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Biological control of *Oligonychus afrasiaticus* (Acari: Tetranychidae) by the predaceous mite, *Phytoseiulus persimilis* Athias-Henriot (Acaria: Phytoseiidae) in date palm farms at El- Dakhla region, New Valley Governorate, Egypt

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ABSTRACT

Date palm plantations are seriously threatened by infestations of the date dust mite (DDM), *Oligonychus afrasiaticus* (McGregor), a major pest of unripe date fruits which results decrease in crop output and financial losses. Therefore, the aim of this research is to evaluate the biological control of DDM by releasing three rates (1000, 2000 and 3000 individuals) of the predatory mite, *Phytoseiulus persimilis* on date fruits in two date palm cultivars (Siwi and Sakkoti) planted in El-Dakhla Oasis, New Valley Governorate, Egypt during 2023 and 2024 years. The effect of DDM infestation on some physical and chemical characteristics of infested dates was also studied compared to uninfested dates, and a comparison was made between these characteristics in the two tested cultivars. The obtained results showed that the reduction percentages in *O. afrasiaticus* population were increased with the increase in the predator release rate in both tested cultivars along the two years. Besides, the reduction % in dust mite population was significantly higher in Siwi cultivar than in Sakkoti cultivar. The results also clearly that the highest mean of reduction % in *O. afrasiaticus* population on date fruits across the two years and tested date cultivars were found in the Siwi cultivar, at the fourth month, with release rate of 3000 individuals of *P. persimilis*, as well as the mean reduction % of the second year 2024. Results showed that DDM infestation led to a significant decrease in the tested physical and chemical characteristics, which led to a significant decrease in the quantity and quality of the date crop. Therefore, it can be recommended, based on these results, to increase the number of predatory mites or add one of the other biological control elements, such as essential oils or other predators, when controlling dust mites in severely infested varieties, to obtain date fruits free of dust mites and pesticide residues, and acceptable for marketing and export.

Keywords: Date palm, date dust mite, biological control, *Oligonychus afrasiaticus, Phytoseiulus persimilis,* predator mite, physical and chemical characteristics

1. Introduction

The date palm, *Phoenix dactylifera* L., is regarded as a significant multipurpose tree and one of the earliest crops that may be grown (El-Lakwah *et al.,* 2011a; El-Lakwah *et al.,* 2012; El-Shafei 2015; Assous *et al.,* 2022a and El-Shafei *et al*., 2024a). North Africa and the Middle East are considered among the most important palm growing regions in the world (El-Lakwah *et al.,* 2011b; El-Shafei 2011; Zinhoum & El-Shafei 2019 ; El-Shafei *et al.,* 2019; El-Shafei 2020 and Mahmoud *et al.,* 2022). More than 24 million palm trees are grown in Egypt, producing about two million tons of dates, which is estimated at about 18% of global production (Egyptian Ministry of Agriculture, 2023). New Valley

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Governorate is considered one of the most important palm production areas in Egypt (El-Shafei *et al*., 2024b).

Date palms are susceptible to many animal, insect and disease pests (El-Shafei 2018; El-Shafei *et al.,* 2018; Assous *et al.,* 2022b and El-Shafei *et al.,* 2022). Infestation by these pests, results in significant financial losses for the Egyptian growers (Darwish *et al.,* 2014; El-Shafei *et al.,* 2020; El-Shafei & Attia, 2023 and El-Shafei & Batt, 2024). As per the Central Administration for Agricultural Extension Services, Egypt (2001), they diminish the overall output by around 52%. One of the most important zoological pests that affect date palms is the date dust mite "The ancient globe date mite"(DDM) in most of North Africa and the Middle East, *Oligonychus afrasiaticus* (McGregor 1939) (Acari: Tetranychidae) is a prevalent spider mite pest that affects date palms (Negm *et al.,* 2015). It is a very dangerous fruit pest of the date palm and it has recently resulted in economic harm and yield decrease. If the infestation is severe, damage loss could reach 100% if left without control. It can range from 50% to 70% (El-Shafie, 2022; Mohammed *et al.,* 2023; Ali *et al.,* 2023 and Gaid *et al.,* 2023). As a possible threat to the date palm sector in the New Valley governorate, the dust mite has expanded to areas with great potential for agricultural growth. Because it is a high cash crop, it is a more significant issue for the native and imported cultivars (Sanad *et al.,* 2017 and El-Shafei & Diab, 2025). *Oligonychus afrasiaticus* McGregor, *Oligonychus pratensis* Banks, and dust mites can cause significant harm to dates during their early fruit development stages. Damage could be highly severe if protective spray treatment is not applied before date palms flower and as soon as attack signs are noticed (Al-Khayri *et al.,* 2015). A variety of cultural management techniques, such as intercropping, chemical control, weed control, tillage, bunch covering, and bunch-remained pruning, were effective in reducing the infestation of date spider mites (Latifian *et al.,* 2014).

