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Population Studies on Wheat Grain Insect Pests and their Natural Enemies at Four Localities in Egypt

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ABSTRACT. The population levels of major insect pests and their associated entomophagous insects were investigated in four localities, Cairo, Alexandria, Beni-Suef and Fayoum during the period from December 1979 to November 1980. Dominance of certain species in different localities seems to vary due to the prevailing climatic conditions and the interactions between various insect species inhabiting the same habitat. The occurrence of population peaks also varied in different localities, as did the prominent species in each locality.

In Egypt, as in most developing countries, the grain storage facilities and techniques are in an early stage of development. Insect pests constitute the most important hazard to stored grains and other products. Recently, problems of using various chemicals against such pests have been reported (Khan and Anwarullah 1970) and consequently a new wave of interest in the use of insect natural enemies has developed.

Because fluctuations of the population densities of these pests and their natural enemies have not been investigated quantitatively, the present work was initiated. This paper contributes some of the needed information on these aspects in stored wheat in four localities in Egypt. Previous studies that relate to natural enemies in stored grains include those of Howe (1943), Yoshida and Kawane (1958) and Cotton (1966).

Material and Methods

Monthly samples were taken by a metallic shovel from silos, shounas (which are opened situations for storage) and mills in Cairo, Alexandria, Beni-Suef and Fayoum during the period from December 1979 to November 1980. Each sample

(1 kg) consisted of spilled grains, dust, flour, webbing and similar residues which were present around machines (Triplehorn 1965). It was taken to laboratory in a cloth bag where it was divided into sub-samples of 250 g and placed in jars (15 cm diameter × 19 cm height) covered with muslin held by rubber bands. Daily inspection of samples was made and emerged adult insects, injurious and beneficial were counted and recorded. Thereafter, each jar was thoroughly screened weekly through a set of fine sieves and the adult insects recovered were identified and counted.

Results

The fluctuations in the population densities of major insect pests of wheat and their associated entomophagous insects during the period of investigation were tabulated in Tables 1-4, and graphically illustrated in Fig. 1-4. Results may be summarized as follows:

1. *Cairo*

In this locality, the pests found were:

Rhizopertha dominica F., *Sitophilus* spp., *Sitotroga cerealella* (Oliv.), *Tribolium* spp., *Latheticus oryzae* Wat., *Tenebroides mauritanicus* L. and *Trogoderma granarium* Everts. The monthly counts of each of these pests are recorded in Table 1. The seasonal fluctuations of these pests showed three periods of activity (Fig. 1). In the first period (December 1979-March 1980), the pest population increased gradualllly to reach a peak of 449 insects/kg in February (13.8°C, 64.7% R.H., Q.I. = 1.30; the quotient of increase (Q.I.) was estimated by dividing the densities of a month by that of the preceeding month; Salem 1972).

In the second period of activity (March-August), the population of pests increased steadily, reaching a peak of 1533 insects/kg in June (28.0°C, 54.4% R.H., Q.I. value = 5.92). During the third period (August – November), the population counts increased suddenly and a peak of 3036 insects/kg appeared in September (38.0°C, 59.3% R.H., Q.I. index = 3.69). Thereafter, counts decreased gradually to 1721 in October and 385 in November (respective Q.I. indices = 0.57 and 0.22). Increase in the pests population showed three peaks of abundance and was coincident with an increase in temperature and a decrease in R.H. The third or highest peak, was well correlated with the highest temperature (38.0°C) and the moderate R.H. (59.3%) (Fig. 1). Accordingly, the annual fluctuation value of wheat pests in Cairo was 36.58, estimated by dividing the highest count by the lowest one (Salem 1972).

No predators were detected in any of the collected samples, although the reduviid, *Allaeocranum biannulipes* (Montrouzier et Signoret) was observed in the crevices of silos buildings and equipment. As for the parasitoids, the species ob-

Table 1. Monthly records of the principal insect pests of wheat and their associated entomophagous insects in Cairo during the period from December 1979 to November 1980.

