

INSECT PESTS AND THEIR ASSOCIATED PREDATORS ON CORN PLANTS, *Zea mays* L., IN MINUFIYA GOVERNORATE Hammad, S.A.

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ABSTRACT

Insect pests of corn plants and their predators in Minufiya governorate were studied in 2005 and 2006. Sweeping net and green plant samples were taken in account in sampling procedure. Data revealed that thirteen insects pest species belonging to four orders were found attacking maize plants in both seasons. The common seedling pests were *Agrotis ipsilon* and *Gryllotalpa gryllotalpa*, cotton leafworms, corn aphid and corn borers were the most abundant and common pests during growing stages following seedling stage. Six insect predators species were detected, however *Coccinella undecimpunctata* and *Paederus affierii* were the most abundant species. Statistical analysis cleared that, the correlation coefficients and regression for each of insect pest to predators, relative humidity and temperature.

INTRODUCTION

Maize is one of the most important cereal food crops in many parts of the world. In Egypt the area planted annually with maize is the largest among all other crops. It is used mainly for human, poultry feeding and food industries. Furthermore, green maize plants are used as forage crop for cattle during summer. However, maize plants are liable to be attacked by several injurious insect pests at different stages of development. These plants are good shelter for many insect pests as well as beneficial insects particularly during adverse environmental conditions. Much knowledge about the abundance of corn pests in relation to the population dynamics of their natural enemies in different plantations (Tawfik, *et al.* 1974c). The different modern agricultural techniques, the weather factors in an area and the intense use of different insecticides during the last few decades undoubtedly affect on the occurrence and the abundance of insect species present.

The present investigation aimed to determine the insect pest species and their associates natural enemies on maize plants in Minufiya governorate. Data of this work may of a useful and good help in drawing the integrated pest management programs for corn pest control.

MATERIALS AND METHODS

The present investigation was carried out during 2005 and 2006 seasons on a private summer corn plantation field 3/4 feddan at samadon locality, Minufiya governorate.

Sampling was started on May 13, 2005 and on May 18, 2006 just few days after the appearance of seedlings. Weekly samples were considered up to August 26, 2005 and on August 31, 2006. Surfing of insect pests and their associates was carried out according Tawfik *et al.*(1974b) as follow: Two methods were applied; the first was achieved by the common insect net to survey the flying insects. The second method was by inspecting plant

samples, fifty corn plants were examined visually and by the aid of a hand tense.

Samples selected at random programme the two diagonals of the field. Soil stages of insects were inspected by digging under each of the tested plants. A part of the collected material was preserved, dry or in 70% ethyl alcohol. Count of larvae was performed by one of two ways according to the larval habits. The small larvae were found mostly on the foliage of the plants. Other instars and pupae were usually found under soil surface when the soil was relatively dry, the samples were thrown over muslin cloth, crushed gently to collect the larvae, pupae or nymph. Climatic factors including temperature and relative humidity were also recorded at each data of inspection. The correlation coefficient values between the two climatic factors and insect population was calculated in the two years of study.

Statistical analysis:

Statistical analysis was be done as follows:

- 1-simple correlation coefficient was computed for various variables as outlined by snedecor and cochran (1989).
- 2-multiple regression analysis that was performed as outlined by draper and smith (1987) to get the prediction equations to estimate the relative contribution of independent variables (r^2) in the total variation of the dependent variable.

RESULTS AND DISCUSSION

Insect pests attacking maize plants of summer plantation as well as insect predators associated were studied during 2005 and 2006 seasons at Samadon locality, Minufiya governorate. Data obtained are presented in Table 1 and 2.

Insect pests:

Data presented in Tables 1 and 2 indicated that the total number of surveyed insects attained 2701 and 2837 individuals in 2005 and 2006 seasons, respectively. The identified insects were found belonging to four insect orders; i.e., Orthoptera (4 species), Hemiptera (1 species), Homoptera (1 species) and Lepidoptera (7 species).

1- Orthopterous insects:

Three representatives were found from this order on corn fields as follow:

- *Grylotalpa grylotalpa* (L.) this insect pest counted 14 and 13 individuals, representing 20.6 and 17.6% of the total orthopterous insects in 2005 and 2006, respectively. The occurrence of this insect was noticed during the seedling stage only.
- *Gyllus domesticus* (L.) this insect pest appeared during seedling stage in May. The counted numbers recorded 28 and 18 individuals represented 41.2 and 24.3% of the total orthopterous insects in 2005 and 2006 seasons, respectively.
- *Euprepocnemis plorans* (Charp.) this insect was less abundant in 2005 season (23 individuals) than in 2006 (42 insects). It was swept during the first half of growing period of corn. It formed 33.8 and 56.8% of the total orthopterous insects in the two respective seasons.