Many methods have been implemented to control this pest, whether evaluating chemical pesticides, such as Alrubeai *et al.* (2015), who evaluated nine chemical and acaricidal pesticides to control dust mite in southern Iraq, but they were flawed by their residual effect and their harmful effect on the environment. There is a trend towards biological control using botanical pesticides, as was tried by Aldosari, 2009 in Riyadh, Saudi Arabia Kingdom. One of the most promising trends is the use of biological control using predators.

The predatory mite, *Phytoseiulus persimilis* Athias-Henriot (Acaria: Phytoseiidae) has been extensively studied for its potential biological control of spider mites on greenhouse vegetables and ornamental plants (reviewed by: McMurtry, 1982; Hussey and Scopes, 1985; van Lenteren and Woets, 1988 and Kostiainen & Hoy, 1996). *P. persimilis* is a selective predator that can rapidly suppress spider mites due to high numbers and functional responses (e.g., Laing & Osborn, 1974; Friese & Gilstrap, 1982). Since the development and reproduction of *P. persimilis* larvae depend on the availability of spider mites as prey (Ashihara *et al.,* 1978; Kennett & Hamai, 1980 and Sabelis, 1985), it is often removed from the greenhouse after the pest mites are eliminated and disappear so reduction only provides short-term control.

Based on the results and suggestions of numerous studies conducted in the fifteen years since McMurtry & Croft (1997) published the lifestyle system, a new classification of the phytoseiid mite lifestyle is proposed. In this newly proposed classification, type I (specialized predators of mites) is divided into three subtypes to highlight the specificity of mite prey: Subtype I-a - specialized predators of the family Tetranychidae; Subtype I-b Type – specialized predator of web mites (Tetranychidae); Subtype I-c – specialized predator of Tydeoids (Tydeoidea).

Subtype I-b – Specialized predators of web-laying mites (Tetranychidae) this subtype contains phytoseiids that have been adapted to attack spider mites, column mites, and some *Oligonychus* mites, producing so-called web nests (WN-u lifeforms in Saito, 1985). These plant tapeworms also appear to exhibit coevolution with their prey (Saito, 1990). *Typhlodromus (Anthoseius) bambusae* (Ehara) is considered an effective biocontrol agent for spider mite (Banks) in China (Zhang *et al.,* 1999). This predator apparently evolved with its prey and has the ability to penetrate their webs.

Accordingly, this research aimed to evaluate the effect of releasing three rates of the predatory mite, *Phytoseiulus persimilis* (1000, 2000 and 3000 individuals) in date palm farms in El Dakhla region, New Valley Governorate, Egypt, on the population numbers of dust spiders, *Oligonychus afrasiaticus* on the fruits of date palm, Siwi and sakkoti cultivars during 2023 and 2024 years. Also, to determine the effect of *O. afrasiaticus* infestation on the physical and chemical characteristics of date fruits and to compare them in the tested cultivars.

2. Materials and Methods

The current study was carried out during two successive seasons from 2023 to 2024 (from beginning of April to end of August each year) in a commercial date palm farm contained two date palm cultivars; Siwi and Sakkoti located in Gharb El Mawhob area, 100 kilometer far from El Dakhla Oasis, New Valley Governorate, in southwest Egypt (25°53'04"N 28°20'28"E) . This area and all the neighboring oases are cultivated by the date palm.