	Dec. 1979	Jan. 1980	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total	Annual fluctuation
Temp. °C	**13.7**	**13.8**	**13.8**	**17.6**	**21.1**	**25.0**	**28.0**	**29.3**	**28.5**	**38.0**	**23.8**	**19.8**		
R.H. %	**68.7**	**64.7**	**64.4**	**54.6**	**48.0**	**37.2**	**54.4**	**53.9**	**57.8**	**59.3**	**62.6**	**69.1**		
a. **Pests**														
Rhizopertha dominica F.	37	92	14	23	80	89	501	229	305	250	229	7	1856	
Sitophilus spp.	27	159	377	138	108	129	765	477	328	2713	1410	314	6944	
Sitotroga cerealella (Oliv.)	0	3	12	6	0	0	10	11	5	2	0	9	58	
Tribolium spp.	14	72	34	23	16	35	85	19	35	51	68	28	480	
Latheticus oryzae Wat.	0	6	0	8	4	0	158	168	124	0	0	13	481	
Tenebroides mauritanicus L.	0	4	0	1	0	0	14	0	4	9	14	6	62	
Trogoderma granarium Everts	5	9	12	0	5	6	0	6	12	9	0	8	72	
Total	83	345	449	199	213	259	1533	910	823	3036	1721	385	9953	36.58
		(4.16)	(1.30)	(0.44)	(1.07)	(1.22)	(5.92)	(0.59)	(0.90)	(3.69)	(0.57)	(0.22)		
b. **Parasitoids**														
Anisopteromalus calandrae How.	0	2	0	7	0	0	0	0	4	33	39	0	85	
Chaetospila elegans West.	6	0	20	0	21	24	6	0	0	6	15	0	98	
Holepyris hawaiiensis Ashmead	0	0	0	0	0	0	0	0	1	0	0	0	1	
Lariophagus distinguendus (Foerst)	7	1	1	4	0	0	0	0	6	69	65	0	153	
Total	13	3	21	11	21	24	6	0	11	108	119	0	337	α
		(0.23)	(7.0)	(0.52)	(1.91)	(1.14)	(0.25)	(0.0)	(α)	(9.82)	(1.10)	(0.0)		

N.B. Figures in parantheses represent Quotient of increase (Q.I.).

Table 2. Monthly records of the principal insect pests of wheat and their associated entomophagous insects in Alexandria during the period from December 1979 to November 1980.

	Dec. 1979	Jan. 1980	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total	Annual fluctuation
Temp. °C	**15.0**	**19.7**	**13.9**	**16.2**	**18.6**	**21.5**	**24.3**	**26.6**	**27.3**	**25.8**	**23.2**	**19.2**		
R.H. %	**68.8**	**69.0**	**64.2**	**69.1**	**63.6**	**62.5**	**64.3**	**68.5**	**68.2**	**64.3**	**68.6**	**67.8**		
a. **Pests**														
R. dominica	181	235	174	81	220	118	75	447	215	131	0	0	1877	
Sitophilus spp.	221	381	714	381	62	101	407	134	110	102	792	185	3590	
Sitotroga cerealella	0	0	0	0	0	0	4	0	0	0	0	5	9	
Triboliuuim spp.	339	43	8	77	53	45	105	19	118	37	0	10	854	
Latheticus oryzae	1	1	0	4	286	54	23	551	18	1352	986	0	3276	
Tenebroides mauritanicus	7	3	0	5	13	5	0	5	12	7	13	0	70	
Trogoderma granarium	17	62	53	7	65	65	65	7	14	0	4	105	464	
Tenebrio molitor	0	0	0	0	11	0	0	0	0	0	0	0	11	
Anagasta kuehniella	0	1	6	0	0	0	0	0	0	0	0	0	7	
Total	766	725 (0.95)	955 (1.32)	555 (0.58)	710 (1.28)	388 (0.55)	715 (1.84)	1163 (1.63)	487 (0.42)	1629 (3.34)	1795 (1.10)	305 (0.17)	10158	5.89
b. **Parasitoids**														
Anisopteromalus calandrae	3	4	2	47	4	3	4	0	13	0	0	0	80	
Choetospila elegans	2	223	265	70	16	6	3	4	2	13	1	0	605	
Lariophagus distinguendus	7	8	8	108	2	11	11	0	9	0	0	1	165	
c. **Predators**														
Allaeocranum biannulipes	8	1	0	0	2	0	0	0	0	0	0	0	11	
Xylocoris flavipes	0	12	9	0	0	0	0	0	0	0	0	0	21	
Total	20	248 (12.4)	284 (1.15)	225 (0.79)	24 (0.11)	20 (0.83)	18 (0.90)	4 (0.22)	24 (6.0)	13 (0.54)	1 (0.08)	1 (1.0)	882	284

N.B. Figures in parantheses represent Quotient of increase (Q.I.).

Table 3. Monthly records of the principal insect pests of wheat and their associated entomophagous insects in Beni-Suef during the period from December 1979 to November 1980.

