National Journal of Multidisciplinary Research and Development
www.multidisciplinaryjournal.org
ISSN: 2455-9040
Received: 11-08-2023, Accepted: 26-08-2023, Published: 12-09-2023
Volume 8, Issue 2, 2023, Page No. 109-113

Comparison between effectiveness of the insect infestation by *Thrips orientalis* and *Macrosiphum rosae* on the quantity and quality characteristics of jasmine essential oil

Rasha M Mahrous
Department of Public Health, College of Health Sciences, Saudi Electronic University, Saudi Arabia

Abstract
Current experiments were carried out to find out the comparison between effectiveness of the insect infestation with Jasmine Thrips, *Thrips orientalis* (Bagnall) (Thripidae: Thysanoptera) and Rose Aphid, *Macrosiphum rosae* L. (Aphididae: Hemiptera) who infested jasmine plants on the quantity and quality characteristics of jasmine essential oil. Experiments were carried out under greenhouses on *Jasminum grandiflorum* (Oleaceae) during season 2022 at two areas (Governorates); Dokki area- Greenhouses of Agricultural Research Center- Giza Governorate and International Garden- Alexandria Governorate
Data obtained indicated that effectiveness of insect infestation with *M. rosae* was more effective than with *T. orientalis* on most quantity and quality characteristics of jasmine essential oil. In terms of quantity characteristics, data obtained indicated that the annual production of jasmine volatile oil (amount of volatile oil that was extracted from 1 kg jasmine flowers which did not infested with any insect) was about 3 gm, While amount of volatile oil that was extracted from 1 kg jasmine flowers which infested with *T. orientalis* was about 2.5 gm and amount of volatile oil that was extracted from 1 kg jasmine flowers which infested with the other insect *M. rosae* was about 2.2 gm. On the other hand, in terms of quality characteristics of jasmine essential oil, data obtained indicated that effectiveness of insect infestation with *M. rosae* was more effective than with *T. orientalis* on the most quality characteristics of jasmine essential oil.

Keywords: *Thrips orientalis*, *macrosiphum rosae*, jasmine plants, greenhouses, jasmine oil, quantity, quality, characteristics

Introduction
Jasmine flowers, *Jasminum grandiflorum* (Fam: Oleaceae) is one of the important commercial traditional flower crops of India, Hena *et al.* (2014) [7]. Also, Ganapthi (2015) [6] indicated that jasmine flower is an attractive, important and commercial crop in most countries all over the world. Latha and Pichumani (2018) [13] referred to jasmine flower is one of the oldest, important and popular fragrant flowers that is cultivated by man. Also, Kumar and Sandhya (2011) [10] in Iran indicated that jasmine flower belonging to Oleaceae family is cultivated in temperate places across the globe and this flower has many traditional, religious, social, spiritual and medicinal benefits.
Jasmine oil is one of the most important aromatic and volatile oils all over the world. Winai and Vorasith (2013) [23] in Thailand indicated that jasmine oil is widely used as a preferred odor in aromatherapy and it has serious effects on the nervous system functions. Food and Agriculture Organization (F.A.O) 2018 indicated that Egyptian production about 70-80% of the global production of jasmine volatile oil. Devi *et al.* (2015) [4] studied essential oil: its economic aspect, extraction, importance, uses, hazards and quality and indicated that essential oils are not the same as fragrance oils or perfume or values where essential oils are derived from true plants, and authors indicated also that rose oil and jasmine oil were more expensive than other essential oils this is due to their many uses.
Jasmine Thrips, *Thrips orientalis* (Bagnall) (Thysanoptera: Thripidae) is one of the dangerous insects that infect jasmine plants on a large scale. Shyam *et al.* (2019) [21] studied life table statistics and seasonal incidence of *Thrips orientalis* (Bagnall) on flowers of *Jasminum multiflorum* and indicated that *Thrips orientalis* is a flower dwelling oligophagous species, found associated with blossoms of Jasminum multiflorum. Also, Ashrith (2020) [1] studied insect pests of jasmine and their management and indicated to that jasmine plants infested by a number of insect and mite pests such as Jasmine Thrips, *Thrips orientalis* that cause minor damage to the jasmine crop.
Rose Aphid, *Macrosiphum rosae* L. (Aphididae: Hemiptera) is one of the dangerous insects infesting jasmine flowers and the strong infestation by it causes deformation of stems, leaves and flowers of jasmine plants, Jaskiewicz (2015) [8]. Also, Derek (2017) [3] in Australia indicated to that serious infestation by *M. rosae* on jasmine flowers led to feed mainly on the young leaves and developing flower-buds of jasmine flowers.
This study was carried out to study comparison between effectiveness of the insect infestation by Jasmine Thrips, *T. orientalis* and Rose Aphid, *M. rosae* which infested jasmine plants on the quantity and quality characteristics of jasmine essential oil.