The date palm of the experiment belonged to two date palm cultivars with height of about 1.5 meters and its age is 7- 8 years. Each palm bears about 8 to 10 bunches. The experiment was designed to evaluate the effect of releasing three rates of the predatory mite, *P. persimilis* (1000, 2000 and 3000 individuals) at date palm farm on reducing the population numbers of *O. afrasiaticus* mite infesting date fruits of Siwi and Sakkoti cultivars.

2.1. Field experiment

Nine date palm trees of each cultivar were chosen, as well as three palm trees for the control of each tested cultivar also in the same place and the same conditions, but in a place isolated from the treatment. Three palm trees were chosen for each treatment (1000, 2000 and 3000 individuals of *P. persimilis*) and the predators are placed over the heart of the palm so that it can be easily moved in a horizon of all the bunches and the fruits of dates and the control was left without treatment. Five replicates were determined for each treatments and the control that each replicate contain 20 date fruits. The population numbers of DDM were counted on the five date fruits replicates using a magnifying lens in the field, then the average was calculated and recorded.

2.2. Source of predatory mites

The numbers of predatory mites, *Phytoseiulus persimilis* used during the years 2023 and 2024 were provided by Biolog-Biosystem company for biological control agents located at Qaha City, Toukh Center, Qalyubia Governorate, Egypt. The predatory mite was raised in the breeding unit outside the incubators at temperatures close to those at which it will be released in the palm fields to increase its adaptation and increase its efficiency when released in the palm fields.

2.3. Predator release dates

Six releases of the predator were carried out throughout the season from April to the end of August at 2023 and 2024 years and were distributed as follows: the first on the first of April and the second on the first of May at a rate of once a month, then the rate was increased to twice a month in June and July as the percent of infestation of DDM on palm trees was increased, so the third release was on the first of June, the fourth was at the mid-June release, the fifth at the first of July release and the last release was in mid-July.

2.4. Field inspection

The numbers of DDM on date fruits of control, in which the predator was not released (Fig.1) and treatment, in which the predator was released (Fig. 2) were checked every week, including before and after the predator release, then the Henderson and Tilton equation is used to calculate the percentage of reduction in the population numbers of DDM as a result of the release of the predatory mite *P. persimilis*.

2.5. Physical and Chemical analysis of Siwi and Sakkoti cultivar fruits

2.5.1. Physical analysis

Five date fruits from each treatment were selected randomly for physical characteristics and each fruit represented one replicate. Fruit weight was estimated with top load balance; diameter and length were measured with the help of a micrometer caliper as well as flesh was recorded as described by Ismail *et al.* (2006).

2.5.2. Chemical analysis

Date fruits of the tested cultivars with the same size, age and height from the ground and/taken from palms of the same age were collected. The samples were transferred to Department of Date Fruit Processing and Marketing, Central Laboratory for Date Palm, Agricultural Research Center, ARC,

Giza, Egypt to determine: Moisture, TSS, Reducing sugar, Non Reducing sugar and Total sugar. AOAC (2000) was followed in determining total, reducing, and non-reducing sugars. Date fruits samples were dried for 48 hours at 65°C in a vacuum oven to evaluate the moisture content, and the water content was computed using the formula Moisture (%) = [(starting weight-final weight)/initial weight] ×100. The amount of solute accumulation is indicated by total soluble solids (TSS) readings, which also relate to the sap's physical characteristics (osmoticum and viscosity). A refractometer (optical technology K7121, Abbe Mod. RMT) was used to measure the TSS in fruit juice.

Fig.1: Control = date fruits infested with *Oligonychus afrasiaticus* without any treatment

Fig. 2: Treatment = date fruits infested with *Oligonychus afrasiaticus* and treated by 3000 individual of *P. persimilis*

2.6. Statistical analysis

The percentage of reduction in the DDM population is determined using the Henderson and Tilton calculation (1955). Then The reduction rate in date palm dust mites was then examined using a one-way ANOVA, and the means were compared using the student's least significant difference. The significance level was set at $P<0.05$. The analysis was conducted using SAS statistical software (SAS Institute, 2010).

