The effect of Planting distance and insecticide on spiny bollworm Earias insulana (Lepidoptera: Phalaenidae) in cotton, Gossypium hirsutum Variety Lachata

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Abstract

The study was carried out in Al-Hawija /Kirkuk in one of farmer field piece that cultivated with Lachata cotton variety. The cultivated area about 1/4 hectare with Lachata variety by using three planting distance (10, 20, 30 cm) and three insecticides Runner (Methoxyfenozide) 1ml/L, Dimilin (48%) (Diflubenzuron) 1.25ml/L and Actara (25WG) (Thiamethoxam) 0.2 gm/L. The results showed that the lowest infestation 6.608% recorded at 30cm distance during blooming stage but the highest infestation 10.742% with spiny bollworm recorded at 10cm distance. The results also indicated that lowest infestation percentage 2.589% recorded with Dimilin insecticide and the highest infestation 10.511% with Runner insecticide. The results of study showed the effect of planting distance on cotton boll weight so the highest weight 4.283 gm recorded at 30cm but the lowest weight 3.708 gm recorded at 10 cm.

Keyword: Spiny bollworm , Earias insulana , IGR , Dimilin , Runner, Actara , Lachata, Planting distance.

1. Introduction

The spiny bollworm Earias insulana Boisd. is a major pest of cotton in many cotton-growing areas of the world [1-3], showed that whenever the incidence of spiny bollworm infestation increases at a rate of (1%), this reduces production by between (2.5-6%), after studying the effects of infestation on the rate of cotton production in Turkey. [4,5], indicated that the cotton spiny bollworm is widespread in most countries of the world that are famous for cultivating cotton. It was recorded in Spain and is considered an important pest in the Wadi Kabir region. [6], in his study to predict the incidence of pink and spiny bollworm, by examining in the Stonville 453 cultivar widely cultivated in the Harran plains in Turkey, found that the infestation rate was 11.81, 14.28 and 14.12% for both insects in 1999, 2000 and 2001 respectively. The results of the [7], study showed that the incidence of both spiny and pink cotton bowl was 61.98% in the Harran region in southern Turkey, while [8], studying the incidence of spiny and pink cotton boll worms, found that the incidence of them was in the Harran region, south of Turkey. Turkey amounted to 73.21% and 65.28% in 2002 and 2003 respectively. [9], reached in their study, which included the cultivation of the two cotton varieties Sayar-314 and Stoneville 453, at five agricultural dates 18 and 28 April and 8, 18 and 28 May and at five agricultural distances of 5, 10, 15, 20 and 30 cm to find out the damage caused by the two cotton spiny boll worms with respect to distances Cultivation, they found that the distance of 20 cm was the effective risk for both cultivars for the occurrence of insect infestation. [10], concluded that the spiny cotton bollworm E. insulana is one of the most important pests that affect the cotton crop in Iraq, as it caused great damage to the flower buds and acorns. [11] mentioned that cotton is attacked by the spiny cotton bollworm from the stage of leaf bud formation to maturity, and it usually infest the boll during its different stages of growth. reported, through their study of the sensitivity of some cotton varieties to infestation with the spiny cotton boll worm, including Ashur, Cuker 310, Lashata, and Marosumi, that the marsome variety was the least affected. [12] , in the Abi Hammad Center in Egypt noted that the pink, thorny and American nuts had caused a decrease in the cotton yield that reached 66.67 in the 2008 season. [13], found that the peak infestation of the larvae of the spiny and pink cotton boll worm was recorded in the last week of July and the end of August, with a rate of 16%. [14], indicated that various IGRs were used in Egypt for cotton crops, especially during the period of hatching egg masses and preserving natural. Giza 80. And [15], found that the effects for both Spinosad and Runner compared to Chlorpyrifos against the pink cotton boll worm were 84.79, 82.19 and 57.76 in the 2005 planting season. [16], showed that insecticidal growth regulators (IGR) have emerged as one of the safe alternatives to insect through their role in inhibiting the development of immature insect stages reducing the rate of adult emergence instead of forming the toxicity of the target, and
that Benzoylphenyl ureas are a class of growth regulators. Insects that inhibit the process of synthesis of chitin and therefore interfere and intersect with the formation of a cuticle. Stopping the process of eliminating the body wall of the insect in these treated insects will lead to the death of many insects during the molting. [17], concluded that the least infestation with the cotton boll worm occurred with the pesticide Sherpa (Cypermethrin), an organic pyrethroid pesticide, after they used seven pesticides in their study in Pakistan. In Iraq [18], indicated that he used Bacillus thuringiensis and Beauveria bassiana and some pesticides against many insects like white fly in Iraq fields. [19], noted that there are few studies on the effect of sublethal doses of insect growth regulators (IGR) on insect pests, and there is previous research on the effect of sublethal doses of Dimilin on reproductive performance of the insect pest of Spodoptera littoralis, and against the potato moth Phthorimaea operculella (Zeller) and against the cotton spiny boll worm Earias insulana, and it was also indicated that Lifentron was effective against several insect pests. [20], also found that the number of cotton bollworms varied clearly between cotton plants planted at different distances, as the number of bollworms reached 0.10, 0.40, 0.50 and 0.40 after 75 days of planting. [21], who concluded that plant density has little or no effect on boll retention, and although there was no significant effect on planting distances, the greater number of boll per plant was recorded with plant density. This may be due to the leaf area index (LAI) or the efficiency of utilizing solar energy. [16], conducted field experiments in southern Ethiopia to test three agricultural distances: (80 x 20) cm, (80 x 25) cm and (90 x 30) cm, with one cotton variety, Sele. Significant differences emerged between cotton production as well as between plant height.

