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The Effectiveness of Aphid Parasitoids in Controlling Certain Aphid Species on Balady Orange Trees.

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Abstract

In the preset study, population density of parasitoids associated with aphids on Balady orange was assessed and recorded during 2022 and 2023 seasons. The aphid species identified included *Aphis gossypii* (Glover), *Aphis citricola* (van der Goot), *Myzus persicae* (Sulzer), and *Aphis craccivora* Koch. During this study three primary parasitoid species; were registered being, *Aphidius matricariae* Haliday, *Trioxys* sp., and *Praon* sp.,beside the hyperparasitoid, *Charips* sp. *A.matricariae* was the most abundant primary parasitoid species, exhibited relative population densities of 59.49and 63.08% during the 2022 and 2023 years respectively, followed by *Trioxys* sp. at 20.84 and 17.39%, *Praon* sp. with 13.58 and 12.58%, and *Charips* sp., with relative population densities of 6.09 and 6.95%.Generally, the heist parasitism rate recorded in 2022 was16.07%, and increased to19.49 % in2023.Under laboratory conditions, the total developmental period of *A.matricariae* on *A.gossypii* recorded at 22.00 ±2 °C and RH was 70 ±5 % rearing *A. matricariae* over three successive generations resulted in a sex ratio of 2.83:1 (females to males). The sex ratio was approximately 1:1 in the first two generations but inclined towards male predominance in the third generation.

Key words: Balady orange, Aphid species, Parasitoids, Survey, Biology.

Introduction

Citrus orchards play a significant role in Egypt's national economy. The cultivation of citrus trees, including balady oranges, mandarins, and Valencia oranges, is vital due to their nutritional benefits, providing essential vitamins and mineral salts for human health. However, citrus insects represent a major threat to these crops, inflicting considerable damage. The most prevalent sucking pests affecting citrus include aphids, mealybugs, scale insects, and mites. These pests congregate on the leaves, stems, and fruits, utilizing their attenuated mouthpart to extract the plant sap through the infested sites**(Aida Kamel 2010**). Aphids extract phloem sap using highly specialized mouthparts that are elongate and flexible. To access the phloem of plants, aphids must navigate and overcome various plant defenses, which may be either physical or chemical in nature **(Guerrieri *et al.*, 2008)**.

Aphis gossypii (Glov.) represents the predominant portion of the aphid population and was the sole species subjected to parasitism. The most prevalent parasitoid species were *Binodoxys angelicae* and *Aphidius colemani.* Variations in the rate of parasitism were observed among the different parasitoid species. *B. angelicae* exhibited the highest colonization rates in larger, centrally located groups of the host (*A. gossypii*), while *A. colemani* was more frequently found in smaller, more isolated host groups**(Güncan *et al.*,2008 and Youssif *et al.*,2021.)** The parasitism rate attributed to *B. angelicae* was notably high in larger host groups, particularly when it was the only parasitoid present. Conversely, in instances where multiple aphidian parasitoids coexisted with hyperparasitoids within the same sampling unit, the overall percentage of parasitism was relatively diminished **(Kavallieratos *et al.*, 2002)**.*B. angelicae* was detected in fewer than 30% of the citrus orchards surveyed. Therefore, it is essential to identify the factors that influence the abundance of *B. angelicae* and other aphid parasitoids in citrus to evaluate and potentially enhance its effectiveness as a biological control agent **Youssif *et al.* (2021)**.

The study focused on:

1. Seasonal occurrence of aphid species and their corresponding parasitoids on balady orange trees throughout 2022 and 2023 seasons.
2. An examination of certain biological aspects life cycle and sex ratio of parasitoids when reared on *A. gossypii*.

Materials and Methods

This study was conducted at the Plant Protection Research Institute in Sharkia, Egypt, during the

2022/23and 2023/24 seasons focused on the aphids' species and their parasitoids on balady orange trees.

