

**HOST PLANTS AND SEASONAL POPULATION
FLUCTUATIONS OF THE COWPEA POD BORER,
ETIELLA ZINCKENELLA TREIT. INFESTING
GREEN PODS OF COWPEA AND BONAVIA
BEAN IN SHARKIA GOVERNORATE, EGYPT**

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ABSTRACT: Field studies were conducted during two successive years in the period from 2001 to 2003 to survey host plants of the cowpea pod borer, *Etiella zinckenella* Treit. in three different regions of Sharkia Governorate, i.e.; Fakous, Zagazig and Belbeis (three sites for each). Moreover, seasonal populations fluctuations of the borer as influenced by changes in certain weather factors, i.e.; temperature and relative humidity were studied on cowpea and bonavia bean (lablab) host plants during two successive summer growing seasons of 2001 and 2002 for cowpea and the two consecutive years of 2001/2002 and 2002/ 2003 for lablab at Khattara, Zagazig and Belbeis regions for the first host plant and the two former regions for the second one. The obtained results can be summarized in the following points:

- 1-** Of 16 leguminous and cruciferous podding plants, the cowpea pod borer infested some leguminous plants such as bonavia bean (lablab), cowpea, pea, soyabean, broad bean, kidney bean and lentil. Bonavia bean, cowpea and soyabean were heavily infested than other hosts, while kidney bean, pea and lentil were slightly attacked. Pods of fenugreek, Egyptian lupine, Egyptian sesban, Egyptian acacia and sponge tree from leguminous plants as well as those of cruciferous ones, i.e.; cauliflower, radish, garden rocket and black mustard were not infested with the borer.
- 2-**The insect larvae firstly occurred in cowpea green pods in the third week of June in both 2001 and 2002 seasons at Khattara region, and then they fluctuated in numbers to show two and four activity peaks in the first and second seasons, respectively. Also, at Zagazig region the borer started to appear in the third and fourth weeks of June and showed four peaks in 2001 season and in 2002 season. While, its initial incidence at Belbeis region took place in the second week of June and had one and two peaks on cowpea during the first and second season consecutively.

- 3-On bonavia bean (lablab) growing at Khattara region, the insect started to appear on the 4th and 8th of May and showed four and six peaks of population activity during 2001/ 2002 and 2002 / 2003 years, successively. While, at Zagazig region, the larvae initially occurred on the 7th and 16th of June of both 2001 and 2002, respectively and then fluctuated in their numbers to indicate five and six activity peaks during the first and second years of 2001 / 2002 and 2002 / 2003, respectively.
- 4-As regards the regional variance in insect occurrence on cowpea and bonavia bean plants, the present results clear that it was more abundant by about twice at Khattara region than at the other two regions of Zagazig and Belbeis.
- 5-With respect to the effect of ambient temperature and atmospheric relative humidity as impacting weather factors on the larval population density, it can be concluded that in case of cowpea, relative humidity had higher effect than temperature at each of Khattara, Zagazig and Belbeis regions. On the contrary, the insect larvae in bonavia bean green pods differently responded to changes in the two tested weather factors showing the opposite case at both Khattara and Zagazig regions.

Key words:insect, cowpea, bonavia bean, host plants, seasonal population fluctuations, temperature, relative humidity, cowpea pod borer and *Etiella zinckenella* Tr.

INTRODUCTION

Leguminous crops are one of the most important field and vegetable crops in Egypt. In many parts of the world especially developing countries legumes are considered the principal food for human feeding due to their high content of protein to cope the increasing needs of people in these countries wherein the highest rate of people growth. The cultivated area of these crops has rapidly increased during the last few years. Unfortunately, the great majority of leguminous crops such as

cowpea, pea, broad bean, kidney bean, soyabean and lentil are subjected to be attacked by the cowpea pod borer, *Etiella zinckenella* Tr. causing a serious damage to these crops in both quantity and quality due to larval feeding on green seeds. Infestation of leguminous crops with this insect pest received comparatively little attention of many authors such as Larson (1926), Abul-Nasr and Awadalla (1957) , Subb *et al.* (1976), Helaly (1978), Harakly and Assem (1980), Wang and Song (1984), Hattori (1988), Segara-Carmona and Barbosa (1990),

Ismail *et al.* (1990); Jaglan *et al.* (1995) and Yang Caixia and Gao Liyuan (1997). Therefore, the present investigation aims to clarify the host plants of the cowpea pod borer at three regions of Sharkia Governorate as well as the seasonal occurrence of its larvae on the main host of cultivated cowpea plants and on the alternative one of bonavia bean (*lablab*), a wild climbing ornamental plant.

MATERIALS AND METHODS

To survey host plants of cowpea pod borer, studies were conducted under field conditions during the two successive years of 2000/ 2001 and 2001/ 2002 in three regions of Fakous, Zagazig and Belbeis in Sharkia Governorate representing three types of soil. In each region, three sites were chosen i.e., Khattara, Salhia and Faddaha (Fakous reg.) ; Zagazig, Meet-Abo Ali and Bani - Shebl (Zagazig reg.) and Belbies, Awlad- Seif and Bordin (Belbeis reg.). Samples of 20 green pods during the podding period were randomly collected from 16 leguminous and cruciferous podding plants, i.e.; cowpea (*Vigna sinensis*), bonavia bean (*Dolichos lablab*), soyabean (*Glycine max*), pea (*Pisum sativum*), broad bean (*Vicia faba*),

kidney bean (*Phaseolus vulgaris*), lentil (*Lens esculenta*), Egyptian lupin (*Lupinus termis*), fenugreek (*Trigonella foenum graecum*) Egyptian sesban (*Sesbania aegyptiaca*), Egyptian acacia (*Acacia arabica*), sponge tree (*Acacia farnesiana*), cauliflower (*Brassica oleracea var. botrytis*), radish (*Raphanus sativus*), garden rocket (*Eurica sativa*) and black mustard (*Brassica tosroafortii*). Samples were taken at 10 days intervals during the whole period of investigation. The collected pods were inspected on the same day in the laboratory with the aid of stereomicroscope to determine the population density of larvae in addition to the percentage of pods and seeds infestation. When pods became dry, 100 dry pods from each host were picked and inspected to determine infestation percentages of both dry pods and seeds.