2. Material and Methods

The plot of land was chosen in one of the farmers' fields in the Kirkuk governorate - Hawija district, and it was planted with the cotton crop, the Lachata variety, with an area of 1/4 hectare, after preparing the land from plowing, leveling, to test three agricultural distances (70x10cm), (70x20cm) and (70x30cm), and the experiment land was fertilized with triple superphosphate fertilizer (P2O5 46%) by the amount 200 kg / hectare when plowing and before cultivation, and urea fertilizer (46% N) at an amount of 200 kg / hectare at the beginning of flowering, and the field was divided into three replications. Each experimental unit included four masts of 5 m length. Factors were studied:

The planting distances between plants (10, 20, 30) cm

2.1. Chemical pesticides included, Runner, Dimilin, Actara insecticides

a. Comparative treatment that was not sprayed throughout the trial period
b. Runner pesticide 240 g / liter, the active ingredient, Methoxyfenozide, produced by Dow Agrociences, based on a mixing ratio of 1 ml / 1 liter, and a spray ratio of 100 liters of water / 2500 m².
c. Dimilin 48% is a suspension concentrate and the active ingredient is Diflubenzuron, from the chemical group Benzoylurea. It is a non-systemic pesticide that works by contact and infectious insect growth regulator, and the rate of use is 1.25 ml / 1 liter of water. Produced by Chemtoranisarl and

d. Dr. Actar pesticide (Actara 25WG) is a systemic pesticide in the form of granules from the Neonicotinoid group and the active ingredient Thiamethoxam, which is produced by the Swiss company Syngenta (according to the leafl et of use is 1.25 ml / 1 liter of water. Produced by Chemtoranisarl and

Chemical pesticides treatments were distributed to the main experimental units in each replicates, and each main piece was divided into three experimental units. The parameters and planting distances were distributed on them and distributed randomly according to For split cutting system, complete random sector design. A 20-liter dorsal sprinkler was used as the main experimental units were sprayed in all the replicates, which included chemical pesticides with 10 liters of water according to the concentration of the pesticide used, while the control treatments were sprayed with water only, as the solution completely covered the plants of the experimental units, taking into account the spraying of all external plants and the spraying was done with pesticides. And for the first two times when the infestation appeared on 31 May and the second time on 21 June in the stage of the emergence of infested flower buds, the following measurements were taken

1. The characteristic of the percentage of plants infested with the spiny cotton bollworm in the flowering stage
2. The relative sensitivity of infestation was calculated by dividing the mean percentage of infestation for the genotype by the lowest average of the percentage of infestation in the genotype.
3. The number of infested boll was calculated for one square meter of area per experimental unit
4. The average weight of the boll = Mean weight of 50 bolls / l m of every experimental unit
5. The amount of loss in the harvest in gm / m² = the total of the bolls supposed to open if there is no injury - the total of the actually open boll x the average weight of the boll
6. The production cotton kg / hectare = and was calculated from the harvest of cotton from middle maris plants from each experimental unit.
3. Results and discussion

