	27.5	15.0	17.4	32.4
$F_{0.05}$	347.25			415.21		
L.S.D	1.035			1.073		

The obtained data showed that the general mean number of *T. orientalis* at El-Orman Garden (Giza Governorate) was 12.9 individuals/leaf, 14.6 individuals/flower and 27.5 individuals /plant. While in The International Garden (Alexandria Governorate) the general mean number of *T. orientalis* was 15.0 individuals /leaf, 17.4 individuals /flower and 32.4 individuals /plant. Statically analysis show that was highly significant differences between the population fluctuations of Jasmine Thrips, *T. orientalis* at both of the two successive locations on jasmine plants (leaves, flowers and all plant); whereas $F_{0.05}$ and L.S.D values were (347.25, 1.035) respectively in Giza Governorate, while in Alexandria Governorate $F_{0.05}$ and L.S.D values were (415.21, 1.073) respectively.

After picking jasmine flowers, the infestation by the successive insect *T. orientalis* was classified into three levels (low, medium and high) according to the mean number of *T. orientalis* which infested jasmine plants (leaves, flowers and all plant) whereas low infestation by that insect represents when mean number of *T. orientalis* which infested all jasmine plant less than 20 individuals /plant, medium infestation represents when mean number of *T. orientalis* which infested all jasmine plant ranged from 20-40 individuals/plant and high infestation represents when mean number of *T. orientalis* which infested all jasmine plant more than 40 individuals /plant.

Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine flowers

Experiments were carried out to study effect of the insect infestation by Jasmine Thrips, *T. orientalis* at three levels of the infestation (low, medium and high infestation) on the quantitative and qualitative adjectives of jasmine flowers, *J. grandiflorum*. Quantitative adjectives which studied stimulated in the annual production of jasmine flowers and expressed on it by three parameters, number of jasmine flowers /m^2 /year, weight of jasmine flowers Kg/m^2/year and weight of jasmine flowers Kg/Feddan/year. While the qualitative adjectives which studied stimulated in six parameters; the jasmine flowers color, number of petals/flower, length of the flower diameter (cm), length of the flower stem (cm), weight of the flower (gm), and the vase life period of the flower/days (long life of jasmine flowers after picking).

The obtained results which tabulated in Table (2) show effect of the insect infestation by Jasmine Thrips, *T. orientalis* at three levels of infestation on the quantitative adjectives of jasmine flowers, *J.grandiflorum* whereas number of jasmine flowers /m^2 /year was 830, 710, 620 for the three levels of the infestation (low, medium, high) respectively compared to control which it was 950 flowers /m^2 /year. And weight of flowers Kg/ m^2/year was 1.3, 1.2 and 1.1 for the three levels of the infestation respectively compared to control which it was 1.5 Kg/ m^2/year. Also, weight of flowers Kg/ feddan/year were 5460, 5040 and 4620 for the three levels of the infestation respectively compared to control which it was 6300 Kg/ feddan/year. While for qualitative adjectives were determined; color of jasmine flowers did not change after infestation by *T. orientalis* compared to control. Number of petals/flower was 7, 6 and 5 for the three levels of the infestation respectively compared to control which it was 9 petals/flower. Length of flower diameter/mm was 320, 300 and 290 for the three levels of the infestation respectively compared to control which it was 350 mm**.** Length of flower stem/cm was 6, 5 and 4 for the three levels of the infestation respectively compared to control which it was 7cm**.** Weight of flower/gm was 2.7, 2.5 and 2.2 for the three levels of the infestation respectively compared to control which it was 3gm. Lastly, The vase life period/days was 7, 6 and 5 for the three levels of the infestation respectively compared to control which it was 9 days**.** Statically analysis show that was significant differences between all the quantitative and qualitative adjectives of jasmine flowers after infestation by the successive insect *T. orientalis*

Table 2: Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine flowers

Adjectives	Low infestation	Medium infestation	High infestation	Control	F(0.05)	L.S.D
Quantitative						
Number of flowers /m^2 /year	830	710	620	950	17.25**	5.35
Weight of flowers Kg/ m^2/year	1.3	1.2	1.1	1.5	15.73*	1.98
Weight of flowers Kg/ feddan/year	5460	5040	4620	6300	18.01***	7.65
Qualitative						
Color of the flower	white	white	white	white	ns	ns
Numb. of petals/flower	7	6	5	9	12.33**	11.67
Length of flower diameter/mm	320	300	290	350	20.41***	9.78
Length of flower stem/cm	6	5	4	7	12.62**	12.30
Weight of flower/gm	2.7	2.5	2.2	3.0	15.07**	1.76
Vase life period/days	7	6	5	8	11.05*	8.99