3. Results and Discussion

3.1. Effect of releasing predatory mite, *P. persimilis* in two date palm cultivars on the reduction percent of *O. afrasiaticus* population in the years 2023 and 2024 .

Results in Table (1) and illustraated in Fig. (3) reported the effect of releasing three rates (1000 , 2000 and 3000 individuals) of predatory mite. *Phytoseiulus persimilis* on the reduction % of dust mite, *O. afrasiaticus* population on date fruits of two date palm cultivars, Siwi and Sakkoti planted in El-Dakhla Oasis in the year 2023.

Results revealed that the reduction percentages of *O. afrasiaticus* population were increased with the increase in the rate of predator release in both tested varieties, where the average reduction during the four months was (38.51 , 44.62 and 50.85 %) for the release rate (1000, 2000 and 3000 predator individuals) respectively, in Siwi variety. While, the average reduction % during the four months was (27.16 , 38.25 and 42.08 %) for the release rate (1000, 2000 and 3000 predator individuals) respectively, in the Sakkcoti variety.

The same trend was observed in 2024 as shown in Table (2) and Fig. (4) with an increase in the reduction percentage of dust mite population with increasing the predator release rates, as the average reduction % were recorded over four months (44.64 , 49.77 and 53.31 %) for the release rates (1000, 2000 and 3000 predator individuals) respectively, in the Siwi variety, while the average reduction over

the four months was (39.43 , 46.65 and 49.73 %) for the release rates (1000, 2000 and 3000 predator individuals) respectively in the Sakkoti variety.

Table 1: Reduction % in dust mite, *O. afrasiaticus* population after releasing of predator mite, *P. persimilis* in Siwi and Sakkoti date palm cultivars in El-Dakhla, New Valley Governorate, Egypt during four months of 2023.

Cultivars	Release rates	Reduction rate % in dust mite *O. afrasiaticus* population				
		May	June	July	August	Mean
Siwi Cultivar	1000	26.49	31.18	40.05	56.35	38.51
	2000	29.35	34.18	42.25	72.72	44.62
	3000	31.73	37.69	52.55	81.42	50.85
Sakkoti Cultivar	1000	22.02	24.47	26.34	35.80	27.16
	2000	23.89	29.88	35.91	63.31	38.25
	3000	27.38	32.06	44.54	64.33	42.08