Table 1. shows effect of Insecticide and agriculture distance on cotton plant infestation with spiny bollworm (Earias insulana) during blooming period. The results of the study showed in table (1) that there were significant differences between infested plants in the flowering stage of the interactions between pesticides and planting distances, as the interaction treatment between the pesticide Dimilin and the distance of 30 cm was superior to the lowest infestation rate of 1.633, while the highest infestation rate was the interaction between the pesticide Runner and the distance 10 cm Which amounted to 13.200 compared with the overlap of the comparison treatment and the distance of 10 cm, which was the highest in the injury rates for the interferences, was 20.600. The results of the statistical analysis showed that there were significant differences between the average rates of infestation due to the effect of pesticides, as the treatment of the pesticide Dimilin exceeded the lowest infestation rate of 2.589, followed by the treatment of the pesticide Actara with an infestation rate of 4.778, while the highest rate of infestation was in the treatment of the pesticide Runner, which amounted to 10.511. The results of average incidence rates showed the effect of planting distances from exceeding the distance 30 cm with the lowest injury rate of 6.608, followed by the distance 20 cm, while the highest percentage of injury in the treatment distance was 10 cm, which was 10.742. The results of the study showed the superiority of the pesticide Dimilin and Actara in reducing the rates of infestation with the spiny cotton bollworm during the moulting process, it also affects the eggs, meaning it prevents their hatching. As for the Actara pesticide, it moves to the nerve ganglion in the insect’s nervous system, affecting the acetylcholine nerve receptors, which in turn stops the nerve impulses and stops the transmission of commands to the insect’s body, and all vital processes of feeding and movement stop and they die. The insect, the pesticide eliminates all stages of the insect except the egg stage. Our results are consistent with what researchers [17], have achieved through their study of the effect of seven pesticides on cotton boll worms, including the cotton boll worm Earias insulana. The above researcher stated that the insecticides that he used were effective against the pest compared to the comparison treatment without any pesticides, as the percentage of infested plants decreased significantly compared to the plants not treated (comparison) with pesticides.

Our results on the effect of planting distances on the percentage of infested plants were not in agreement with [22], as the researchers noted that the agricultural distances had no significant effect on the elements of cotton production as well as the rate of cotton seed production after their study of three agricultural distances (80 x 20 cm). And (80 x 25) cm and (90 x 25) cm, on the cotton variety Sele during the 2004 agricultural season in southern Ethiopia.

| Planting distance | 10cm | 20cm | 30cm | effect of insecticide |
|-------------------|------|------|------|----------------------|
| Control           | 20.600 a   | 15.033 b | 12.400 cd | 16.011 a             |
| Runner            | 13.200 bc | 10.300 de | 8.033 e | 10.511 b          |
| Dimilin           | 3.833 fg | 2.300 gh | 1.633 h | 2.589 d          |
| Actara            | 5.333 f | 4.633 fg | 4.367 fg | 4.778 c          |
| Effect of distance| 10.742 a | 8.067 b | 6.608 c |                     |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%.

Table 2 Shows The effect of insecticides and planting distances on the relative sensitivity. The results of the study showed in Table (2) that there were no significant differences between the interactions between the insecticides and the planting distances, as the interaction treatment between the insecticide Dimilin and the distance of 20 cm was superior to the lowest infestation rate of 1.136, while the highest infestation rate for the interaction between the insecticide Runner and the distance 10 cm Which amounted to 13.548 compared with the overlap of the comparison treatment and the 10 cm distance, which was the highest in the injury rates for the interferences, was 20.600. The results of the statistical analysis showed that there were significant differences between the average rates of infestation due to the effect of pesticides, as the treatment of the insecticide Dimilin exceeded the lowest infestation rate of 1.562, followed by the treatment of the insecticide Actara with an infestation rate of 2.546, while the highest infestation rate was in the treatment of the insecticide Runner, which amounted to 12.513. The results of average incidence ratios showed the effect of planting distances for exceeding the distance 30 cm, with the lowest injury rate of 7.424, followed by the distance 20 cm, while the highest percentage of injury in the treatment distance was 10 cm, which amounted to 8.913. The results of the study showed the superiority of the insecticide Dimilin and Actara in reducing the rates of infestation with the spiny cotton boll worm. The effect of insecticides and spacing on relative sensitivity: The insect dies upon the molting process and also affects the eggs, which prevents them from