SA = Statistical analysis
ns - Non significant
* - significant
** - significant
*** - high significant compared to control (jasmine flowers did not infest by *T. orientalis*) except color of the jasmine flower which it was non-significant whereas the color of jasmine flower still white and did not change after the infestation by *T. orientalis*

Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine oil

Jasmine oil considers one of the most important aromatic oils in the world. Egypt is considered the first country in the world to produce jasmine oil followed by India, Morocco, France and China. Egypt produces approximately70-80% of the world's jasmine oil production. Egypt and India are the main producers of jasmine concrete all over the world with percentage 95% of the global market share. Egypt's production of jasmine oil reached to 5.5 tons in 2015, which is considered the highest quality and price in the world, Food and Agriculture Organization (F.A.O), 2018

The obtained results tabulated in Table (3) show effect of the insect infestation by Jasmine Thrips, *T. orientalis* at three levels of infestation (low, medium and high infestation) on the quantitative and qualitative adjectives of jasmine oil. Quantitative

Table 3: Effect of the insect infestation by Jasmine Thrips, *T. orientalis* on the quantitative and qualitative adjectives of jasmine oil

Adjectives	Low infestation	Medium infestation	High infestation	Control	F (0.05)	L.S.D
Quantitative						
Weight of oil gm/kgm	2.8	2.5	2.3	3.0	16.18**	3.37
Weight of oil kgm/Ton	2.8	2.5	2.3	3.0	16.18**	3.37
Qualitative						
Odour	normal	normal	normal	normal	ns	ns
Texture	normal	normal	normal	normal	ns	ns
Color	normal	normal	normal	normal	ns	ns
Solubility / Alcohol %	93	91	90	95	9.89**	1.66
Volatilization %	97	95	93	99	12.06**	1.98
Specific Gravity kn/m^3	0.7	0.6	0.5	0.8	10.86**	1.75
Relative Density gm/cm^3	1.7	1.5	1.3	1.8	12.33***	1.65
Optical Rotation (nano)	0.33	0.31	0.30	0.35	9.87**	5.56
Refractive Index (n)	1.23	1.22	1.20	1.25	15.65*	1.73
Freezing Degree (c)	18	18	18	18	ns	ns

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

n= c/v
n= refractive index nano= nanometer
c= speed of light
v= phase velocity of light

kn = kilo newton

Adjectives which studied stimulated in the annual production of jasmine oil and expressed on it by two parameters, weight of jasmine oil gm/kgm and weight of jasmine oil kgm/Ton; whereas in the control flowers (jasmine flowers did not infest by *T. orientalis*) the annual production of jasmine oil was 3gm oil for each 1kgm

fresh jasmine flowers and 3kgm oil for each ton of fresh jasmine flowers, while in the infestation by *T. orientalis* the production of jasmine oil reduce to 2.8gm oil for each 1kgm fresh flowers in the low infestation by the successive insect, and 2.5gm oil for each 1kgm fresh flowers in the medium infestation and lastly reached 2.3gm oil for each 1kgm fresh flowers in the high infestation. While qualitative adjectives of jasmine oil which studied stimulated in ten parameters, odour, texture, color. solubility, specific gravity, volatilization, relative density, optical rotation, refractive index and freezing degree. The obtained data tabulated in Table (3) too indicated to the most of qualitative adjectives of jasmine oil were changed after the infestation by *T. orientalis* compared to control (jasmine flowers did not infest by *T. orientalis*) while few of these adjectives did not change after the infestation such as; odour, texture and the color of the jasmine oil.