	Dec. 1979	Jan. 1980	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total	Annual fluctuation
Temp. °C	**14.8**	**12.5**	**14.1**	**18.5**	**23.8**	**28.2**	**33.9**	**31.0**	**30.0**	**28.5**	**25.9**	**20.7**		
R.H. %	**57.4**	**57.0**	**53.8**	**40.3**	**34.1**	**28.5**	**33.8**	**36.9**	**43.9**	**46.8**	**45.2**	**54.1**		
a. **Pests**														
Rhizopertha dominica	33	0	40	299	82	355	329	661	1060	319	24	60	3262	
Sitophilus spp.	200	63	176	223	108	2	27	64	61	50	243	11	1194	
Sitotroga cerealella	2	0	0	0	0	0	0	0	0	0	0	0	2	
Tribolium spp.	1	36	5	195	81	133	59	49	41	239	803	31	1673	
Latheticus oryzae	0	0	8	64	154	858	2	226	193	68	76	0	1649	
Oryzaephilus surinamensis	1	2	0	0	0	0	0	0	0	0	0	0	3	
Tenebroides mauritanicus	3	0	0	11	0	7	1	26	25	18	16	41	148	
Trogoderma granarium	0	0	0	19	0	0	0	20	18	9	0	0	66	
Total	240	101 (0.43)	229 (2.27)	811 (3.54)	425 (3.52)	1355 (3.19)	418 (0.31)	846 (2.02)	1398 (1.65)	713 (0.51)	1162 (1.63)	143 (0.12)	7997	13.84
b. **Parasitoids**														
Anisopteromalus calandrae	0	4	0	13	0	10	0	16	19	8	0	0	70	
Chaetospila elegans	0	0	16	56	0	8	0	2	1	0	0	0	83	
Holepyris hawaiiensis	0	0	0	0	0	0	0	0	2	2	0	0	4	
Lariophagus distinguendus	11	11	3	28	0	0	0	11	39	11	5	0	119	
c. **Predators**														
Xylocoris flavipes	0	0	3	12	0	0	0	0	0	0	0	0	15	
Total	11	15 (1.36)	22 (1.47)	109 (4.95)	0 (0.0)	18 (α)	0 (0.0)	29 (α)	61 (2.10)	21 (0.34)	5 (0.24)	0 (0.0)	291	α

N.B. Figures in parantheses represent Quotient of increase (Q.I.).

Table 4. Monthly records of the principal insect pests of wheat and their associated entomophagous insects in Fayoum during the period from December 1979 to November 1980.

	Dec. 1979	Jan. 1980	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total	Annual fluctuation
Temp. °C	**13.7**	**12.8**	**13.7**	**18.5**	**23.7**	**26.8**	**29.2**	**30.2**	**29.6**	**26.9**	**24.8**	**20.8**		
R.H. %	**65.5**	**65.2**	**61.1**	**51.0**	**42.8**	**36.8**	**40.7**	**43.8**	**50.8**	**54.2**	**51.4**	**62.0**		
a. **Pests**														
Rhizopertha dominica	140	5	98	44	30	39	40	86	32	25	32	0	571	
Sitophilus spp.	35	41	60	40	52	36	39	11	0	2	22	12	350	
Tribolium spp.	15	14	43	19	16	28	36	16	16	12	35	4	254	
Latheticus oryzae	152	3	72	8	315	210	835	142	197	160	110	63	2267	
Oryzaephilus surinamensis	1	0	0	0	0	1	0	1	0	1	1	0	5	
Tenebroides mauritanicus	3	0	3	0	4	6	5	3	2	0	3	0	29	
Total	346	63 (0.18)	276 (4.38)	111 (0.40)	417 (3.76)	320 (0.77)	955 (2.98)	259 (0.27)	247 (0.95)	200 (0.81)	203 (1.02)	79 (0.39)	3476	15.16
b. **Parasitoids**														
Anisopteromalus calandrae	0	0	0	0	6	7	0	0	4	0	2	0	19	
Choetospila elegans	0	0	0	0	0	3	0	0	2	0	1	0	6	
Holepyris hawaiiensis	0	0	0	0	0	0	0	0	1	0	0	0	1	
Lariophagus distinguendus	0	0	0	1	7	5	0	0	5	2	4	0	24	
c. **Predators**														
Xglocoris flavipes	4	0	2	0	13	3	30	20	7	12	2	0	93	
Total	4	0 (0.0)	2 (α)	1 (0.50)	26 (26.0)	18 (0.69)	30 (1.67)	20 (0.67)	19 (0.95)	14 (0.74)	9 (0.64)	0 (0.0)	143	α

N.B. Figures in parantheses represent Quotient of increase (Q.I.).