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hatching. As for the Actara insecticide, it moves to the nerve node in the insect’s nervous system, affecting the acetylcholine nerve receptors, which in turn stops the nerve impulses and stops the transmission of commands to the insect’s body and stops all vital processes from feeding and the movement of the insect dies. The pesticide eliminates all stages of the insect, except for the egg phase. Our results regarding the effect of the three planting distances on the relative sensitivity ratio were consistent with what the researcher [23], found in their study in Iran on a number of cotton varieties where they concluded that the hybrid cotton type (S8) in the agricultural distances implemented is (80 × 50) cm achieved the highest production in cotton compared to the other distance, which is (80 × 20), but the differences between the two distances were not statistically significant, after their study of four types of cotton: S8, S5, Sahel1 and Sahel 2.

Table 2. The effect of pesticides and planting distances on the relative sensitivity.

| Planting distance | Effect of insecticide |
|-------------------|-----------------------|
| Control           | 19.923 a               |
| Runner            | 13.483 a               |
| Dimmilin          | 2.267 a                |
| Actara            | 2.976 a                |
| Control           | 15.033 b               |
| Runner            | 12.033 a               |
| Dimmilin          | 1.136 gh               |
| Actara            | 2.297 a                |
| Effect of distance| 8.913 a               |
| Planting distance | 10 cm                  |
|                   | 20 cm                  |
|                   | 30 cm                  |
| Control           | 14.027 cd              |
| Runner            | 12.023 e               |
| Dimmilin          | 1.283 a                |
| Actara            | 2.363 a                |
| Effect of distance| 7.710 b               |
| Planting distance | 10 cm                  |
|                   | 20 cm                  |
|                   | 30 cm                  |
| Control           | 1.843                   |
| Runner            | 10.020 a               |
| Dimmilin          | 1.843 a                |
| Actara            | 2.917 a                |
| Effect of distance| 8.037 a               |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%.

Table 3. Shows the effect of pesticides and planting distances on the number of infested bolls by the spiny cotton boll worm (open and not open boll). The results of the study showed in Table (3) that there were no significant differences between the interactions between the insecticides and the planting distances, as the interaction treatment between the insecticide Dimmilin and the distance of 30 cm was superior to the lowest number of infested boll reaching 1.843, while the highest number of infested boll was the interaction between the insecticide Runner and the distance was 20 cm, which reached 13.09. Compared with the comparison treatment and the distance of 10 cm was the highest, the number of bolls infected reached 14.537. The results of the statistical analysis showed the presence of significant differences between Average rates of infestation due to the effect of insecticides, as the treatment of the insecticide Dimmilin was superior to the lowest number of infested bolls, which reached 2.443, followed by the treatment of the insecticide Actara with the number of infested bolls amounting to 3.499, while the highest number of infested bolls was in the treatment of the insecticide Runner, which reached 11.933. The results of average incidence ratios showed the effect of planting distances for the distance exceeding 30 cm with the lowest number of infested bolls reaching 6.580, followed by the distance 20 cm, while the highest incidence rate in the treatment distance was 10 cm, which reached 8.768. Our results are in agreement with [3, 12, 14, 17, 23].

Table 3. The effect of pesticides and planting distances on the number of acorns infested boll by Spiny bollworm.

| Planting distance | Effect of insecticide |
|-------------------|-----------------------|
| Control           | 14.537 a               |
| Runner            | 12.683 a               |
| Dimmilin          | 2.267 a                |
| Actara            | 4.196 a                |
| Control           | 13.840 a               |
| Runner            | 13.097 a               |
| Dimmilin          | 1.830 a                |
| Actara            | 3.383 a                |
| Effect of distance| 8.768 a               |
| Planting distance | 10 cm                  |
|                   | 20 cm                  |
|                   | 30 cm                  |
| Control           | 11.543 a               |
| Runner            | 10.020 a               |
| Dimmilin          | 1.843 a                |
| Actara            | 2.917 a                |
| Effect of distance| 8.037 a               |
| Planting distance | 10 cm                  |
|                   | 20 cm                  |
|                   | 30 cm                  |
| Control           | 13.07 a                |
| Runner            | 11.933 a               |
| Dimmilin          | 2.443 c                |
| Actara            | 3.499 b                |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%. Table 4. shows effect of insecticides and planting distances on the average boll weight.