1. Survey of aphidspecies and their parasitoids on balady orange trees.

The study examined aphid populations on balady orange trees cultivated across five feddans. Sampling(40 leaves weekly/sample)from four randomly selected trees. The normal agricultural practices were carried outwithoutapplying any chemical treatment. Leaves were collected from various trees, and both nymphs and adult aphids were counted in the laboratory. To determine parasitism rates, the adults' aphid individuals were isolated and monitored until the parasitized aphids formed mummies, from which adult parasitoids emerged , counted with expert assistance and identified with the assistance of Prof. Dr. Ahmed El-Heneidy, Chief of Biological Control Researchers, at the Biological Control Department, ARC, Giza, Egypt. The research aimed to quantify parasitism rates following the same methods **(Farrell and Stufkens, 1990).**

Biology

Life cycle of *A. matricariae* on *A. gossypii*

The study investigated the life cycle of the parasitoid *A. matricariae* in relation to its host, *A. gossypii*, under controlled laboratory conditions. The cotton aphids were maintained in the laboratory at a temperature of 22 ± 2 °C& 70 ± 5 RH% on young balady orange seedlings or freshly detached leaves. The parasitoid culture was initiated using field-collected mummies, emerged adults were supplied 50 %sugar droplets whenever needed. The developmental stages of *A. matricariae*, interactions with *A. gossypii* were assessed by dissecting forty aphid nymphs daily. This were contributed understanding the biology of parasitoid on its aphid host.

2.2 Sexratio:

A culture of *A. matricariae* was established through three successive generations on the third nymphal instar of *A. gossypii*. The emerged adults were counted andthe sex ratio (female: male) was calculated by dividing the total number of emerging females by the total number of emerged males collected from field mummies. Additionally, the sex ratio of *A. matricariae* were determined depending on the ratio of females: males emerged from the total number of aphid mummies (in the field and in the three generations), also the percentage of adult emergence were calculated.

Statistical Analysis

Data analysis was conducted using SAS software version 8.2 **(SAS Institute, 2003).** Results were evaluated through one-way ANOVA to determine significant differences among treatment groups. In cases where significant F values were noted, means were compared using Tukey's Honestly Significant Difference (HSD) test at a significance level of 0.05. This statistical approach facilitated a robust examination of the effects of various factors on both the sex ratio and behavioral patterns of the parasitoid.

Results and Discussion

The survey study recorded four aphid species being; *A.gossypii, A. citricola, M. persicae,* and *A. craccivora* on Balady orange trees. Thus confirming highlighting their significant presence. Primary parasitoids, including *A. matricariae* and *Trioxys* sp., along with hyper parasitoids such as *Alloxysta* sp., were also noted.

Survey and estimation of parasitism by aphid parasitoids rates on the balady orange trees:-

In the first season,(2022),three peaks of aphid abundance were detected in the 4th week of April, 4th week of May, and3th week of June2022(609, 674 and 578 individuals / 40leavesrespectively) at 23 .93, 26.27and 29.06 ºC and 44.34, 47.19, and 47.49 % RH.(Table1and Fig.1), whileinthe second season two peaks recorded in 2th week of April and2thweekofMay2023(613 and 608 individuals/40 le aves) at 20.37, 23.71 ºC and 53.76, 52.21 % RH.(Ta ble2 and Fig. 2). The present findings align with previous research indicating these aphid species as key pests on Balady orange, suggesting a consistent trend in their population dynamic according to the earlier study, the main aphid species on balady orange trees were *A. gossypii, A. citricola, M.persicae,* and *A. craccivora*.

These results are in line with those of **Mohsen (2019)** and **Youssif *et al.*(2021)**, who surveyed theprimary insect pests on balady trees and found that *A. gossypi i, A. citricola, M. persicae,* and *A. craccivora* had the highest populations.The aphid species, *A.gossypii* (Glover), *A.citricola* (van der Goot), *M.persicae* (Sulzer), and *A.craccivora* Koch, were determined on Balady orange leaves. Total aphid species count monitored three peaks of abundance in the first season occurredduring the 4th week of April, May and the3rdweek of June 2022(609,674 and 578 individuals / 40 leaves)at23.93 ,26.27 and 29.06 ºC and 44.34 , 47.19 and 47.49 % RH.(Table1andFig . 1) However, in the second season, two peakswere recorded (613 and 608 individuals/40 leaves) during the 2ndweek of April and May 2023at 20.37, 23.71 ºC and 53.76,52.21 % RH.(Table2 andFig.2)The present investigation revealed that *A. gossypii*, *A. citricola*, *M. persicae*, and *A. craccivora* were the key aphid species on balady orange trees. These outcomes are consistent with those of **Godfray 1994 Mohsen (2019) and Youssif*et al.* (2021),** who surveyed the main insect pests on balady orange trees and reported that the highest densities were obtained by *A. gossypii*, *A.citricola*, *M. persicae*, and *A. craccivora*.