To clarify the seasonal population fluctuations of insect larvae on cowpea plants, three regions representing three types of soil i.e., newly reclaimed sandy soil of Khattara, old heavy clay of Zagazig and silty of Belbeis where an area of about ¼ feddan for each region was cultivated with the cowpea variety, cream seven during the two summer growing seasons of 2001 and 2002. Moreover, the seasonal occurrence of larvae on the wild plants of

bonavia bean (lablab) was studied at the two regions of Khattara and Zagazig only. Samples of 20 green pods from each host were taken at random from different levels of plants. Sampling began immediately after pod setting and continued at ten-days intervals till pod dryness. All pods were collected and kept in tightly paper bags to be examined in the laboratory as previously mentioned. In each sample, the infested green pods and seeds as well the number of insect larvae were counted.

Records of both ambient temperature and atmospheric relative humidity were obtained from the Meteorological Stations in Abu-Kebeer and Ismailia from monthly reports of agricultural meteorology edited by Ministry of Agriculture and Land Reclamation (Aenar and Eid, 2001 - 2003) to represent certain weather conditions prevailing in the field. At Zagazig, Belbeis and Khattara regions during the period of investigation. In order to show the main and interaction effects of the two tested weather factors as well their total effect on the larval population density of the pyralid, coefficients of simple correlation (r), partial regression (b) and determination (C.D.) were calculated according to Fisher (1950).

RESULTS AND DISCUSSION

Field ecological studies to survey the host plants of the cowpea pod borer, *E. zinckenella* and clarify its seasonal population fluctuations as influenced by certain ecological weather factors were carried out at Khattara, Zagazig and Belbeis regions of Sharkia Governorate during two successive years for each study in a period of three years from 2001 to 2003. The obtained results can be arranged and discussed as follows:

1. Host Plants:

As regards the survey of host plants of cowpea pod borer, it was found that; 7 leguminous plants of 16 podding leguminous and cruciferous ones were infested with the cowpea pod borer and the others were not attacked. The host plants were cowpea, pea, bonavia bean, broad bean, kidney bean, soyabean and lentil, whereas the non host plants involved fenugreek, Egyptian lupin, Egyptian sesban, Egyptian acacia and sponge tree from leguminous plants as well cauliflower, radish, green rocket and black mustard from cruciferous ones. The results obtained in Tables (1, 2 and 3) show the infestation rates of both green pods and seeds of leguminous plants as well as mean numbers of larvae/20 green pods in the three sites of each region. Irrespective of region, it is evident

Table (1): Mean infestation percentages of green pods with the cowpea pod borer, *Etiella zinckenella* Tr. on some leguminous host plants growing in three different regions (three sites for each) of Sharkia Governorate during the three successive years of 2001, 2002 and 2003.

Host plants Regions and sites	Cowpea		Bonavia bean		Pea		Broad bean		Kidney bean		Soyabean		Lentil	
	2001	2002	2001/ 2002	2002/ 2003	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Zagazig region														
Zagazig	16.25	23.57	20.61	15.87	0.00	0.00	0.91	1.00	0.23	0.35	-	-	-	-
Meet-Abo Ali	7.5	1.72	-	-	0.00	0.00	2.50	3.00	-	-	1.00	0.83	-	-
Beni- Shebl	9.13	12.50	-	-	0.67	0.83	0.00	0.00	0.31	0.29	-	-	-	-
Average	10.96	12.60	20.61	15.87	0.22	0.28	1.14	1.33	0.27	0.32	1.00	0.83	-	-
Fakous region														
Khattara	20.84	23.21	44.09	28.64	4.89	5.20	7.57	4.24	0.36	0.25	22.14	19.00	-	-
Salhia	18.00	15.90	75.00	-	1.20	0.53	15.76	2.50	-	-	-	-	6.50	7.25
Fadadna	8.88	12.88	-	-	0.39	0.55	4.70	0.83	0.18	0.15	-	-	-	-
Average	15.91	17.33	59.55	28.64	2.16	2.09	9.34	2.52	0.27	0.20	22.14	19.00	6.50	7.25
Belbeis region														
Belbeis	15.38	12.25	-	-	1.17	0.22	2.75	0.83	0.00	0.00	-	-	-	-
Awlad Seif	-	-	-	-	-	-	4.00	2.01	-	-	-	-	-	-
Bordin	10.63	9.00	-	-	0.00	0.20	2.08	0.50	-	-	-	-	-	-
Average	13.01	10.63	-	-	0.59	0.21	2.94	1.11	0.00	0.00	-	-	-	-
General average	13.29	13.52	40.08	22.26	0.99	0.86	4.47	1.65	0.18	0.17	11.57	9.92	6.50	7.25

-Indicates that the plant species was not grown neither in region nor in season

Table (2): Mean infestation percentages of green seeds with the cowpea pod borer, *Etiella zinckenella* Tr. on some leguminous host plants growing in three different regions (three sites for each) in Sharkia Governorate during the three successive years of 2001, 2002 and 2003.

Host plants Regions and sites	Cowpea		Bonavie bean		Fava		Broad bean		Kidney bean		Soyabean		Lentil	
	2001	2002	2001/ 2002	2002/ 2003	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Zagazig region														
Zagazig	5.2	8.74	10.78	6.29	0.00	0.00	0.30	0.31	0.16	0.95	-	-	-	-
Meet-Abo Ali	2.53	0.48	-	-	0.00	0.00	0.42	0.28	-	-	0.52	0.44	-	-
Beni- Shebl	2.04	3.65	-	-	0.38	0.33	0.00	0.00	0.20	0.21	-	-	-	-
Average	3.26	4.29	10.72	6.29	0.13	0.11	0.24	0.20	0.18	0.58	0.52	0.44	-	-
Fakous region														
Khattara	7.02	8.56	28.26	14.62	2.35	0.61	3.48	2.13	0.16	0.13	8.82	8.57	-	-
Salhia	6.48	2.64	52.71	-	0.38	0.24	7.31	1.17	-	-	-	-	0.86	1.59
Fadadna	1.42	3.12	-	-	0.17	0.19	1.74	0.34	0.13	0.08	-	-	-	-
Average	4.97	4.77	40.49	14.62	0.97	0.35	4.18	1.21	0.15	0.11	8.82	8.57	0.86	1.59
Belbeis region														
Belbeis	4.39	2.25	-	-	0.34	0.09	1.39	0.36	0.00	0.00	-	-	-	-
Awlad Seif	-	-	-	-	-	-	0.51	0.48	-	-	-	-	-	-
Bordin	2.66	2.20	-	-	0.00	0.03	0.26	-	-	-	-	-	-	-
Average	3.53	2.23	-	-	0.17	0.06	0.72	0.42	0.00	0.00	-	-	-	-
General average	3.92	3.76	25.64	10.46	0.42	0.17	1.71	0.61	0.11	0.23	4.67	4.51	0.86	1.59

Table (3): Mean numbers of larvae per 20 green pods of the cowpea pod borer, *Etiella zinckenella* Tr. on some leguminous host plants growing in three different regions (three sites for each) in Sharkia Governorate during the three successive years of 2001, 2002 .