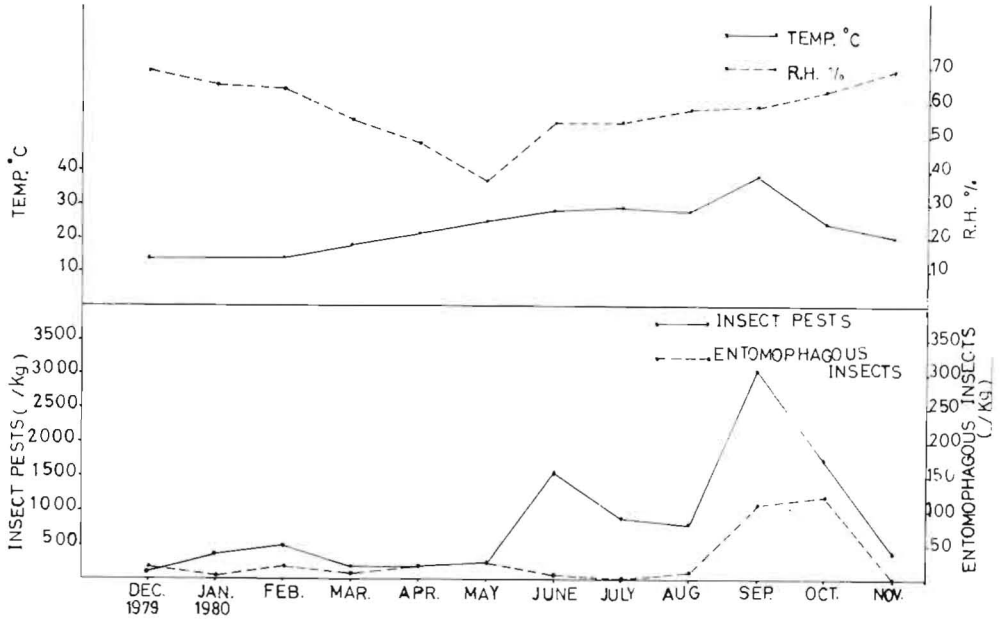

Fig. 1. Fluctuations in the population densities of wheat insect pests and their associated entomophagous insects in Cairo.

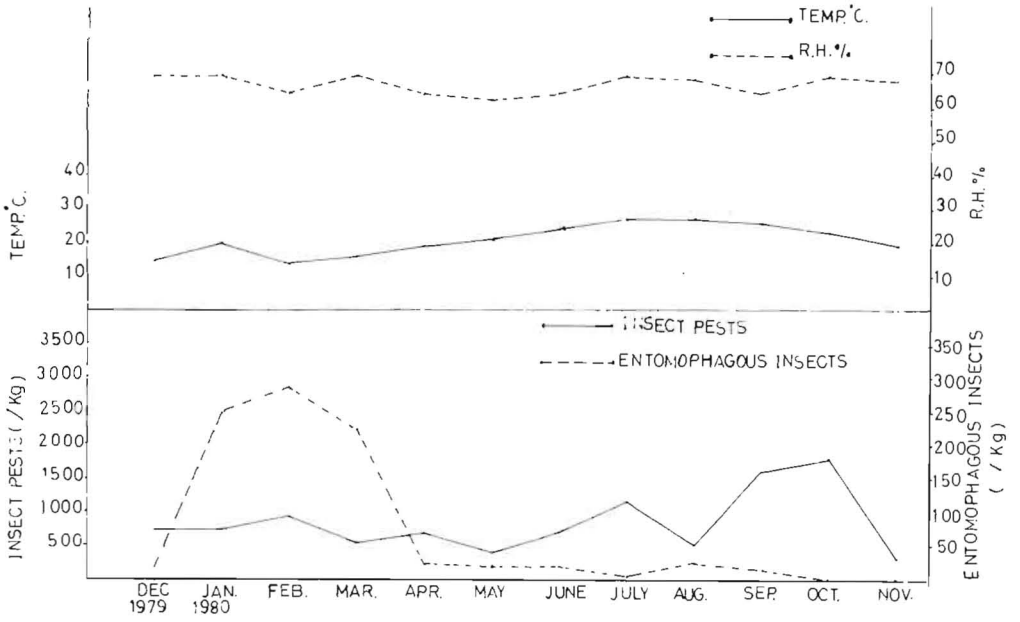

Fig. 2. Fluctuations in the population densities of wheat insect pests and their associated entomophagous insects in Alexandria.