Materials and methods
Experimental design
Population density (fluctuations) of Jasmine Thrips, *Thrips orientalis* and Rose Aphid, *Macrosiphum rosae*
Experiments were carried out on *Jasminum grandiflorum* during season 2022 at two areas (Governorates); Dokki area- Greenhouses of Agricultural Research Center- Giza Governorate and International Garden- Alexandria Governorate under greenhouses. Jasmine plants were planting in the first of February season 2022 in both of the two examined areas. Both of each area (governorate) contained a greenhouse with dimensions 20x25 m^2 and each one divided into three big parts, each part isolated from other with polyethylene plastic with holes size (0.5 mm) and

each part divided into five plots (replects) each one with dimensions 5x7m^2. Jasmine plants were planted at the same time both of the two examined areas in the first of February month season 2022. An artificial infestation was done by Jasmine Thrips, *T. orientalis* in the first part and artificial infestation was done by Rose Aphid, *M. rosae* in the second part and third part was left free as control. Directly observations of the infestation by both of *T. orientalis* and *M. rosae* were carried out weekly during the examined season. Directly and laboratory counting were done weekly from first of March month until last of August. After harvest (pick up) jasmine flowers at both of the two examined areas (separated from each part), flowers were carried on paper bags to the laboratory (Faculty of Science, Ain Shams University- plant physiology laboratory) to determined and carried out physiological studies.

Laboratory designs

Effectiveness of the infestation with *T. orientalis* and *M. rosae* on quantity and quality characteristics of jasmine volatile oil

Laboratory experiments in this study were conducted on jasmine flowers after harvest which was collected separated from each part (infested by *T. orientalis*, infested by *M. rosae* and control) and carried on paper bags to the plant laboratory, Faculty of Science, Ain Shams University. Jasmine volatile oil was extracted from about 1.0 kg weight of jasmine flowers (fresh petals) from each examined part. Jasmine flowers petals were ground up in concentration of liquid nitrogen in a mortar and determined according to Laemmli (1970) [12]. Quantity characteristics of jasmine volatile oil were determined; weight of jasmine volatile oil per gm/kgm of jasmine flowers and weight of jasmine volatile oil per kgm/ton of jasmine flowers. While quality characteristics of jasmine volatile oil were determined; color, odor, texture, volatilization, solubility, relative density, specific gravity, optical rotation, freezing degree and refractive index.

Statistical analysis

Current study contains population density (fluctuation) both of *T. orientalis* and *M. rosae* were analyzed and also effectiveness of infested jasmine plants by both of the two examined insects on the quantity and quality characteristics of jasmine essential oil were determined and analyzed of variance (ANOVA) and population means of the examined insects were compared by L.S.D. test < 0.05 level using SAS program (SAS Institute, 1988).

Results and discussion

Population density (fluctuations) of Jasmine Thrips, *Thrips orientalis* and Rose Aphid, *Macrosiphum rosae* on jasmine plants

Data obtained and tabulated at Table (1) show population density (fluctuations) of Jasmine Thrips, *T. orientalis* and Rose Aphid, *M. rosae* on jasmine plants at both of the two examined areas during 2022.

Data obtained at Giza Governorate show that mean numbers of *T. orientalis* at both leaf and flower was (15.1 individuals/leaf, 17.1 individuals/flower) respectively. While the general mean numbers of *M. rosae* at both leaf and flower was (11.9 individuals/leaf, 13.4 individuals/flower) respectively. Whereas at Alexandria Governorate mean numbers of *T. orientalis* at both leaf and flower was (13.2 individuals/leaf, 15.2 individuals/flower) respectively. While the general mean numbers of *M. rosae* at both leaf and flower was (9.9 individuals/leaf, 11.2 individuals/flower) respectively.

