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# Influence of Different Mango Cultivars on the Population Density of the Soft Scale Insect, *Kilifia acuminata* (Signoret) (Homoptera: Coccidae) in Damietta Governorate

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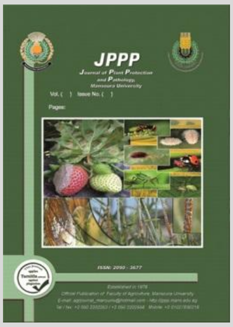

## ABSTRACT

The soft scale insect, *Kilifia acuminata* (Signoret) (Homoptera: Coccidae) is one of the most destructive pests affecting mango trees in Egypt. This study investigates the impact of different mango cultivars on the population dynamics of this insect in New Damietta mango orchards during the 2022 and 2023 seasons. The effects of natural enemies and weather factors, including mean temperature (°C), relative humidity (%), tree orientation, and seasonality, were analyzed. The findings revealed four annual population peaks of *K. acuminata*, occurring in February, March, August and December in the 1st year and February, March, June and August in the 2nd year across different mango cultivars. The highest infestation levels were recorded during summer, with mean densities of 4398.9±504.6 and 3569.8±376.6 individuals per 125 leaves in the first and second study years, respectively, while the lowest populations were observed in winter. Statistical analysis showed that *K. acuminata* populations were significantly influenced by daily means temperature, while relative humidity parasitoids had no significant effect. Additionally, the insect exhibited a preference for the northern orientation of mango trees. These findings provide valuable insights into the seasonal trends and ecological interactions of *K. acuminata*, contributing to the development of effective integrated pest management strategies for mango orchards in Egypt.

***Keywords***: *Kilifia acuminata*, mango cultivars, seasons, directions.

## INTRODUCTION

Mango (*Mangifera indica* L., Anacardiaceae) are among the most significant fruit crops in Egypt, valued for their rich nutritional composition, which includes lipids, salts, sugars, proteins, and vitamins (FAO, n.d.). In addition to their nutritional benefits, mangoes hold substantial economic importance, particularly in juice production, with Egyptian cultivars being highly esteemed in international markets due to their superior quality (Economic Agricultural Report, 2007). Consequently, the area under mango cultivation has expanded considerably in recent years (Abdelsalam *et al*., 2018). According to the Economic Agricultural Report from the Central Administration for Economic Agriculture, Ministry of Agriculture (2007), mango cultivation in Egypt covered approximately 129,073 acres in 2007, producing around 497,771 tons. Historical records by Abdelsalam *et al.* (2018) indicate that mangoes were introduced to Egypt nearly 200 years ago. By 2015, the cultivated area had grown to approximately 102,071.76 hectares, with the majority of production concentrated in Ismailia Governorate.

The soft scale insect, *Kilifia acuminata* (Signoret) (Hemiptera: Coccidae) is a common pest that infests various fruit trees and ornamental plants, primarily causing damage to the leaves of its host plants (Elwan, 1990; Hassan, 1993; Atalla *et al*., 2007; Attia & Radwan, 2013). In Egypt, only a few studies have examined the impact of different directional orientations on the population density of this insect pest, as well as seasonal variations throughout the year (Elwan, 1990; Kwaiz, 1999; Elwan, 2007; Abdel-Rahman *et al*., 2012).

Therefore, the present study aimed to investigate the population density of *Kilifia acuminata* over two successive years, examining the effects of different seasons and directional orientations on its average abundance across three mango cultivars. The findings from this research are intended to provide essential data for the development of effective integrated pest management programs.

## MATERIALS AND METHODS

The experiments for the current study were conducted from January 2022 to December 2024 on mango trees (*Mangifera indica* L.) of the family Anacardiaceae. Three cultivars, Ghrawy, Sokary, and Baladi approximately seven years old, were selected from a private orchard exclusively planted with mango trees mixed cultivars. The orchard, covering an area of approximately three feddans, is located in the New Damietta region, Damietta Governorate, Egypt. Throughout the study period, no chemical control measures were applied to the selected orchard. All trees received uniform standard horticultural practices.

**1. Sample size:**

For this study, five trees of each mango cultivars within the same orchard were selected and labeled. The chosen trees were relatively similar in their infestation levels by *Kilifia acuminata* and comparable in size, shape, height, and vegetation. Samples were collected biweekly throughout the study period from the middle of each selected tree and from the four cardinal directions: north, south, east, and west.