Host plants Regions and sites	Cowpea		Bonavia bean		Pea		Broad bean		Kidney bean		Soyabean		Lentil	
	2001	2002	2001/ 2002	2002/ 2003	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Zagazig region														
Zagazig	3.75	3.25	4.59	4.85	0.00	0.00	0.17	0.33	0.21	0.44	-	-	-	-
Meer-Abo Ali	1.75	0.75	-	-	0.00	0.00	0.33	0.00	-	-	0.38	0.50	-	-
Beni- Shebl	1.75	3.13	-	-	0.00	0.33	0.00	0.00	0.32	0.27	-	-	-	-
Average	2.42	2.38	4.59	4.85	0.00	0.11	0.17	0.11	0.27	0.36	0.38	0.50	-	-
Fakous region														
Khattara	5.25	7.62	12.26	8.22	0.67	0.41	1.83	0.67	0.86	1.22	4.43	4.67	-	-
Salhia	3.25	4.86	33.00	-	0.40	0.50	2.33	0.83	0.28	0.48	-	-	1.00	1.25
Fadadna	2.25	2.43	-	-	0.00	0.33	0.50	0.33	-	-	-	-	-	-
Average	3.58	4.97	22.63	8.22	0.36	0.41	1.55	0.61	0.57	0.85	4.43	4.67	1.00	1.25
Belbeis region														
Belbeis	4.50	2.50	-	-	0.50	0.00	0.50	0.17	0.00	0.00	-	-	-	-
Awlad Seif	-	-	-	-	-	-	0.00	0.33	-	-	-	-	-	-
Bordin	3.63	2.50	-	-	0.00	0.00	0.50	0.17	-	-	-	-	-	-
Average	4.07	2.50	-	-	0.25	0.00	0.33	0.22	0.00	0.00	-	-	-	-
General average	3.36	3.28	13.61	6.54	0.20	0.17	0.68	0.31	0.28	0.40	2.41	2.59	1.00	1.25

that the insect incidence on bonavia bean (lablab) plants was the highest indicating the maximum general averages of 40.08, 22.26%; 25.64, 10.46% and 13.61, 6.54 larvae/20 green pods for the infestation of both green pods and seeds as well the larval population density, respectively. On the other hand, pea and kidney bean plants showed the lowest corresponding values of 0.99, 0.86% ; 0.42, 0.17% and 0.20, 0.17 larva/20 pods for the first host and 0.18, 0.17%; 0.11, 0.23% and 0.28, 0.40 larva / 20 pods for the second one. Respecting the insect incidence on both green pods and seeds of different host plants, the data arranged in Tables (1 and 2) demonstrate in the three tested regions that the highest averages of pods infestation of 59.55; 28.64; 22.14, 19.00 and 15.91, 17.33% were found in Fakous region on bonavia bean, soyabean and cowpea plants, successively. Also, the same trend was obtained with respect to the averages infestation percentages of green seeds and averages numbers of larvae per 20 pods recording the highest values of 40.49, 14.62% and 22.63, 8.22 larvae / 20 pods on bonavia bean in Fakous region (Tables 2 & 3) during the investigating years of 2001/ 2002 and 2002/ 2003, consecutively.

Results tabulated in Tables (4 and 5) show % infestation of dry pods and seeds of the various tested hosts with this pyralid

species in the three different sites of three regions in Sharkia Governorate. The infestation percentage of bonavia bean either in sites or regions were higher than those recorded with the other host plants in both years, but the lowest infestation was found with kidney beans. Also, the results appeared that bonavia bean infestation of dry pods and seeds was the highest at both Khattara and Zagazig sites comparing with that of Sulhia site showing means of 69.9 , 61.91 and 48.20% for infestation percentage of dry pods and 47.20, 42.19 and 29.82% for infestation of dry seeds in the first year of 2001/2002, respectively. While, in the second one (2002/ 2003), the infestation was higher at Khattara site than that at Zagazig showing 77.53 and 49.42% for dry pods and 39.42 and 37.12% for dry seeds alternatively. The infestation percentage of dry pods and seeds of cowpea, soyabean, broad bean, pea and kidney bean at Fakous region were much higher than those of the other two regions of Zagazig and Belbeis showing the highest infestation of dry pods (39.12, 41.31; 42.00, 8.00; 13.79, 9.96; 4.23, 4.22; 2.22, 2.05%) and dry seeds (14.56, 19.22; 22.67, 23.50; 7.24, 4.62; 2.41, 1.98; 1.35, 1.08%) during the first and second growing seasons of 2001 and 2002, respectively. In this respect, it is worthy to note that lenti was cultivated only at Salhia site

Table (4): Mean infestation percentages of dry pods with the cowpea pod borer *Etiella zinckenella* Tr. on some leguminous host plants growing in three different regions (three sites for each) in Sharkia Governorate during the three successive years of 2001, 2002 and 2003.

Host plants Regions and sites	Cowpea		Bonavia bean		Pea		Broad bean		Kidney bean		Soyabean		Lentil	
	2001	2002	2001/ 2002	2002/ 2003	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Zagazig region														
Zagazig	19.82	18.25	61.91	49.42	0.00	0.00	3.00	3.50	2.10	1.58	-	-	-	-
Meet-Abou Ali	7.22	18.15	-	-	0.00	0.00	3.50	2.50	-	-	6.00	5.00	-	-
Beni- Shebl	14.85	19.14	-	-	2.75	2.10	0.00	0.00	0.83	0.55	-	-	-	-
Average	13.96	18.51	61.91	49.42	0.92	0.70	2.17	2.00	1.47	1.07	6.00	5.00	-	-
Fakous region														
Khattara	51.29	60.81	69.91	77.53	4.89	5.20	16.38	14.49	2.3	2.12	42.00	38.00	-	-
Salhia	44.30	38.96	48.20	-	5.00	4.80	19.75	12.00	-	-	-	-	9.35	14.00
Fadadna	21.76	24.15	-	-	2.80	2.65	5.25	3.40	2.13	1.98	-	-	-	-
Average	39.12	41.31	59.06	77.53	4.23	4.22	13.79	9.96	2.22	2.05	42.00	38.00	9.35	14.00
Belbeis region														
Belbeis	26.91	19.80	-	-	2.11	3.67	3.67	4.50	0.00	0.00	-	-	-	-
Awlad Seif	-	-	-	-	-	2.80	4.00	3.50	-	-	-	-	-	-
Bordin	16.04	22.05	-	-	1.56	2.30	2.30	2.00	-	-	-	-	-	-
Average	21.48	20.93	-	-	1.84	3.92	3.32	3.33	0.00	0.00	-	-	-	-
General average	24.85	26.92	60.49	63.48	2.33	2.40	6.43	5.10	1.23	1.04	24.00	21.50	9.35	14.00

