The Influence of Bunches Thinning and Pesticides on Some Traits and the Rate of Infection with Lesser Date Moth in Date Palm

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Abstract. The experiment was carried out in one of the private palm orchards infested with the lesser date moth (Batrachedra amydraula Meyrick) in the village of AL-Buali AL-Jassim 8 km northwest of Ramadi during the season 2020, with the aim of studying the influence of bunches thinning and pesticides on some of physical and chemical and productivity and rate of infection with lesser date moth on date palm. The results revealed that the thinning factors C1(6 bunch) and C2 (8 bunch) date palm-1 reduce rate of infestation of the lesser date moth after 14 days of spraying pesticides at rates of 20.80 and 23.10% compared to the control treatment (28.30%). The pesticide A2 (Matrixine plus) outperformed in reducing the rate of infection after 7, 14, 21 days with an average of 6.34, 16.10, and 26.10% respectively, these rates were increased in the control treatment (11.88 and 31.30 and 61.90%) respectively. On the other hand, treatments 6 and 8 bunch outperformed the control treatment in terms of fruit setting, increased ripening rate and reduced khalal ratio, with rates of (76.33 and 73.78%), (50.00 and 50.11%), and (50.00 and 50.00%) respectively. The results confirmed that there were no significant differences between the thinning treatments on the total yield between treatments and their interactions. When using the pesticide A2, it caused a significant increase in the rate of ripening and a decrease in the percentage of khalal with rates of 56.22 and 43.78% respectively. The results indicate outperformed of the thinning treatment C2 and pesticide treatment A2 in phosphor, nitrogen, and potassium percent in fruits with an average of (0.0806,0.0820%), (0.4022,0.3989%), and (0.6856,0.6933%) respectively. These values decreased in the control treatment by rates of (0.0766 and 0.0750%), (0.3767 and 0.3767%), and (0.6422 and 0.6356%) respectively.

1. Introduction
Date palm (Phoenix dactylifera L.) considered to be one of the oldest fruit crops known around world, Date palm trees can grow well in sever environmental conditions [1]. It's one of the important food and vegetable crops that grow well in hot and arid regions. It is believed that it originated in Mesopotamia (Iraq), then it moved from Mesopotamia to the rest of the world [2]. The fruits of the date palm are infected by many insect pests, including lesser date moth Batrachedra amydraula Meyrick, whose larvae feed on young fruits and continues until the later stages, and infected fruits become dry and red in color [3]. Improving the quality of palm fruits, including increasing their
weight and size, is a primary objective, and for this, several techniques have been used, including the thinning process, either by hand or using chemicals [4]. Previous studies confirmed that all the treatments of thinning of strand or bunch, led to a significant increase in all physical characteristics of the fruits [5]. Studies have shown that the process of thinning the strands of the bunch led to an increase in the fruits content of the chemicals due to the increased exposure to light as a result of the decrease in the density of the fruits, as light plays an important role in the photosynthesis process [6]. Latifian [7] confirmed that removing some of the bunches, especially the infected and broken ones, reduced the damage caused by pests and diseases, including lesser date moth, it did not show an increasing effect on the severity of the damage caused by it in any way. The use of pesticides is one of the methods used to control the lesser date moth to reduce the damage caused by it [8]. Previous studies have proven that the timely application of pesticides and the use of natural enemies of pests, which have special characteristics, such as low toxicity to humans and animals and the absence of damage to plants leads to the success of the control [9]. Some pests develop resistance to pesticides, so we should not rely on chemical pesticides as short-term solutions against date palm pests. In order to avoid the risks of residues in fruits and to maintain the ecological balance and to reduce the use of pesticides, it is necessary to implement an integrated pest management [10]. Oleiwi et al. [11] showed the possibility of using the pesticide Matrixine plus in combination with agricultural operations to reduce the rate of the infestation of the lesser date moth on palm, as the lowest rate of infection on the fallen fruits was 2.5% after 14 days of treatment. The current study aims to evaluate the efficiency of the bunch thinning and the use of lesser date moth pesticides, and the integration between them on the rate of infection with the lesser date moth insect, and the percentage of fruit set, ripening, yield and fruits content of the basic elements of the date palm variety Khastawi in the Ramadi Jazira area of Anbar Governorate during the season 2020.