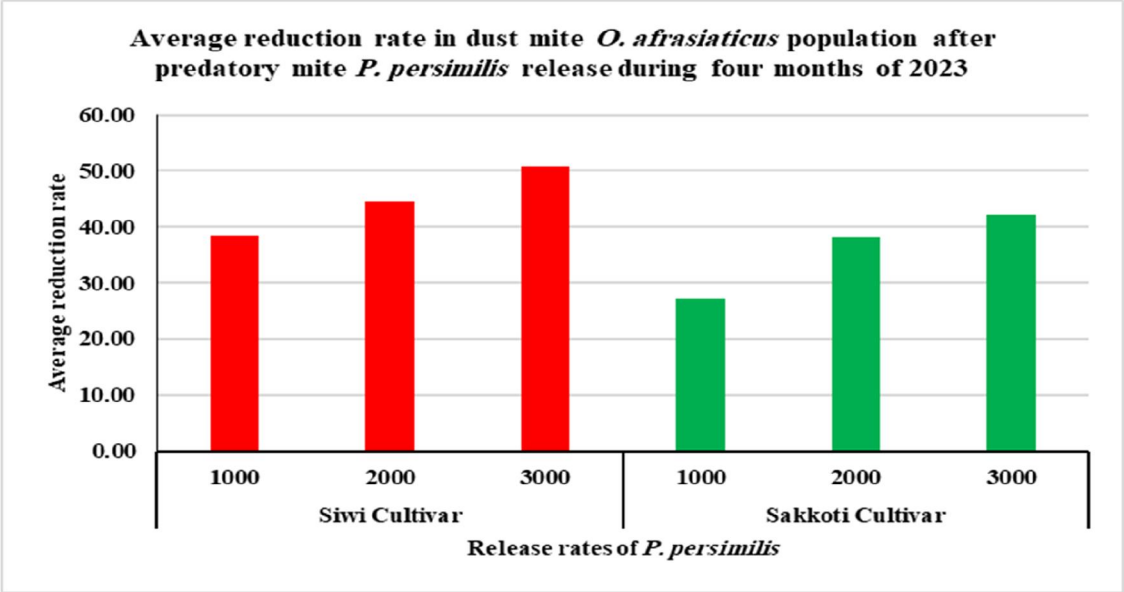

Fig. 3: The mean reduction rate in dust mite *O. afrasiaticus* population after predatory mite *P. persimilis* release during four months of 2023

Table 2: Reduction % in dust mite *O. afrasiaticus* population after releasing of predator mite *P. persimilis* in Siwi and Sakkoti date palm cultivars in El-Dakhla, New Valley Governorate, Egypt during four months of 2024.

Cultivars	Release rates	Reduction rate % in dust mite O. *afrasiaticus* population				
		May	June	July	August	Mean
Siwi Cultivar	1000	30.38	31.38	43.52	73.29	44.64
	2000	35.47	37.94	46.63	79.04	49.77
	3000	37.04	40.52	49.02	86.66	53.31
Sakkoti Cultivar	1000	25.42	27.39	37.18	67.76	39.43
	2000	32.22	38.13	43.67	72.60	46.65
	3000	32.56	36.82	51.03	78.50	49.73

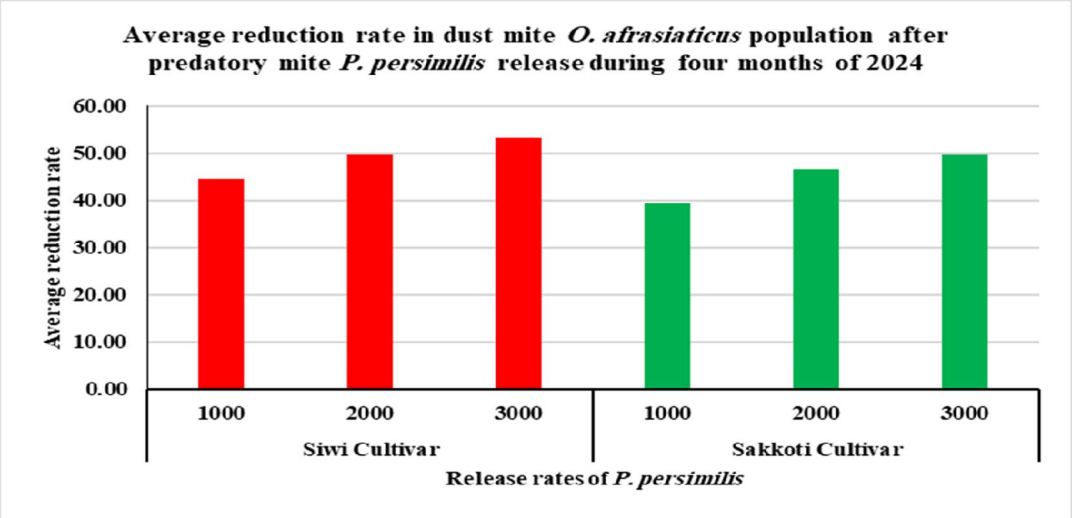

Fig. 4: The mean reduction rate in dust mite *O. afrasiaticus* population after predatory mite *P. persimilis* release during four months of 2024

The obtained results clearly show that the rate of reduction in the number of dust mites as a result of releasing the predatory mite on the dates of the Siwi variety was significantly higher than the rate of reduction in the number of dust mites on the dates of the Sakkoti variety. This is due to the fact that the infestation rate and the number of dust mites on the Sakkoti variety were much higher than those on the Siwi variety.

Additionally, the data in Table (3) show that Siwi cultivar, released at the rate of 3000 individuals of predatory mite, *P. persimilis*, at the fourth month, and the mean reduction % of the second year 2024 had the highest average reduction % on the dust mite, *O. afrasiaticus* population infesting date fruits across the two years and tested date cultivars.