Table (5): Mean infestation percentages of dry seeds with the cowpea pod borer *Etiella zinckenella* Tr. on some leguminous host plants growing in three different regions (three sites for each) in Sharkia Governorate during the three successive years of 2001, 2002 and 2003.

Regions and sites	Cowpea		Bonavia bean		Pea		Broad bean		Kidney bean		Soyabean		Lentil	
	2001	2002	2000/ 2002	2002/ 2003	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Zagazig region														
Zagazig	7.25	9.11	42.19	37.12	0.00	0.00	1.98	2.3	1.07	0.95	-	-	-	-
Meet-Abo Ali	5.23	3.86	-	-	0.00	0.00	1.85	1.25	-	-	3.00	1.98	-	-
Beni- Shebl	6.25	8.11	-	-	1.48	1.25	0.00	0.00	0.34	0.29	-	-	-	-
Average	6.24	7.03	42.19	37.12	0.49	0.42	1.28	1.18	0.71	0.62	3.00	1.98	-	-
Fakous region														
Khattara	23.96	38.97	47.20	39.42	3.01	2.73	8.14	6.36	1.04	0.97	22.67	23.50	-	-
Salhia	16.21	12.14	29.82	-	2.37	1.65	9.23	5.65	-	-	-	-	4.65	7.00
Fadadna	3.52	6.55	-	-	1.85	1.55	4.35	1.86	1.65	1.19	-	-	-	-
Average	14.56	19.22	38.51	39.42	2.41	1.98	7.24	4.62	1.35	1.08	22.67	23.50	4.65	7.00
Belbeis region														
Belbeis	10.67	5.51	-	-	1.75	1.25	1.75	2.10	0.00	0.00	-	-	-	-
Awlad Seif	-	-	-	-	-	-	2.90	1.35	-	-	-	-	-	-
Bordin	6.51	5.39	-	-	0.00	0.95	1.85	0.95	-	-	-	-	-	-
Average	8.61	5.45	-	-	0.88	1.10	2.17	1.47	0.00	0.00	-	-	-	-
General average	9.8	10.57	40.35	38.27	1.26	1.17	3.56	2.42	0.69	0.57	12.84	12.74	4.65	7.00

(Fakous region) in both 2001 and 2002 winter growing seasons and showed moderate means of 9.35, 14.00% for dry pods and 4.65, 7.00 for seeds, successively.

Generally, the infestation degree of both green and dry pods and seeds as well as average numbers of larvae in green pods differently varied on the different host plants in each of the three tested regions during the whole period of the three successive investigating years of 2001, 2002 and 2003.

The present results agree with those obtained by Larson (1926), Abul-Nasr and Awadalla (1957), Helaly (1978), Harakly and Assem (1980), Naito and Harnoto (1984), Wang and Song (1984), Ismail *et al.* (1990), Jaglan *et al.* (1995) and Retchie *et al.* (2000) who reported that some leguminous plants can be infested by the pyralid cow pea pod borer and another ones can't to be infested.

2. Seasonal Population Fluctuation

2.1. On cowpea plants

2.1.1. At Khattara region

Data illustrated graphically in Figures (1,2) indicate that the first appearance of the cowpea pod borer on cowpea plants in Khattara was on the 18th of June during 2001 and 2002 cowpea summer growing seasons, showing five and

four larvae 20 green pods, respectively. The corresponding means of ambient temperature and atmospheric relative humidity at the above dates were 28.38°C and 53.80% R. H. in the first season and 28.03°C and 54.70% R. H. in the second one. In the first season, three peaks of activity were shown, the first one was the lowest seven larvae/ 20 pods occurring on the 28th of June at 28.75°C and 57.40% R. H., whereas the second peak (the highest) of 15 larvae / 20 pods was recorded on the 18th of July at means of 30.64°C and 57.50% R. H.. Lastly, the third peak of seven larvae/ 20 pods was appeared on the last week of August at 29.83°C and 56.90% R. H..

In the second season, four peaks of larval population activity were recorded, the lowest one of five larvae / 20 pods took place on the 18th of July at means of 30.94°C and 55.30% R. H., while the highest one was the last showing 21 larvae / 20 pods and exhibited on the 27th of August at 29.48°C and 57.10% R. H.. Other two moderate peaks of eight and six larvae/ 20 pods were recorded on the 28th of June and 7th of August at the corresponding means of 28.23°C and 54.40% R. H. and 32.56°C and 55.90% R. H., respectively.

As clearly shown in Table (6) the pyralid population density in

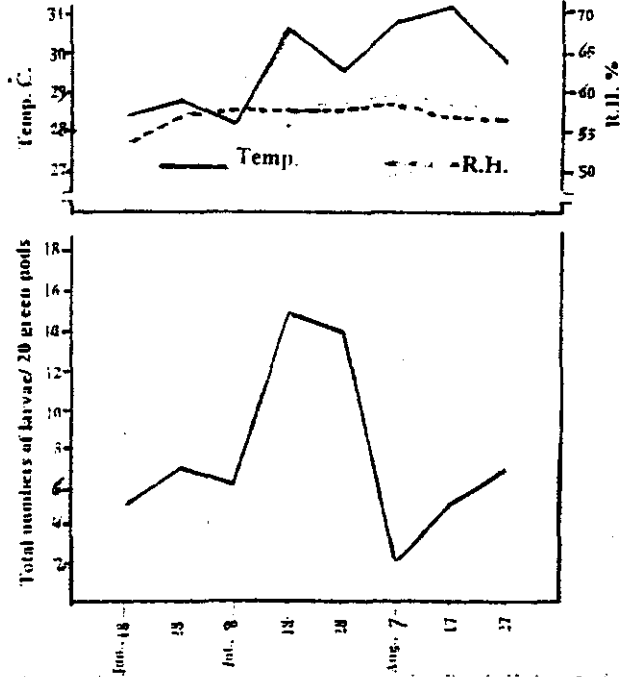


Fig. (1): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Khattara region during the first season of 2001.