Aphid parasitoids

Four hymenopterous parasitoid species were identified during the present study: three primary parasitoids, *Aphidius matricariae*, *Trioxys* sp., and *Praon* sp. and one secondary parasitoid, *Alloxysta* (*Charips*) sp. The most common aphid species found on balady orange trees was *A. gossypii*, while the primary parasitoid species present was *A. matricariae*. The relative occurrence of the parasitoids was noted(Figs.1 &2).

From Table (1), it was be noted that the maximum number of mummified aphids was recorded in the 4th week of May (81mummies) when the temperature and relative humidity were 26.27 ºC and 47.19 % RH in the first season (Fig. 1) and (87 individuals) in the 3rd week of April in the second season. The temperature and RH. were 23.43 ºC & 43.36% RH in the second season (Table 2 andFig.2)

Additionally, **Abo Kaf (2005), and Ali (2009)** reported that citrus aphid individuals infested navel orange trees were found attacked by parasitoids including *Diaeretiella rapae, Aphidius* sp., *and Charips* sp. They also identified several genera such as *Diaeretiella, Ephedrus, Lysiphlebus, Praon,* and *Binodoxys,* along with the subfamily Aphelininae (Hymenoptera: Chalcidoidea, Aphelinidae)were represented by just one species from the *Binodoxys*. Furthermore, **Hemidi and Laamari (2020)** documented 18 species of primary parasitoids collected from 22 aphid species, highlighting that *A. matricariae* and *L. testaceipes* were the most dominant. The findings of the present research are contrast with **Tomanović*et al.* (2009)**, who indicated that *Ephedrus* sp. was the predominant parasitoidspecies on citrus aphid species found on navel orange trees. In the first season of the present study, the primary parasitoid, *A. matricariae*, was observed at an exceptionsally of high density of 100% from the 4th week of March until the 3rd week of April, during which the temperature fluctuated between 11.93 and 22.09°C. This high density of *A. matricariae* was sustained until the 3rd week of April, with relative densities ranging from 37.50 to 71.43%. The average annual density of this parasitoid was recorded at 53.54% (Table 1). A similar pattern was noted in the subsequent season, where *A. matricariae* constituted 100% of all parasitoids from the 3rd week of March until the end of March, establishing it as the predominant species. The temperatures during this period varied from 18.30 to 19.20°C, with relative humidity ranging from 48.04% to 51.70%in the first season. The relative density of *A. matricariae* remained high, ranging from 33.33 to 71.87%, and the average annual density was 48.15% in the second season (Table2). The primary parasitoid, *Trioxys* sp., was first observed in the fourth week of April, with a density of 28.57% at 23.93 °C and a of 44.34R.H.%. The density of this parasitoid varied, beinglow of 20.69% in the 4th week of June (29.73 °C and 47.39% R.H.) and peaking at 28.86% in the 4th week of May (26.27 °C and 47.19% R.H.). The average annual density recorded was 15.69% (Table 1). In the subsequent season, *Trioxys* sp. was first detected in the first week of April, with a density of 34.21%. The density fluctuated between 17.14% in the second week of June (29.20 °C and 46.11% R.H.) and 58.33% in the first week of July (29.79 °C and 53.59% R.H.), resulting in an average annual density of 21.18% (Table 2). The initial appearance of the primary parasitoid, *Praon* sp., occurred in the first week of May during the 2022 season, with a relative occurrence of 11.43%. Its relative occurrence varied from 10.45% in the fourth week of May to 18.75% in the first week of July, yielding an annual average of 8.90% for the first season (Table1). In the second season, *Praon* sp. was first noted in the second week of April, with a relative occurrence of 10.94%. The relative occurrence ranged from 10.71% in the second week of May to 25.71% in the second week of June, culminating in an annual average of 11.48% (Table2).The hyper parasitoid, *Charips* sp., was first recorded at a frequency of 5.97% during the fourth week of Mayin the initial season of the study. The peak occurrence of this parasitoid was noted in the second week of July, reaching 25%. The average annual frequency of *Charips* sp. during the first season was calculated to be 4.81% (Table1). In the second season, the initial appearance of *Charips* sp. occurred in the third week of April, with a frequency of 8.82%. The highest density of this parasitoid was observed in the first week of June, also at 25%, resulting in an annual average of 8.05% (Table2). These findings align with those reported by **Ali (2009)**, who noted the presence of the parasitoids *D. rapae, Aphidius sp.*, and *Charips* sp. on navel orange trees infested with citrus aphids. Furthermore, the infestation of navel oranges by *D. rapae*was first recorded in the first week of May, reaching its peak in June at a rate of 5.1%.