A total of 125 mango leaves were sampled for each mango cultivars during the two-season study period [i.e., 5

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trees × 5 sampling points (4 cardinal directions + center) × 5 leaves]. Samples were collected from each direction of the mango trees using garden scissors and immediately placed into plastic bags for same-day analysis. In the laboratory, a stereomicroscope was used to observe and record the nymphal and adult stages of *K. acuminata* as well as its predators, including both immature and adult stages.

To assess the parasitism ratios of *K. acuminata*, the insects in each sample were categorized into two groups: healthy, living insects and parasitized insects. The parasitized group included those containing parasitoid larvae or pupae, as well as those with emergence holes from adult parasitoids. Each parasitized and healthy insect was carefully counted and recorded.

**2. Distribution of *K. acuminata:***

Directional preference of *K. acuminata* was determined by applying the following equation Al Shidi *et al.* (2018) and Gillison (2006):

**F1 = (East – West) F2 = (North – South)**

**Tan. Q = F2/F1**

**Where**:

**F1 = Total numbers of *K. acuminata* on the (East direction) minus that on the (West direction) if former is higher, and vice versa.**

**F2 = Total numbers of *K. acuminata* on the (North direction) minus that on the (South direction) if former is higher, and vice versa.**

The tangent is represented by the resulting figure, whose matching value the equation received.

**Tan. Q = Tan of the angle between F1 and F2.**

During the two study years, the distribution of *K. acuminata* populations in various seasons was also determined.

**3. Meteorological data:**

The Central Laboratory for Agricultural Climate provided data on the average air temperature (°C) and average relative air humidity (R.H. %) for the experimental area throughout the study period.

**4. Statistical analysis:**

The effect of the tested factors; temperatures ◦C and relative humidity% on the population abundance of *K. acuminata* was ascertained using one-way analysis of variance (ANOVA) in the SPSS system. To compare the significance between the means, Duncan's Multiple Range Test (Duncan 1955) at 0.05 probability level was employed.

## RESULTS AND DISCUSSION

**Effect of different mango cultivars on the population density of the soft scale insect *Kilifia acuminata*:**

The data presented in Fig. (1) indicate that the green soft scale insect, *Kilifia acuminata* (Signoret) (Coccidae), exhibited four population peaks on mango trees during the first year (2022). The first peak occurred on February 1, 2022, with population densities of 2193, 1848, and 1638 individuals per 125 leaves for the Gahrawy, Sokary, and Baladi cultivars, respectively. The second peak was recorded on March 15, 2022, with 1903, 1625, and 1547 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively. The third peak, observed on August 15, 2022, showed the highest population densities, reaching 5886, 5341, and 5131 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively. The fourth and final peak occurred on December 15, 2022, with population densities of 1723, 1378, and 1168 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively.

Similarly, during the second year of study (2023), *Kilifia acuminata* exhibited four population peaks on mango trees. The first peak occurred on February 1, 2023, with population densities of 2373, 2138, and 1978 individuals per 125 leaves for the Gahrawy, Sokary, and Baladi cultivars, respectively. The second peak was recorded on March 15, 2023, with 2083, 1848, and 1708 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively. The third peak, observed on June 1, 2023, showed population densities of 1777, 1542, and 1382 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively. The fourth and highest peak occurred on August 15, 2023, with population densities reaching 4479, 4244, and 4084 individuals per 125 leaves for Gahrawy, Sokary, and Baladi, respectively Fig. (2).

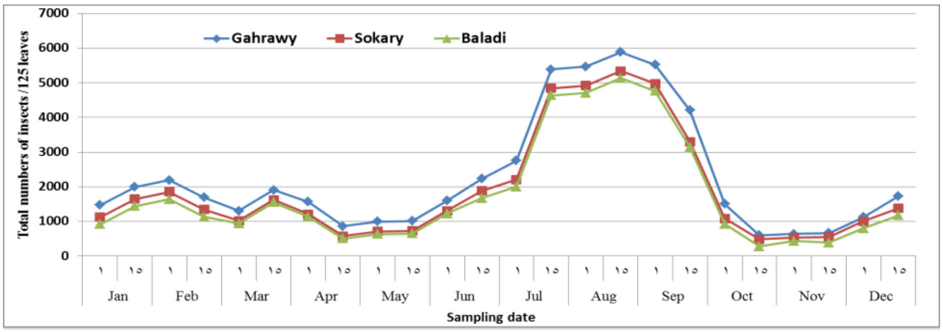



**Fig. 1. Population density of *Kilifia acuminata* on three mango cultivars during first year 2022 at New-Damietta region.**

