

## **THE EFFECT OF SOME TEMPERATURE AND RELATIVE HUMIDITY ON THE HATCHABILITY PERCENTAGE OF THE COTTON LEAF WORM, *SPODOPTERA LITTORALIS* (BOISD.) IN MINIA GOVERNORATE**

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**ABSTRACT:** *Studies were conducted in Minia Governorate at Mallawi Agricultural Research Station (Research Farm) to find out the effect of temperature and the percentage of relative humidity on the percentage of egg-mass hatchability during two successive growing seasons (2004/ 2005). Results showed that the highest general percentage of egg-masses hatchability during the whole period of investigation exhibited 97.04 and 96.58 at 26.6°C, 30°C of mean temperature and 54, 48 percentage of the relative humidity at 15<sup>th</sup> and 21<sup>st</sup> of June on 2004 and 2005 growing seasons respectively. While the lowest general percentage of egg-masses hatchability exhibited 70.11 and 67.77 at 26.7°C, 26.8°C of mean temperature and 65, 70 percentage of the relative humidity at 30<sup>th</sup> of August on 2004 and 2005 growing seasons respectively.*

*A significant negative relationship occurred between the hatchability percentage and relative humidity percentage as correlation values "r" (-0.55 & -0.178) and (-0.068 & -0.178) on 2004 and 2005 cotton growing seasons, respectively. And a significant positive relationship occurred between the hatchability percentage and the mean of temperature as correlation values "r" (0.346 & 0.014) and (0.259 & 0.346) on 2004 and 2005, respectively.*

*These results represented that the increase of the relative humidity and decrease of the mean of temperature was affected the decreasing of the egg-masses hatchability, and the decreasing of relative humidity with increasing the mean of temperature affected to the increasing of the egg-masses hatchability and fecundity.*

**Key words:** Cotton leaf worm. Temperature. Humidity. Hatchability. Egg masses. Minia.

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### **INTRODUCTION**

The cotton leaf worm, *Spodoptera littoralis* (Boisd.) is one of the most serious polyphagous insect pests in Egypt. It attacks many different field crops especially cotton, causing huge damage to the foliage, squares, flowers as well as green bolls. The activity period of this insect lasted about 25 weeks during the season (Radwan, 1979 and 1985). Various studies were

conducted by several investigators, the effect of some weather factors such as (Nasr *et al.*, 1973 and 1974; El-Borolossy, 1959; Hanna and Hamad, 1975; and Hassan, 2005). Many authors studied the seasonal fluctuation (Abul-Nasr *et al.*, 1966a, 1973 and 1974a; Bishara, 1928; Naguib, 1971; Nasr *et al.*, 1980; El-Deeb, 1988; and Romeilah *et al.*, 2000). Wissa (1978) and Ismail (1989) mentioned that the mean of temperature seemed to play a major role as a key factor for regulating the activity of this pest throughout spring, summer and autumn seasons.

## **MATERIALS AND METHODS**

This study was carried out at the farm of the Agricultural Research Station, Mallawi province, Minia Governorate, during the two successive growing cotton seasons for (2004 and 2005). An area of approximately one feddan was selected for conducting the experiment was cultivated with Giza83 cotton variety, on the 15<sup>th</sup> of March, and without used any insecticides throughout the period of experiment. It was divided into 4 plots (¼ Fed.) for each plot.

And examined randomized for 10 egg-masses and counted the number of the egg by the calculator (Model B. S. D.), and after three days from labels by different colors were counted the hatching larvae.

Other plots are examined every month by the same techniques from May to August at the whole periods of the experiment.

The mean of temperature and relative humidity percentages were recording every three days throughout the cotton growing seasons (2004 and 2005). The statistical analysis was used the complete randomized block design to determine the effect of the mean of temperature and relative humidity on the percentages of the egg-masses hatching, according to the methods adopted by Sendecor and Cochran, 1967.

## **RESULTS AND DISCUSSION**

The effect of some weather factors on the hatchability percentages of the egg-masses for the cotton leaf worm *Spodoptera littoralis* (Boisd.).