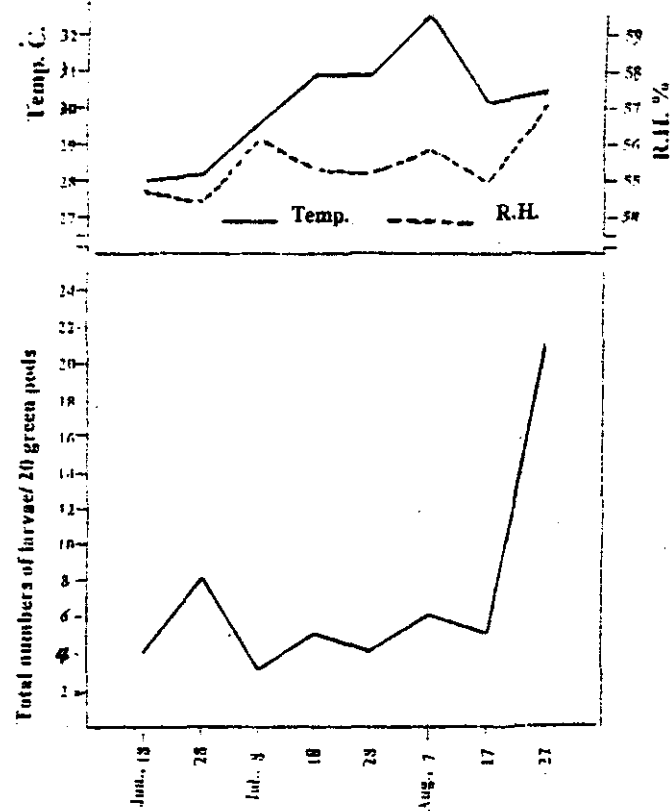


Fig. (2): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Khattara region during the second season of 2002.

the larval stage was slightly higher in the first season than in the second one indicating means numbers of 7.63 and 7.00 larvae / 20 green pods in 2001 and 2002 seasons, successively.

2.1.2. At Zagazig region

The data presented in Figs. (3 and 4) reveal that the first incidence of the pyralid took place on the 18th and 28th of June showing relatively high total numbers of seven and six larvae / 20 pods during 2001 and 2002 seasons, respectively. Then, the pest population varied in size showing four activity peaks in the first season and two peaks in the second one. In the first season, the

first and highest peak occurred on the 28th of June with total numbers of 14 larvae / 20 pods at 28.95°C and 56.10% R. H.. Then, the population of larvae sharply decreased to disappear completely through the following ten days on the 8th of July. Afterwards, the insect larvae reappeared and fluctuated in their numbers during the remaining period of cow pea growing season to show another three relatively low peaks of four, five and three larvae / 20 pods occurred on the 28th of July, 17th of August and 6th of September at ten days means of 28.37, 31.52, 30.26°C and 64.70, 65.65, 63.50% R. H.; successively.

Table (6) : Occurrence of larval stage of the cowpea pod borers, *Etiella zinckenella* Tr. on cowpea and bonavia bean green pods at Khattara, Zagazig and Belbeis regions during the two successive seasons of 2001 and 2002 for cowpea and two years of 2001 / 2002 and 2002 / 2003 for bonavia bean .

Host plant and regions	Mean number of larvae/ 20 pods	
	2001	2002
a- Cowpea plants		
Khattara	7.63	7.00
Zagazig	4.22	3.25
Belbeis	4.50	2.50
b-Bonavia bean plants	2001/2002	2002/2003
Khattara	17.47	10.76
Zagazig	6.92	6.41

During the second season, the first peak occurred on the 28th of June recording six larvae / 20

pods at 29.21°C and 55.10% R. H., then an obvious gradually depression in the insect numbers

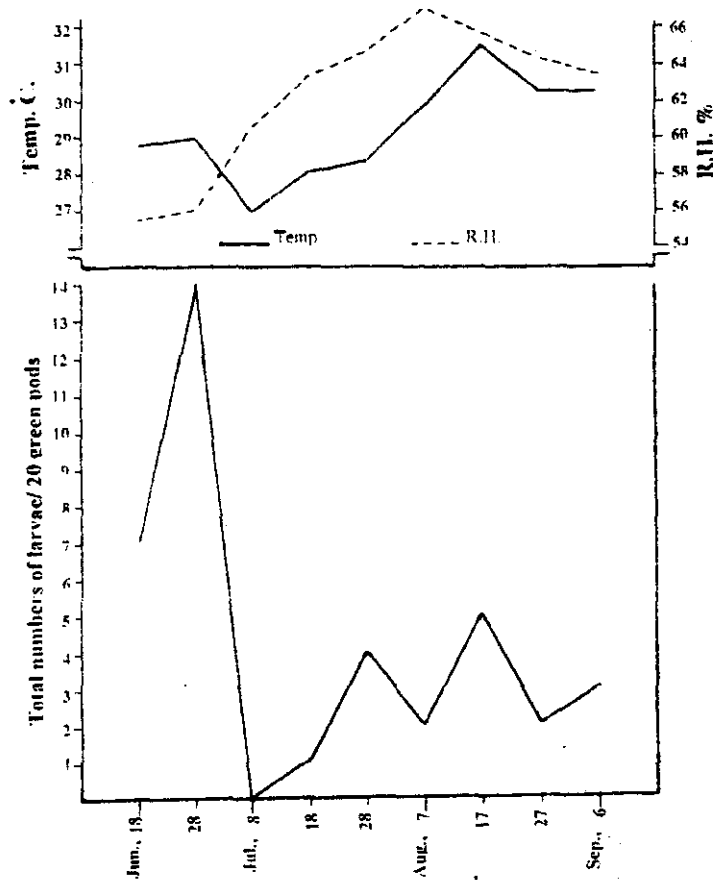


Fig. (3): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Zagazig region during the first season of 2001.