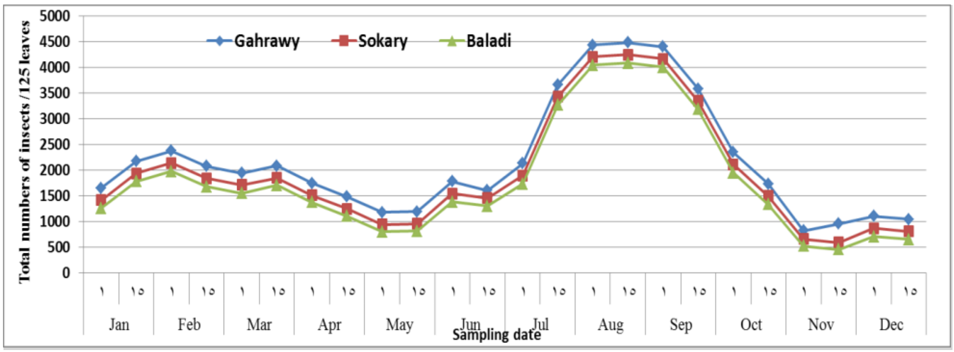



**Fig. 2. Population density of *Kilifia acuminata* on three mango cultivars during first year 2022 at New-Damietta region.**

In conclusion, the obtained results highlight the complexity of *Kilifia acuminata* population dynamics and the significant influence of environmental factors and natural enemies in regulating pest activity. The findings indicate that the Gahrawy cultivar is the most susceptible to *K. acuminata* infestation compared to Sokary and Baladi. Additionally, the study confirms that *K. acuminata* exhibited four distinct population peaks on mango trees during both years of investigation.

The results obtained in this study align with previous findings on the population dynamics of *Kilifia acuminata*. Habib *et al*. (1971) observed that the highest insect population was concentrated in the middle and upper zones of the tree, peaking in August. Similarly, Salama and Saleh (1971) reported that the coccid reached its seasonal abundance peak between October and November. Shahein (1974) documented three periods of *K. acuminata* activity: the first from October to February, the second from April to May, and the third from July to September. El-Dash (1997) found that the total monthly count revealed three abundance peaks in May, July, and October–November. Bakry (2009) recorded two generations of *K. acuminata* in June and November over two years. Hassan *et al*. (2012) reported that *K. acuminata* had two to three peaks of activity per year on mango trees in Inshas El-Raml district, Sharkia Governorate, with three annual generations lasting about four months each: March to June, July to October, and November to February. Awadalla *et al*. (2017) found that the population density of *K. acuminata* on mango trees exhibited six and five peaks of infestation in two successive years, with the highest peaks recorded in March and June in Desouk district, Kafr El-Sheikh Governorate. El-Baradey *et al*. (2020) observed that the mango shield scale, *Milviscutulus mangiferae* (Green), was present on mango trees year-round in Kafr El-Sheikh Governorate, with two seasonal activity peaks per year—one in November and June in the first year and another in November and July in the second year.

These findings collectively emphasize the variability in *K. acuminata* population dynamics across different regions and years, influenced by environmental conditions and host plant characteristics.

**Seasonal distribution of the soft scale insect *Kilifia acuminata*:**

The data presented in Table (1) and Fig. (3) illustrate the impact of different seasons on the population density of the green soft scale insect, Kilifia acuminata, during the two study years (2022/23).

The results indicate that the average population of K. acuminata across the four seasons of both years can be classified into two statistical categories. During the first year, the highest population density was recorded in the summer season, with an average of 4398.9±504.6 individuals per 125 leaves (nymphal and adult stages). The other three seasons formed the second category, with population densities of 1488.4±133.7, 1139.2±203.3, and 849.0±166.7 individuals per 125 leaves in winter, spring, and autumn, respectively.

