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VI. SUMMARY

6.1- Ecological Studies :

6.1.1- Survey of predaceous mites associated with some different field crops :

This study was carried out during two successive seasons 1998/99 and 1999/2000 for winter crops, and seasons 1999 and 2000 for summer field crops to record predaceous mites on 75 leaves or leaflets from sugar beet, clover, lentil, soybean and maize crops, at two locations, Sakha Agricultural Experimental Farm and Biala district, Kafr El-Sheikh governorate. Hence fourteen species of predaceous mites belonging to thirteen genera, six families, six superfamilies and two orders were found.

The aim of this study was to survey the predaceous mites and the sucking pests which were found with this mites on the target crops.

A- Order : Parasitiformes :

This order was represented by one suborder Gamasida, and include nine species belonging to three families. These families were Phytoseiidae, Laelapidae and Ascidae.

B- Order : Acariformes :

This order was represented by one suborder Actinedida, which include five species belonging to three families. These families were Tydeidae, Stigmaeidae and Cheyletidae.

1- On sugar beet crop :

Four species of predaceous mites were surveyed on sugarbeet crop belonging to four genera, two families and two superfamilies.

2- On clover crop :

Five species of predaceous mites were surveyed on clover crop belonging to five genera, three families and three superfamilies.

3- On lentil crop :

Only two species of predaceous mites were surveyed on lentil crop belonging to two genera, two families and two superfamilies.

4- On soybean crop :

Eight species of predaceous mites were surveyed on soybean crop belonging to eight genera, five families and five superfamilies.

5- On maize crop :

Six species of predaceous mites were surveyed on maize crop belonging to six genera, four families and four superfamilies.

5.1.2- Survey of certain sucking pests associated with predaceous mites on some field crops :

This study was carried out during two successive seasons 1998/99 and 1999/2000 for winter crops, and seasons 1999 and 2000 for summer field crops to record sucking pests inhabiting some field crops, such as sugar beet, clover, lentil, soybean and maize. The survey carried out on 75 leaves or leaflets from the previous crops, at two locations, Sakha Agricultural Experimental Farm and Biala district, Kafr El-Sheikh governorate. Hence the aim of this study was to survey sucking pests on these crops and the role of some natural enemies in control these pests to maintenance human health and environment from risks of pesticides use. From survey sucking pests on the previous crops, thirteen species of pests were found belonging to eight genera, five families and three

orders as follows :

1- Sugar beet crop :

On sugarbeet crop, six species of sucking pests were found, belonging to five genera, four families and three orders.

2- Clover crop :

On clover crop, five species of sucking pests were found, belonging to four genera, four families and three orders.

3- Lentil crop :

On lentil crop, five species of sucking pests were found, belonging to five genera, four families and three orders.

4- Soybean crop :

On soybean crop, seven species of sucking pests were found, belonging to five genera, six families and three orders.

5- Maize crop :

On maize crop, eight species of sucking pests were found, belonging to six genera, four families and three orders.

6.1.3- Relationship between mean population of sucking pests and predaceous mites on some different field crops during two successive seasons at two localities:

A- Sugar beet crop :

Statistical analysis of obtained results revealed that, during the first season 1998/1999 at the first location on sugar beet crops, mean population of the predatory mites was positive correlated but not significant with means of thrips and it was significant and positive

correlated with jassids. Also, it was negative correlated but not significant with aphids, and it was highly significant and positive with phytophagous mites. During the second season (1999/2000), the mean population of the predatory mites was highly significant positive correlation with mean no. of thrips, jassids, aphids and phytophagous mites. At the second location, during the first season on sugar beet crop found that, simple correlation was highly significant positive between mean no. of predatory mites and phytophagous mites and it was positive and not significant with mean no. of thrips, jassids and aphids. During the second season, at Biala district, high significant positive correlation was found between the mean population of predatory mites and thrips, aphids and phytophagous mites, while it was significant positive with jassids.

2- Clover crop :

The results of statistical analysis revealed that, the mean population of predatory mites was highly significant positive correlation with thrips and phytophagous mites, and it was negative and not-significant with jassids and positive and not significant with aphids. During the second season at the first location, found that highly significant positive correlation was between mean predaceous mites and mean phytophagous mites and correlation was positive and not significant between mean population of predaceous mites and thrips, aphids and it was negative and not significant with mean of jassids.