Parasitism %:

In season2022, the rate of parasitism varied between 5.66% in the fourth week of March and peaked to 15.54% during the third week of May, resulting in an annual average of 7.15% (Table1 and Figure 1). In the next season of 2023, parasitism levels ranged from 4.72% in the 3rd week of March to the high of 17.19% in the 3rd week of April, yielding an annual mean of 9.52% (Table 2 and Fig. 2).

Relative densities of aphid parasitoids:-

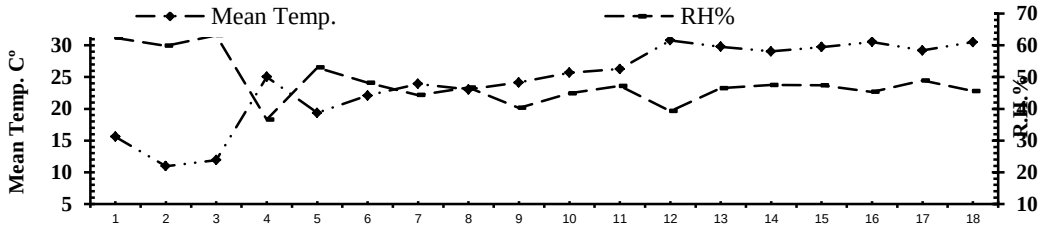
As illustrated in (Fig. 3), three primary species of parasitoids were identified, and ranked in descending order based on their overall relative densities across the two seasons of study.These species were; *A. matricariae* Haliday, *Trioxys* sp., *Praon* sp., and one hyperparasitoid, *Charips* sp. Their respective contributions to the total parasitoids collected were 55.80, 24.11, 14.51, and 5.58% in the first year opposed to52.77, 22.72, 14.49, and 10.02% in the second year.

Biological aspects life cycle of *A. matricariae* on *A. gossypii*

The data presented in table (1) clearly indicate that the average incubation period for the egg stage was 2.55 ± 0.09 days. Durations for the larval and pupal stages were recorded as 5.37 ± 0.11 days and 4.82 ± 0.58 days, respectively. The total developmental period for the parasitoid *A. matricariae* was found to be 12.74 ± 0.37 (11-16) days. These findings are somewhat consistent with those reported by **Saleh (2000)**, who found that the total developmental period of *Aphidius* sp. when reared on *S. avenae*was approximately 13.85 ± 0.29 days at a temperature of 21.7°C. In similar studies, **Stary (1970), Evans (1993), and Shalaby and Rabasse (1997)** reported that various factors, such as temperature, humidity, feeding conditions, and the availability of hosts, significantly, influenced the adult lifespan of parasitoids.

Sex ratio:-

In addition to observing three laboratory generations of *A. matricariae*, the sex ratio and the proportion of individuals that emerged from mummies in the field were recorded. The field exhibited a sex ratio 2 : 1 (females : male) with a parasitoid emergence rate of 81.66%. In the laboratory, the first generation yielded a 73.39% emergence rate from host mummies, accompanied by a sex ratio of 1.18 females : 1 male. The second generation showed a slightly lower emergence rate of 71.49%, with a sex ratio of 1.15 females to 1 male. The third generation had an emergence rate of 48.50%, resulting in a male to female sex ratio of 1.08: 1 (Table 2). The findings are generally consistent with those reported by **El-Naggar*et al.* (2008)**, and **Saleh*et al.* (2009)** who studied the parasitoid *D. rapae* on aphids over five successive generations, noting that the first three generations exhibited an approximately 1:1 sex ratio, while the fourth and fifth generations were predominantly males.