A similar trend was observed in the second year, where the summer season again recorded the highest population density, with an average of 3,569.8±376.6 individuals per 125 leaves. The remaining seasons fell into the second category, with average densities of 1,841.6±100.6, 1,300.2±111.6, and 1,120.7±245.2 individuals per 125 leaves in winter, spring, and autumn, respectively.

This trend was consistent across the three studied mango cultivars; Gahrawy, Sokary, and Baladi demonstrating a similar seasonal pattern in the population density of K. acuminata.

**Table 1. seasonality average numbers of *K. acuminata* on three mango cultivars during two successive years 2022/23 in New-Damietta region.**

| Season | 1st year | | | | 2nd year | | | |
|---|---|---|---|---|---|---|---|---|
| | Gahrawy | Sokary | Baladi | Average | Gahrawy | Sokary | Baladi | Average |
| Winter | 1760.0±138.7 | 1435.7±135.2 | 1269.7±130.5 | 1488.4±133.7 b | 2050.5±100.5 | 1815.5±100.5 | 1658.9±100.8 | 1841.6±100.6 b |
| Spring | 1376.5±216.9 | 1070.6±205.6 | 970.6±188.0 | 1139.2±203.3 b | 1495.5±110.0 | 1275.6±114.1 | 1129.5±111.1 | 1300.2±111.6 b |
| Summer | 4869.5±492.8 | 4264.9±512.9 | 4062.4±510.0 | 4398.9±504.6 a | 3779.8±376.6 | 3544.8±353.2 | 3384.8±366.4 | 3569.8±376.6 a |
| Autumn | 1042.6±202.1 | 839.7±153.2 | 664.6±146.9 | 849.0±166.7 b | 1334.4±244.4 | 1090.4±247.4 | 937.1±244.8 | 1120.7±245.2 b |
| Total | 9048.6 | 7610.9 | 6967.3 | 7875.6 | 8660.2 | 7726.4 | 7110.2 | 7832.3 |
| Annulay Ave. | 2262.1±345.7 | 1902.7±317.6 | 1741.8±312.1 | 1968.9±324.9 | 2165.1±229.1 | 1931.6±229.3 | 1777.6±228.4 | 1958.1±228.9 |

**The average numbers followed by the same letter within the same column indicate no significant differences.**

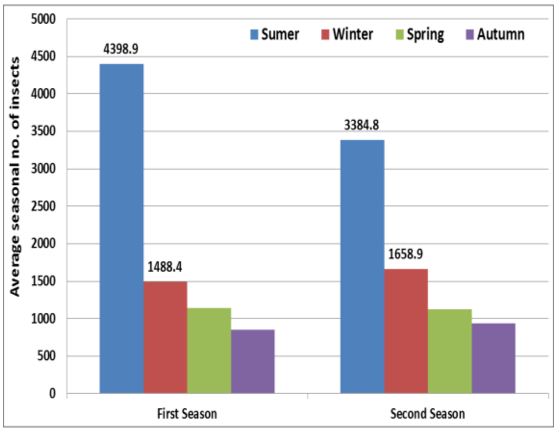



**Fig. 3. Seasonal distribution of *Kilifia acuminata* on mango trees during the two successive years of the study (2022/23) in Damietta Governorate.**

From the obtained results, it can be summarized that the summer season was the most favorable for *Kilifia acuminata* on mango trees.

Our findings are consistent with those of Kwaiz (1999), who observed the highest densities of the insect pest during late autumn and early summer, and Elwan (2007), who noted that the highest generation of the insect on mango trees occurred in autumn.

In contrast, studies by Salem (1994) in Al-Sharqia Governorate, Egypt, El-Dash (1997) in Shebin El-Kom, Egypt, and Kwaiz (1999) in Qalubyia, Egypt, reported significant differences in soft scale insect activity during the spring and autumn seasons. Additionally, Atalla *et al*. (2007), Elwan (2007), and Attia and Ramadan (2013) in Qalubyia Governorate, Egypt, mentioned that the insect pest had different peaks of abundance on mango trees, with the highest peaks recorded in the spring and autumn seasons. Awadalla *et al*. (2017) revealed that the highest average population density of *K. acuminata* on mango trees was recorded during the autumn season in the first year, while the highest was observed during the spring in the second year at Desouk district, Kafr El-Sheikh Governorate. El-Baradey *et al*. (2020) showed that the mango shield scale, *Milviscutulus mangiferae* (Green) (*K. acuminata*), occurred year-round on mango trees in Kafr El-Sheikh Governorate, Egypt, with two peaks of seasonal activity, both recorded in the autumn months across two years. They also noted that autumn's climatic conditions were more suitable for the activity and maximum population of *M. mangiferae*.