### **I- In 2004 cotton growing season:**

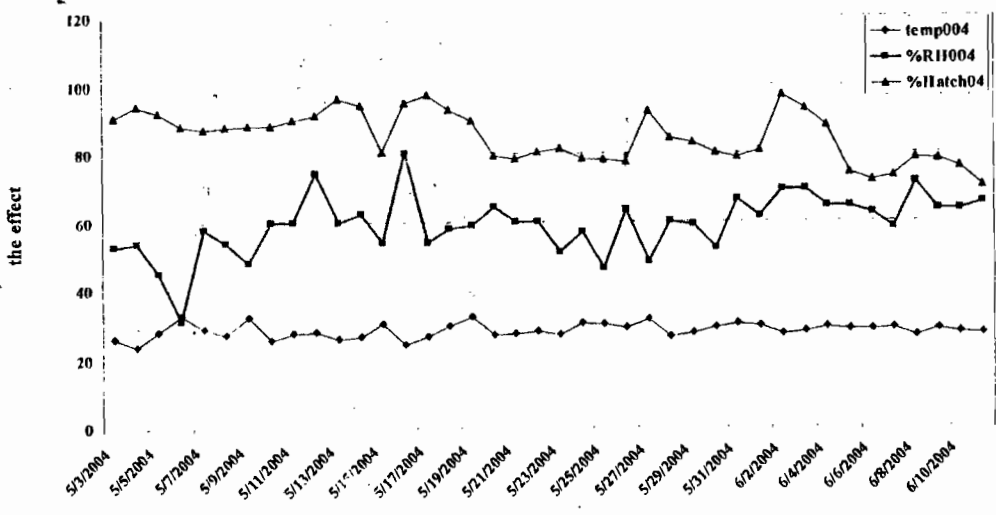
a- The effect of mean daily temperature and relative humidity on the hatchability percentages of the egg-masses for the C. L. W. throughout the sampling dates:

The results are shown in Table (1) and Fig. (a), it is clear that the highest mean number of hatchability percentage was (97.04) at the 15<sup>th</sup> of June while the mean of temperature and relative humidity were (26.6 and 54), the second date was (96.90) at the 3<sup>rd</sup> of August, while the mean of temperature and relative humidity were (26.8 and 69), the third date was noticed at the 6<sup>th</sup> of May were (94.08), while the mean temperature and relative humidity were (23.90 and 54), and the 4<sup>th</sup> date was (92.32) after 12 days from July, while the mean of temperature and relative humidity were (31 and 48).

**Table (1): Mean number of % hatching egg-masses of cotton leaf worm, *Spodoptera littoralis* (Boisd.) and its compared with the daily averages of Temp. and % relative humidity in cotton field, Mallawi, 2004**

| Data based on<br>10 egg<br>masses /<br>inspection | May    |           |           | June  |       |           | July  |           |           | August |           |           |
|---|--------|-----------|-----------|-------|-------|-----------|-------|-----------|-----------|--------|-----------|-----------|
|   | *Temp. | %<br>Rel. | %<br>Hat. | Temp. | %Rel. | %<br>Hat. | Temp. | %<br>Rel. | %<br>Hat. | Temp.  | %<br>Rel. | %<br>Hat. |
| 3   | 26.20  | 53.00     | 90.93     | 25.70 | 60.00 | 96.20     | 26.90 | 51.00     | 81.33     | 26.8   | 69.00     | 96.90     |
| 6   | 23.90  | 54.00     | 94.08     | 26.30 | 62.00 | 94.09     | 30.20 | 57.00     | 78.21     | 27.50  | 69.00     | 92.81     |
| 9   | 28.00  | 45.00     | 92.29     | 30.20 | 54.00 | 80.26     | 29.80 | 46.00     | 78.18     | 28.90  | 64.00     | 88.08     |
| 12  | 32.60  | 31.00     | 88.36     | 24.00 | 80.00 | 94.98     | 31.00 | 48.00     | 92.32     | 28.20  | 64.00     | 72.18     |
| 15  | 28.60  | 58.00     | 87.20     | 26.60 | 54.00 | 97.04     | 26.10 | 60.00     | 84.17     | 28.00  | 62.00     | 71.87     |
| 18  | 27.10  | 54.00     | 88.81     | 29.40 | 58.00 | 92.94     | 27.00 | 59.00     | 82.97     | 28.30  | 58.00     | 73.00     |
| 21  | 31.00  | 48.00     | 88.31     | 32.20 | 59.00 | 89.68     | 28.60 | 52.00     | 80.42     | 26.00  | 71.00     | 78.40     |
| 24  | 25.40  | 60.00     | 88.41     | 26.80 | 64.00 | 79.46     | 29.60 | 66.00     | 78.83     | 28.20  | 63.00     | 78.05     |
| 27  | 27.50  | 60.00     | 90.08     | 27.10 | 60.00 | 78.51     | 29.10 | 61.00     | 80.60     | 27.20  | 63.00     | 75.56     |
| 30  | 27.80  | 74.00     | 91.11     | 27.90 | 60.00 | 80.31     | 28.90 | 63.00     | 77.52     | 26.70  | 65.00     | 70.11     |
| Mean  | 27.81  | 55.7      | 89.95     | 27.62 | 61.1  | 88.35     | 28.72 | 56.3      | 81.46     | 52.58  | 64.80     | 79.69     |

\* Mean number of temperature, % relative humidity and % hatchability of one egg-mass every three days throughout the four months. LSD 5% of sampling: 0.0556, LSD 5% of temp.: 1.3896 and LSD 5% of R. H.: 1.9635



Sampling days

Fig. (A) : The effect of heat and relative humidity on hatching the eggs of cotton leaf worm 2004.