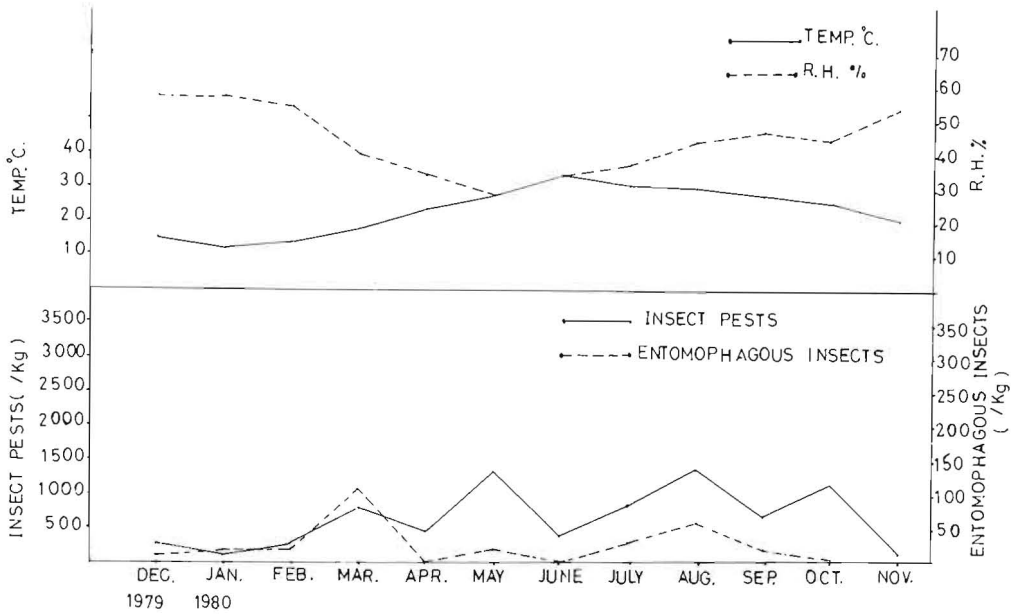

Fig. 3. Fluctuations in the population densities of wheat insect pests and their associated entomophagous insects in Beni-Suef.

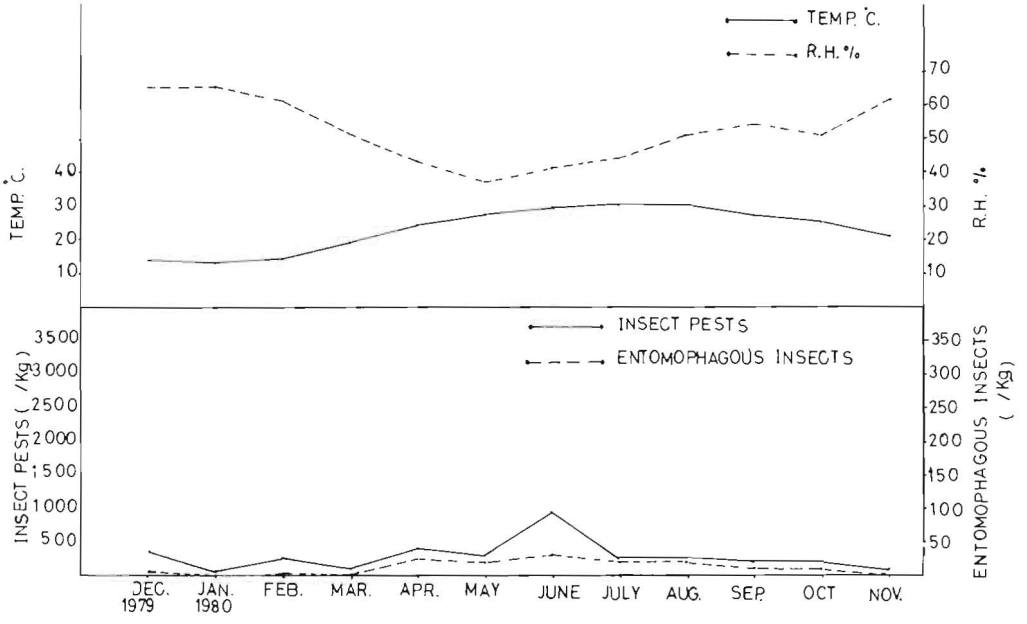

Fig. 4. Fluctuations in the population densities of wheat insect pests and their associated entomophagous insects in Fayoum.