These differences may be attributed to variations in weather factors, particularly temperature and relative humidity, between Damietta and Qalubyia. The warmer conditions in Qalubyia during the spring are more favorable for this insect and other scale insects.

**Influence of the mango tree directions on distribution of *K. acuminata* population on mango trees:**

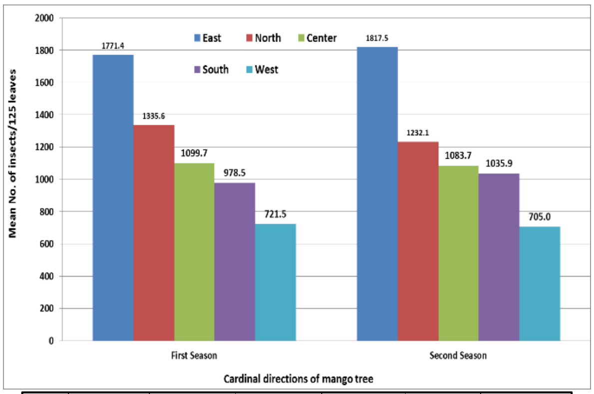
The data presented in Figures (4 and 5) demonstrate the effect of cardinal directions on the distribution of *K. acuminata* populations during the first (2022) and second (2023) years of the study. These data were derived from the original seasonal abundance data, where each mango tree was sampled in the four cardinal directions (north, south, east, and west) as well as the center. Each subsample from a direction was examined separately, and the data were then pooled to determine the seasonal abundance.

In the first year (2022), as shown in Figures (4 and 5), the highest population per sample of *K. acuminata* was recorded in the eastern direction of the mango tree, which formed the first category. The annual average number of insects in this direction was 1,771.4±236.0 insects per sample. This was followed by the north, center, and south directions, with average population densities of 1,335.6±241.5, 1,099.7±195.6, and 978.5±224.0 insects per sample, respectively. The lowest population was found in the western direction, with an average of 721.5±200.5 insects per sample (Figure 4).

The same trend was observed during the second year (2023), where the highest population per sample of *K. acuminata* was recorded in the eastern direction of the mango tree. The annual average number of insects in this direction was 1,817.5±199.6 insects per sample. This was followed by the north, center, and south directions, with average population densities of 1,232.1±161.7, 1,083.7±153.5, and 1,035.9±160.7 insects per sample, respectively. The lowest population was found in the western direction, with an average of 705.0±151.3 insects per sample (Figure 4).

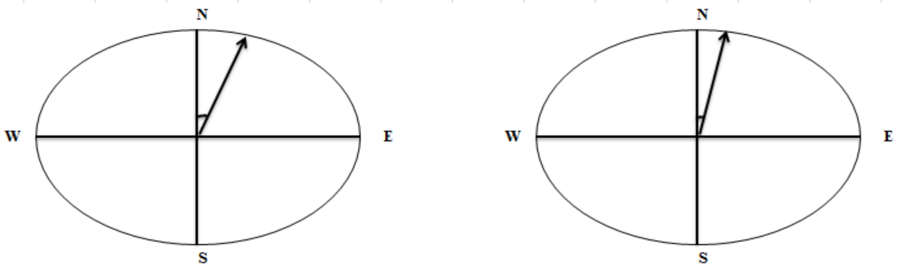
Statistical analysis revealed significant differences in the mean numbers of *K. acuminata* between the different directions of the mango tree. The least significant differences (LSD) at 0.05 were 617.3 and 465.9 insects in the first and second years, respectively. The southern direction of the mango tree harbored the highest numbers of this insect during both years of testing (Figure 4).