Statically analysis show that were highly significant differences between most of the quantitative and qualitative adjectives of jasmine oil extracted from jasmine flowers which infested by *T. orientalis* compared to control (oil extracted from jasmine flowers did not infest by *T. orientalis*) except few of these adjectives which did not change after the infestation by *T. orientalis*

The obtained results were agreement with those obtained by Kumar *et al.* (2015) [8] in India who studied South East Asia pest thrips species; *Thrips orientalis* is a serious pest on a number of agricultural and ornamental plants and indicated to the serious effect of *T. orientalis* on jasmine flowers. Shyam *et al.* (2019) [15] found that *T. orientalis* is a flower dwelling oligophagous species, found associated with flowers of *Jasminum multiflorum* and indicated to the density of thrips was appreciably good in March, April, September and October under the climatic conditions. Jaskiewicz (2008) [6] in Poland who reported the effect of the carnation thrips, *H. cottei* feeding on carnation flowers and when found in greater numbers caused deformation of the leaf blades, shorting of shoots and petioles, as well as deformation of the flowers. Stone (2012) [16] who studied effect of infested carnation flowers by three species of thrips on the vase life period of these flowers and referred to the serious effect of this infestation on the vase life period. Also, Ashrith (2020) [2] in India indicated to jasmine is one of the oldest traditional flowers grown in India**,** it is infested by a number of insect and mite pests, and *T. orientalis* was a serious pest to jasmine flowers which causes minor damage to the flowers and also to the jasmine oil. Nichols (2010) [11] in France who indicated the quantitative changes in total soluble sugars (glucose, fructose and sucrose) of carnation flowers petals as a result of infestation by three species of thrips. Sauer (2015) [14] in Germany found that jasmine flowers petal damage could not always be attributed to the population of thrips only but also attributed to the time of the infestation, total infestation percentages depending on the average colonization /week. Lastly, Decheva *et al.* (2010) [3] in Bulgaria who studied effect of infested carnation flowers by three species of thrips on the vase life period of these flowers and estimated the damage of this infestation on carnation flowers.

References

1. Adnan Y, Aqsa M, Atif R. Supercritical carbon dioxide extraction and gas chromatography analysis of Jasmine essential oil. Pakistan Journal of Botany,2011:43(2):163-168.
2. Ashrith K. Insect pests of jasmine and their management. Advances in Pest Management in Commercial Flowers,2020:5(2):103-118.
3. Decheva R, Koseva D, Mikhailova Y. Some biochemical and histochemical changes in the tissues of the carnation flowers during and after dormancy. Fiziologiya na Rasteniyata,2010:12(3):75-82.
4. Food and Agriculture Organization (F.A.O). FAO Stresses the importance of innovative approaches during meeting of the committee on World Food Security,2018:6(3):25-27.
5. Gonzalez C, Suris M. New genera and species of Thysanoptera in Cuba. Revista de Proteccion Vegetal,2005:12(3):235-240.
6. Jaskiewicz B. Observations on the occurrence on the Carnation thrips *H. cottei* on the flowers of Carnation plants. Folia Horticulturae,2008:8(3)**:**25-31.
7. Kiran C, Narayan J, Hegde A. Seasonal incidence of major insect and mite pests of jasmine. International Journal of Current Microbiology and Applied Sciences,2017:6(10):5060-5070.
8. Kumar V, Tyagi K, Singha D. Morphological and DNA barcoding evidence for invasive pest thrips, *Thrips orientalis* (Thripidae: Thysanoptera), newly recorded from India. Journal of Insect Science,2015:15(1):105-108.
9. Laemmli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature,1970:15(27):680-685.
10. Meral P. Elemental concentration of Jasmine flowers and their uses. Journal of Horticultural Sciences,2020:5(2):180-185.
11. Nichols R. Senescence of the cut carnation flowers, respiration and sugar status. Journal of Horticultural Science,2010:5(3):45-56.
12. Reddy B, Kulkarni M, Ramakrishna M. Studies on transmission of Jasmine Chlorotic Spot Virus (JCSV) in Karnataka. Journal of Ornamental Horticulture,2004:7(3):353-362.
13. SAS Institute. SAS-STAT User`s Guide, Ver.6.03.SAS Institute Inc., Cary, North Carolina, 1988.
14. Sauer A. Population dynamics of Thysanoptera and infestation differences in jasmine flowers in the greenhouse. Mitteilungen der Deutschen Gesellschaft fur Allgemeine und Angew. Entomol,2015:11(1/6):337-340.

15. Shyam M, Johnson T, Rachana R. Life table statistics and seasonal incidence of *Thrips orientalis* (Bagnal) on flowers of *Jasminum multiflorum*. Annals of Plant Protection Sciences,2019:27(1):49-53.
16. Stone M. Factors affecting the growth of Carnation plants from shoot apices. Annals of Applied Biology,2012:7(3):67-75.
17. Winal S, Vorasith S. The effect of jasmine oil inhalation on brain wave actives and emotions. Journal of Health Research,2013:27(2):73-77.