FIELD STUDIES ON THE MAIN PESTS INFESTING COTTON WITH REFER TO THEIR NATURAL ENEMIES

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Abstract

The present work was carried out at El-Wasta district, Beni-Suef governorate, during 1999 & 2000 cotton seasons, to study the population fluctuation of certain sucking pests and their associated natural enemies with interrelations between them.

Obtained data showed that the population fluctuation of common red spider mite *Tetranychus arabicus* Attiah, thrips, *Thrips tabaci* (lind), aphid, *Aphis gossypii* Glover and whitefly, *Bemisia tabaci* (Genn.) and their associated natural enemies of insects, mites and true spiders as well as the effect of temperature and relative humidity.

Results obtained could be summarized as follow:-

1. In both seasons the population of common red spider mite *T. arabicus* has two peaks of abundance during seedling and bolling stages. Climatic factors affected positively mite population.
2. The infestation with cotton thrips *Thrips tabaci* started heavily as soon as the cotton seedlings appeared (20-25 days after planting).
3. The population of cotton aphids *Aphis gossypii* recorded three small peaks during seedlings and bolling stages. Meanwhile the abundance of whitefly regarding two distinct peaks occurred during August of 1999 & 2000 seasons.

The statistical analysis of obtained data showed that non-significant correlation coefficient found between the populations of certain sucking pests infesting cotton and their natural enemies except that of spider mites, correlation was generally negative while it was positive for whitefly.

Introduction

The future of cotton industry in Egypt depends on the competitiveness in the world market and its profitability to the producer. These demands emphasize the need for more effective integrated cotton management system.

It is well known that the use of pesticides on cotton plants has its harmful effects on natural enemies, which are one of the main elements of natural balance between pests and predators.

Sucking pests such as the common red spider mite *Tetranychus arabicus*, *T. cucurbitacearum* (Sayed), *Thrips tabaci*, *Aphis gossypii* and whitefly *Bemisia tabaci* are considered among the economic pests of cotton plants at present. Arthropod predators of insects, mites and the spiders are considered the main elements for minimizing the population of different pests, therefore it is necessary to follow up the status of different sucking pests during the growing season to gain more information concerning the population trends of these pests and their natural enemies which play a rather important role in biological control of certain pests attacking cotton plants and will be useful for an enlightened integrated control.

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Several workers have studied similar factors such as: Hassanein et al. (1971), El-Heneidy et al (1979), Taha et al. (1990), Nassef et al (1999a,b), El-Guindy et al. (1996) and Taha & El-Raies (1996).

The present study aims to investigate the population fluctuation of certain sucking pests infesting cotton plants and their associated natural enemies as well as the interrelation between them and climatic factors.

Materials and Methods

Experimental Design

An experiment was carried out at El-Wasta district, Beni-Suef Governorate, during the two growing cotton seasons of 1999 & 2000 to study the population fluctuation of certain sucking pests and their natural enemies.

One area of feddan (4200m^2) was chosen and divided into three plots. The field was planted with Giza 80 cotton variety on March, 7 during two seasons. Normal agricultural practical were followed and no pesticidal treatments were applied during the whole experiment period.

Population Fluctuation of Sucking Pests

Samples were collected at random from both diagonals of the inner square area of each experiment plot, for counting the common red spider mites 25 seedlings or leaves were sampled fortnight intervals from each plot from different levels of the plant, one square inche of the lower surfaces of the leaves were examined carefully using hand lens 20x.

For counting the other pests 25 cotton leaves for each were examined early in the morning from different levels of the plant (2, 1 and 2 leaves/plant from upper, middle and lower level respectively). The upper and lower surfaces of the leaf were examined carefully (Hassunein et al, 1971).

Population Fluctuation of the Natural Enemies

Direct count of the arthropod predators in cotton field experiment was carried out in fortnight intervals, samples of 25 plants for each plot were examined using hand lens 20x to determine the abundance of the predacious insects & true-spiders according to Hafez (1960) tequnique except predacious mites were counted on 25 leaves for each plot. User's Guide to Mstate-C (A software program for design management and analysis). Freed et al (1989) was used for estimating the simple correlation between sucking pests, predators and climatic factors of temperature and relative humidity.