The results of the study showed in Table (4) that there were no significant differences between the interactions between the insecticides and the planting distances, as the interaction treatment between the insecticide Dimmilin and the actara and the distance of 30 cm exceeded the highest average for the weight of the boll which reached 4.367, while the lowest average for the nut weight of the interaction between the insecticide Runner and the distance was 10 cm, which reached 3.637 compared to the overlap of the comparison treatment and the distance of 10 cm, which was the lowest average for the average nut weight for the interactions, was 3.600. The results reported in Table (4) showed that the three chemical insecticide used (Runner, Dimmilin, and Actara) had a clear effect on the cotton plants of the Lachata variety on the average weight of the boll. The treatment of the insecticide Dimmilin surpassed the highest average weight of the boll, reaching 4.156, followed by the treatment of the insecticide Actara and Runner, where the average weight of the boll was equal to 4.056. The results of average rates of infest showed the effect of planting distances on the distance exceeding 30 cm, with the highest average boll
weight being 4.283, followed by 20 cm distance, while the lowest average boll weight in the treatment distance was 10 cm, which was 3.608. Our results are in agreement with [24,25].

### Table 4. The effect of pesticides and planting distances on the average boll weight (gm).

| Planting distance | 10cm   | 20cm   | 30cm   | effect of insecticide |
|-------------------|--------|--------|--------|-----------------------|
| Control           | 3.600 a| 4.000 b| 4.166 a| 3.922 a               |
| Runner            | 3.800 a| 4.133  a| 4.233  a| 4.056 b               |
| Dimilin           | 3.800 a| 4.300 a| 4.367 a| 4.156 c               |
| Actara            | 3.633 a| 4.167 a| 4.367 a| 4.056 b               |
| Effect of distance| 3.708 a| 4.150 a| 4.283 a|                       |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%.

The effect of pesticides and planting distances on the amount of loss in the harvest.

The results of the study showed in Table (5) that there were no significant differences in the interactions between pesticides and planting distances, as the interaction treatment between the insecticide Dimilin and the distance of 30 cm was superior to the lowest percentage loss in a crop of 38,380, while the highest amount of loss in the forage yield was the overlap between the insecticide Actara and the distance 20 cm that amounted to 83.71.

The results recorded in Table (5) showed that the three chemical pesticides used (Runner, Dimilin, Actara) had a clear effect on cotton plants of the Lachata variety in the amount of loss in the harvest due to infestation with the spiny cotton bollworm. The results of the statistical analysis showed the presence of significant differences between the average quantity of loss in the forage crop due to the effect of insecticide as the treatment of the insecticide Dimilin was superior to the lowest amount of loss in the forage yield amounting to 52,037, followed by the treatment of the insecticide Actara with a loss amount of 64,642, while the highest loss of the forage yield was in the treatment of the insecticide Runner, which amounted to 66,630.

The results of average rates of injury showed the effect of planting distances from exceeding the distance 30 cm with the lowest amount of loss in the harvest of 51,490, followed by the distance 10 cm with a loss amounting to 72,162 while the highest percentage of injury in the treatment distance was 20 cm, which amounted to 82,081.

These results were in agreement with [7], when it became clear to them that the infestation rate in cotton when it increased at a rate of 1% is equivalent to a loss in yield between 2.5-6% in both the spiny and pink cotton nut worm, after studying the effect of the infestation rate on the production of cotton grown in Turkey. Our results were in agreement with both [21], who concluded that plant density has little or no effect on boll retention, and although there was no significant effect on planting distances, the greater number of boll per plant was recorded with Low plant density and this may be due to the leaf area index (LAI) or to the efficiency of utilizing solar energy. Our results agreed with both researchers [26]. Increased leaf area index (LAI) however these plants will also be exposed to a lower rate of light energy (photosynthesis) per unit leaf area due to the mutual exchange of shade [26], found that the cotton leaves found in densely packed plants overall had lower levels of carbohydrates than the leaves of low-density plant populations. Cotton plants at low plant densities will maintain (high boll retention) in the plant compared to plants with higher plant densities.