**b- The effect of mean temperature and R. H. throughout the months of investigation:**

The results of statistical analysis of the data showed the highest number of hatchability percentage was (89.95) on May, while the temperature and R.H. were (27.81 and 55.70), the second month was (88.35) on June when the mean of temperature and R. H. were (27.62 and 61.1), the third month (81.46) on July, when the mean of temperature and R. H. were (28.72 and 56.3), and the lowest month (79.69) on August, the mean of temperature and R. H. were (52.58 and 64.80), respectively.

**II- In 2005 cotton growing season:**

**a- The effect of mean daily temperature and R. H. on the hatchability percentages of the egg-masses for C. L. W. throughout the sampling dates:**

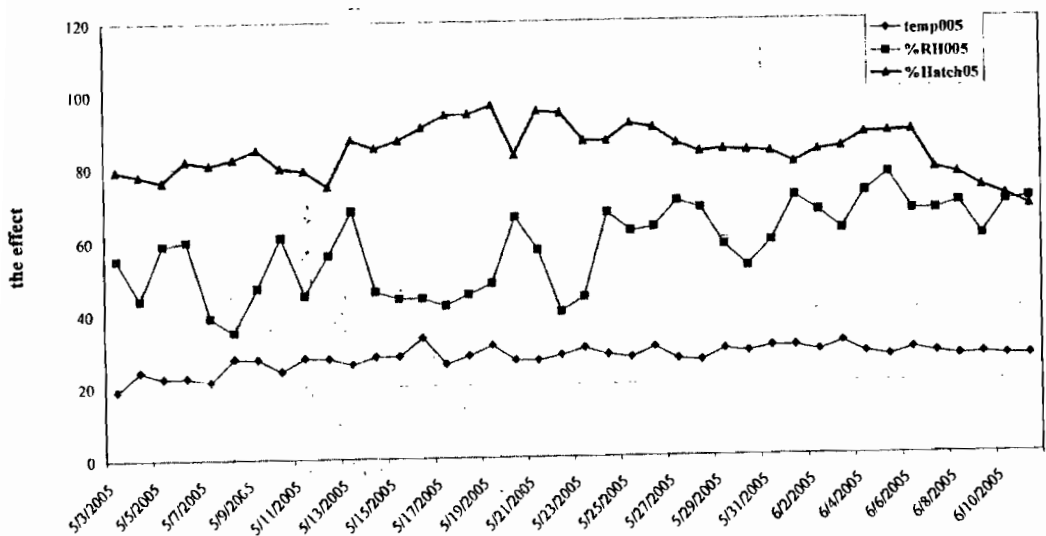
The results are shown in Table (2) and Fig. (b), it is noticed that the highest mean of hatchability percentage was (96.58) after 21 days from June, while the mean temperature and R. H. were (30.90 and 48). The second date was (91.37) after 9 days from July at (27.2 and 62) temperature and R. H. respectively. While the third hatchability percentage was (88.75) at the 15<sup>th</sup> of

Table (2): Mean number of % hatching egg-masses of cotton leaf worm, *Spodoptera littoralis* (Boisd.) and its compared with the daily averages of Temp. and % relative humidity in cotton field, Mallawi, 2005

| Data based on 10 egg masses / inspection | May    |        |        | June  |       |        | July  |        |        | August |        |        |
|--|--------|--------|--------|-------|-------|--------|-------|--------|--------|--------|--------|--------|
|  | *Temp. | % Rel. | % Hat. | Temp. | %Rel. | % Hat. | Temp. | % Rel. | % Hat. | Temp.  | % Rel. | % Hat. |
| 3  | 18.90  | 55.00  | 79.25  | 26.00 | 68.00 | 87.38  | 29.90 | 44.00  | 76.63  | 28.70  | 67.00  | 83.58  |
| 6  | 24.30  | 44.00  | 77.78  | 28.00 | 64.00 | 85.04  | 28.00 | 67.00  | 86.60  | 31.00  | 62.00  | 84.46  |
| 9  | 22.40  | 59.00  | 76.21  | 28.10 | 44.00 | 87.10  | 27.20 | 62.00  | 91.37  | 28.00  | 72.00  | 88.21  |
| 12                                       | 22.60  | 66.00  | 81.85  | 33.20 | 44.00 | 90.58  | 30.00 | 73.00  | 90.11  | 27.10  | 77.00  | 88.50  |
| 15                                       | 21.40  | 39.00  | 80.60  | 25.80 | 42.00 | 94.11  | 26.60 | 70.00  | 85.82  | 29.00  | 67.00  | 88.75  |
| 18                                       | 27.70  | 35.00  | 81.23  | 28.10 | 45.00 | 94.19  | 26.20 | 68.00  | 83.42  | 27.90  | 67.00  | 78.35  |
| 21                                       | 27.50  | 47.00  | 84.78  | 30.90 | 48.00 | 96.58  | 29.30 | 58.00  | 84.03  | 27.00  | 69.00  | 76.83  |
| 24                                       | 24.20  | 61.00  | 79.62  | 26.70 | 66.00 | 82.84  | 28.60 | 52.00  | 83.63  | 27.50  | 60.00  | 73.13  |
| 27                                       | 27.80  | 45.00  | 78.92  | 26.60 | 57.00 | 94.99  | 30.00 | 59.00  | 83.22  | 26.90  | 69.00  | 70.69  |
| 30                                       | 27.60  | 56.00  | 74.67  | 28.00 | 40.00 | 94.43  | 30.00 | 71.00  | 80.19  | 26.80  | 70.00  | 76.77  |
| Mean                                     | 24.44  | 50.10  | 79.59  | 28.14 | 50.00 | 90.72  | 28.58 | 61.40  | 85.50  | 27.99  | 68.00  | 80.03  |