From Figure (5), it is clear that the soft scale insect *K. acuminata* was most concentrated in the area between the northern and eastern directions of the mango tree during both years of the study, forming an angle of 18.8° and 10.0° to the east.




| Season | East | North | Center | South | West | LSD 0.05 |
|---|---|---|---|---|---|---|
| First | 1771.4±236.0 a | 1335.6±241.5 ab | 1099.7±195.6 ab | 978.5±224.0 ab | 721.5±200.5 b | 617.3 insects |
| Second | 1817.5±199.6 a | 1232.1±161.7 b | 1083.7±153.5 b | 1035.9±160.7 b | 705.0±151.3 b | 465.9 insects |

**Fig. 4. Mean numbers of *K. acuminata* at different directions of mango tree during the first and second years in New-Damietta region. Means followed by the same letter are not significantly different.**




**Angle = 18.8º**
**First year 2022**

**Angle = 10.0º**
**Second year 2023**

**Fig. 5. Preferable cardinal directions of *K. acuminata* infestation on mango tree in the New Damietta region during 2022 and 2023.**

From the obtained results, it can be summarized that the northern and eastern directions were the most preferred for *K. acuminata* on mango trees. These findings may be attributed to the increased brightness of the sun in the southern direction, which causes the insects to move toward the opposite, northern direction.

The results align with those of Metwally (2017), who found that the most favorable direction for the population activity of the striped mealybug, *Ferrisia virgata*, on corn plants (shrub) and *Dracaena fragrans* was in the northeastern direction. The same author also revealed that the preferred direction for *P. citri* was in the northeastern part of the *C. variegatum* plant. In contrast, Awadalla *et al*. (2017) found that the highest average number of the soft scale insect *K. acuminata* was recorded in the southern direction during the two successive years. On the other hand, the lowest average number was observed in the northern direction. The statistical analysis indicated highly significant differences between the various directions during the two years of study in Desouk district, Kafr El-Sheikh Governorate.

**Influence of certain weather factors (Temp. ◦C and R.H. %) on the population density of the green soft scale insect, *Kilifia acuminate*:**

The simple correlation (r) and regression (b) coefficients between the daily mean temperature and the daily mean relative humidity, as well as the population density of the green soft scale insect, *K. acuminata*, during the first (2022) and second (2023) years, are presented in Table (2).

The correlation between the population of *K. acuminata* and the daily mean temperature was significantly positive in both the first and second years. The correlation coefficients (r) were 0.450 in 2022 and 0.495 in 2023, indicating a moderate positive relationship between temperature and the population density of the insect.

On the other hand, the correlation between relative humidity and the population of *K. acuminata* was non-significant and positive in both years. The correlation coefficients (r) were 0.231 in 2022 and 0.255 in 2023, suggesting a weak and statistically insignificant positive relationship between relative humidity and insect population density.

The partial regression data, as shown in Table (2), reveal the exact impact of each meteorological factor on the population of *K. acuminata*. These results followed the same pattern as the simple correlation coefficients. The total impacts of the daily mean temperature (°C) and relative humidity (R.H. %) on the total population of *K. acuminata* during the two years were 24.6% and 30.3%, respectively.

This analysis highlights the significant role of temperature in influencing the population density of *K. acuminata*, while the effect of relative humidity, although positive, was less pronounced and statistically non-significant.

**Table 2. Simple correlation and regression coefficients and explained variance (E.V.) between tested weather factors and biweekly means of *K. acuminata* populations during 2022 and 2023 in New-Damietta region.**

| Year | Factor | Simple correlation analysis | | Multiple regression analysis | | | | |
|---|---|---|---|---|---|---|---|---|
| | | r. | P. | b. | p. | "F" | Prob>F | E.V. |
| 2022 | Temp. ◦C | 0.450 | 0.028 | 101.05 | 0.031 | 3.42 | 0.052 | 24.60% |
| | R.H. % | 0.231 | 0.277 | 102.11 | 0.283 | | | |
| 2023 | Temp. ◦C | 0.495 | 0.014 | 85.12 | 0.014 | 4.57 | 0.022 | 30.30% |
| | R.H. % | 0.255 | 0.228 | 49.86 | 0.199 | | | |