### Table 5. The effect of pesticides and planting distances on the amount of harvest loss (gm/m).

| Planting distance | 10cm  | 20cm  | 30cm  | effect of insecticide |
|-------------------|-------|-------|-------|-----------------------|
| Control           | 100.130 a | 102.600 a | 55.540 a | 91.006               |
| Runner            | 64.190 a | 80.160 a | 38.380 a | 4.056                |
| Dimilin           | 55.883 a | 61.847 a | 38.380 a | 52.037               |
| Actara            | 68.457 a | 83.717 a | 41.75a  | 64.64                |
| Effect of distance| 72.162 b| 82.081 a| 51.490 c|                       |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%.

Table 6 shows the effect of insecticide and planting distances on the yield of cotton bloom. The results of the study showed in Table (6) that there were no significant differences between the interactions between the insecticide and the planting
distances, as the interaction treatment between the insecticide Demilene and the distance of 20 cm exceeded the highest yield of cotton blossom reached 2654.00, while the lowest yield of the cotton blossom for the interaction between the insecticide Runner and the distance was 10 cm, which reached 1003.33.

The results indicated in Table (6) showed that the three chemical insecticide used (Runner, Dimilin, and Actara) had a clear effect on the cotton plants of the Lachata variety in the yield of the cotton blossom. The results of the statistical analysis showed that there were significant differences between the average rates of infestation with the effect of the insecticide, which exceeded The treatment of the insecticide Dimilin with the highest yield of blossom cotton reached 2575.67 kg / ha, followed by the treatment of the insecticide actara with the yield of cotton blossom reached 2026.78 kg / hectare, while the lowest yield of cotton blossom was in the treatment of the insecticide Runner, which reached 1183.56 kg / ha.

The results of average incidence rates showed the effect of planting distances on the distance exceeding 30 cm with the highest yield of cotton blossom reaching 21749.83 kg / ha, followed by the distance of 20 cm, reaching 1741.25 kg / hectare, while the lowest yield of cotton blossom in the treatment of distance was 10 cm, which amounted to 1452.67 kg / ha, our results are in agreement with [12,14] and Our results are in agreement with [22], who conducted field experiments in southern Ethiopia to test three agricultural methods (flat, open and tied ridge) to test three agricultural distances: (80 × 20 cm), (80 × 25 cm) and (90 × 25 cm) with one cotton variety, Sele, and significant differences appeared between cotton production as well as between plant height, and agricultural distances had no significant effect on the cotton production elements and its seeds. The three cultivation methods affected plant height and seed production, but did not affect the number of plant bolls and the length of the cotton staple, so the greater the planting distances, the greater cotton seed production, but the differences were not statistically significant here, and that cotton production in wide line distances contributes to the production of cotton seeds by increasing the number of cotton bolls compared to narrow agricultural distances, and this in turn will reduce the competition over the humidity between The vegetarian population is here

Table 6. The effect of pesticides and planting distances on the yield of seed cotton production kg/ha.

| Planting distance | Control  | Runner  | Dimilin  | Actara  | Effect of distance |
|-------------------|----------|---------|----------|---------|-------------------|
| 10cm              | 661.67a  | 1003.33a| 2368.00a | 1777.67a| 1452.67b         |
| 20cm              | 102.600a | 1283.33a| 2705.00a | 2125.00a| 1741.25a         |
| 30cm              | 55.540a  | 1264.00a| 2654.00a | 2177.67a| 1749.83a         |

Numbers bearing similar letters mean that there are no significant differences between the averages of the transactions horizontally according to the Duncan Multiple Range Test at a probability level of 5%

Conclusions

We conclude from the results of this study that the planting distance is 30 cm, which is the best distance from the two distances 10 cm and 20 cm, due to the decrease in infestation with the spiny boll worm with the increase in cotton production, both in quality and quantity in the aforementioned planting distance. Also, Dimilin; It was the best of the two insecticides Runner and Actara, because the pesticide Dimilin reduced the numbers of the cotton bollworm Earias insulana in exchange for an increase in the cotton yield.

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