2. Materials and Methods

The experiment was carried out in one of the private palm orchards infested with the lesser date moth in the region of Al-Bualy AL-Jassim 8 km northwest Al-Ramadi during growing season 2020. Twenty-seven palm trees were selected as homogeneous as possible and 8 years old. A factorial experiment (3×9) was carried out within the randomized block design (RCBD) with two factors: The first factor, bunch thinning. (C) The thinning process was carried out ten days after the pollination process (without thinning, 6 bunch, and 8 bunch thinning) and designated (C0, C1 and C2) respectively. The second factor is the spraying of pesticides (A), which are as follows:

1- Spray water only without pesticide (A0).

2- Karate Zeon 10 CS pesticide (0.25 ml/litre of water recommended concentration) produced by the Swiss company Syngenta and symbolized by A1 (the active substance (Lambda - cyhalothrin) received from the Ministry of Agriculture (National Committee for the Registration and Approval of Pesticides).

3- Matrixine plus EC pesticide (0.3 / litre of water - recommended concentration) is a product of the British company Russel and has the symbol A2 (the active substance consists of two substances Abamectine 5% + Oxymatrine 2.4%). Two sprays, the first to target the first generation of the insect in the Hababuk stage ten days after the completion of the pollination, and the second spray to target the second generation at the Kamri stage a month after the first spray. Spraying were conducted in the early morning.

The results were statistically analyzed according to the randomized complete block design, and the means were compared using the least significant difference (LSD) at the 5% probability level using GenStat v12.1 program.

2.1. Study the effect of bunches thinning or pesticides and the interaction between them on the infection with lesser date moth
The appearance of lesser date moth larvae was monitored in the Hababuk stage and no infection was observed on the fallen fruits or the fruits on the palm, and the infection began to appear in the Kamri stage. The samples were taken 7, 14 and 21 days after the spraying process by collecting the fallen fruits under the palm each time and counting the number of infected and uninfected fruits [2].

2.2. Studying the effect of bunches thinning and pesticides and the interaction between them on some physical properties of fruits

1. Percent of fruit setting 2. Ripening percent and Khalal percent

2.3. Studying the effect of bunches thinning and pesticides and the interaction between them on the percentage of elements in fruits

The effect of thinning and pesticides treatments on the percentage of elements in the fruits at the ripening stage was studied, as ten fruits were selected from each palm tree and dried and chemical analyses were conducted on them according to the method described in [12].

1. Total P % 2. Total N % 3. Total K %

3. Results and Discussion

3.1. A study of the effect of bunches thinning and pesticides and the interaction between them on the rate of infestation of the lesser date moth

Monitoring of the appearance of the lesser date moth larvae continued after the completion of the pollination process in the hababok stage through infecting the fruits, and the date palm lesser date moth is nocturnal and depends on the accumulated thermal units that are mainly affected by the environmental conditions during the development period of the larvae, no infection was observed at that time because of the extreme weather conditions, especially the low night temperatures of 16°C, which reduce egg laying, hatching and fertility [13]. This is consistent with what was mentioned by [14] that temperature has a major role in influencing the biological, morphological and taxonomic characteristics of the lesser date moth.

The results showed in Table (1) that the effect of thinning treatments on the infection rate did not show significant differences on the infection rate after 7 days of spraying. While the pesticides showed a significant superiority on the infection rate after 7 days of spraying. The treatment of Matrixine plus was significantly superior to the rest of the treatments, which recorded the lowest infection rate of 6.34%, followed by the treatment of Karate Zeon which scored 10.67% and did not differ from the control treatment, which recorded 11.88%. The results indicate non-significant effect of the interaction on the infection rate after 7 days of spraying.