These findings align with those reported by Dent (1991), who stated that seasonal insect population dynamics, the number of generations, and overall abundance are influenced by environmental factors at a given location. Similarly, Kwaiz (1999) in Egypt observed that *Kilifia acuminata* populations were at their lowest densities in mid-April and August during the first year of study, while in the second year, the lowest densities occurred in early September, early May, and mid-August. Bakry (2009) further supported these findings, reporting that multiple regression analysis demonstrated that maximum temperature, minimum temperature, and relative humidity collectively influenced fluctuations in *K. acuminata* populations. The explained variance (%E.V.) of these factors was 70.7% and 13.6% in the first year, and 46.9% and 9.8% in the second year for the first and second generations, respectively. These results suggest that weather factors had a more pronounced effect on the insect population during the first generation. Attia and Radwan (2013) reported that the activity period of *K. acuminata* (Green) coincided with the phenology of mango trees, with peak abundance observed from October to December during periods of strong vegetative growth, and again in April, coinciding with flowering and early fruiting. Similarly, Hassan *et al*. (2012) found that abiotic factors, including temperature (°C), relative humidity (%RH), and light intensity (Lux), significantly influenced the total number of active insect stages over two years. Their study recorded total effects of 84.17% and 38.30% in the upper tree canopy and 85.87% and 43.76% in the lower canopy, respectively, in mango orchards of Inshas El-Raml, Sharkia Governorate, Egypt. El-Baradey *et al*. (2020) also documented the year-round presence of *Milviscutulus mangiferae* (*K. acuminata*) populations in Kafr El-Sheikh Governorate, Egypt, with two seasonal activity peaks per year, both occurring in autumn. The favorable climatic conditions of the autumn months were associated with increased insect activity and the highest abundance of total living stages. Additionally, the impact of weather factors, including daily mean maximum and minimum temperatures and relative humidity, was found to have a highly significant effect on *M. mangiferae* populations over two consecutive years. The explained variance (%E.V.) for these environmental variables accounted for 88.08% and 76.60% of population variability in 2016/2017 and 2017/2018, respectively, indicating a strong correlation between climatic conditions and population dynamics. Similar findings were reported for another scale insect, *C. floridensis*. Helmy *et al*. (1986) observed that population density exhibited strong correlations with abiotic factors, particularly temperature and relative humidity, when considering monthly variations. Farag *et al*. (2014) further supported these results, reporting that an increase in *C. floridensis* nymph numbers was directly associated with rising mean monthly temperatures.

**Influence of the predatory insects on the population density of the green soft scale insect *Kilifia acuminate*:**

During the two-year investigation period, from January 2022 to December 2023, three parasitoids were recorded in association with *K. acuminata*. These parasitoids belonged to the order *Hymenoptera* and included *Encarsia* sp. and *Coccophagus* sp. (Family: Aphelinidae), as well as *Metaphycus* sp. (Family: Encyrtidae).

The simple correlation (r) and regression (b) coefficients between *K. acuminata* population density and the parasitoid populations during 2022 and 2023 are presented in Table (3). Statistical analysis indicated a non-significant correlation between *K. acuminata* and all examined parasitoid species during both years of study.

Partial regression data in Table (3) further illustrate the precise impact of these parasitoids, following the same trend as the simple correlation coefficient. The total influence of parasitoids on *K. acuminata* populations was estimated at 4.1% in the first year and 6.2% in the second year.

**Table 3. statistical data on the correlation, regression coefficients, and explained variance (E.V.) between predatory insects and the biweekly population means of *K. acuminata* during 2022 and 2023 in New-Damietta region**

| Year | Factor | Simple correlation analysis | | Multiple regression analysis | | | | |
|---|---|---|---|---|---|---|---|---|
| | | r. | P. | b. | p. | "F" | Prob>F | E.V. |
| 2022 | Parasitoids | 0.203 | 0.342 | 148.1 | 0.342 | 0.94 | 0.342 | 4.10% |
| 2023 | Parasitoids | 0.249 | 0.241 | 104.76 | 0.241 | 1.45 | 0.241 | 6.20% |