Table (1): Corn insect pests and their predators during 2005 season.

Insect pests:	Date of inspection														Total	%		
	13/5.	20	27	3/6.	10	17	24	1/7.	8	15	22	29	5/8.	12			19	26
Orthopterous insects:																		
<i>Gryllotalpa gryllotalpa</i> (L.)	4	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	14	20.6
<i>Gryllus domesticus</i> (L.)	0	19	9	0	0	0	0	0	0	0	0	0	0	0	0	0	28	41.2
<i>Euprepocnemis plorans</i> (Charp.)	0	0	0	0	0	10	8	5	0	0	0	0	0	0	0	0	23	33.8
<i>Anacridium aegyptium</i> (L.)	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	4.4
Total																		
Lepidopterous insects:																		
<i>Agrotis ipsilon</i> (Huf.)	11	13	9	7	0	0	0	0	0	0	0	0	0	0	0	0	40	12.8
<i>Spodoptera littoralis</i> (Boisd.)	0	0	6	7	8	0	10	7	0	15	7	0	0	0	0	0	60	19.2
<i>Spodoptera exigua</i> (Hb.)	0	0	0	0	13	24	16	0	0	0	0	0	0	0	0	0	53	16.9
<i>Sesamia cretica</i> (Led.)	0	0	0	0	0	0	10	17	7	0	0	0	0	0	0	0	34	10.9
<i>Chilo agamemnon</i> (Bles.)	0	0	0	0	0	0	0	0	8	14	8	11	0	0	0	0	41	13.1
<i>Ostrinia nubilalis</i> (Hbn.)	0	0	0	0	0	0	0	0	0	0	0	11	15	7	9	0	42	13.4
<i>Heliothis zea</i> (Boddie.)	0	0	0	0	0	0	0	0	0	0	0	0	14	17	9	3	43	13.7
Total																		
Hemipterous insect:																		
<i>Nezara viridula</i> (L.)	0	0	0	0	7	6	4	0	0	0	0	8	12	0	0	0	37	
Homopterous insect:																		
<i>Rhopalosiphum maidis</i> (Fitch.)	0	0	0	0	0	0	0	0	75	127	305	393	0	369	652	138	2059	
Predators:																		
<i>Chrysopa vulgaris</i> (Schn.)	0	5	4	0	0	5	3	0	0	0	0	0	0	0	0	0	17	7.6
<i>Paederus affinis</i> (Koch.)	0	0	0	0	13	0	9	5	0	0	15	0	0	8	5	3	66	29.5
<i>Hemianax ephippiger</i> (Selys.)	0	0	0	0	0	0	0	4	0	3	0	0	0	9	0	0	16	7.1
<i>Mantis religiosa</i> (L.)	0	1	0	0	0	0	0	0	1	3	0	0	0	0	1	0	6	2.7
<i>Coccinella undecimpunctata</i> (L.)	0	0	10	6	5	7	14	9	5	7	11	15	10	3	5	2	109	48.7
<i>Polistes gallica</i> (L.)	0	0	0	0	0	0	0	0	7	3	0	0	0	0	0	0	10	4.5
Total of Predators																		
Total																		
	15	43	41	30	46	52	74	47	103	172	346	438	54	413	681	146	2701	

Table (2): Corn insect pests and their predators during 2006 season.