Table 1. Effect of bunches thinning and pesticides on the infection rate (%) by lesser date moth after 7 days from spraying

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|---------------|-------------|---------------|-----------------|
| Without thinning    |                   | 11.07         | 12.45       | 7.96          | 10.49           |
| Thinning 6 bunches  |                   | 13.19         | 9.83        | 6.55          | 9.86            |
| Thinning 8 bunches  |                   | 11.37         | 9.72        | 4.52          | 8.54            |
| Mean of pesticides  |                   | 11.88         | 10.67       | 6.34          |                 |

LSD at 0.05 Thinning of bunch N.S pesticides Interaction N.S 2.837

3.2. A study of the effect of bunches thinning and pesticides and the interaction between them on the rate of infestation of the lesser date moth after 14 days

The results in Table (2) showed that there were significant differences between the levels of bunches thinning on the infection rate after 14 days of spraying, where the two thinning treatments 6 and 8 bunches were significantly superior to the control treatment by giving them the lowest infection rate of 20.80 and 23.10%, respectively. The results also indicated in the same table that there were significant
differences between the pesticides on the infection rate after 14 days of spraying. The Matrixine plus treatment recorded the lowest infection rate of 16.10%, which outperformed the Karate Zeon treatment, which recorded 24.80%, which in turn was significantly superior to the control treatment, which gave a percentage of 31.30%. The results indicate non-significant effect of the interaction on the infection rate after 14 days of spraying.

Table 2. Effect of bunches thinning and pesticides on the infection rate (%) by lesser date moth after 14 days from spraying

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|---------------|------------|---------------|-----------------|
| Without thinning    |                   | 38.40         | 27.80      | 18.70         | 28.30           |
| Thinning 6 bunches  |                   | 28.10         | 22.20      | 12.10         | 20.80           |
| Thinning 8 bunches  |                   | 27.60         | 24.50      | 17.40         | 23.10           |
| Mean of pesticides  |                   | 31.30         | 24.80      | 16.10         |                 |
| LSD at 0.05         | Thinning 5.38     | Pesticides 5.38 | Interaction | N.S           |                 |

3.3. A study of the effect of bunches thinning and insecticides and the interaction between them on the rate of infestation of the lesser date moth after 21 days

The results showed in Table 3 that there were no significant differences between the thinning treatments on infection rate after 21 days of spraying. The results also indicated that there were significant differences between the pesticide treatments on the percentage of infection, where the Matrixine plus treatment gave the lowest infection rate of 26.10%, which differed significantly from the treatment of Karate Zeon, which recorded 49.70%, which in turn differed significantly from the control treatment with infection rate of 61.90%. The results indicate non-significant effect of the interaction on the infection rate after 21 days of spraying.

Table 3. Effect of bunches thinning and pesticides on the infection rate (%) by lesser date moth after 21 days from spraying

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|---------------|------------|---------------|-----------------|
| Without thinning    |                   | 64.80         | 56.80      | 31.50         | 51.00           |
| Thinning 6 bunches  |                   | 62.30         | 45.00      | 21.50         | 42.90           |
| Thinning 8 bunches  |                   | 58.50         | 47.40      | 25.50         | 43.80           |
| Mean of pesticides  |                   | 61.90         | 49.70      | 26.10         |                 |
| LSD at 0.05         | Thinning N.S      | Pesticides 9.20 | Interaction | N.S           |                 |

The results showed (Table 2) that there are clear differences between the thinning treatments on the rate of infection with the lesser date moth after 14 days of spraying due to increase ventilation, and exposure to light, and this is consistent with [15] that the process of bunch thinning reduces the chances of pest infestation including lesser date moth. The results in Table 1, 2, 3 showed a significant superiority of Matrixine plus on the infection rate over the rest of the pesticides due to the repellent and anti-feeding effect of this pesticide in addition to its effect on the insect nervous system [16], and this pesticide contains two active substances, Oxymatrine, which has a rapid effect on the pest, and its effect on the physiological functions of the insect and impedes the metabolism process and thus leads to an imbalance in feeding the larvae, which affects their growth. The second substance is
Abamectine, which affects the immature stages of the insect’s life, affecting its nervous system, stopping the movement and activity of the insect and thus stopping feeding and laying eggs. This agrees with [17] that most plant insecticides affect the early stages of the insect's life.