The obtained results from this research agreed with many scientists who used a number of predator mite species of the phytoseiid family in the biological control of date dust mite, *O. afrasiaticus* and proved their high effectiveness under different temperatures and humidity in controlling this pest, which encouraged us to try this predatory mite, *P. persimilis* for the first time in controlling date dust mite, *O. afrasiaticus* on date palm trees such as: McMurtry *et al.* (2013) who stated that after 15 years of study, the predatory mites of the family phytoseiid mites (Acari: Phytoseiidae) used in biological pest control were divided according to their feeding behavior into five types. The first type is divided into three subtypes. The second subtype is specialized predators of web-nest producing mites (Tetranychidae) and the date dust mite is among the mites of this family that are characterized by making webs on date fruits. Negm *et al*. (2014) studied the effectiveness of two species of family (Acari :Phytoseiidae) collected from date palm orchards, namely *Cydnoseius negevi* (Swirski and Amitai) and *Neoseiulus barkeri* Hughes (Acari: Phytoseiidae) in controlling the date dust mite *O. afrasiaticus*. The intrinsic rate of increase and net reproduction rate values were found to be higher in *C. negevi* than in *N. barkeri* at both temperature regimes. Therefore, it was concluded that *C. negevi* performed better than *N. barkeri* against *O. afrasiaticus* and could be considered as a valuable addition to the existing methods of palm dust mite control. Alatawi *et al.* (2018) evaluated the maximum feeding capacity, functional response type, and parameters of the predatory mite *Cydnoseius negevi* (Swirski & Amitai) (Acari: Phytoseiidae) deutonymph and adult female at varying densities of movable stages of the two-spotted spider mite (TSSM) *Tetranychus urticae* Koch (Acari: Tetranychidae) and date palm mite (DPM) *Oligonychus afrasiaticus* (McGregor).When compared to TSSM, the maximal feeding capacity of an adult female *C. negevi* was noticeably greater for DPM females. Previous and ongoing research suggests that *C. negevi* may be a predator at a variety of humidity levels. Al-Alazzazy (2022) and Al-Azzazy, & Alhewairini (2024) evaluated the use of two species; *Amblyseius swirskii* and *Neoseiulus cucumeris* (Acari:Phytoseiidae), of family Phytociidae predators mite in the biological control of date dust mites, *O. afrasiaticus* on palm trees at different temperatures. results suggested that the two species are

promising in the biological control of dust mites on palm trees at a wide range of temperatures. From the above, it is clear that the measures taken by contacting the company that is the source of the predator, *P. persimilis* to raise it outside the incubator in normal weather conditions similar to the conditions in which it will be released in the fields until it adapts, as well as the method of placing the predator on top of the palm tree from above so that we can facilitate its horizontal movement only through the leaves to the fruits, helped the predator to do its job in combating the dust mite, *O. afrasiaticus*.

Table 3: Factorial analysis for the significance of different studied factors.

Factor	Level	Mean reduction rate ± SE
Year	2023	40.25 ± 3.53 b
	2024	47.26 ±2.18 a
$F_{1,40}$		26.06
P		<.0001
$LSD_{0.05}$		2.78
Cultivar	Siwi	46.95 ± 2.41 a
	Sakkoti	40.55 ± 3.53 b
$F_{1,40}$		21.73
P		<.0001
$LSD_{0.05}$		2.78
***P. persimilis* release Rates (individual)**	1000	37.44 ± 3.29 c
	2000	44.74 ±2.16 b
	3000	49.07 ± 2.17 a
$F_{2,40}$		24.44 a
P		<.0001
$LSD_{0.05}$		3.4
Inspction (Months)	1st	29.50 ± 2.05 d
	2nd	33.47 ± 2.18 c
	3rd	42.72 ± 3.24 b
	4th	69.32 ± 6.05 a
$F_{3,40}$		170.27
P		<.0001
$LSD_{0.05}$		3.92

Means containing the same letter in the same row do not differ significantly.