Results and Discussion

Data presented in tables (1a & b) and Figs (1-4) show the population fluctuation of certain sucking pests and their natural enemies associated with cotton plants from April to September 1999 & 2000.

Population Fluctuation of Sucking Pests

Data presented in table (1a) and figs (1-2) show population fluctuation of common red spider mite *T. arabius* which reached its first peak during the seedling stage at mid of May representing 275 and 197 individuals throughout the two successive seasons respectively. Meanwhile the second peak occurred on August, 8 and 23 representing 180 and 155 individuals during 1999 and 2000. Table (2a) shows a positive correlation between mite population and maximum RH, though table (3) shows simple regression equation between them.

Data presented in table (1a) and figs (1-2) show that in both seasons, the infestation with thrips *Thrips tabaci* started heavily as soon as the cotton seedling appeared representing 179 and 244 in the first week of April during the two growing seasons. Table (2a) shows highly negative correlation between thrips population with minimum and average

temperature as well as average of RH, though table (3) shows simple regression equations between them.

Population of aphid insects *Aphis gossypii* recorded two small peaks on the first week of May and fourth week of July 1999 season represented by 173 and 158 aphids individuals. Meanwhile two peaks were recorded during the first week of April and fourth week of July 2000 season recording 241 and 212 aphid insects. Table (2a) shows negative correlation between aphids population with minimum temperature and average RH, though table (3) shows simple regression equations between them.

Regarding the abundance of whitefly adults, it is clearly that a distinct peak occurred during the second week of August 1999 season recording 312 insects while in the second season peak occurred during the fourth week of July 2000 season recording 338 whitefly. Tables (2a & 3) show positive correlation and regression between whitefly population with minimum and average temperatures, as well as minimum and average RH.

Population Fluctuation of Natural Enemies

Obtained results in table (1b) and Figs (3-4) indicate the population fluctuation of certain predators associated with pests in cotton field experiments during 1999 and 2000 cotton growing seasons at Beni-Suef governorate could be arranged as follow:

Five predacious insects were recorded in cotton field experiments: lady-birds *Coccinella undecimpunctata* L., *C. septempunctata* L., *Cydonia vicinia* nolitica Muls. In addition to the *Orius laevigatus* (Fieb.) and the aphid lion *Crysopa carnea* (steph.). Data cleared that the population densities of predacious insects were, low in the first season than the second, whereas the high numbers were recorded on June, 13 recording 87 predators in the first season, while in the second season the high numbers of predacious insects were recorded on July, 12 represented by 196 predators. Tables (2b & 3) show positive correlation and regression equations between predacious insects population with minimum, maximum and average temperatures.

One peak was recorded from the population fluctuation of true spiders in cotton fields during 1999 & 2000 seasons, whereas in the first season the high numbers occurred on the second week of August while in the second season during the last ten days of July. Tables (2b & 3) show positive correlation and regression equations between true-spiders population and average RH.

Predacious mites *Egistemus exsertus* (Gonn.), *Amblyseius cydnodactylon* shehata & zaher and *A. swirskii* Ahias-Henriot were recorded in few numbers during the two growing cotton seasons at the experimental area, whereas 20 and 36 as a total numbers of predator mites during the season 1999 & 2000 respectively. Tables (2b & 3) show positive correlation and regression between predacious mite population with minimum, and average temperatures, as well as minimum and average RH.

Sucking Pests-Natural Enemies Interrelations

The interrelation between sucking pests and natural enemies was studied. The obtained results are given in tables (2a & b).

Correlation coefficient in tables (2a & b) concerning pests and predacious revealed that although the negative relations between spider mites and predacious, they were not significant. As for thrips, there were negative significant correlation between thrips and predacious. Thus, aphids correlated significantly negative with true-spider and nonsignificant negative with predacious mites and insects. Also, whiteflies correlated significantly positive with predacious insects and true-spiders. These relations either correlation or regression need more studies to generalize under one metrological zone.