The results indicated in Table 2.3 the superiority of the insecticide Karate Zeon treatment over the control treatment on the infection rate after 14 and 21 days of spraying, since all pyrothroids, including Karate Zeon, block acetylcholine, nicotine and gamma butyric acid receptors in insect neurons, leading to hyper excitability of the nervous system, irritation of the respiratory muscles and inhibition of its functions, which leads to the death of the insect [18].

3.4. Studying the effect of the level of the process of thinning the taste and pesticides and their integration on some physical characteristics of the fruits

3.4.1. Percentage of the fruit set (%)
The results indicated that the thinning factor 6 and 8 bunches did not differ significantly in the percentage of fruit set (Table 4), with a rate of 76.33 and 73.78% respectively, but they were significantly superior to the control treatment without thinning, which gave the lowest fruit set rate of 70.44%. The results showed in the same table indicate that there were no significant differences between the treatments of the type of pesticide and the interaction between the two factors on the percentage of fruit set.

Table 4. Effect of bunches thinning and pesticides on percentage of fruit set (%)

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|----------------|-------------|---------------|-----------------|
| Without thinning    |                   | 69.67          | 75.67       | 66.00         | 70.44           |
| Thinning 6 bunches  |                   | 74.00          | 76.67       | 78.33         | 76.33           |
| Thinning 8 bunches  |                   | 71.33          | 75.00       | 75.00         | 73.78           |
| Mean of pesticides  |                   | 71.67          | 75.78       | 73.11         |                 |

LSD at 0.05       Thinning Pesticides N.S Interaction N.S
4.286  N.S

3.4.2. Percentage of the ripening (%)
The results showed that the thinning factor 6 and 8 bunches did not differ significantly in the rate of ripening at rates (50.00% and 50.11%), but they were significantly superior to the control treatment (without thinning) which gave the lowest rate of ripening amounted to 45.33% (Table 5). The results in the same table showed that the treatment of Matrixine plus was significantly superior to the rest of the treatments in increasing the ripening rate at a rate of 56.22%. The control gave the lowest rate of 38.44%. Whereas, the interaction between the study factors did not show significant differences on the ripening rate of the fruits.

Table 5. Effect of bunches thinning and pesticides on percentage of fruit ripening (%)

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|----------------|-------------|---------------|-----------------|
| Without thinning    |                   | 35.33          | 46.33       | 54.33         | 45.33           |
| Thinning 6 bunches  |                   | 38.67          | 53.67       | 57.67         | 50.00           |
| Thinning 8 bunches  |                   | 41.33          | 52.33       | 56.67         | 50.11           |
| Mean of pesticides  |                   | 38.44          | 50.78       | 56.22         |                 |

LSD at 0.05       Thinning Pesticides 4.135 Interaction N.S
4.135  N.S
3.4.3. Khalal Percentage (%)

The results presented in Table 6 indicates that thinning factors 6 and 8 bunches did not differ significantly in the Khalal percentage and gave the lowest rate of (50.00% and 50.00%) respectively and significantly superior to the control treatment without thinning which gave the highest rate of Khalal 54.67 %. The results confirm that the treatment of Matrixine plus was significantly superior to the rest of the treatments in reducing the Khalal rate at a rate of 43.78%, while the control gave the highest rate of 61.67%. The results showed that there were significant differences between the interaction treatments on reducing the Khalal rate, as the two treatments Matrixine plus + thinning 8 and 6 bunches gave the best values to reduce the Khalal rate with rates of 43.33 and 42.33%) respectively, while the control gave the highest rate of Khalal 64.67%.