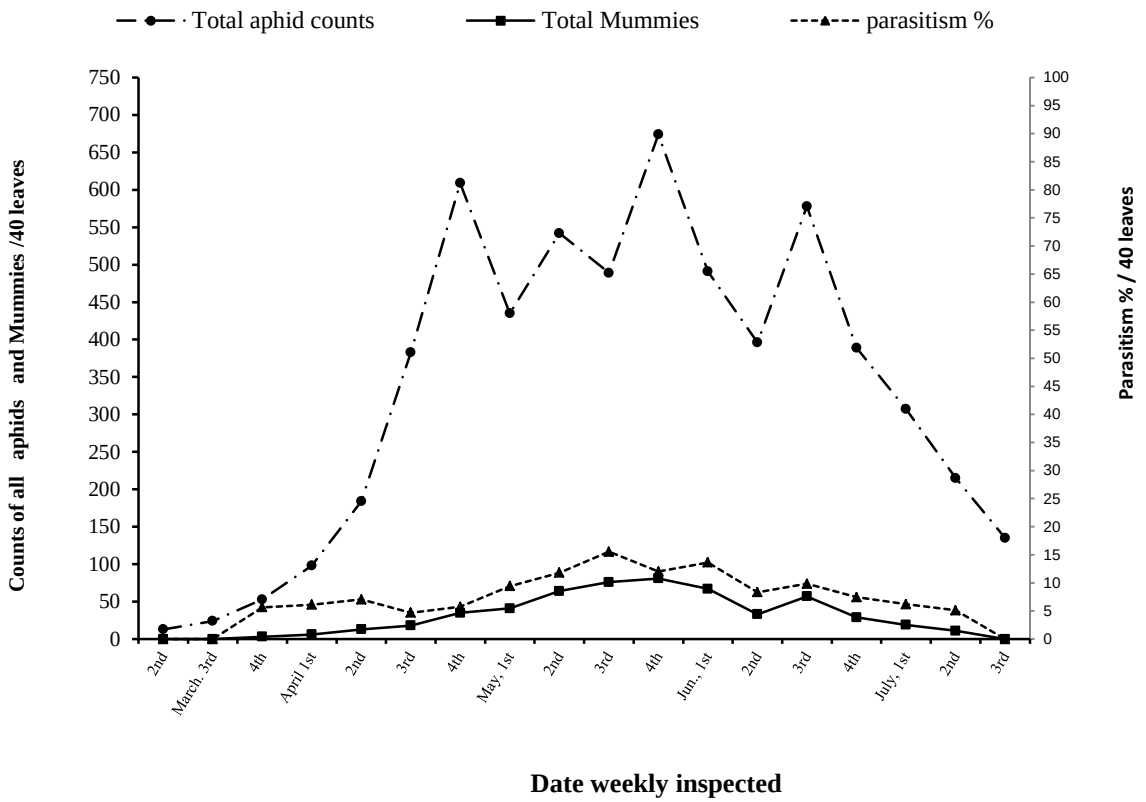


Fig. (1):Populationabundanceof aphid species and total mummiescounts and parasitismpercentage on Balady orange trees during 2022 seasons.

Table 1. Parasitism rate of the aphids (*A. gossypii, A.citricola, M. persicae, A. craccivora*) on Balady orange season 2022

Sample date		Totalno. aphid species	Totalno. Mummies	% parasitim	Emerged parasitoid						Hyper parasitoid		Total parasitoid	Mean Temp.	Mean RH%
					A.matricariae		*Trioxys sp.*		*Paron sp.*		*Charips sp.*				
					No.	RD%	No.	RD%	No.	RD%	No.	RD%			
March.	2nd	13	0	0	0	0	0	0	0	0	0	0	0	15.61	62.39
	3rd	24	0	0	0	0	0	0	0	0	0	0	0	10.97	59.87
	4th	53	3	5.66	2	100	0	0	0	0	0	0	2	11.93	63.17
April	1st	98	6	6.12	4	100	0	0	0	0	0	0	4	25.03	36.61
	2nd	184	13	7.06	9	100	0	0	0	0	0	0	9	19.36	52.99
	3rd	383	18	4.7	13	100	0	0	0	0	0	0	13	22.09	48.19
	4th	609	35	5.75	20	71.43	8	28.57	0	0	0	0	28	23.93	44.34
May	1st	435	41	9.42	23	65.71	8	22.85	4	11.43	0	0	35	23.04	46.7
	2nd	542	64	11.81	30	58.82	13	25.49	8	15.69	0	0	51	24.16	40.29
	3rd	489	76	**15.54**	33	55.93	15	25.42	11	18.64	0	0	59	25.7	44.87
	4th	674	81	12.02	38	56.72	18	28.86	7	10.45	4	5.97	67	26.27	47.19
Jun	1st	491	67	13.64	21	43.75	12	25	9	18.75	6	12.5	48	30.79	39.29
	2nd	396	33	8.33	13	44.83	8	27.58	5	17.24	3	10.34	29	29.77	46.5
	3rd	578	57	9.86	22	44	14	28	9	18	5	10	50	29.06	47.49
	4th	389	29	7.45	12	41.38	6	20.69	8	18.75	3	10.34	29	29.73	47.39
Juli	1st	307	19	6.19	7	43.75	4	25	3	18.75	2	12.5	16	30.53	45.34
	2nd	215	11	5.12	3	37.5	2	25	1	12.5	2	25	8	29.21	48.89
	3rd	135	0	0	0	0	0	0	0	0	0	0	0	30.51	45.59
Total		6015	553	128.67	250	963.82	108	282.46	65	160.2	25	86.65	448		
Mean		334.17	30.72	7.15	13.89	53.54	6	15.69	3.61	8.9	1.3	4.81	24.88		