tained were the pteromalids *Anisopteromalus calandrae* How., *Lariophagus distinguendus* (Foerst), *Chaetospila elegans* West. and the bethylid *Holepyris hawaiiensis* Ashmead. The counts of each of these species were recorded in Table 1. Their abundance (Fig. 1) fluctuated throughout the whole season, showing highest activity in September (38.0°C, 59.3% R.H.) and October (23.8°C, 62.6% R.H.), represented by monthly records of 108 and 119 individuals/kg. (Q.I. indices = 9.82 and 1.10, respectively). These two peaks were coincident with the pest peaks attained during these two months. However, no parasitoids were detected in the samples collected in July (29.3°C, 53.9% R.H.) and November (19.8°C, 69.1% R.H.).

Statistical analysis of data showed highly significant correlations between the monthly abundance of pests and temperature or counts of natural enemies (r = 0.80 and 0.82, respectively). However, relative humidity showed no significant relationship in pest abundance (r = 0.06). The partial regression factors were 68.62, 30.86 and 60.55 for temperature, relative humidity and entomophagous insects, respectively. On the other hand, the correlation between the counts of entomophagous insects and temperature, relative humidity or pests' counts appeared insignificant for the first two factors (r = 0.47 and 0.001, respectively) and highly significant for the latter one (r = 0.82). The respective partial regression factors reported for temperature, relative humidity and pests were 46.79, 16.93 and 0.45.

2. *Alexandria*

In this locality, the pests were the same as in Cairo, in addition to the two species *Tenebrio molitor* L. and *Anagasta kuehniella* Zell. The monthly counts of each species could be traced in Table 2. The seasonal curve of their abundance (Fig. 2) showed four periods of activity. The first two periods were represented by relatively lower counts than those of the following two; the last period giving the greatest counts. During the first (December 1979 – March 1980) and second (March-May) periods, the pests' peaks were represented by the respective counts 955 and 710 insects/kg in February (13.9°C, 64.2% R.H.) and April (18.6°C, 63.6% R.H.). The corresponding Q.I. indices were 1.32 and 1.28. During the third period (May-August), a steady increase in the monthly counts occurred towards a relatively high peak of 1163 insects/kg in July (26.6°C, 68.5% R.H., Q.I. index = 1.63). In the fourth period, from August to November, the monthly counts showed the highest peak of abundance (1795 individuals/kg) in October (23.2°C, 68.6% R.H., Q.I. index = 1.10). Accordingly, the value of the annual fluctuation of wheat pests in Alexandria reached 5.89.

The entomophagous group of insects collected from Alexandria included the predaceous bugs *A. biannulipes* and *Xylocoris flavipes* (Reuter), and the parasitoids *A. calandrae, C. elegans* and *L. distinguendus*. Their monthly counts

could be traced in Table 2. As seen in Fig. 2, the highest period of activity occupied from December 1979 to April 1980, being represented by 284 individuals/kg in February (13.9°C, 64.2% R.H., Q.I. index = 1.15). The monthly counts, after this peak, decreased steadily to 24 individuals/kg in April (18.6°C, 33.6% R.H., Q.I. value = 0.11). Subsequently, these counts fluctuated monthly, showing a relatively noticeable increase of 24 individuals in August. The value of annual fluctuation of entomophagous insects was 284.

Correlations between the monthly counts of wheat pests and temperature, relative humidity or natural enemies were insignificant (respective coefficient factors were 0.31, 0.05 and 0.14, associated with the respective partial regression factors 53.8, 25.22 and 1.26). On the other hand, correlations between counts of entomophagous insects and temperature, relative humidity or pest counts were significant with regard to temperature (r = −59) and insignificant in the case of the remaining two factors (r = 0.12 and 0.14, respectively). The respective partial regression factors were 12.52, 8.72 and 0.05.

3. *Beni-Suef*

In this locality, the pests found were the same as in Cairo in addition to *Oryzaephilus surinamensis* L. The monthly counts of each species are recorded in Table 3. The curve of their abundance (Fig. 3) clearly shows four periods of noticeable activity. During the first period (January-April 1980), the monthly counts increased gradually from the lowest record (101 individuals/kg) in January to a peak of 811 individuals/kg in March (18.5°C, 40.3% R.H., Q.I. = 3.54). The peaks reported for the second and third periods of activity were represented by 1355 and 1398 individuals/kg during May (28.2°C, 28.5% R.H.) and August (30.0°C, 43.9% R.H., respective Q.I. values = 3.19 and 1.65). During the fourth period of activity, the pest counts increased gradually from 713 individuals/kg in September to a peak of 1162 individuals/kg in October (25.9°C, 42.2% R.H.), after which the population decreased to 143 individuals/kg in November (Q.I. values reported for these respective months = 0.51, 1.63 and 0.12). Accordingly, the annual fluctuation value of wheat pests in Beni-Suef was 13.84.