| Thinning of bunches | Type of pesticide | Spraying water | Karate Zeon | Matrixine plus | Mean of thinning |
|---------------------|-------------------|---------------|-------------|---------------|-----------------|
| Without thinning   |                   | 64.67         | 53.67       | 45.67         | 54.67           |
| Thinning 6 bunches |                   | 61.33         | 46.33       | 42.33         | 50.00           |
| Thinning 8 bunches |                   | 59.00         | 47.67       | 43.33         | 50.00           |
| Mean of pesticides |                   | 61.67         | 49.22       | 43.78         |                 |

LSD at 0.05 Thinning 4.083 Pesticides 4.083 Interaction 7.072

The effect of bunches thinning 6 and 8 bunches on of the percentage of the fruit set, ripening, and the percentage of Khalal (Table 4, 5, and 6) is due to decreased competition between fruits for nutrients and to the increase in the ratio between leaves to bunches, which results in an increase in nutrients and an accumulation inside the fruits and utilization of them in vital processes and the formation of degrading enzymes, including Invertase and Cellulase, known for their activity in the softness of the cell wall of the cells of fruits, which leads to an increase in their freshness and ripening, as well as natural production of ethylene inside the fruits [5][19][20].

The pesticide Matrixine plus showed a significant superiority on the rate of ripening and the percentage of Khalal because this pesticide contains two active substances (Oxymatrine, Abamectine) that prevent the insect from feeding on the contents of the fruits and affect their early stages and prevent their growth, which is reflected on the characteristics of the fruits [13].

3.4.4. Total yield (kg)

The results of the statistical analysis confirmed that there were no significant differences between the thinning treatments, pesticide treatments, and the interaction between them on the trait of the total yield (Table 7). Whereas, the treatments 8 bunches, Matrixine plus and Karate Zeon + 8 bunches gave the best averages of total yield (196.6, 181.6 and 205.9 kg) respectively, while the control treatments gave the lowest values of 175.3, 173.1 and 174.0 kg respectively.

| Thinning of bunches | Type of pesticide |
|---------------------|-------------------|
|                     | Spraying water    | Karate Zeon | Matrixine plus |
| Without thinning   | 174.0             | 174.8       | 177.1          | 175.3           |
| Thinning 6 bunches | 155.1             | 131.6       | 173.8          | 153.5           |
| Thinning 8 bunches | 190.1             | 205.9       | 193.9          | 196.6           |
| Mean of pesticides | 173.1             | 170.8       | 181.6          |                 |

LSD at 0.05 Thinning N.S Pesticides N.S Interaction N.S
The results of the statistical analysis in Table (7) confirmed that there were no significant differences between the thinning and pesticide treatments, and the interaction between them on the characteristic of the total yield. Whereas, the treatments thinning 8 bunches, Matrixine plus, Karate Zeon + 8 bunches gave the best averages of total yield, which amounted to (196.6, 181.6 and 205.9 kg) respectively. Whereas, the control treatments gave the lowest values (175.3, 173.1 and 174.0 kg), respectively. The reason is due to the increased bunch retention of fruits and the increase in the individual weight of the fruits as a result of the increased supply of nutrients manufactured by leaves, this explains the role of moderate bunch thinning in providing the greatest amount of nutrients for bunches and providing good lighting and ventilation [5].

3.5. Studying the effect of the level of thinning process and pesticides and the interaction between them on some chemical properties of palm fruits.