N-Number **RD= Relative density**

Table 2. Parasitism rate of the aphids (*A. gossypii*, *A.citricola*, *M. persicae*, *A. craccivora*) on Balady orange season 2023

sample date		Total aphid species	Total Mummies	Parasitim %	Emerged parasitoid						Hyper parasitoid		Total parasitoid	MeanTemp.	MeanRH%
					A .matricariae		*Trioxys sp.*		*Paron sp.*		*Charips sp.*				
					No.	RD%	No.	RD%	No.	RD%	No.	RD%			
March.	1st	48	0	0	0	0	0	0	0	0	0	0	0	20.16	47.11
	2nd	89	0	0	0	0	0	0	0	0	0	0	0	18.93	48.87
	3rd	127	6	4.72	4	100	0	0	0	0	0	0	4	18.3	48.04
	4th	215	18	8.37	12	100	0	0	0	0	0	0	12	19.2	51.7
April	1st	408	45	11.03	25	65.79	13	34.21	0	0	0	0	38	21.44	39.74
	2nd	613	76	12.4	46	71.87	11	17.19	7	10.94	0	0	64	20.37	53.76
	3rd	506	87	**17.19**	38	55.88	14	20.59	10	14.7	6	8.82	68	23.43	43.36
	4th	574	71	12.37	34	47.89	16	22.35	12	16.9	9	12.68	71	22.7	44.89
May,	1st	493	59	11.79	21	48.84	9	20.93	8	18.6	5	11.63	43	22.99	44.49
	2nd	608	80	13.16	32	57.14	11	19.64	6	10.71	7	12.5	56	23.71	52.21
	3rd	485	56	11.55	19	47.5	8	20	9	22.5	4	10	40	24.97	48.17
	4th	523	52	9.94	15	39.47	10	26.31	7	18.42	6	15.79	38	27.59	38.47
Jun.,	1st	417	44	10.55	12	37.5	7	21.87	5	15.62	8	25	32	28.56	44.58
	2nd	382	49	12.83	15	42.86	6	17.14	9	25.71	5	14.28	35	29.2	46.11
	3rd	311	31	9.97	9	37.5	8	33.33	5	20.83	2	8.33	24	27.77	54.18
	4th	227	23	10.13	7	41.18	5	29.41	2	11.76	3	17.65	17	29.09	51.13
Juli	1st	192	16	8.33	4	33.33	7	58.33	0	0	1	8.33	12	29.79	53.59
	2nd	114	8	7.02	2	40	2	40	1	20	0	0	5	29.7	56.17
Total		6332	721	171.35	295	866.75	127	381.3	81	206.69	56	145.01	559		
Mean		351.78±	40.05	9.52	16.39	48.15	7.05	21.18	4.5	11.48	3.11	8.05	31.05		