3.2. Effect of *O. afrasiaticus* infestation on some physical characteristics and chemical components of two date fruits cultivars, Siwi and Sakkoti:

Physical characteristics demonstrated in Table (4) as fruit weight, pulp weight, seed weight, fruit length and fruit diameter of date palm cultivars, Siwi and Sakkoti were determined under the infestation by *O. afrasiaticus* compared to the uninfested date fruits which had significant adverse effects on date fruit physical characteristics. Results of fruit weight, pulp weight, fruit length and fruit diameter exhibited significant differences between the uninfested and infested date fruits by *O. afrasiaticus* which recorded (14.01 g, 12.30 g, 4.23 cm and 2.57cm) respectively, for the uninfested date fruits of Siwi cultivar compared to the infested date fruit which were (7.96 g,6.24 g,4.23 cm and 1.17 cm). The Sakkoti cultivar took the same trend, as the physiological characteristics: fruit weight, pulp weight, seed weight, fruit length and fruit diameter were recorded (8.89 g, 7.89 g ,5.72 cm and 1.98 cm) in the uninfested dates respectively, while a significant decrease in these characteristics was recorded, to be (4.18 g, 3.13 g, 2.96 cm and 1.03 cm) in the infested date fruits for the mentioned characteristics, respectively.

Table 4: Effect of *O. afrasiaticus* infestation on the physical characteristics of infested date fruits.

Cultivars	Treatments	Fruit weight (g)	Pulp weight (g)	Fruit length (cm)	Fruit diameter (cm)
Siwi	Uninfested	14.01±0.59a	12.30±0.56a	4.23±0.25a	2.57±0.12a
	Infested	7.96±0.24b	6.24±0.18b	2.58±0.20b	1.17±0.19b
	Pr.	<.0001	<.0001	0.0009	0.0004
	$LSD_{0.05}$	1.0137	0.9369	0.5216	0.3583
Sakkoti	Uninfested	8.89±0.48a	7.89±0.41a	5.72±0.30a	1.98±0.03a
	Infested	4.18±0.34b	3.13±0.29b	2.96±0.29b	1.03±0.08b
	Pr.	0.0002	<.0001	0.0003	<.0001
	$LSD_{0.05}$	0.942	0.811	0.671	0.136

Regarding to chemical contents of date fruits Table (5) under the infestation by *O. afrasiaticus*, significant differences were recorded in the chemical fruit component between the uninfested and infested date fruits of the two tested cultivars, Siwi and Sakkoti as moisture % , total soluble solids(TSS) %, reducing sugars , non- reducing sugars and total sugars %.The uninfested Siwi cultivar fruit component mentioned recorded (24.15 , 78.81 ,65.70 , 9.50 and 75.00) % compare to the infested chemical content (17.52 , 70.05 , 58.35 ,7.11 and 65.46) % for the mentioned component respectively with significant decrease difference.

Table 5: Effect of *O. afrasiaticus* infestation on chemical component of infested fruits.

Cultivars	Treatments	Moisture %	TSS %	Reducing sugar %	Non Reducing sugar %	Total sugar %
Siwi	Uninfested	24.15±0.05a	78.81±0.18a	65.70±0.27a	9.50±0.18a	75.00±0.30a
	Infested	17.52±0.63b	70.05±1.25b	58.35±1.17b	7.11±0.32b	65.46±0.88b
	Pr.	<.0001	0.0003	0.0004	0.0003	<.0001
	$LSD_{0.05}$	1.0111	2.0202	1.9186	0.5825	1.4189
Sakkoti	Uninfested	13.07±0.02a	79.15±0.06a	10.23±0.07a	61.54±0.07a	71.77±0.00a
	Infested	12.12±0.62a	70.33±0.63b	8.58±0.38b	53.77±1.20b	62.33±1.41b
	Pr.	0.0549	<.0001	0.0018	0.0004	0.0003
	$LSD_{0.05}$	0.987	1.012	0.624	1.927	2.256

Means containing the same letter in the same column do not differ significantly.

Sakkoti cultivar date fruits content had the same order for mentioned chemical content of uninfested fruits,13.07,75.15,10.23,61.54 and 71.77 % compared to infested fruits, 12.12, 70.33, 8.58, 53.77 and 62.33% respectively with significant decrease difference.