3.5.1. Percentage of phosphorus in fruits (%)
The study factors of the bunch thinning and pesticides had a significant effect on some characteristics of date palm, whether alone or interaction. Where the results showed that the effect of the thinning treatments was significant on the percentage of phosphorus in the fruits (Table 8), where the treatment thinning 8 bunches recorded the highest rate of 0.0806%, which outperformed the rest of the treatments, followed by the treatment of thinning 6 bunches, which recorded 0.0786%, which in turn differed significantly from the control treatment, which recorded the lowest rate of 0.0766%. In addition, the factor of using different types of pesticide, the results confirmed that the treatment of the pesticide Matrixin plus was significantly superior to the rest of the treatments, which gave the highest value of the phosphorous percentage in the fruits amounted to 0.0820%, followed by the treatment of the pesticide Karate Zeon (0.0790%), which significantly differed from the control treatment which recorded the lowest value of 0.0750%.

Table 8. Effect of bunches thinning and pesticides and interaction between them on Percentage of phosphorous in fruits (%)

| Thinning of bunches | Type of pesticide | Mean of thinning  |
|---------------------|-------------------|------------------|
|                     | Spraying water    | Karate Zeon      | Matrixine plus |
| Without thinning    | 0.0733            | 0.0770           | 0.0796         | 0.0766 |
| Thinning 6 bunches  | 0.0743            | 0.0783           | 0.0833         | 0.0786 |
| Thinning 8 bunches  | 0.0773            | 0.0816           | 0.0830         | 0.0806 |
| Mean of pesticides | 0.0750            | 0.0790           | 0.0820         |        |

LSD at 0.05   Thinning Pesticides 0.0016 Interaction N.S

3.5.2. Percentage of nitrogen in fruits (%)
The results in Table 9 showed a significant superiority of the thinning 8 bunches treatment on the nitrogen percentage in the fruits, which gave the highest rate of 0.4022%, which differed significantly from the thinning 6 bunches treatment, which gave an average of 0.3911%, which differed significantly from the control treatment, which gave the lowest rate of 0.3767%. As for the effect of the type of pesticide on the nitrogen percentage, treatment Matrixin plus recorded the highest nitrogen ratio (0.3989%), which differed significantly from the rest of the treatments, followed by treatment Karate Zeon, which recorded a percentage of 0.3944%, which in turn was significantly superior to the control treatment which recorded the lowest rate of 0.3767%. Whereas, the interaction between the two factors of the study, it did not show any significant differences on the percentage of nitrogen in the fruits.
Table 9. Effect of bunches thinning and pesticides and interaction between them on Percentage of nitrogen in fruits (%)

| Thinning of bunches | Type of pesticide       | Mean of thinning |
|---------------------|-------------------------|------------------|
|                     | Spraying water          | Karate Zeon      | Matrixine plus |               |
| Without thinning    | 0.3667                  | 0.3833           | 0.3800         | 0.3767        |
| Thinning 6 bunches  | 0.3733                  | 0.3900           | 0.4100         | 0.3911        |
| Thinning 8 bunches  | 0.3900                  | 0.4100           | 0.4067         | 0.4022        |
| Mean of pesticides  | 0.3767                  | 0.3944           | 0.3989         |               |

LSD at 0.05
Thinning 0.0088
Pesticides 0.0088
Interaction N.S

3.5.3. Percentage of potassium in fruits (%)
The results indicate that there were significant differences between the different thinning treatments on the potassium percentage in the fruits (Table 10). Where the results showed that the thinning treatment 8 bunch significantly outperformed the rest of the treatments by giving highest value of 0.6856%, followed by treatment thinning 6 bunch which gave a value of 0.6667%, which outperformed the control treatment 0.6422%. The effect of the pesticide type on the phosphorous ratio indicates that the treatment Matrixine plus recorded the highest potassium rate of 0.6933%, which differed significantly from the rest of the treatments, followed by treatment Karate Zeon which recorded a rate of 0.6656%, which in turn was significantly superior to the control treatment, which recorded the lowest rate of 0.6356%. Whereas, the interaction between the two factors of the study, it did not show any significant differences on the percentage of nitrogen in the fruits.