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Table 1a. Population fluctuation of (a) sucking pests infesting cotton during 1999 & 2000 seasons.

Invest.	Mites	Thrips	Aphids	Whitefly
4-4-1999	161	179	55	0
19-4-99	193	60	69	2
2-5-99	224	46	173	18
16-5-99	275	36	70	27
30-5-99	191	12	21	46
13-6-99	181	6	9	63
27-6-99	169	7	12	103
11-7-99	160	6	21	173
22-7-99	141	3	158	219
8-8-99	180	5	33	312
22-8-99	168	1	5	201
5-9-99	173	0	0	126
Mean	185	30	52	108
5-4-2000	62	244	241	0
19-4-00	85	159	195	0
3-5-00	97	106	167	13
17-5-00	197	66	118	87
31-5-00	187	25	50	125
14-6-00	126	11	31	183
28-6-00	85	6	59	217
12-7-00	90	3	101	271
26-7-00	92	0	212	338
9-8-00	108	0	65	325
23-8-00	155	0	12	232
6-9-00	146	0	6	110
Mean	120	52	105	158
LSD	**at**	5%		
Year (Y)	1.14	0.68	1.02	0.77
Invest.(I)	2.80	1.67	2.50	1.89
Y x I	3.95	2.37	3.54	2.67

Table 1b. Natural enemies during 1999 & 2000 seasons.

Invest.	Insects	Mites	True-spiders
4-4-1999	12	0	0
19-4-99	25	2	0
2-5-99	33	2	4
16-5-99	47	4	4
30-5-99	76	6	7
13-6-99	87	13	8
27-6-99	51	20	12
11-7-99	25	16	16
22-7-99	9	9	27
8-8-99	6	2	32
22-8-99	12	0	23
5-9-99	8	0	15
Mean	33	6	12
5-4-2000	3	0	0
19-4-00	18	0	1
3-5-00	27	2	3
17-5-00	41	6	4
31-5-00	103	36	5
14-6-00	144	34	9
28-6-00	148	20	11
12-7-00	196	17	16
26-7-00	191	18	25
9-8-00	174	11	21
23-8-00	136	8	15
6-9-00	78	5	12
Mean	105	13	10
LSD	at	5%	
Year (Y)	0.82	0.59	0.34
Invest.(I)	2.00	1.44	0.83
Y x I	2.83	2.04	1.17

Invest. = investigation intervals

Table 2a. Matrix correlation of different pests with predators as well as with temperature or relative humidity (n=24) (1999-2000).

Sources	Mites	Thrips	Aphids	Whitefly
P-Insects	-0.349 ^{ns}	-0.452*	-0.366 ^{ns}	0.598**
P-mites	-0.136 ^{ns}	-0.420*	-0.340 ^{ns}	0.384 ^{ns}
True-spiders	-0.126 ^{ns}	-0.645**	-0.661**	0.883**
T-max	ns	ns	ns	ns
T-min	ns	-0.642**	-0.457*	0.732**
T-avg	ns	-0.634**	ns	0.718**
RH-max	0.437*	ns	ns	ns
RH-min	ns	ns	ns	0.502*
RH-avg	ns	-0.650**	-0.716**	0.584**

Table 2b. Matrix correlation of different predators with temperature or relative humidity (n = 24)(1999-2000)

Sources	Predator Insects	Predator Mites	True-spiders
T-max	0.453*	ns	ns
T-min	0.530**	ns	0.619**
T-avg	0.625**	ns	0.576**
RH-max	ns	ns	ns
RH-min	ns	ns	0.447*
RH-avg	ns	0.455*	0.517*

T-max = maximum temperature, T-min = minimum temperature, T-avg = average temperature, RH-max = maximum relative humidity, RH-min = minimum relative humidity, RH-avg = average relative humidity
* = significant at 5%, ** = significant at 1%,, ns = non significant

Table 3. Simple regression equations between population and temperature or relative humidity (n = 24) (1999 – 2000).