The obtained results clearly indicate that dust mite *O. afrasiaticus* infestation leads to a significant decrease in the quantity and quality of the date crop. It causes a significant decrease in the weight of the fruit and the weight of the fruit flesh as a result of the mite nymphs feeding on the fruit juice in the early stages of growth, in addition to its effect on the length and diameter of the fruit and thus affecting the total size of the fruit, which makes the fruit worthless and rejected for marketing.

As for the chemical properties of date palm fruits, it was found that dust mite, *O. afrasiaticus* infestation affects the chemical properties of the fruit, which is represented by a decrease in the percentage of moisture, total sugars and total soluble substances, which makes the fruit unfit for human consumption.

3.3. Chemical differences between date fruits of the two tested cultivars, Siwi and Sakkoti

The results shown in Table (6) registered significant differences in the chemical components of the date fruits from the tested cultivars Siwi and Sakkoti. Results showed significant increasing in moisture, reducing sugar, and Total sugar in the date fruits from cultivar, Siwi (24.15, 65.80 and 75.30)% compared to the same components in the date fruits from cultivar, Sakkoti,(13.07 , 10.23 and 71.77)% respectively. While the obtained results showed significant decreasing in TSS and non-reducing sugar

in the date fruits from tested cultivar, Siwi (78.81 and 9.50) % compared to the same components in the date fruits from cultivar, Sakkoti (79.15 and 61.54), respectively.

From the obtained results in the analysis of the components of date fruits, it is clear that the dry cultivar, Sakkoti which had low-moisture% in its fruits compared to the semi-dry cultivar, Siwi with relatively higher moisture in its fruits. This is consistent with the fact that mite infestations spread in dry places, as they spread in palm trees planted on the edges of farms and roads and exposed to drought and dust. Infestation also spreads during drought waves. It was also found that the Sakkoti cultivar, which was the most infested in this study, has a higher content of non-reducing sugars (sucrose) and TSS than the Siwi cultivar, which was the least infested by the mite, indicating that the mite prefers a high content of sucrose and TSS, which was available in the dry cultivar Sakkoti, while it was not available in the same quantity in the semi-dry cultivar, Siwi .The current results are in accordance with (Van de Vrie *et al.,* 1972) who indicated that the population of the dust mite, *O. afrasiaticus* increases to its highest value during times of drought and high temperatures. Chaaban *et al.,* 2012, demonstrated that, in spite of the application of sulfur, *O. afrasiaticus* populations were favored on Deglet Noor fruits during the hot and dry July and August seasons.

Table 6: Comparison of the chemical components of date fruits of Siwi and Sakkoti cultivars.

Cultivars	Moisture %	TSS %	Reducing sugar %	Non Reducing sugar %	Total sugar %
Siwi	24.15±0.05 [a]	78.81±018 [b]	65.80±0.18 [a]	9.50±0.27 [b]	75.30±0.09[a]
Sakkoti	13.07±0.02 [b]	79.15±0.06 [a]	10.23±0.07 [b]	61.54±0.08 [a]	71.77±0.00 [b]
P. value	<.0001	0.0326	<.0001	<.0001	<.0001
L.S.D.$_{0.05}$	0.077	0.297	0.444	0.305	0.146

Means containing the same letter in the same column do not differ significantly.

4. Conclusion

It may be concluded from the results of the current investigation, that the biological control of dust mite *O. afrasiaticus* in date palm fields on two date palm cultivars (Siwi and Sakkoti) by releasing predatory mite *P. persimilis* at three release rates (1000, 2000, and 3000 individuals) increased the reduction rates of dust mite *O. afrasiaticus* that infest date palms in the field during the growth seasons of 2023 & 2024. The use of a range of 3000 individuals of predatory mites in the Siwi variety in the second year resulted the highest rate of reduction. This is because the Sakkoti variety had a higher dust mite infestation than the Siwi variety. So, In order to obtain good date fruits that are suitable for marketing and export and free of pest and pesticide residues, we advise either increasing the number of predatory mite individuals when using them in severely date palm infested varieties or adding one of the other biological control elements, such as oils extracts, predators, parasites, and pathogens.

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