Table 10. Effect of bunches thinning and pesticides and interaction between them on Percentage of potassium in fruits (%)

| Thinning of bunches | Type of pesticide       | Mean of thinning |
|---------------------|-------------------------|------------------|
|                     | Spraying water          | Karate Zeon      | Matrixine plus |               |
| Without thinning    | 0.6133                  | 0.6467           | 0.6667         | 0.6422        |
| Thinning 6 bunches  | 0.6400                  | 0.6667           | 0.6933         | 0.6667        |
| Thinning 8 bunches  | 0.6533                  | 0.6833           | 0.7200         | 0.6856        |
| Mean of pesticides  | 0.6356                  | 0.6656           | 0.6933         |               |

LSD at 0.05
Thinning 0.0165
Pesticides 0.0165
Interaction N.S

The effect of the thinning on the chemical properties presented in Tables 8-9-10 is due to increasing the photosynthesis process, increasing absorption from the soil and increasing the leaves that feed the bunches. Thus, it provides large amounts of nutrients to the fruits, and exposure of the fruits to sunlight makes them healthy and reduces infection. This is reflected in the quality of the fruits and the increase in their chemical content, as the improvement in chemical characteristics was associated with the removal of the number of bunches, [6] [16] [21] [22].

The results in the same tables showed the superiority of the pesticide Matrixine plus in these studied characteristics, and this is due to the effect of this pesticide in reducing the rate of infection of the lesser date moth as a result of preventing it from feeding on the contents of the fruits and completing its development and thus its death, which is reflected on the characteristics of the fruits [13].
4. Conclusion
The results confirmed that moderate thinning of the fruits when treated with 8 bunches gave the best yield in quantity and quality and reduced the infestation of the lesser date moth, so it is recommended to make thinning of the fruits instead of removing the entire bunches, and since the pesticide Matrixine plus reduced the rate of infection after 7, 14 and 21 days of spraying, this was reflected in some of the characteristics of the fruits, so a conclusion can be drawn about the use of pesticides of plant origin as an effective alternative in the control of lesser date moth on palms.