During the first season, at the second location, found that the correlation between mean population of predaceous mites and thrips was positive and not-significant, and it was significant negative with jassids and it was negative and not- significant with aphids, while highly significant with phytophagous mites. During the second season, at the

same location, found that correlation between mean population of predaceous mites and thrips, aphids was positive and not significant, also it was negative and not significant with jassids, while highly significant positive with phytophagous mites was obtained.

3- Lentil crop :

Results of statistical analysis revealed that, during the first season 1998/99 at the first location, on lentil crop, found that correlation between mean population of predaceous mites and mean of aphids and phytophagous mites was significant positive, while positive and not significant with thrips and jassids was found. But during the second season 1999/2000 at the same location, found highly significant positive correlation between mean population of predaceous mites and mean no. of aphids and phytophagous mites, while correlation between mean population of predaceous mites and thrips was positive and not significant, and it was negative and not significant with jassids.

At the second location, during the first season found that correlation between mean population of predaceous mites and jassids, phytophagous mites was highly significant positive, while it was positive but not significant with thrips and aphids. During the second season, at the same location, found that correlation between mean population of predaceous mites and aphids, phytophagous mites was highly significant positive, while it was negative and not-significant with thrips and jassids.

4- Soybean crop:

At the first location, during season 1999, results indicated that simple correlation between mean population of predaceous mites and aphids, phytophagous mites was highly significant positive and it was significant positive with whitefly and positive but not significant with

jassids, and negative but non-significant with thrips. The same location and during the second season, 2000, on soybean crop, found that the mean population of predaceous mites was positive and not-significant correction with both of thrips, jassids, aphids, whitefly and phytophagous mites. During the first season, at the second location, on soybean found that correlation between mean population of predaceous mites and thrips, aphids was negative and not-significant, while it was positive but not significant with mean of jassids, whitefly and phytophagous mites. At the same location and during the second season on the same crop, found that correlation between mean population of predaceous mites and thrips, jassids, aphids and phytophagous mites was negative but not significant. While it was positive but not significant with whitefly population.

5- Maize crop :

The results during the first season 1999, at first location, on maize crop, indicated that simple correlation between mean population of predaceous mites and thrips, jassids, aphids, whitefly and phytophagous mites was positive but not significant. During the second season 2000, at the same location on maize crop, found that correlation between mean population of predaceous mites and thrips, jassids, whitefly and phytophagous mites was positive but not significant, while it was significant positive with aphids. During the first season, at the second location, Biala district, found that correlation between mean population of predaceous mites was positive but not significant with thrips, jassids, whitefly and phytophagous mites. During the second season at the same location, found that correlation between mean population of predaceous mites and thrips was significant negative, while it was negative but not significant with jassids, aphids, whitefly and phytophagous mites.

6.1.4- Relationship between mean population of predaceous mites and mean of temperature degrees and relative humidity on some different field crops :

1- Sugar beet crop :

The results revealed that regression between mean of temperature degrees and mean population of the predaceous mites was positive and highly significant. But, it was negative and significant between mean relative humidity and mean predaceous mites and the combined effect of two weather factors (explained of variance, E.V. % = 61 %) and it was significant at the first location during the first season 1998/99. While the regression between mean temp. and mean population of predaceous mites was positive and not significant. While it was negative and not significant with mean relative humidity (E.V. = 33 %) and not significant during the second season at Sakha Agric. Exp. Farm, during 1999/2000.

During the first season at the second location, it was found that regression between mean population of predaceous mites and mean temperature and mean relative humidity was positive and not-significant and explained variance (E.V. = 35 %) not significant. During the second season at the same location, found that regression between mean population of predaceous mites and mean temperature, relative humidity was negative but not significant, and explained variance (E.V. = 26 %) and not significant.

2- Clover crop :

The regression between mean temp. and mean population of predaceous mites during the first season at the first location was positive and highly significant. While it was negative and not significant with relative humidity, and explained of variance (E.V. = 59 %).

During the second season at the same location, on clover crop, found that relationship between mean temperature and relative humidity with mean population of predaceous mites was positive and negative but not significant, and explained variance (E.V. = 30 %) not significant.

At the second location, during two seasons found that regression between mean temperature and mean population of predaceous mites was positive and highly significant during the first season, while it was also positive but not significant during the second season, while the relation with relative humidity during two seasons was negative but not significant.