Table 1: Population density (fluctuations) of Jasmine Thrips, *T. orientalis* and Rose Aphid, *M. rosae* on jasmine plants at Giza and Alexandria Governorates during season 2022

Giza Governorate				Alexandria Governorate				
T. orientalis		*M. rosae*		*T. orientalis*		*M. rosae*		
leaf	flower	leaf	flower	leaf	flower	leaf	flower	
1/3/2022	5	-	3	-	4	-	1	-
8/3/2022	7	-	5	-	6	-	3	-
15/3/2022	9	-	7	-	8	-	5	-
22/3/2022	11	7	9	6	9	6	6	4
29/3/2022	12	9	10	8	11	8	8	6
5/4/2022	14	11	11	10	12	10	9	8
12/4/2022	15	13	13	11	13	12	11	9
19/4/2022	16	16	14	12	14	14	12	10
26/4/2022	18	18	15	14	16	16	14	12
3/5/2022	20	20	17	15	18	18	15	13
10/5/2022	22	22	19	17	20	20	16	15
17/5/2022	23	25	20	19	21	23	18	17
24/5/2022	25	27	21	23	23	25	19	20
31/5/2022	27	30	22	25	25	28	20	23
7/6/2022	24	29	20	24	23	27	18	22
14/6/2022	22	28	18	23	21	26	16	20
21/6/2022	20	27	17	21	19	24	14	18
28/6/2022	19	25	15	20	17	22	13	17
5/7/2022	17	23	14	19	15	20	12	16
12/7/2022	15	22	13	17	13	19	10	14
19/7/2022	14	21	11	16	11	18	9	13
26/7/2022	12	19	10	14	9	16	7	12
2/8/2022	11	17	8	13	8	14	6	10
9/8/2022	10	16	5	11	7	13	4	8
16/8/2022	9	15	3	10	6	12	2	7

23/8/2022	7	12	2	8	4	10	0	5
30/8/2022	5	10	0	5	3	9	0	4
Total	409	462	322	361	356	410	268	303
Mean	15.1	17.1	11.9	13.4	13.2	15.2	9.9	11.2
$F_{(0.05)}$	324.74	287.92	477.42	421.73	375.11	355.32	287.11	328.92
L.S.D	1.032	1.056	1.061	1.035	1.042	1.051	1.075	1.025

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

Effectiveness of the infestation by *T. orientalis* and *M. rosae* on the quantity and quality characteristics of jasmine essential oil

Obtained results and tabulated in Table (2) indicate to effectiveness of the infestation by *T. orientalis* and *M. rosae* on quantity and quality characteristics of jasmine volatile oil. For quantity characteristics of jasmine volatile oil which studied represented in weight of jasmine volatile oil per gm/kgm jasmine flowers and weight of jasmine volatile oil per kgm/Ton jasmine flowers compared to control plants (quantity of jasmine volatile oil which produced from jasmine plants free of infestation by both of the two examined insects).

In terms of quantity characteristics, data obtained indicate that effectiveness of *M. rosae* on decreasing the quantity of jasmine volatile oil was higher than effectiveness of *T. orientalis* this is due to that the mouse parts of *M. rosae* is sucking parts while *T. orientalis* scratching parts. Whereas data obtained show that the annual production of jasmine volatile oil which extracted from 1 kgm of jasmine flowers (which did not infested with any insect- control) was 3 gm jasmine volatile oil and the quantity of jasmine volatile oil which extracted from ton of jasmine flowers was 3kgm, while the annual production of jasmine volatile oil which extracted from 1 kgm of jasmine flowers (infested by *T. orientalis*) was 2.5 gm and the quantity of jasmine volatile oil which extracted from ton of jasmine flowers was 2.5 kgm, and the annual production of jasmine volatile oil which extracted from 1 kgm of jasmine flowers (infested by *M. rosae*) was 2.2 gm and the quantity of jasmine volatile oil which extracted from ton of jasmine flowers was 2.2 kgm.