Insect pests:	Date of inspection														Total	%	
	18/5.	25	1/6.	8	16	22	29	6/7.	13	20	27	3/8.	10	17			24
Orthopterous insects:																	
<i>Gryllotalpa gryllotalpa</i> (L.)	2	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	13
<i>Gryllus domesticus</i> (L.)	6	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	18
<i>Euprepocnemis plorans</i> (Charp.)	4	5	3	11	6	0	3	8	2	0	0	0	0	0	0	0	42
<i>Anacridium aegyptium</i> (L.)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total																	74
Lepidopterous insects:																	
<i>Agrotis ipsilon</i> (Huf.)	8	9	7	3	0	0	0	0	0	0	0	0	0	0	0	0	27
<i>Spodoptera litoralis</i> (Boisd.)	0	8	5	0	0	9	0	0	8	9	7	0	0	0	0	0	46
<i>Spodoptera exigua</i> (Hb.)	0	0	0	22	19	18	10	0	0	6	0	0	0	0	0	0	75
<i>Sesamia cretica</i> (Led.)	0	0	0	0	0	8	17	14	0	0	16	0	0	0	0	0	55
<i>Chilo agamemnon</i> (Bles.)	0	0	0	0	0	0	0	0	9	12	0	7	0	0	0	0	28
<i>Ostrinia nubilalis</i> (Hbn.)	0	0	0	0	0	0	0	0	0	0	3	8	13	0	0	0	24
<i>Heliothis zea</i> (Boottle.)	0	0	0	0	0	0	0	0	0	0	0	9	7	5	7	3	31
Total																	286
Hemipterous insect:																	
<i>Nezara viridula</i> (L.)	0	0	0	0	2	0	0	5	9	0	0	0	0	0	0	0	16
Homopterous insect:																	
<i>Rhopalosiphum maidis</i> (Fitch.)	0	0	0	0	0	0	0	0	0	159	486	516	607	397	72	0	2237
Predators:																	
<i>Chrysopa vulgaris</i> (Schn.)	0	0	0	4	3	0	5	0	0	0	0	0	0	0	0	0	12
<i>Paederus affinis</i> (Koch.)	0	0	9	5	9	0	3	9	0	3	9	19	0	5	0	2	73
<i>Hemianax ephippiger</i> (Selys.)	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	3	20
<i>Mantis religiosa</i> (L.)	0	0	0	0	0	0	3	0	0	1	0	0	3	0	0	0	7
<i>Coccinella undecimpunctata</i> (L.)	0	0	0	14	10	12	0	0	2	7	12	7	16	10	8	0	98
<i>Polistes gallica</i> (L.)	0	0	0	0	0	0	0	0	0	0	0	7	0	0	5	2	14
Total of Predators																	224
Total	20	35	34	69	49	47	41	36	30	197	633	673	646	428	99	10	2837

- *Anacridium aegyptium* (L.) this insect was collected in neglected numbers (3 and 1) in both seasons.

2- Lepidopterous insects:

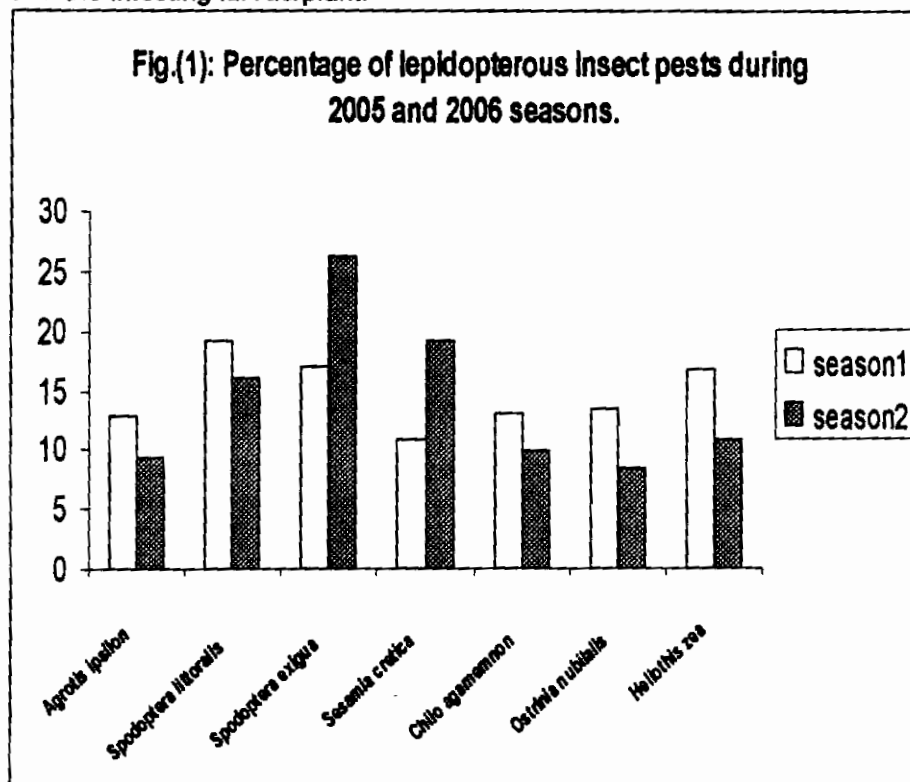
Lepidopterous insect pests were the most abundant and common pests during growing stages following seedling stages even preharvest.