3- Lentil crop :

The results indicated that the relation between mean temperature and mean relative humidity with mean population of predaceous mites during the first season at the first location was positive but not significant and E.V. = 55 % and not significant.

During the second season, at the same location, the regression between mean temperature and mean relative humidity with mean population of predaceous mites was negative and not significant, and E.V. = 24 % and not significant. During the first season, at the second location, Biala district, found that regression between mean temperature and mean relative humidity and mean population of predaceous mites was positive but not significant and explained of variance (E.V. = 21 %) and not significant. But during the second season, on lentil, at the same location, found that the relation between mean temperature, mean relative humidity and mean population of predaceous mites was negative nut not significant and E.V. = 47 % and was not significant.

4- Soybean crop :

The obtained results indicated that regression between mean temperature and men population of predaceous mites was positive but not significant. While with relative humidity, it was negative and not significant, and E.V. = 4 % not-significant at the first location, during the first season 1999. But during the second season 2000, at the same location, found that the relationship between mean temperature and men population of predaceous mites was positive but not significant, while with relative humidity was negative and not significant and E.V. = 64 % and not significant. During the first season at the second location, Biala district on soybean crop, found that regression between mean temperature and mean population of predaceous mites was negative but not significant, while with relative humidity was positive and significant and E.V. = 80 % and significant. At the same location and during the second season, found that the relationship between mean temperature and mean population of predaceous mites was positive and significant. While it was positive and not significant with relative humidity, and E.V. = 81 % and significant.

5- Maize crop :

The results indicated that the relationship between mean temperature and men population of predaceous mites was positive and not significant, while with relative humidity was negative and not significant, at the first location, during the first season 1999, and E.V. = 5 % and not significant. But during the second season 2000 at the same location, found that regression between mean temperature and mean population of predaceous mites was negative and not significant, while with relative humidity it was positive but not significant, and E.V. = 31 % and not significant.

At the second location, during the first season, found that the relationship between mean temperature and mean population of predaceous mites was positive and not significant, while with relative humidity it was negative and not significant, and E.V. = 56 % and was not significant. But during the second season and at the same location found that the regression between mean temperature and mean population of predaceous mites was negative but not significant, while it was positive but not significant with relative humidity, and E.V. = 48 % and not significant.

6.1.5- The relationship between population fluctuation of predaceous mites and some climatic factors (temperature and relative humidity) :

(A) Winter crops :

1- At Sakha (the first location):

*** During the first season (1998/1999) :**

a) Sugar beet crop :

The results revealed that the population fluctuation of predaceous mites had five periods of increase through its activity. These periods occurred in January 5*th*, February 16*th*, March 15*th*, April 12*th* and May 10*th* with total number 30, 24, 48, 60 and 72 mites/75 sq. inch, respectively. While the highest peak recorded in May 10*th* with 72 mite individuals/75 sq. inch at temp. (21.34°C) and R.H. (56.11 %).

b) Clover crop :

The results proved that the population fluctuation of predaceous mites had three periods of increase through its activity. These periods occurred in January 19*th*, April 12*th* and May 10*th* with total number 42, 78 and 120 mites/75 sq. inch, respectively. While the highest peak

recorded in May 10*th* with 120 mite individuals/75 sq. inch at temp. (21.34°C) and R.H. (56.11 %).

c) Lentil crop :

At the same location, the results revealed that the population fluctuation of predaceous mites had three periods of increase through its activity, occurred in January 19*th*, February 16*th* and April 12*th* with total number 36, 24 and 180 mites/75 sq. inch, respectively. While the highest peak recorded in April 12*th* with 180 mites/75 sq. inch at temp. (17.09°C) and R.H. (60.66 %).

*** During the second season (1999/2000) :**

a) Sugar beet crop :

The results revealed that there were four periods of increase for population fluctuation of predaceous mites through its activity. These periods occurred in January 19*th*, February 16*th*, April 12*th* and May 10*th* with total number 30, 48, 60 and 72 mites/75 sq. inch, respectively. The highest peak recorded in May 10*th* with 72 mite individuals/75 sq. inch at temp. (21.74°C) and R.H. (56.47 %).

b) Clover crop :

On clover crop, five peaks of population fluctuation of predaceous mites were occurred during its activity. These periods occurred in January 19*th*, February 16*th*, March 15*th*, April 12*th* and May 10*th* with total number 18, 36, 72, 162 and 180 mites/75 sq. inch, respectively. The highest peak of predaceous mites was in May 10*th* with 180 mite individuals/75 sq. inch at temp. (21.74°C) and R.H. (56.47%).

c) Lentil crop :

Obtained results revealed that there were three peaks of population fluctuation of predaceous mites through its activity, occurred in February 16*th*, Mar. 15*th* and April 12*th* with total number 42, 96 and 108 mites/75 sq. inch, respectively, and the highest peak was in April 12*th* with 108 mites/75 sq. inch at temp. (20.09°C) and R.H. (57.82 %).