While in terms of quality characteristics of jasmine volatile oil data obtained indicate that quality characteristics of jasmine volatile oil which were determined: color, texture, odor, freezing degree, volatilization, solubility, specific gravity, relative density, optical rotation and refractive index. Data obtained and tabulated in Table (2) indicate that there four adjectives of jasmine volatile oil not changed after infestation by both of the two examined insects, *T. orientalis* and *M. rosae*, these adjectives were; color, texture, odor and freezing degree. And data obtained also show that the other adjectives of jasmine volatile oil such as; volatilization, solubility, specific gravity, relative density, optical rotation and refractive index were changed after infestation by both of the two examined insects and effectiveness of the infestation by *M. rosae* was more than by *T. orientalis*

Table 2: Effectiveness of the infestation by *T. orientalis* and *M. rosae* on the quantity and quality characteristics of jasmine essential oil

Adjectives	Control	*T. orientalis*	*M. rosae*	F(0.05)	L.S.D
Quantitative					
Weight of volatile oil gm/kgm	3.0	2.5	2.2	16.18^{***}	1.037
Weight of volatile oil kgm/Ton	3.0	2.5	2.2	16.18^{***}	1.037
Qualitative					
Color	N	N	N	ns	ns
Texture	N	N	N	ns	ns
Odor	N	N	N	ns	ns
Freezing Degree (c)	18	18	18	ns	ns
Volatilization %	99	95	93	12.06^{**}	1.057
Solubility / Alcohol %	95	92	90	15.23^{**}	1.023
Specific Gravity kn/m^3	0.8	0.6	0.4	13.26^{**}	1.045
Relative Density gm/cm^3	1.8	1.5	1.3	12.45^{***}	1.033
Optical Rotation (nano)	0.35	0.32	0.30	15.25^{**}	1.025
Refractive Index (n)	1.25	1.23	1.21	13.65^{*}	1.053

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

kn = kilo newton
nano = nanometer
N: normal

Statistical analyses indicated to that were significant differences between determined quantity and quality characteristics of jasmine volatile oil (extracted from jasmine flowers) which infested by both of *T. orientalis* and *M. rosae* compared to control.

Obtained results were agreement with those obtained by Dararajan and Pirithiraj and (2022) [2] in India who studied seasonal incidence of major insect pests of jasmine, *Jasminum sambac* L. and indicated in the horticulture farm that thrips population was maximum during May with (22 thrips/flower). Sauer (2015) [20] studied population fluctuation of *T. orientalis* on jasmine plants (leaves and flowers) and indicated that the maximum numbers of *T. orientalis* population (adults and nymphs) was during MAY with numbers 23 individuals/flower and 20 individuals/leaf. And Kumar *et al.* (2015) [11] in India who indicated that Jasmine Thrips, *T. orientalis* is a dangerous insect infested many ornamental plants such as jasmine flowers. Also, Roopini *et al.* (2018) [18] studied population dynamics of

pests on *Jasminum multiflorum* and referred to that jasmine variety is infested majorly by Jasmine Thrips, *T. orientalis* and its population dynamics indicate to it is present most of the year and high infestation led to bad effectiveness on jasmine crop and jasmine volatile oil. While Mirab (2017) [15] in Iran who indicated that were several species of aphids are associated with flowers of jasmine flowers especially Rose Aphid, *M. rosae* and they cause serious damages to jasmine flowers stage. Peng and Miles (2014) [16] in Australia stated that tissue sap of jasmine flowers became more acceptable to The Rose Aphid, *M. rosae.* Khan *et al.* (2019) [9] studied insect pests associated with ornamental plants and found that Rose Aphid, *M. rosae* was a serious pest on jasmine plants and high infestation led to serious damage to jasmine flowers.

Data obtained were also agreement with those obtained by Ashrith (2020) [1] who indicated that jasmine is one of the most important flowers grown in India, and it is infested by many insects such as; *T. orientalis* which cause serious damage to the flowers crop and also serious damage to the annual production of jasmine oil crop. Swathy (2022) [22] studied documentation and management of *T. orentalis* infesting *Jasminum spp.* And indicated to the serious damage which occurs on the annual production of jasmine oil as result of this infestation. Shyam, *et al.* (2019) [21] studied life table statistics and seasonal fluctuations of *T. orientalis* on jasmine flowers of *J. multiflorum* and indicated that serious infestation with this insect led to serious damage to jasmine flowers crop and also to the annual production of jasmine essential oil. While Mani and Suganthy (2022) [14] studied pests and their management in aromatic plants, and found that jasmine plants infested by Rose Aphid, *M. rosae* and high infestation with it led to serious damage to jasmine flowers and also led to serious damage to quantitative and qualitative adjectives of jasmine oil. Revanna and Kumari (2018) [18] studied effect of the insect infestation with many insects on jasmine plants and flowers and found that Rose Aphid, *M. rosae* was a serious pest on jasmine plants and a serious infestation led to many changes in the quantity and quality of jasmine oil.