N-Number **RD= Relative density**

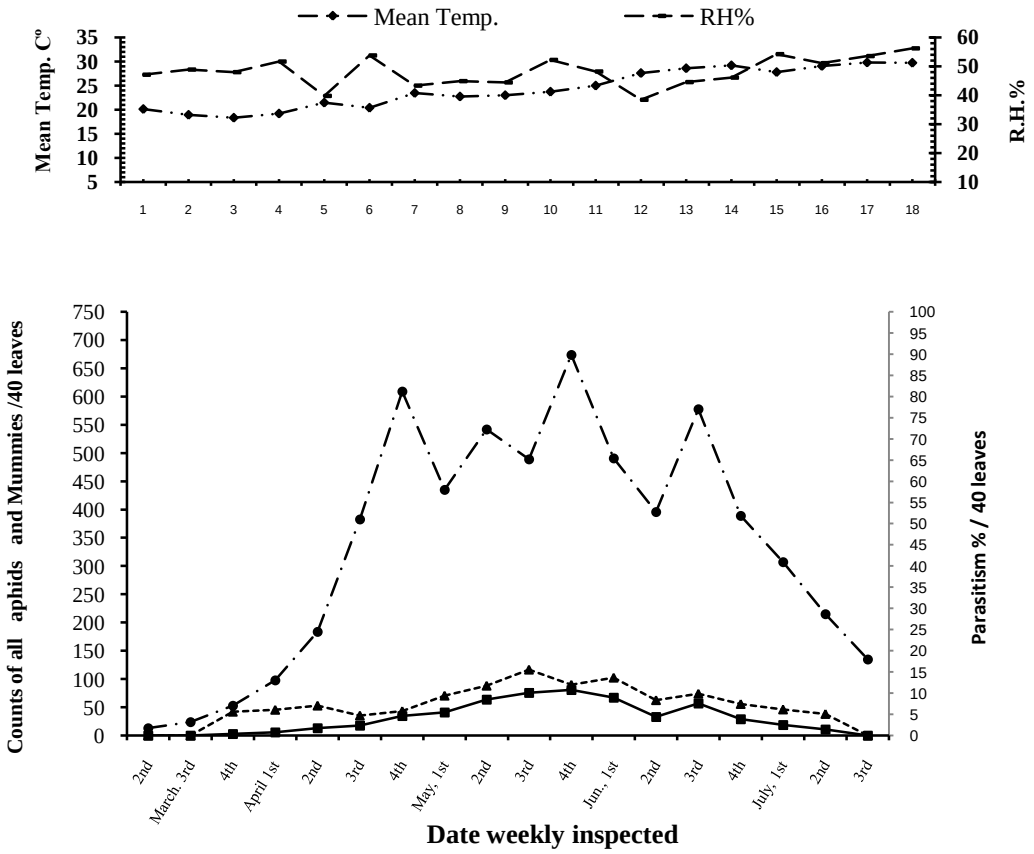


Fig. (2) :Population abundance of aphid numbers, total mummies counts and parasitism percentage on Balady orange trees during 2023 season.

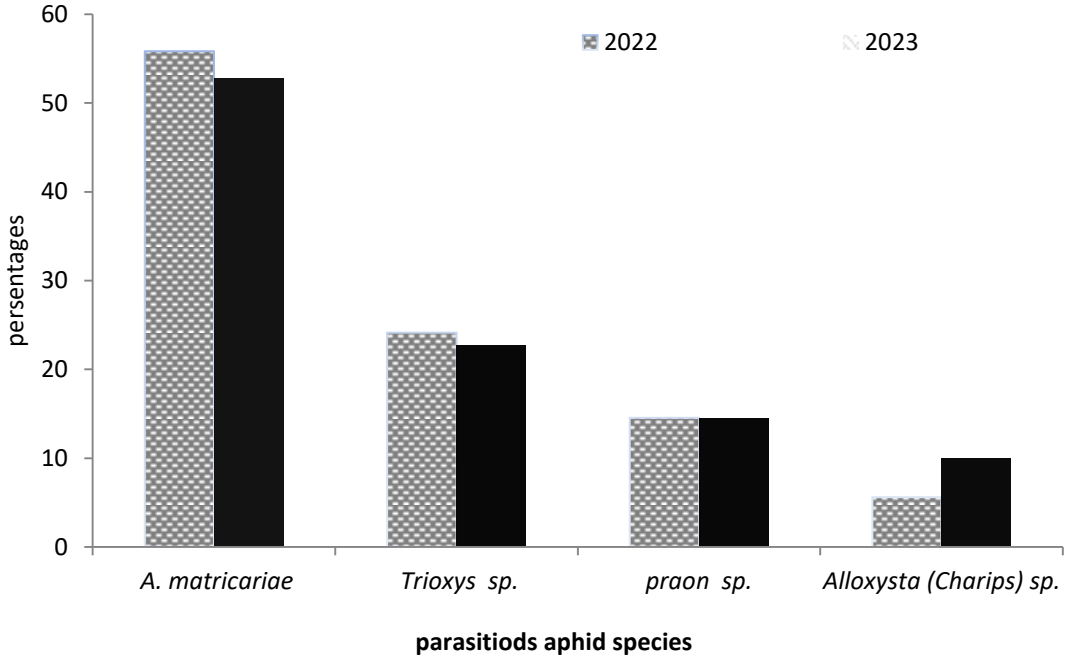


Fig.(3): Occurrence percentages of primary and hyper parasitoid species on onBalady orange trees infested with aphid speacies (*A. gossypii*, *A. citrocola*, *A.craccivora*and *M. persicae*) during 2022 and 2023 seasons.