2- At Biala (the second location):

*** During the two seasons :**

a) Sugar beet crop :

Obtained results during the first season, at the first location, revealed that there were five peaks of abundance occurred during January 5*th*, February 2*nd*, March 15*th*, April 12*th* and May 10*th* with total number 18, 36, 42, 60 and 72 mites/75 sq. inch, respectively, and the highest peak was in May 10*th* with 60 mite individuals/75 sq. inch at temp. (21.34°C) and R.H. (56.11 %). During the second season, four peaks of population fluctuation of predaceous mites occurred during January 19*th*, February 16*th*, March 15*th* and April 12*th* with total number 30, 24, 36 and 120 mites/75 sq. inch, respectively, and the highest peak was in April 12*th* with 120 mites/75 sq. inch at temp. (20.00°C) and R.H. (57.82 %).

b) Clover crop :

The population fluctuation of predaceous mites represented by three and four peaks during the two successive seasons. During the first season these peaks were in January 19*th*, March 15*th* and May 10*th* with total number 30, 48 and 210 mites/75 sq. inch, respectively, and the highest peak recorded in May 10*th* with 210 mite individuals/75 sq. inch at temp. (21.34°C) and R.H. (56.11 %). While during the second season, these peaks were in January 19*th*, February, 16*th*, March 15*th* and April,

12*th* with total number 36, 30, 84 and 180 mites/75 sq. inch, respectively, and the highest peak was in April 12*th* with 180 mites/75 sq. inch at temp. (20.00°C) and R.H. (57.82 %).

c) Lentil crop :

The results indicated that, on lentil crop, the population fluctuation of predaceous mites represented by two and four peaks through its activity during the two successive seasons, at Biala district. During the first season, these peaks were in January 19*th* and March 29*th* with total number 30 and 108 mites/75 sq. inch, respectively, and the highest peak was in March 29*th* with 108 mite individuals/75 sq. inch at temp. (16.13°C) and R.H. (56.93 %). While during the second season, these peaks were in January 19*th*, February, 16*th*, March 15*th* and April, 12*th* with total number 18, 36, 120 and 150 mites/75 sq. inch, respectively, and the highest peak was in April 12*th* with 150 mites/75 sq. inch at temp. (20.00°C) and R.H. (57.82 %).

(B) Summer crops :

1- At Sakha (the first location) :

a) Soybean crop :

The results indicated that, during the first season (1999), the population of the predaceous mites had one peak of abundance in August 24*th* with total number of 156 mites/75 sq. inch at temp. (29.32°C) and R.H. (76.90 %). During the second season (2000), the predaceous mites had three peaks of population in July 9*th*, August 20*th* and September 17*th* with total number 84, 180 and 114 mites/75 sq. inch, and the highest one was in August 20*th* with 180 mites/75 sq. inch at temp. (26.63°C) and R.H. (65.65 %).

b) Maize crop :

The results indicated that, during the first season (1999), there was one peak of population of the predaceous mites in August 10*th* with total number of 54 mites/75 sq. inch at temp. (26.98°C) and R.H. (72.83 %). During the second season (2000), the predaceous mites had two peaks of population in August 6*th* and September 17*th* with total number 60 and 48 mites/75 sq. inch, and the highest one was in August 6*th* with 60 mites/75 sq. inch at temp. (26.55°C) and R.H. (71.72 %).