The collected insects belong to order Lepidoptera counted 313 and 286 individuals in 2005 and 2006 seasons, respectively. The representatives of this order are as follow:

- *Agrotis ipsilon* (Huf.) the black cutworm appeared during May and lasted to the 1st week of June, then it disappeared completely. *A. ipsilon* represented 12.8 and 9.4% of the total lepidopterous insects in 2005 and 2006 seasons, respectively, Table(1,2).
- *Spodoptera littoralis* (Boisd.) the cotton leafworm occurred all over the growing season of corn manifesting June and July generations. This pest represented 19.2 and 16.1% of the total lepidoterous insects in the two respective years.
- *Spodoptera exigua* (Hb.) this insect pest counted 53 and 75 individuals representing 16.9 and 26.2% of the total lepidopterous insects in 2005 and 2006 seasons, respectively. It was occurred during June and rarely in July.
- *Sesamia cretica* (Led.) the stem borer was found abundantly during late June and early July only. *S. cretica* counted 34 and 55 individuals, respectively 10.9 and 19.2% of the total lepidopterous insects in 2005 and 2006 seasons respectively. The results are agreement with Farag et al., (1991) determined the activity of *S. cretica* on maize plants in Egypt, the maximum rate of infestation occurred on July, 10th in Qalubia governorate. Semada et al., (1993) recorded tat the percentage of infested plants by *S. cretica* in Giza region (Egypt), ranged between 10-22%.
- *Chilo Agamaemnon* (Bles.) this pest was found on corn plants during July. It formed 13.1 and 9.8% of the total lepidopterous catch in the two years of study, respectively Fig. (1).
- *Ostrinia nubilalis* (Hb.) the European corn borer appeared during late July and the first half of August, counting 42 and 24 individuals (13.4 and 8.4%) of the total lepidopterous. The total percent of infested plants with *O. nubilalis* at Fayoum governorate were 29.2% and 28.6% in 2003 and 2004 seasons, respectively, Sabra, et al. (2005). In Egypt, Semada (1998) found that 13 - 18% reduction in yield of maize was due to *O. nubilalis*. Musser and Shelton (2003) studied the predation of *O. nubilalis*.
- *Heliothis zea* (Boddie.) this pest started to appear on corn plants during August, forming 13.7 and 10.8% of the total Lepidopterous insects in 2005 and 2006, respectively.

Data obtained concerning Lepidopterous insects attacking maize plants showed the usual time of occurrence. For instance, the black curworm appeared during seedling stage only, followed by the cotton leafworm, then stem corn borers. In this concern *S. cretica* appeared first followed by *C. agamaemnon* then *O. nubilalis*, *H. zea*, however was found later during August to be conceded with formation and maturity of corn ear. Obtained results are in partial accordance with those of Ebaid (1997). Sherif and Lutfallah (1991), studied the infestation rates by *O. nubilalis* in maize plants.

A positive relationship was detected between the number of entrance holes and the infesting larvae/plant.



3- Hemipterous insect:

- *Nezara viridula* (L.) this pest was the unique representative of order Hemiptera. It was poorly represented, as it counted 37 and 16 individuals in 2005 and 2006 seasons, respectively.

4- Homopterous insect:

- *Rhopalosiphum maidis* (Fitch.) is the only species found on corn plants from this order, being severely counted, recording 2059 and 2237 individuals in 2005 and 2006 seasons, respectively. *R. maidis* was found in huge numbers during the second half of corn growing season. Darwish (1989) studied in untreated maize field the corn leaf aphid *R. maidis* remained active during the second week of July, this results agree with the detected in this investigation and Abd El-Rahim et al (1991). Youssef (1990) studied seasonal abundance of the *R. maidis* and survey of predators of the aphid.

Insect Predators:

- *Chrysopa vulgaris* (Schn.) Aphid lion was surveyed in fewer numbers during June and July only, forming 7.6 and 5.4% of total number of predators in 2005 and 2006, respectively.
- *Paederus affierii* (Koch.) the predator was found all over the season, being more abundant on July 22, 2005 and on August 3, 2006, recording 66 and

73 individuals, respectively in the two years of study. Results are approximately according to Tawfik et al., (1974c) estimated the population densities of the rove beetle *Paederus affierii* had 3 peaks in numbers on corn sown in May, 5th, showing 30, 695 and 1040 adult / 20 plants on Jun 1st & 22nd and August 3rd.