Table (1): Life cycle of *Aphidiusmatricariae*reared on *A. gossypii* under laboratory conditions (22±2°C&70±5 RH.)

Period in days		Range	Mean ± Se
Egg		**2 -3**	**2.55± 0.09^{c}**
Larva		**4 -7**	**5.37± 0.11^{b}**
Pupa		**4 -6**	**4.82±0.58^{c}**
Total developmental period(Egg – Adult)		**11 -16**	**12.74±0.37^{a}**
Longevity	**Female**	**4-6**	**5.13±0.10^{d}**
	Male	**2 -4**	**3.09±0.90^{f}**
F. test		*******	*******

Mean under each variety having different letters in the same raw denote a significant different (p≤0.05).

Table (2): Sex ratio of *Aphidius matricariae*and adults' emergence

Host aphid	Source parasitoid	Mummies	Adults emerged	% Emergence	Females	Males	Sex ratio (M: F)
A. gossypii	In the field	169.00+12.44^{a}	138.0± 9.73 ^{a}	81.66± 5.09^{a}	92.00±7.40^{a}	46.00±3.07^{a}	**1: 2.00^{a}**
	In laboratory: First generation	114.00± 9.55^{b}	83.67±5.08^{b}	73.39 ±0.47^{b}	45.00± 5.09^{b}	38.67±2.21^{ab}	**1: 1.18^{b}**
	Second generation	80.67 ± 6.82 ^{bc}	57.67± 4.01^{c}	71.49±6.06 c	28.67± 2.29^{b}	25.00±3.98^{b}	**1: 1.15^{b}**
	Third generation	55.67± 5.26^{c}	27.00 ± 2.35 ^{bc}	48.50± 1.25^{d}	14.00± 1.41^{c}	13.00±2.12^{c}	**1 : 1.08 ^{c}**
F. test		*******	*******	*******	*******	*******	*******

Mean under each variety having different letters in the same raw denote a significant different (p≤0.05).
N.B. Generations were reared in the laboratory at (22±2°C&70±5 RH.)

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فاعلية طفيليات المَنّ في مكافحة بعض أنواع المَنّ علي أشجار البرتقال البلدي.

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أجريت تلك الدراسة بهدف حصر ودراسة الكثافة العددية لأنواع حشرة المَنّ التى تصيب أشجار البرتقال البلدي والطفيليات الحشرية المصاحبة خلال موسمي2022 و 2023 بمحافظة الشرقية. أوضحت النتائج انه يصيب أشجار البرتقال البلدى أربعة أنواع من المَنّ *A. citricola*, *Myzus persicae*,*Aphis craccivora*.*gossypii*,*A* . واظهرت الدراسة حصر ثلاث طفيليات أولية *Aphidius matricariae*, *Trioxys* sp. , *Praon* sp., ونوع واحد من الطفيليات الثانوية*Charips* sp.

واظهرت النتائج ان الطفيل الأولي*Aphidus matricariae* كان أكثرهم تواجدا حيث سجل كثافة نسبية 55.80 و 52.72 % ثم *Trioxys* sp. 24.11sp. و22.72% يليه الطفيل *Praon* 14.51 و14.49% بينما سجل الطفيل الثانوي 5.58 و 10.02 %خلال عامى الدراسة على التوالي .وأوضحت النتائج أن نسبة التطفل تراوحت بين (5.66–15.54%)و (4.72–17.19%)خلال عامي الدراسة .وأظهرت النتائج أيضا أن دورة حياة الطفيل*Aphidiusmatricariae*على درجة حرارة 22± 2م درجة مئوية ورطوبة نسبية 70± 5%وسجلت فترة النمو الكامل13.64± 0.38 يوم.

وقد سجلت أعلى نسبة من الإناث 2.00 أنثى : 1 ذكر في الحقل و بعد التربية للطفيل على من القطن لمدة جيلين و كانت النسبة الجنسية تقريبا 1 أنثى : 1 ذكر بينما كانت الذكور سائدة (في صالح الذكور) في الجيل الثالث .

الكلمات الدالة :طفيليات المن – الحصر– بيولوجي– البرتقال البلدي.