2- At Biala (the second location):

a) Soybean crop :

During the first season (1999), It was found that the predaceous mites had two peaks of abundance occurred in August 9*th* and September 20*th* with total number of 162 and 120 mites/75 sq. inch, and the highest peak was in August 9*th* with 162 mites/75 sq. inch at temp. (26.93°C) and R.H. (7082 %). During the second season (2000), the predaceous mites had one peak only of population in August 27*th* with total number of 168 mites/75 sq. inch at temp. (26.54°C) and R.H. (64.72 %).

b) Maize crop :

During the first season (1999), the population of the predaceous mites had two peaks of abundance in August 17*th* and September 14*th* with total number 62 and 72 mites/75 sq. inch, and the highest peak was in September 14*th* with 72 mite individuals/75 sq. inch at temp. (25.57°C) and R.H. (62.43 %). During the second season (2000), the predaceous mites had also two peaks of population in July 28*th* and August 25*th* with total number 60 and 108 mites/75 sq. inch, and the highest peak was in August 25*th* with 108 mites/75 sq. inch at temp. (26.54°C) and R.H. (65.15 %).

6.2- Biological Studies :

When *Euseius scutalis* (Athias-Henriot) fed on immature stages of *Bemisia tabaci (*Genn.) at 28±1°C and 75±5 % R.H. it was found that the incubation period durated 1.75±0.38 day for female and 0.67±0.26 day for male, in average.

Larval stage lasted 1.0±0.29 day for female and 0.58±0.20 day for male. Protonymphal stage durated 1.04±0.14 day for female and 0.92±0.20 day for male, in average. Deutonymphal stage durated 1.67±0.62 day for female and 1.25±0.27 day for male, in average. Total immature stage durated 4.77±0.74 days for female and 3.55±0.42 days for male, in average. Life cycle durated, in average, 6.52±0.92 days for female and 4.21±0.47 days for male. Generation period durated for female, in average, 10.31±1.50 days. Longevity period averaged 16.08±2.15 days for female and 11.0±1.82 days for male. Life span lasted for female 20.85±2.28 days and 15.21±1.46 days for male, in average.

Pre-oviposition period for female lasted 3.79±1.39 days, oviposition period lasted 8.71±0.75 days and post-oviposition period averaged 3.58±1.06 days. Fecundity of *E. scutalis* female when fed on immature stages of *B. tabaci* at 28±1°C and 75±5 % R.H. deposited, in average, 21.42±2.35 eggs/female during oviposition period with daily rate 2.46±0.17 eggs/day.

Sex ratio for female to male was 73.14 : 26.86 (%), *i.e.* 2.72 : 1. Hatchability was 90 % from total summation of eggs.

Food consumption of developmental stages of *E. scutalis* at 28±1°C and 75±5 % R.H. :

When the predatory mite, *E. scutalis* reared at 28±1°C and 75±5 % R.H. on immature stages of *B. tabaci* obtained results indicated that the food consumption of developmental stages of the predatory mites for each stage (larva, protonymph, deutonymph, and adult) of female and male averaged (3.33±1.07 & 1.5±0.84, 6.67±0.89 & 4.5±1.38, 12.17±2.04 & 8.17±1.17 and 22.17±2.55 & 14.67±1.97 prey individuals, respectively. While the daily rate of each stage of predator mites averaged 3.89±2.5 & 2.50±0.84, 6.44±0.86 & 5.0±1.26, 7.99±2.41 & 6.83±1.24 and 18.32±3.72 & 14.33±2.79 individuals of immature stages of whitefly, respectively, for female and male. while the consumed number of prey during female and male longevity averaged 312.33±27.56 and 137.67±20.99 individuals of prey, respectively, with average daily rate 66.15±8.99 and 12.56±0.95 individuals of prey, respectively.

The adult female and male consumption during their life span averaged 334.5±26.58 and 152.33±19.77 individuals, respectively, with daily rate averaged 84.47±8.65 and 26.89±2.58 individuals of prey, respectively.

The consumed number for female during the following stage (pre-oviposition, oviposition and post- oviposition) averaged 144.33±18.79, 132.33±13.10 and 35.67±12.60 prey individuals, respectively. The average daily rate 41.15±8.93, 15.19±0.57 and 9.81±0.96 individuals, respectively.

From the previous results, it is cleared that average consumption for female during pre-oviposition period was higher than the other stages because that during this period composition of yolk began to appear. Also, the previous results indicated that *E. scutalis* has high economic

importance because of this predator had a good ability in consuming a great number of this pest. Thus, it could be consider a biocontrol agent against this serious pest and can be used during an integrated pest program on different crops instead of using the traditional pesticides to avoid the pollution and bad effect of pesticides on the different elements of the ecosystem.