\* Mean number of temp., % relative humidity and % hatching of one egg-mass every three days throughout the four months.

LSD 5% for sampling: 2.3310, LSD 5% for temp.: 1.4747, LSD 5% for R. H.: 2.2679



**Sampling days**

Fig. (B) : The effect of heat and relative humidity on hatching the eggs of cotton leaf worm 2005.

August, while temperature and R. H. were (29 and 67), respectively. After 21 days from May, the hatchability percentage was (84.78), while the temperature and R. H. were (27.5 and 47), respectively.

**b- The effect of temperature and relative humidity throughout the months of investigations:**

The results of statistical analysis of the data showed that the highest number of hatchability percentage was (90.72), on June, while the mean of temperature and R. H. were (28.14 and 50), and the second highest was (85.50) on July at (28.58 and 61.40) temperature and R. H., respectively, while the third month (80.03) on August, while temperature and R. H. were (27.99 and 68) and the lowest month (79.59) on May while temperature and R. H. were (24.44 and 50.10) respectively.

**III- The relationship between the mean of temperature and mean relative humidity on the effect of hatchability percentage:**

It was shown statistically that a significant negative relationship occurred between the daily averages of R. H. and hatchability percentages during 2004

## The effect of some temperature and relative humidity on the.....

and 2005 cotton seasons expressed as correlation values "r" (-0.500 & -0.178) and (-0.259 & -0.346).

And significant positive relationship between the mean of daily temperature and hatchability percentages expressed as correlation coefficient values "r" (0.346 & 0.014) and (0.346 & 0.259).

### CONCLUSION

These results occurred that increasing of the relative humidity with decreasing the mean daily of temperature were affected to the decreasing of hatchability percentage of the egg-masses. And the mean of temperature play a major role as a key factor regulating the hatchability percentages throughout the two years of study (2004 and 2005) while R. H. seemed to come next.

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تأثير درجات الحرارة والرطوبة النسبية على نسب الفقس للطع دودة ورق  
القطن في محافظة المنيا

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الملخص العربي

أجريت هذه الدراسة في محافظة المنيا بالمزرعة البحثية لمحطة البحوث الزراعية بملوي لمدة عامين متتاليين ٢٠٠٤ - ٢٠٠٥ على قطن صنف ج ٨٣ لدراسة تأثير بعض العوامل الجوية متوسط ( الحرارة اليومية - الرطوبة النسبية ) على نسبة الفقس للطع دودة ورق القطن .

أوضحت النتائج المتحصل عليها ما يلي:

١. أعلى نسبة فقس ( ٩٦,٥٨ ، ٩٧,٠٤ ) عند متوسط حرارة ٢٦,٦ ، ٣٠,٩ م ومتوسط رطوبة ٥٤ ، ٤٨ في ١٥ ، ٢١ يونيه عامي ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٢. أقل نسبة فقس ( ٦٧,٧٧ ، ٧٠,١١ ) عند متوسط حرارة ٢٦,٧ ، ٢٦,٨ م ومتوسط رطوبة ٦٥ ، ٧٠ في ٣٠ أغسطس عامي ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٣. وجدت علاقة معنوية سالبة بين نسبة الفقس والرطوبة ( 0.178 - 0.500 )، ( 0.068 - 0.178 ) خلال موسمي الدراسة ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٤. وجدت علامة منوية موجبة بين متوسط الحرارة ونسبة الفقس ( 0.14 - 0.346 )، ( 0.259 - 0.346 ) خلال موسمي الدراسة ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٥. متوسط الحرارة له دور مهم في التأثير معنويا على نسبة الفقس للطع بين سنه وأخرى.
٦. متوسط الحرارة مع الرطوبة المناسبة يؤثر معنويا على حيوية ونسبة الفقس.