Similar findings were reported by Hassan *et al*. (2012), who recorded *Metaphycus* sp. and *Coccophagus* sp. as parasitoids of *Kilifia acuminata* on mango trees in Inshas El-Raml district, Sharkia Governorate, Egypt. Similarly, Salem (1994) reported that a hymenopterous parasite belonging to the family Encyrtidae was more closely associated with *K. acuminata* in Egypt. The percentages of parasitism on this insect were low during both seasons, with the parasite exhibiting one to four periods of activity. Abd-Rabou (2002) noted that *Coccophagus bivittatus* Compers was recorded as a parasitoid of *K. acuminata* in Giza Governorate, while *Diversinervus elegans* Silvestri was found parasitizing the same scale insect in Ismailiya, Sharqiya, and Beheira Governorates (Abd-Rabou *et al*., 2001). Additionally, Atalla *et al*. (2007) recorded the Aphelinid parasitoid *Coccophagus* sp. and the Encyrtid parasitoid *D. elegans* Silvestri on *K. acuminata* infesting mango trees in Qalyubia Governorate. Our results are partially supported by previous studies. Maximum, minimum, and average temperatures showed a highly significant positive effect on the population density of *Icerya aegyptiaca*, *Icerya seychellarum*, *Rodolia cardinalis*, and *Chrysoperla carnea* (Awadalla, 2013). Temperature also played a crucial role in the development of *Planococcus citri*, where lower temperatures increased the size of the mealybug and prolonged its developmental period (Ahmed and Abd-Rabou, 2010). Additionally, the population densities of *I. seychellarum* were significantly affected by fluctuations in both temperature and relative humidity across different host plants, including sago palm (El-Borollsy *et al*., 1990), mulberry (Osman, 2005), mango (Attia and Youssef, 2017), and citrus (Moustafa, 2012). However, our findings contradict those of other studies (Zaki *et al*., 2013; Abdel-Rahman *et al*., 2007). These variations are difficult to explain, as multiple climatic factors may interact, influencing seasonal effects and altering insect population dynamics.

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# تأثير أصناف المانجو المختلفة على الكثافة العددية لحشرة المانجو القشرية في محافظة دمياط

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## الملخص

تُعد حشرة المانجو القشرية الرخوة ، التابعة لعائلة الحشرات القشرية الرخوة ورتبة متشابهة الأجنحة ، من أكثر الآفات تدميرًا لأشجار المانجو في مصر. تهدف هذه الدراسة إلى تقييم تأثير الأصناف المختلفة من أشجار المانجو على ديناميكيات تعداد تلك الآفة في بساتين المانجو بمنطقة دمياط الجديدة خلال عامي 2022 و 2023. كما تم تحليل تأثير الأعداء الطبيعية والعوامل المناخية، بما في ذلك متوسط درجة الحرارة °م، الرطوبة النسبية (%) ، الإتجاهات الأصلية لشجرة المانجو، وأيضًا تأثيرالتغيرات الموسمية على تعداد تلك الآفة. كشفت النتائج عن اربعة ذُروات سنوية لتعداد تلك الآفة، حيث سُجلت في في شهور فبراير، مارس، أغسطس، وديسمبر في السنة الأولى، وفي شهور فبراير، مارس، يونيو، وأغسطس في السنة الثانية على مختلف أصناف المانجو. وبلغت أعلى معدلات الإصابة خلال فصل الصيف، بمتوسط كثافة 4398.9±504.6 و 3569.8±376.6 فردًا لكل 125 ورقة خلال العامين الأول والثاني من الدراسة، على التوالي، في حين سُجلت أدنى الكثافات خلال فصل الشتاء. أظهرت التحليلات الإحصائية أن تعداد تلك الآفة تأثر بشكل كبير بكل من الأعداء الطبيعية ومتوسط درجة الحرارة اليومية، بينما لم يكن للرطوبة النسبية تأثير معنوي .كما تبين أن هذه الآفة تفضل الاتجاه الجنوبي لأشجار المانجو. والأهم من ذلك، أن التغيرات في تعداد الحشرة وتعداد أعدائها الطبيعيين كانت متزامنة طوال فترة الدراسة. توفر هذه النتائج رؤى هامة حول الدورات الموسمية والتفاعلات البيئية لحشرة المانجو القشرية البيضاء، مما يساهم في تطوير استراتيجيات فعالة للإدارة المتكاملة للآفة في بساتين المانجو بمصر. التحليل الإحصائي أظهر أن أعداد تلك الآفة تأثرت بشكل كبير بمتوسط درجات الحرارة اليومية، بينما لم يكن للرطوبة النسبية أو الطفيليات الحشرية تأثير كبير. بالإضافة إلى ذلك، أظهرت الحشرة تفضيلًا للاتجاه الشمالي لشجرة المانجو. تقدم هذه النتائج رؤى قيمة حول الاتجاهات الموسمية والتفاعلات البيئية لحشرة المانجو القشرية الرخوه، مما يسهم في تطوير استراتيجيات فعالة للإدارة المتكاملة لتلك الآفة في بساتين المانجو في مصر.