Conclusion

Data obtained indicated to that effectiveness of the infestation by *M. rosae* was more than *T. orientalis* on quantity and quality characteristics of jasmine essential oil. In terms of quantity characteristics, data obtained indicate to that the quantity of jasmine volatile oil which extracted from jasmine flowers infested with *M. rosae* was lower than which extracted from jasmine flowers infested with *T. orientalis* compared to control. Also, In terms of quality characteristics, data obtained indicate to that effectiveness of the infestation by *M. rosae* was more than *T. orientalis* on the quality characteristics of jasmine volatile oil whereas most characteristics of jasmine volatile oil were changed after the infestation by *M. rosae* higher than *T. orientalis*

References

1. Ashrith K. Insect pests of jasmine and their management. Advances in Pest Management in Commercial Flowers,2020:5(2):103-118.
2. Dararajan R, Pirithiraj U. Seasonal incidence of major insect pests of jasmine, *Jasminum sambac* L. Indian Journal of Entomology,2022:3(5):11-14.
3. Derek M. The biology and main causes of changes in number of the *M. rosae* and *T. urticae* on cultivated jasmine in South Australia. Australian Journal of Zoology,2017:24(3):344-351.
4. Devi M, Chakrabarty S, Ghosh S. Essential oil: its economic aspect, extraction, importance, uses, hazards and quality. Value Addition of Horticultural Crops,2015:5(3):269-278.
5. 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.
6. Ganapthi R. A study on factors affecting marketing of jasmine in Dindigul district. Journal of Management Research and Analysis,2015:2(4):238-242.
7. Hena R, Biswas A, Parua S. Characterization of the volatile aroma compounds from the concrete and jasmine flowers grown in India. Chemical Engineering Transactions,2014:40(5):265-270.
8. Jaskiewicz B. Effect of the feeding of *Macrosiphum rosae* on the flowering of jasmine flowers. Acta-Agrobotanica,2015:25(3):327-335.
9. Khan M, Lanjar A, Chang B, Bukero A. Insect Pests Associated With Ornamental Plants. Biological Sciences- PJSIR,2019:62(3):188-194.
10. Kumar S, Sandhya H. The rationale behind wearing strings of jasmine flower by the lactating South Indian Women. Iranian Journal of Medical Hypotheses and Ideas,2011:5(3):225-230.
11. Kumar V, Tyagi K, Singha D. Morphological and DNA barcoding evidence for invasive Jasmine Thrips, *Thrips orientalis* (Thripidae: Thysanoptera), newly recorded from India. Journal of Insect Science,2015:15(1):105-108.
12. Laemmli U. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature,1970:15(27):680-685.
13. Latha R, Pichumani R. An economic study on jasmine cultivation in Ettarai Village in Tiruchirappalli District. International Journal of Research and Analytical Reviews,2018:5(3):54-60.
14. Mani M, Suganthy M. Pests and Their Management in Aromatic plants. Trends in Horticultural Entomology,2022:5(3):1305-1329.
15. Mirab M. Pests on ornamental plants in Mahallat, Markazi province, Iran. Journal of Ornamental Plants,2017:5(3):215-221.
16. Peng Z, Miles P. Studies on the salivary physiology of plant bugs, function of the catechol oxidase of The Rose Aphid, *M. rosae*. Journal of Insect Physiology,2014:25(9):1025-1035.
17. Revanna R, Kumari S. A review on integrated pest management in medicinal and aromatic plants in India. Journal of Pharmacology and Phytochemistry,2018:7(35):220-224.
18. Roopini G, Kumar P, Jayappa J. Population dynamics of pests on *Jasminum multiflorum*. Indian Journal of Entomology,2018:80(3):572-576.

19. SAS Institute SAS-STAT User`s Guide, Ver.6.03.SAS Institute Inc., Cary, North Carolina, 1988.
20. 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.
21. 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.
22. Swathy M. Documentation and management of pests of jasmine, *Jasminum spp*. Department of Agricultural Entomology, College of Agriculture, Vellayani,2022:5(3):225-231.
23. Winai S, Vorasith S. The effect of jasmine oil inhalation on brain wave actives and emotions. Journal of Health Research,2013:27(2):73-77.