Entomophagous insects associated with wheat pests in Beni-Suef were the predator *X. flavipes*, and the parasitoids *A. calandrae, C. elegans, H. hawaiiensis* and *L. distinguendus*. The monthly counts of each species were given in Table 3. Their seasonal fluctuation (Fig. 3) shows two noticeable peaks of abundance in March (18.5°C, 40.3% R.H.) and August (30.0°C, 28.5% R.H.). Their respective monthly counts were 109, 61 and 18 individuals, showing a noticeable coincidence with the corresponding three peaks of pests (Fig. 3).

Statistically, significant correlations existed between counts of pests and temperature or relative humidity (r −0.61 and −0.59, respectively) and no significant correlation between these counts and natural enemies (r = 0.38). The respective

partial regression factors were 35.25, −6.35 and 6.09. Insignificant correlations also existed between counts of entomophagous insects and temperature, relative humidity or pest counts (r = −0.08, −0.11 and 0.38 associated with the respective partial regression factors −2.12, −0.19 and 0.04).

4. *Fayoum*

The pests found were *R. dominica, Sitophilus* spp., *Tribolium* spp., *L. oryzae, O. surinamensis* and *T. mauritanicus*. The monthly counts of each species were reported in Table 4. These counts (Fig. 4) fluctuated through the period of investigation representing a noticeable peak of 955 individuals/kg in June (29.2°C, 40.7% R.H., Q.I. = 2.98) and a lowest monthly count of 63 individuals in January (12.8°C, 65.2% R.H., Q.I. = 0.18). Accordingly, the annual fluctuation value of wheat pests in Fayoum reached 15.16.

Entomophagous insects collected from wheat pests in Fayoum were the predator *X. flavipes*, and the parasitic species *A. calandrae, C. elegans, H. hawaiiensis* and *L. distinguendus*. The monthly counts of each species were given in Table 4. The population density curve of this group (Fig. 4) fluctuated, as in the case of their associated pests, toward a peak of 30 individuals/kg in June, coinciding with the pest peak.

Statistically, no significant correlations existed between pest population and temperature or relative humidity (r = 0.39 and −0.53, respectively), but with entomophagous insects, the correlation appeared highly significant (r = 0.74). The respective partial regression factors were 4.02, −3.24 and 11.85. On the other hand, highly significant correlations existed between counts of entomophagous insects and temperature, relative humidity or densities of pests (r = 0.80, −0.83 and 0.74 associated with the respective partial regression factors 7.79, −6.19 and 0.09).

Discussion

Through the previous data, it appeared that the dominance of different pests varied in different localities. According to Cotton (1966), many insect pests infesting stored grains and milled cereals are of tropical or subtropical origin, a phenomenon that explains why the peaks of pests were frequently attained during hot or moderate temperate months and varied according to locality. In Alexandria, the annual count of pests in the collected samples outnumbered those obtained from samples of other regions, being arranged descendingly as follows: 10158, 9953, 7997 and 3476 individuals in Alexandria, Cairo, Beni-Suef and Fayoum, respectively. The occurrence of the peaks of pests also varied in different localities, depending upon the prominent species in each locality. In the aforementioned localities, these peaks were attained, respectively, in October, September, August

and June, represented by the respective 1795, 3036, 1398 and 955 individuals/kg. The associated temperatures and relative humidities were 23.2°C and 68.0% R.H., 38.0°C and 59.3% R.H., 30.0°C and 43.9% R.H. and 29.2°C and 40.7% R.H., respectively.