Y (Population) = a + b x (T or RH)	R^2%	Significant
Mites No. = - 131 + 3.2 RH-max	19.1	*
Thrips No. = 26.1 – 10.8 T-min	41.3	**
Thrips No. = 459 - 14.4 T-avg.	40.1	**
Thrips No. = 680 – 11.1 RH avg.	42.3	**
Aphid No. = 208 - 7.85 T-min	20.9	*
Aphid No. = 766 – 12.5 RH- avg.	51.2	**
White flies No. = - 292 + 20.8 T-min	53.6	**
White flies No. = - 671 + 27.7 T-avg	51.6	**
White flies No. = - 57.3 + 7.24 RH-min	25.2	*
White flies No. = - 838 + 16.9 RH-avg	34.1	**
P-insects No. = - 249 + 8.42 T-max	20.5	*
P-insects No. = - 106 + 8.58 T-min	28.0	**
P-insects No. = - 329 + 13.7 T-avg	39.0	**
P-mites No. = - 60.3 + 1.22 RH-avg	20.7	*
True-spiders No. = - 18.4 + 1.45 T-min	38.4	**
True-spiders No. = - 41.9 + 1.83 T-avg	33.1	**
True-spiders No. = - 2.71 +0.531RH-min	20.0	*
True-spiders No. = - 59.6 + 1.24 RH-avg	26.7	*

* = significant at 5%, ** = significant at 1%, ns = non significant.

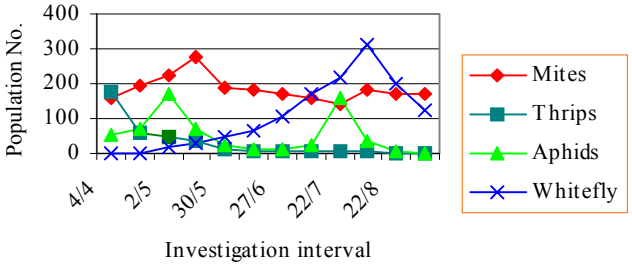

Figure 1. Pests population (1999).

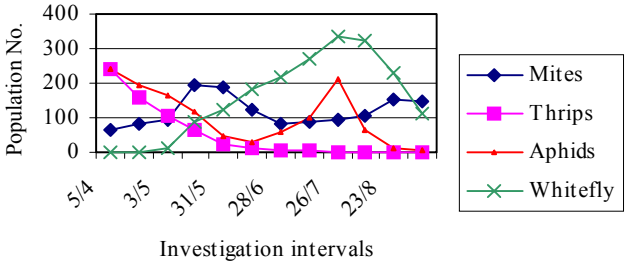

Figure 2. Pests population (2000).

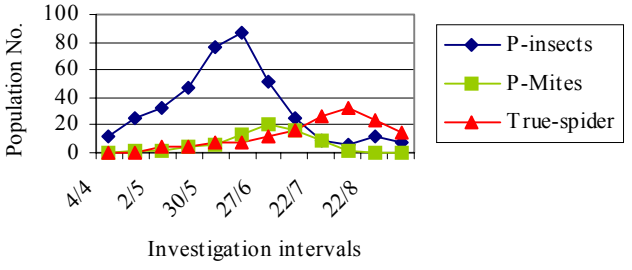

Figure 3. Predators population (1999).

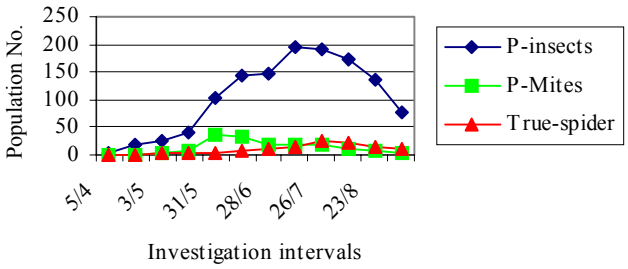

Figure 4. Predators population (2000).