- *Hemianax ephippiger* (Selys.) this insect predator was swept in lower number (16 and 20 individuals) during the second half of corn growing season.
- *Mantis religiosa* (L.) this predator was poorly represented in both seasons (6 and 7 individuals).
- *Coccinella undecimpunctata* (L.) this coccinellid beetle proved to be the most abundant predator in the two seasons of study, as the counted numbers attained 109 and 98 individuals representing (48.7 and 43.8%) of the total in 2005 and 2006, respectively. *C. undecimpunctata* (L.) was detected on corn plants all over the season. The study is partial agreement with Tawfik et al., (1974c). Found that the lady beetle *C. undecimpunctata* (L.) appeared on plants sown on May, 5th, in two periods from the end of May till the first week of July and from the end of August till the first week of September. On plants sown on July, 5th, it was observed from August, 20th till harvesting.
- *Polistes gallica* (L.) this wasp occurred accidentally forming 4.5 and 6.3% of the total number of predators in 2005 and 2006 seasons, respectively. Ebaïd (1997) studied some natural enemies on some corn pests.

1- Simple correlation.

a- First season:

The obtained results in Table (3) cleared highly significant relation among Y1 and each of minimum RH and Temp. ($r = -0.620$ and -0.803). Results also, clearly indicated that p1 and p6 had high influence on the Y1 ($r = 0.454$ and -1.88). Obtained results for Y2 cleared highly significant relation with p1 ($r = 0.677$) and significant relation with each of maximum RH ($r = -0.560$) and Temp. minimum ($r = -0.477$). Results also, clearly indicated that p2, p3, p4, p5, p6, RH minimum and Temp. maximum had now significance. Obtained results for Y2 cleared highly significant relation with p1 ($r = 0.677$) and significant relation with each of maximum RH ($r = -0.560$) and Temp. minimum ($r = -0.477$).

Results also, clearly indicated that p2, p3, p4, p5, p6, RH minimum and Temp. maximum had now significance. All independent variables had now significance with Y3 except p1 scored significant relation with r values being 0.526 and this result due to that environmental conditions may be not suitable for other predators. Also, all independent variables had now significance with Y4 except Temp. minimum recorded significant relation with r values equal 0.466 and this result also due to that environmental conditions may be not suitable for other predators.

Table (3): Correlation coefficients (r) between com insect pests (Yi) and their predators (Pi), Relative Humidity and Temperature during 2005 season.

Insect pests (Yi)	Predators (Pi)					Relative Humidity		Temperature		
	P1	P2	P3	P4	P5	P6	maximum	minimum	maximum	minimum
Y1	0.454	-0.399	-0.228	-0.012	-0.475	-0.188	-0.282	-0.621	0.111	-0.803
Y2	0.677	-0.260	-0.149	0.137	-0.292	-0.123	-0.560	-0.398	0.291	-0.477
Y3	0.526	0.055	-0.025	-0.221	0.324	-0.160	0.425	-0.331	-0.021	-0.068
Y4	-0.145	-0.190	-0.109	-0.124	0.189	-0.090	-0.160	0.249	0.392	0.466
Y5	0.433	-0.412	-0.236	-0.036	-0.452	-0.194	-0.248	-0.600	0.039	-0.791
Y6	-0.069	0.318	0.074	0.387	0.365	0.056	0.205	0.000	-0.264	0.108
Y7	0.515	0.214	-0.194	-0.222	0.192	-0.160	0.467	-0.400	-0.050	-0.138
Y8	-0.042	0.137	0.187	-0.096	0.290	0.202	0.169	-0.111	0.027	0.021
Y9	-0.313	-0.079	0.006	0.601	0.348	0.546	0.078	0.382	0.025	0.387
Y10	-0.309	-0.136	0.116	-0.113	0.285	-0.191	-0.341	0.443	0.344	0.566
Y11	-0.282	0.081	0.541	-0.106	-0.137	-0.147	-0.312	0.387	0.256	0.509
Y12	0.024	-0.024	-0.261	-0.297	0.465	-0.215	0.067	0.012	0.337	0.342
Y13	-0.379	0.248	0.227	0.141	0.085	-0.069	-0.324	0.546	0.041	0.404

* Significant at 5% level ** Significant at 1% level

Table (4): Regression coefficients (b), Relative contributions (R²) and their Constants (a) between com insect pests (dependent variables (Yi)) and their predators (Pi), Relative Humidity, Temperature (independent variables) during 2005 season.