References
[1] Iubied, IA, and Hamzah HA 2019, Effect of pollen Grains and Growth Regulator NAA on some fruit characterization of Date Palm Phoenix Dactylifera L. Cultivar. Sultani. Al-Qadisiyah Journal for Agriculture Sciences 9(1), 136-142.
[2] Metwally, HAA, and Basheer AM 2019, Sensitivity of Some Date Palm Cultivars to Infestation with Lesser Date Moth Batrachedra amydraula. World Journal Agricultural Sciences 15(5): 310-316.
[3] Ali, AA, and Hama NN 2016, Integrated management for major date palm Pests in Iraq. Journal of Food and Agriculture 28(1), 24-33.
[4] Awad, MA, and Al-Qurashi AD 2015, Influences of different whole bunch removal or bunch thinning treatment on yield and fruit quality of three date palm cultivars. Journal Wulfenia Klagenfurt Austria 22(2), 1561-882X.
[5] Mukhtar, SA, and Ali AM 2019, Bunch and different types of strand thinning effects on yield and fruit characteristics of Barhee date palm cultivar under River Nile state condiation sudan. Shendi University Journal of Applied Science 1,14-18.
[6] Hussain, Ahmad IS, Amjad M, and Ahmed R 2016, Execution of strands thinning improves the phytochemicals and sugars profiling in date palm (phoenix dactylifera L.) fruit. Pakistan Journal of Pharmaceutical Sciences 29(4), 1209-1215.
[7] Latifian, M 2011, The effects of bunch management to reduce pests and diseases of date palm fruits. Agricultural Research, Education and Extension Organization 188 publication 211 citations doi:10.13140/RG.2.2.18327.98729.
[8] Al-Khatri, Al-Abri SN, Al-Aufi M, Al-Busaidi A, Al-Hamadani A, Al-Yahmadi R, Al-Khumaisi M, Al-Hasani M, and Mohamed Ben Salah 2017, Efficiency of some insecticides against Lesser Date Moth, Bartachedra amydraula. International Center for Agricultural Research in the Dry Areas (ICARDA).
[9] Ali, HM, and Phaid KA 2019, Field efficacy of pesticides against dust mites Oligonychus afrasiaticus on date palm, Hillawi cultivar. Basrah Journal of Agricultural Sciences 32(2),160-168.
[10] Abdel-Samad, SSM, Hala A, and Abbas MK 2019, A New strategy for controlling three devastating pests attacking date palm plantations in El bahariya and siwa oases, Egypt through using a special group of natural enemies. Egyptian Journal of Agricultural Research 97(1).
[11] Oleiwi, KA, Ibade KW, and Farhan DD 2020, Effect of fertilizer’s type and insecticides individual and combined against Bartachedra amydraula Meyrick on a date palm. International Journal of Agricultural and Statistical Sciences 16(1), 1571-1575.
[12] AOAC 1980, Official Methods of Analysis 13th Ed. Association of Official Analytical Chemists Washington, D. C.
[13] Omar, AEK, and Alam-Eldein SM 2014, Effect of Strand Thinning on Yield and Fruit quality of Egyptian Dry Date Palm (phoenix dactylifera L.) cv. Sultani. Journal of the American Pomological Society 68(3), 135-140.
[14] Jatoi, FAHA, Sahito, Wali TK, Mangrio M, and Shah ZH 2020, Biology, Morphology and taxonomy of Lesser Date Moth, Batrachedra amydraula (Lepidoptera: Batrachedridae) under two different temperatures. Pure and Applied Biology 9(1), 1137-1147.
[15] ICARDA 2018, Field operations in date palm and their importance for reducing pest infestation Impacts of chemical thinning to improve fruit characteristics of Date Palm cultivar Khalas. *Iraqi Journal of Agricultural Sciences* 50 (5), 1361-1368.

[16] Saleem, MS, Baitool TS, Akbar MF, Raza S and Shahzad S 2019, Efficiency of botanical pesticides against some pests infesting hydroponic cucumber, cultivated under greenhouse condition. *Egyptian Journal of Biological Pest Control* 29, 37.

[17] Abbas, SS, Subaih AJ, and Saleh YA 2020, The effects of biological and chemical agents on the management of main pests in Tomato plant. *Al-Qadisiyah Journal for Agriculture Sciences* 10(2), 325-334.

[18] Krzepilko, A, and Zych-Wezyk I 2010, Effect of The Pesticide Karate Zeon Zeon 0.25 EC on Antioxidant Properties of Radish (*Raphanus sativus* L.) Seedling Extract. *Ecological Chemistry and Engineering* 17, 12.

[19] Al-Shammari, GN, and Mohammed AH 2019, Effect of number leaves, benzyl adenine spraying on characteristics date of palm *Phoenix dactylifera* L. fruits c.v. Khidrawi and Mekkawy. *Arab Journal of science and Research publishing* 2(3), 2522-3364.

[20] El-Dengawy, EFA, Abul-soad AA, and EL-Attar ANA 2019, Impact of Thinning Bunches and spraying calcium nitrate and Gibberellic acid on set, Drop, Yield and Quality of fruits in Hayany Date Palm. *Journal of Plant Production, Mansoura University* 10(10), 815-821.

[21] Abd El-Kader, AM, El-Makhtoun FB, Hoda, Aly SH, and El-Roby KA 2008, Effect of Naphthalene Acetic Acid (NAA) Spray on Yield and Fruit Characteristics of Zaghloul Date Palm. *Alexandria Science Exchange Journal* 28, 4.

[22] Radwan, EMA 2017, Response of Bent Aisha and Sewy Data Palm to some fruit Thinning Treatments. *Assiut Journal of Agricultural Sciences* 48(2), 115-126.