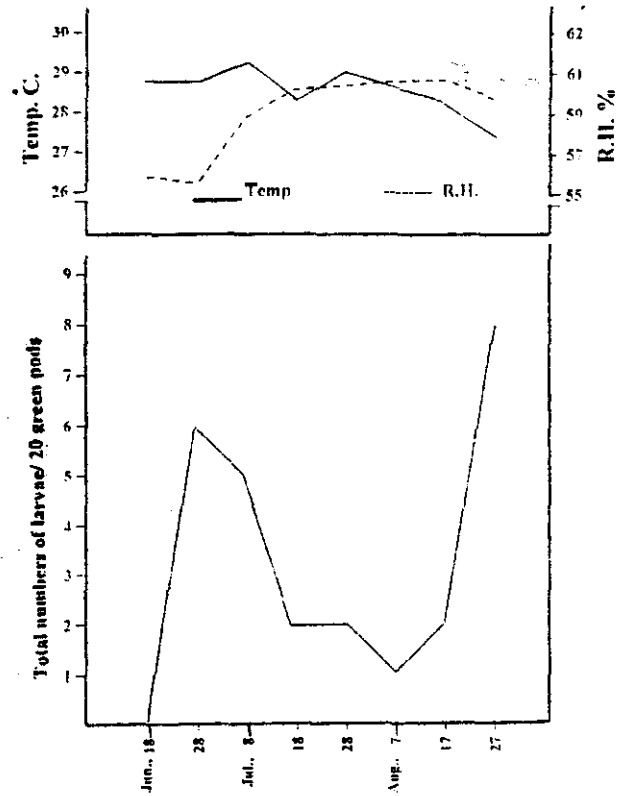


Fig. (4): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Zagazig region during the second season of 2002.

took place and became constant on both 18th and 28th of July showing two larvae / 20 pods and fluctuated through two sampling dates and then followed by a sharp increase during the last ten days of cowpea growing season, recording the second and highest peak of eight larvae / 20 pods on the 27th of August at means of 27.40°C and 60.50 % R. H..

As shown in Table (6) , the population density of the cowpea pod borer larvae at Zagazig region was higher in the first season than that occurred in the second one . The mean numbers of larvae / 20 pods were 4.22 and 3.25 in 2001 and 2002 seasons, respectively.

2.1.3. At Belbeis region

Data illustrated graphically in Figs. (5 and 6) reveal that the cowpea green pods were infested with the pyralid larvae during the period from mid- June to the last week of August during both 2001 and 2002 seasons. In the first season, the larvae firstly appeared with relatively high numbers of 16 individuals/ 20 pods at the last day of the second week of June at means of 28.20°C for ambient temperature and 56.70% for atmospheric relative humidity. Then, the insect population was sharply decreased to vanish on the 4th of July. Afterwards, it began to

increase gradually exhibiting the unique peak of five larvae/ 20 pods on the 3rd of August at means of 28.41°C and 65.60% R. H.. After this maximum level of abundance, the larvae decreased in numbers to reach two larvae/ 20 pods on the 23rd of August at 30.40°C and 65.00% R. H. and the larval population size became constant during the following ten days (23rd of August).

In the second season, the first incidence was detected in mid – June showing relatively moderate total numbers of four larvae / 20 pods at means of 28.53°C and 53.60% R. H., then the larvae fluctuated in numbers in the period from their first appearance to the last week of August before harvest exhibiting two activity peaks and two sampling dates of disappearance. The first peak occurred on the 5th of July and proved to be the highest in size having six larvae/ 20 pods at 29.82°C and 59.20% R. H.. But the other of three larvae / 20 pods was observed on the 14th of August at 28.99°C and 62.20% R. H. The insect period of disappearance continued for ten days from the 25th of July to the 4th of August .

The population density of the cowpea pod borer was higher in the first season (about two times) than that obtained in the second one. The means numbers of larvae/

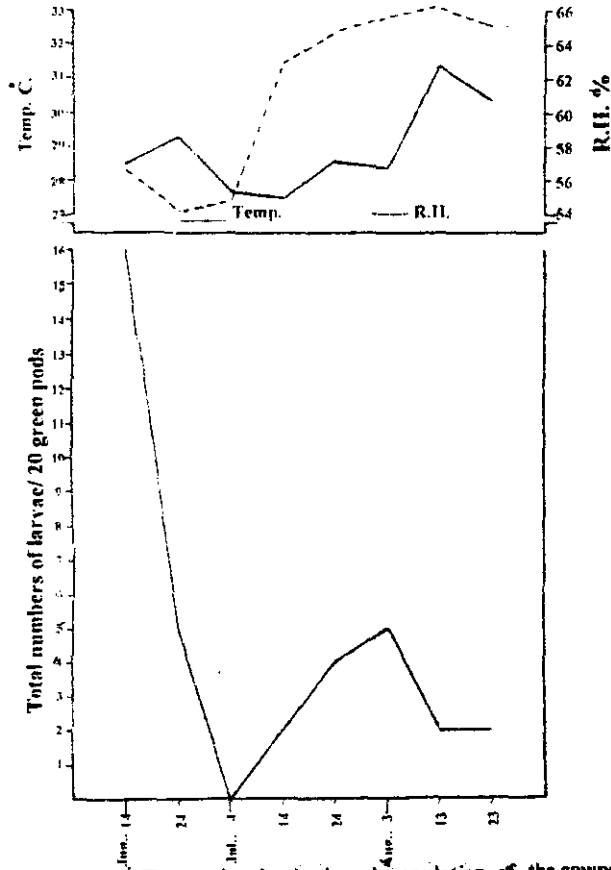


Fig. (5): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Belbeis region during the first season of 2001.

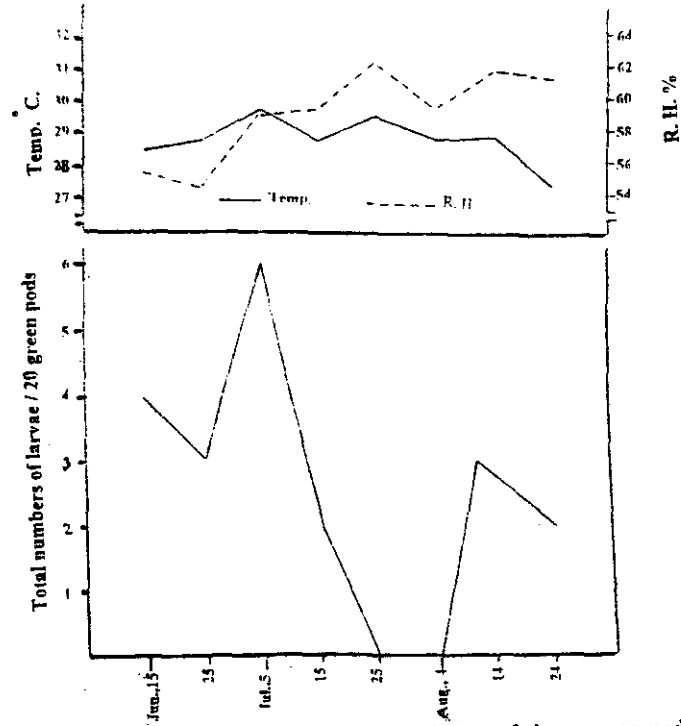


Fig. (6): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of cowpea at Belbeis region during the second season of 2002.