Dependent variables (insect pests)	Independent variables													R ² %	(a)
	Predators (Pi)						Relative Humidity						Temperature		
	P1 (x1)	P2 (x2)	P3 (x3)	P4 (x4)	P5 (x5)	P6 (x6)	maximum (x7)	minimum (x8)	maximum (x9)	minimum (x10)	maximum (x11)	minimum (x12)			
Y1	-0.264	-0.114	-0.185	0.173	-0.441	-0.634	-0.866	-0.499	-0.208	-0.418	-0.208	-0.418	86.8	88.164	
Y2	1.526	-0.812	0.204	0.598	-0.379	0.242	-3.44	0.219	0.327	-1.403	0.327	-1.403	86	331.81	
Y3	1.266	0.986	0.310	-0.604	0.298	-0.102	3.365	0.223	0.906	-0.653	0.906	-0.653	75	-312.2	
Y4	-0.169	-0.871	-0.198	0.341	-0.124	-0.155	-0.981	-0.153	0.289	0.821	-0.153	0.289	84.8	-2.592	
Y5	-0.143	-0.328	-0.687	0.339	-0.110	-0.250	-2.52	-0.167	-0.310	-1.059	-0.167	-1.059	83.5	261.91	
Y6	-0.662	0.389	-0.180	0.558	0.379	-0.659	-0.505	-0.614	-1.569	1.218	-0.614	-1.569	79.6	89.788	
Y7	2.203	0.514	-0.871	0.370	-0.324	-0.670	6.359	-0.539	-1.26	2.684	-0.539	-1.26	82.4	-587.3	
Y8	0.469	0.158	1.259	-2.01	0.988	1.406	1.912	0.690	1.038	-3.498	0.690	-3.498	44	-158.8	
Y9	-0.517	-0.095	0.204	2.965	0.740	0.753	0.900	0.304	0.833	-1.405	0.304	-1.405	74.5	-91.11	
Y10	-0.924	-0.526	-0.156	-0.569	-0.801	-0.921	-1.05	-0.137	0.758	1.868	-0.137	0.758	73.6	40.551	
Y11	-0.553	-0.274	0.259	-1.02	-0.980	-0.786	-2.36	-0.600	-0.321	4.205	-0.600	-0.321	81.5	161.77	
Y12	-0.517	-0.279	-0.976	0.651	-0.243	-0.864	1.273	-0.642	0.360	3.229	-0.642	0.360	77.2	-162.1	
Y13	8.148	10.56	31.12	-5.06	19.37	-3.76	-22.9	40.98	33.13	-119.9	40.98	-119.9	57.2	2011.3	

* Significant at 5% level ** Significant at 1% level

Correlation coefficients (r) between RH and Temp. minimum and Y5 presented highly significant relations being -.600 and -.791. Significant relations being 0.433, -.412 and -.425, with Y5 for p1, p2, p5 and Temp. minimum, respectively. Except p1 recorded significant relation r being 0.515, all independent variables had now significance with Y7 and this due to that environmental conditions may be not suitable for other variables.

On the other hand, all independent variables had now significance with Y6 and Y8 and this result due to that environmental conditions may be not suitable for these variables. Predators, p4 and p6 cleared highly significant relation being 0.601 and 0.546 with Y9 and other variables were not significance. Also, all variables had now significance with Y10 except Temp. minimum had significant relation with r values equal 0.566 and this result due to that other predators may be not sufficient.

All variables had now significance with Y11 except p4 and Temp. minimum had significant relations with r values equal 0.541 and 0.509 and this result due to that other predators may be not influenced. No significance recorded for all variables with Y12 except p5 had significant relations with r values equal 0.465 and this result due to that other predators may be not active. RH and Temp. minimum had significant relations being 0.548 and 0.404 with Y13 and other variables had not significance and this result also due to that other predators may be not active.

b - Second season:

The obtained results in Table (5) cleared highly significant relation among Y1 and minimum RH ($r = -.760$) in 2006 season. Results also, clearly indicated that p5, RH max. and Temp. Max. had high influence on the Y1 ($r = -.480, -.467$ and 0.546). Obtained results for Y2 presented highly significant relation with RH minimum ($r = 0.828$) and significant relation with each of p5, maximum RH and Temp. minimum with r values being -.580, -.434 and -.516, respectively.

