

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 15th and 21st 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 30th 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.*

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 15th 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 15th of June while the mean of temperature and relative humidity were (26.6 and 54), the second date was (96.90) at the 3rd of August, while the mean of temperature and relative humidity were (26.8 and 69), the third date was noticed at the 6th of May were (94.08), while the mean temperature and relative humidity were (23.90 and 54), and the 4th date was (92.32) after 12 days from July, while the mean of temperature and relative humidity were (31 and 48).

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Table 1

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 15th of

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Table 2

Fig b

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

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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.

REFERENCES

- Abul-Nasr, S., M. A. Moussa and M. A. Naguib (1966a). Ecological study on cotton leaf worm, *Prodenia litura* (Fabr.), Part I. The egg-masses in cotton fields. Bull. Soc. Ent. Egypt, 50: 149-162.
- Abul-Nasr, S., S. I. El-Sherif and M. A. Naguib (1973). Seasonal fluctuations of moths of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) during the cotton season. Bull. Soc. Ent. Egypt, 57: 413-418.
- Abul-Nasr, S., S. I. El-Sherif and M. A. Naguib (1974a). Seasonal fluctuations of the egg-masses of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) in cotton fields. Bull. Soc. Ent. Egypt, 57: 353-360.
- Bishara, I. (1928). Preliminary experiments with dusting and spraying against insect pests of cotton. Bull. Min. Agric. Egypt, No. 77, 11pp., 1pl., 5 graphs, Cairo.
- El-Borolossy, F. M. (1959). Studies on the effect of some major weather conditions on the activity of cotton leaf worm and bollworms and estimation and forecasting of changes in their population. Ph. D. thesis, submitted to Faculty of Agric., Cairo Univ.
- El-Deeb, Y. A. A. (1988). Studies on the changes in the population density of the cotton leaf worm, *Spodoptera littoralis* (Boisd.). Ph. D. thesis, Fac. of Agric., Al-Azhar University.
- Hanna, H. M., and N. E. F. Hamad (1975a). Effect of climatic factors on flight activity of moths of certain cotton pests. Bull. Soc. Ent. Egypt, LIX: (39-47).
- Hassan, F. Dahi (2005). Egyptian cotton leaf worm, *Spodoptera littoralis* (Boisd.) development on artificial diet in relation to heat units requirements. Agric. Res. Rev. Vol. 83, No. 1, p (199-210), The 3rd int. conf. of Plant Prot. Res. Inst.
- Ismail, H. M. (1989). Ecological and toxicological studies on the cotton leaf worm, in Middle Egypt. M. Sc. thesis, Fac. of Agric., Min. Univ. Pp. (183).

- Naguib, M. A. (1971). Seasonal abundance of the different stages of cotton leaf worm, *Spodoptera littoralis* (Boisd.) in cotton and clover fields. Ph. D. thesis, Fac. of Agric., Cairo Univ., Egypt.
- Nasr, El-Sayed A., K. El-Rafei, M. M. Hosny and A. Badawy (1973). Effect of temperature and relative humidity on the life-cycle of the cotton leaf worm, *Spodoptera littoralis* (Boisd.). Bull. Soc. Ent. Egypt, 57: 139-144.
- Nasr, El-Sayed A. and F. Nassif (1974). Response of various stages of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) to temperature and relative humidity. Bull. Soc. Ent. Egypt, 58: 123-131.
- Nasr, El-Sayed A., S. M. Radwan, S. A. Dessouki and A. E. Abdel-Wahab (1980). Seasonal abundance of egg-masses of the cotton fields at Fayoum Governorate. Agric. Res. Rev., Min. of Agric. Egypt. Vol. 58. No.1, p. 65-67.
- Nasr, El-Sayed A., N. H. Wissa, M. M. Hosny and A. Habib (1980). The time-relative population trends of the egg-masses of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) in Kafr El-Sheikh and El-Minia Governorates throughout (9-10) years. Agric. Res. Rev., Min. of Agric. Egypt. Vol. 58, no. 1, p. 59-62
- Radwan, S. M. (1979). Studies on the factors affecting the data of appearance of cotton leaf worm, *Spodoptera littoralis* (Boisd.) infestation in Fayoum province. M. Sc. thesis, Al-Azhar Univ., Egypt. Pp. (102).
- Radwan, S. M. (1985). Studies on distribution and population dynamic of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) moth in some region. Ph. D. thesis, Al-Azhar Univ., Egypt. Pp (190).
- Romeilah, M. A., Nagwa A. Badr, H. M. Ismail and M. M. M. Aly (2000). Effect of the distance between sex pheromone or light traps and *Spodoptera littoralis* (Boisd.) egg-masses on hatchability percentage in the cotton fields. Annals of Agric. Sci., Moshtohor, Vol. 38(2): 1257-1267.
- Sendecor, G. W. and W. G. Cochran (1967). "statistical methods" 6th ed., the Iowa state Univ. Press Ames, Iwoa.
- Wissa. (1978). Ecological studies on the cotton leaf worm *Spodoptera littoralis* (Boisd.). M. Sc. thesis, Ain Shams Univ., Cairo, Egypt, 102 Pp.

تأثير درجات الحرارة والرطوبة النسبية على نسب الفقس للطح 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 متتالين ٢٠٠٤ - ٢٠٠٥ على قطن صنف ج ٨٣ لدراسة تأثير بعض العوامل الجوية متوسط (الحرارة اليومية - الرطوبة النسبية) على نسبة الفقس للطح دودة ورق القطن . أوضحت النتائج المتحصل عليها ما يلي:

١. أعلى نسبة فقس (٩٧.٠٤ ، ٩٦.٥٨) 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 (٧٠.١١ ، ٦٧.٧٧) 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 (٠.١٧٨ - ٠.٥٠٠)، (٠.٠٦٨ - ٠.١٧٨) خلال موسمي الدراسة ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٤. وجدت علامة مئوية موجبة بين متوسط الحرارة ونسبة الفقس (٠.١٤ - ٠.٣٤٦)، (- ٠.٣٤٦ - ٠.٢٥٩) خلال موسمي الدراسة ٢٠٠٤ ، ٢٠٠٥ على التوالي.
٥. متوسط الحرارة له دور مهم في التأثير معنويا على نسبة الفقس للطح بين سنة وأخرى.
٦. متوسط الحرارة مع الرطوبة المناسبة يؤثر معنويا على حيوية ونسبة الفقس.

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

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

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 10 egg masses / inspection	May			June			July			August		
	*Temp.	% Rel.	% Hat.	Temp.	%Rel.	% Hat.	Temp.	% Rel.	% Hat.	Temp.	% Rel.	% 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

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

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