20 pods were 4.50 in 2001 season and 2.50 in 2002 (Table, 6).

2.2.On bonavia bean (lablab) plants

2.2.1. At Khattara region

The data illustrated graphically in Figs. (7 and 8) reveal that the initial occurrence of the cowpea pod borer larvae showed relatively high rates of 23 and seven larvae / 20 pods and occurred on the 4th and 8th of May during 2001 / 2002 and 2002/2003 years, respectively. In the first year, the larval population fluctuated to record five peaks where it was rapidly increased to attain its first peak (67 larvae / 20 pods) on the 24th of May at the prevailing temperature of 24.29°C and relative humidity of 55.40%. After-wards, the population density of larvae fluctuated throughout three podding periods a year extending from the 4th of May, 2001 to 28th of April, 2002 to record four other peaks of 28, nine, four and 26 larvae / 20 pods on the 29th of November, 2001, 28th of January, 17th of February and 18th of April, 2002 at means of 17.54, 13.77, 16.20, 22.50°C for ambient temperature and 57.10, 56.45, 62.90, 56.90% for atmospheric relative humidity consecutively.

In the second year of 2002 / 2003, the larval population activity

showed seven peaks in three periods of bonavia bean podding. The first and highest one occurred on the 7th of June 2002 showing 31 larvae/20 pods at means of 25.17°C and 54.20% R. H. in the first podding period. The four low peaks of activity took place during the second period of podding and ranged between 2-8 larvae / 20 pods including the lowest one (2 larvae/20 pods) that occurred on the 10th of February, 2003 at means of 15.14°C and 57.00% R. H.. The population density of larvae fluctuated during the third podding period to record two moderate peaks of 12 and 14 larvae/ 20 pods at means of 16.79, 19.37°C and 60.40, 61.90% for temperature and relative humidity, respectively.

In Table (6), it is obvious that the abundance level of the cowpea pod borer larvae was more higher in the first year than in the second one. Means numbers of larvae / 20 pods of 17.47 in 2001 / 2002 and 10.71 in 2002/ 2003 were recorded.

2.2.2. At Zagazig region

Figs. (9 and 10) show the seasonal population fluctuations of cowpea borer larvae on bonavia bean plants at Zagazig region during the whole period of the two consecutive years of 2001/ 2002 and 2002 / 2003. Five and six

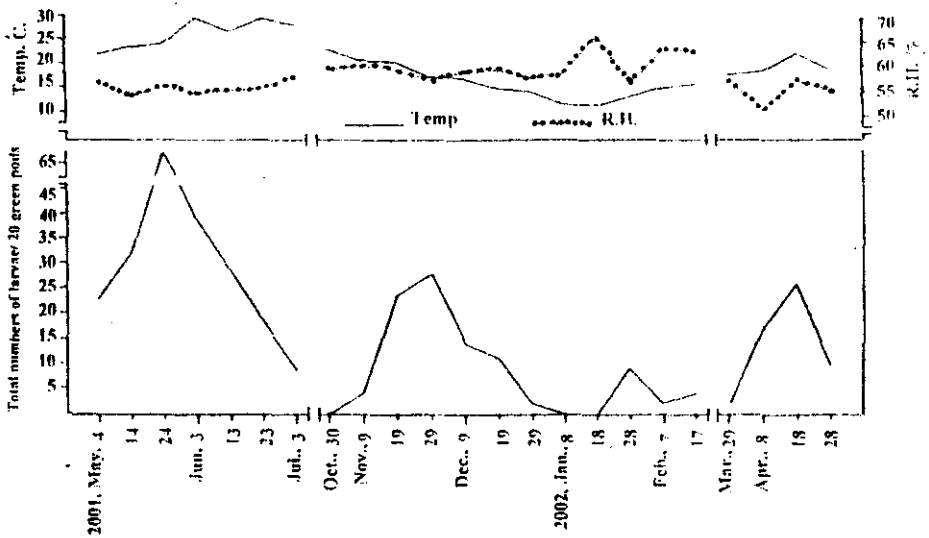


Fig. (7): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of bonavia bean (lablab) at Khattara region during the first year of 2001/2002.

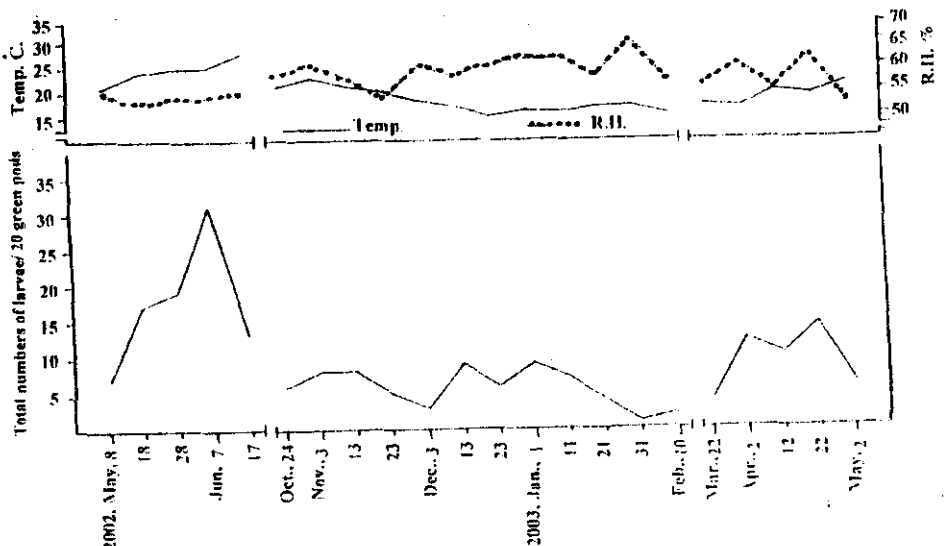


Fig. (8): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of Bonavia bean (lablab) at Khattara region during the second year of 2002/2003.