Results also, clearly indicated that p1, p2, p3, p4, p6 and Temp. maximum had now significance. Results for Y3 showed highly significant with RH maximum ($r = -.570$) and significant relation with each of p1 and RH minimum with r values equal 0.539 and -.412, respectively. Also, results indicated that p2, p3, p4, p5, p6, Temp. minimum and Temp. maximum had now significance. All independent variables had now significance with Y4 except p3 scored highly significant relation with r being 0.784 and this result due to that other variables may be not suitable for other predators.

Independent variables RH maximum and minimum had highly significance with Y5 and p5 was significant relation with $r = -.437$ while other factors had no significance. All independent variables had now significance with Y6 except Temp. maximum recorded significant relation being 0.436 and this result due to that other variables may be not suitable for other predators.

Correlation coefficients (r) between Y7 and p1 scored highly significant relation equal 0.702. Significant relation was found between each of p5, RH maximum, Temp. minimum and Y7 with r values being 0.427, -.475 and 0.410, respectively.

Table (5): Correlation coefficients (r) between corn insect pests (Yi) and their predators (Pi), Relative Humidity and Temperature during 2006 season.

Insect pests (Yi)	Predators (Pi)						Relative Humidity		Temperature	
	P1	P2	P3	P4	P5	P6	maximum	minimum	maximum	minimum
Y1	-0.206	-0.094	-0.191	-0.193	-0.480	-0.190	-0.467	-0.760	0.546	-0.348
Y2	-0.241	-0.209	-0.190	-0.225	-0.580	-0.191	-0.434	-0.828	0.306	-0.516
Y3	0.539	0.093	-0.345	-0.178	-0.132	-0.344	-0.570	-0.412	-0.189	0.334
Y4	-0.121	0.022	0.784	-0.113	0.178	-0.111	0.221	0.260	-0.015	0.124
Y5	-0.103	-0.175	-0.233	-0.236	-0.437	-0.232	-0.565	-0.870	0.226	-0.354
Y6	-0.354	-0.239	-0.328	-0.183	-0.031	-0.326	-0.089	-0.181	0.436	-0.084
Y7	0.702	-0.021	-0.263	0.026	0.427	-0.262	-0.475	-0.251	-0.378	0.410
Y8	0.275	0.137	-0.240	0.272	-0.088	-0.239	0.085	0.313	0.285	0.136
Y9	-0.219	0.134	-0.202	-0.004	-0.061	0.201	0.366	0.261	-0.100	-0.066
Y10	-0.196	0.235	-0.181	0.497	0.474	0.301	0.300	0.251	-0.030	0.026
Y11	-0.263	0.266	0.446	0.176	0.391	0.728	0.498	0.298	0.010	0.054
Y12	-0.131	-0.087	-0.130	-0.212	-0.355	-0.133	0.244	0.343	-0.105	0.018
Y13	-0.280	0.373	0.142	0.302	0.586	0.261	0.419	0.391	0.005	0.071

* Significant at 5% level

** Significant at 1% level

Table (6): Regression coefficients (b), Relative contributions (R²) and their Constants (a) between corn insect pests (dependent variables (Yi)) and their predators (Pi), Relative Humidity, Temperature (independent variables) during 2006 season.

Insect (dependent variables)	pests/independent variables													R ² %	(a)
	Predators (Pi)						Relative Humidity			Temperature					
	P1 (x1)	P2 (x2)	P3 (x3)	P4 (x4)	P5 (x5)	P6 (x6)	maximum (x7)	minimum (x8)	maximum (x9)	minimum (x10)	maximum (x11)	minimum (x12)			
Y1	-0.376	0.820	0.128	0.476	-0.968	-0.217	0.451	-0.196	0.231	0.653	0.808	-5.417			
Y2	-0.713	0.105	0.168	0.788	-0.170	-0.338	0.374	-0.316	-0.110	0.103	95.3	-19.34			
Y3	0.271	0.146	-0.665	-0.566	-0.267	-0.541	0.164	-0.210	-0.593	0.738	76.8	0.563			
Y4	-0.494	0.322	0.914	0.798	-0.401	-0.963	0.989	-0.180	-0.276	0.252	93.5	-4.395			
Y5	-1.01	0.143	0.237	1.202	-0.260	-0.416	0.329	-0.454	-0.353	0.386	93.1	-7.498			
Y6	0.387	-0.316	-0.807	-2.69	0.347	-0.459	0.491	0.136	1.322	-0.525	71.7	-77.65			
Y7	4.141	-0.466	-0.755	-3.81	0.726	0.339	-1.51	0.472	0.493	-0.297	84.2	121.70			
Y8	3.116	-0.977	-0.817	-2.70	0.273	-0.511	-0.550	0.690	2.333	-1.06	79.5	-27.43			
Y9	-0.703	0.500	-0.564	-0.882	-0.929	0.407	1.382	0.145	-0.526	0.148	36.5	-106.9			
Y10	-1.82	0.326	-0.141	3.55	0.154	0.205	0.769	-0.215	-0.587	0.406	90.2	-52.61			
Y11	-0.997	0.204	0.481	2.201	0.104	0.769	0.415	-0.169	-0.301	0.221	94.2	-27.51			
Y12	0.439	-0.143	-0.394	-1.34	-0.196	-0.165	0.265	0.198	-0.223	0.674	65.7	-20.29			
Y13	-0.91.2	30.52	16.55	147.8	16.13	-27.4	92.73	-11.4	-19.56	12.45	93.4	-76.49			