The pests secured at the four regions (*R. dominica, Sitophilus* spp., *S. cerealella, Tribolium* spp., *L. oryzae, O. surinamensis, T. mauritanicus* and *T. granarium*) were represented by obviously different densities. *S. cerealella* was completely absent at Fayoum and rarely found in other regions. *O. surinamensis* did not exist in Cairo and Alexandria, and was of rare occurrence in Beni-Suef and Fayoum. *Sitophilus* spp. showed, among the primary pests, the highest annual record in Cairo and Alexandria (9644 and 3590 individuals, respectively), and *R. dominica* in Beni-Suef and Fayoum (3262 and 571 individuals, respectively). Among the secondary pests, *L. oryzae* gave the highest annual count at any region, represented by respective counts of 481, 3276, 1649 and 2267 individuals in Cairo, Alexandria, Beni-Suef and Fayoum. During cold months (December 1979-February 1980 and in November 1980), *L. oryzae* was either absent or rarely present. *Tribolium* spp. ranked second to *L. oryzae*, being represented by 480, 854, 1673 and 254 individuals at the above-mentioned regions, respectively.

Sitophilus spp. were most prominent throughout the year in Alexandria. *R. dominica* outnumbered these species during hot months (April, July, August and September). A similar phenomenon was also detected in Beni-Suef, where the most abundant species *R. dominica* was predominant only during the hot temperate months (March, May, July, August and September), being replaced by *Sitophilus* spp. during moderate and cold months. On the other hand, *L. oryzae* appeared among the secondary pests, as a predominant species during moderate and hot temperate months in Beni-Suef and Fayoum, and in summer in Cairo and Alexandria where it was replaced by *Tribolium* spp.

In different regions, the entomophagous insects were always coincident with their associated pests. Their respective annual counts reached 337, 882, 291 and 143 individuals/kg in Cairo, Alexandria, Beni-Suef and Fayoum, showing respective peaks in October, February, March and June. These peaks existed during active periods of the predominant natural pests and were represented by 119, 284, 109 and 30 individuals/kg at 23.8°C and 62.6% R.H., 13.9°C and 64.2% R.H., 18.5°C and 40.3% R.H. and 29.2°C and 40.7% R.H., respectively.

The anthocorid *X. flavipes* was the sole predator recorded in Beni-Suef and Fayoum where its respective annual counts reached 15 and 93 individuals/kg, indicating its higher abundance at the latter region. In Cairo, this anthocorid was absent from the samples, but in Alexandria, it was represented only by 12 and 9 individuals/kg during January and February, respectively. The reduviid, *A. biannulipes* was collected in the samples only from Alexandria, being poorly represented by the monthly counts 8, 1 and 2 individuals/kg in December, January

and April, respectively, although it was frequently observed in cracks of silos building and equipment.

The parasitic species collected from the different localities were *A. calandrae, C. elegans, H. hawaiiensis* and *L. distinguendus*. *H. hawaiiensis* was totally absent in Alexandria. *L. distinguendus* was represented by the highest annual counts in Cairo, Beni-Suef and Fayoum (153, 119 and 24 individuals, respectively). *C. elegans* ranked second to this parasitoid in Cairo, and Beni-Suef, respective counts of 98 and 83 individuals were reported. However, this parasitoid showed the highest annual count (605 individuals) compared to other parasitoids in Alexandria, followed by *L. distinguendus* (165 individuals). In Fayoum, *A. calandrae* took the second position after *L. distinguendus*, the former was represented by an annual record of 19 individuals. Generally, all parasitoids were completely absent or poorly represented in summer (from June to August) in all localities.

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التعـدادات الموسمية للآفات الحشرية لحبوب القمح وأعدائها الحيوية فى مصر

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درس التـوزيع الموسمى لأهم الآفات الحشرية لحبوب القمح وأعـدائهـا الحيـوية فى أربع من مناطق جمهورية مصر العربية هى القاهرة والاسكندريه وبنى سويف والفيوم، وذلك خلال الفـترة من ديسمـبر سنـه ١٩٧٩ الى نوفمـبر سنـه ١٩٨٠. تتوقف سيادة أنواع حشرية معينة فى منطقة دون الأخرى على الظروف المناخية السائدة، وكذا على العلاقات المتداخلة بين الأنـواع المختلفـة المتـواجـدة فى المنطقـة كما تتفاوت الذروات التعـداديـة لكل نوع من هذه الآفات من منطقة لأخرى وفقا للنـوع السـائـد فيهـا حيث اتضـح أن أكثر الأنواع عددا هى سوس الحبـوب فى منطقتى القـاهـرة والاسكنـدريـه وثـاقبـة الحبوب الصغرى بمنطقتى بنى سويف والفيوم.

وفى مجال الأعـداء الحيـوية تم حصر مفترسين من رتبة نصفية الأجنحة وأربعة طفيليات من رتبة غشائيه الأجنحة. وقـد أظهـرت تعـدادات هذه الأعداء الحيويه ارتباطا واضحا بعوائلها فى كل من المناطق الأربعة.