* Significant at 5% level

** Significant at 1% level

The analysis of correlation coefficient between Y8, Y9 and Y12 with all independent variables had no significance, this result due to that other variables may be not suitable. Independent variables p4 and p5 recorded significant relation being 0.497 and 0.474. On the other hand, all independent variables had now significance with Y10.

Y11 and predators, p6 was highly significant relation being 0.728 while p3 and RH maximum had significant relation with r values being 0.443 and 0.498 with, respectively. Beside that the other variables had now significance. Highly significant relations being 0.586 was recorded by p5 with Y13. Significant relations being 0.461 and 0.419 also, recorded by p6 and RH maximum. In addition to, the relation between Y13 and other variables was not significant.

2- Multiple regression analysis :

a- First season:

Regression coefficients (b) and relative contributions (R^2) for Y1, Y2,Y13 were shown in Table (4) in 2005 season. Results in Table (4) showed that relative contributions (R^2) for all variables were 86.8, 86, 75, 84.8, 83.5, 79.6, 82.4, 44, 74.4, 73.6, 81.5, 77.2 and 57.2 % in the total variation of Y1, Y2Y13, respectively in the first season. Prediction equation for each of Y1, Y2,Y13 was presented in Table (4).

Regression coefficients give chance to predict the best equation about activity of insect pests (Yi) by values of independent variables and their value of constants as follows:

$$\hat{Y} = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10}$$

Where:

\hat{Y} = predicted value

a = constant

b = regression coefficient

Previous results cleared that this study include most independent variables that had more influence on the activity of insect pests on maize.

b - Second season:

Regression coefficients (b) and relative contributions (R^2) for Y1, Y2,Y13 were shown in Table (6) in 2006 season.

Results in Table (6) showed that relative contributions (R^2) for all variables were 90.8, 95.3, 76.8, 93.5, 93.1, 71.7, 84.2, 79.5, 36.5, 90.2, 94.2, 65.7 and 93.4% in the total variation of Y1, Y2Y13, respectively in the second season. Prediction equation for each of Y1, Y2,Y13 was presented in Table (6).

Previous results cleared that this study include most independent variables that had more influence on the activity of insect pests of maize.

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الأنواع الحشرية والمفترسات المرتبطة بها على نباتات الذرة الشامية في محافظة المنوفية

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تمت دراسة الأفات الحشرية المختلفة على نبات الذرة والمفترسات المرتبطة بها بمحافظة المنوفية وذلك في موسمي الزراعة المتتاليين ٢٠٠٥ و ٢٠٠٦ وقد تم أخذ العينات بالطرق المتبعة باستخدام شبكة جمع الحشرات، وقد أفادت البيانات عن تواجد ١٣ نوعاً من الأفات الحشرية والتي تنتمي إلى أربعة رتب مختلفة والتي تهاجم نباتات الذرة في كلا الموسمين.

وبصفة عامة فإن آفات البادرات (الدودة القارضة والحفار) وكذلك دودة ورق القطن ومن الذرة والثاقبات كانت من أكثر الأفات تواجداً من حيث الوفرة، وقد تم ملاحظة تواجد ستة أنواع من المفترسات وقد كانت خنفساء أبو العيد ذو الاحدى عشر نقطة وكذلك الحشرة الرواحة من أكثر الأنواع تواجداً نسبياً من حيث الوفرة العددية. وقد أجريت الدراسات الاحصائية التي اوضحت تأثير المفترسات والرطوبة النسبية وكذلك درجة الحرارة على كل أفة حشرية من خلال تقدير معامل الارتباط والاحتمال.