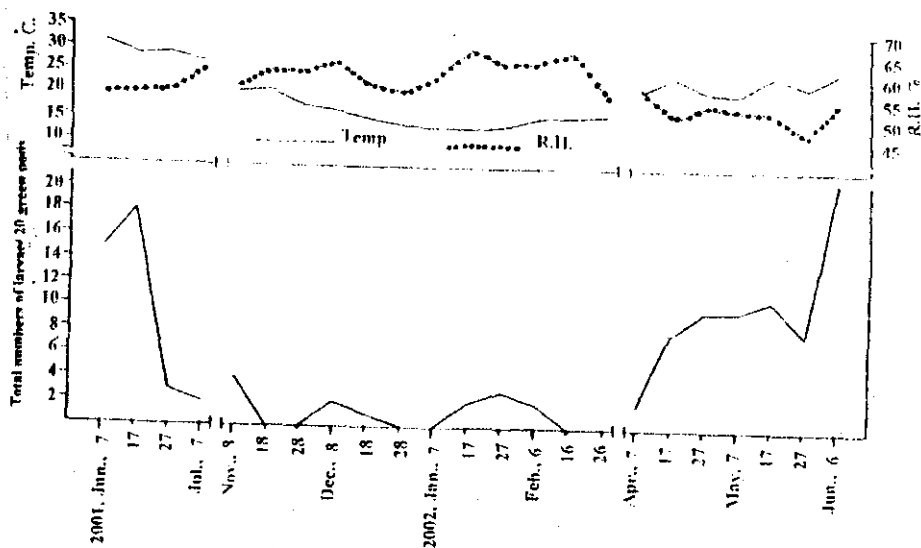


Fig. (9): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of bonavia bean (lablab) at Zagazig region during the first year of 2001/2002.

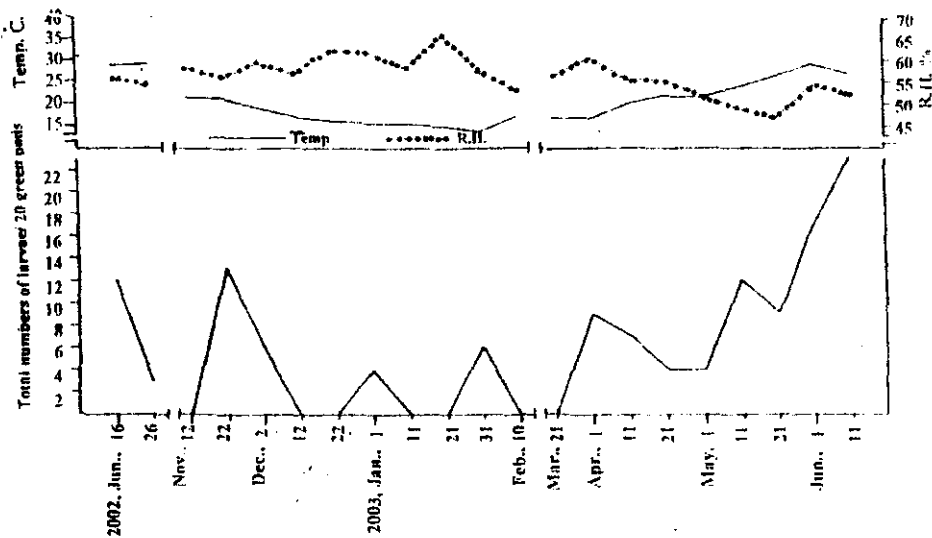


Fig. (10): Fluctuation in the larval population of the cowpea pod borer, *Etiella zinckenella* Tr. infesting green pods of bonavia bean (lablab) at Zagazig region during the second year of 2002/2003.

peaks were detected in the first and second years, respectively during three podding periods for each. In the first year, the first peak of 18 larvae / 20 pods occurred on the 17th of June, 2001 at means of 28.60°C and 55.00% R. H. during the first podding period. Afterwards, the second and lowest peak of two larvae/ 20 pods took place on the 8th of December 2001 at 17.03 °C and 62.40% R. H.. During this period another low peak of three larvae / 20 pods occurred on the 27th of January, 2002 at means of 14.32°C and 62.50% R. H. The insect larvae during the 3rd podding period, had two peaks of 11 and 21 larvae/ 20 pods occurring on the 17th of May and 6th of June , 2002 at means of 25.79°C, 52.80% R.H. and 26.75°C, 55.00% R. H. respectively.

In the second year, activity peaks were recorded during the second and third podding periods (three for each) but the insect abundance did not show maximum levels during the first podding period. The first peak occurred on the 22nd of November, 2002 showing 13 larvae/20 pods at means of 21.33°C and 55.60% R. H., but the second one (the lowest) took place on the 1st of January, 2003 showing four larvae/ 20 pods at means of 15.86°C and 61.70% R. H., then the population density

of larvae fluctuated to record three moderate peaks, one during the second period showing six larvae/ 20 pods that occurred on the 31st of January, 2003 at means of 15.4°C and 57.00% R. H. and the other two peaks exhibited during the third period of podding showing nine and 12 larvae/ 20 pods on the 1st of April and 1st of May, 2003 at means of 16.79, 24.18°C and 60.40, 49.40% R. H.. Lastly, the sixth peak was the highest in size and occurred on the 11th of June , 2003 having 23 larvae/ 20 pods at means of 27.12°C and 52.30% R. H..

The larval abundance in the two investigating years on lablab plants was nearly the same showing means numbers of larvae/ 20 pod of 6.92 and 6.41 during the first and second years of 2001 / 2002 and 2002/ 2003, successively.

The present results are in partial accordance with those obtained by Abul – Nasr and Awadall (1957), Talekar and Chen (1983), Islam *et al.* (1984), Wang and Song (1984), Hirano *et al.* (1992), Segarra –Carmona and Barbasa (1992) , Metwally (1993) and Kilimnik *et al.* (1996) who reported the occurrence of cowpea pod borer during different periods of year, specially the period from May to September (Talekar and Chen 1983).

2.3. Effect of temperature and relative humidity

From the data compiled in Table (7), it is clear that temperature showed an insignificant effect on the population activity of the cowpea pod borer on cowpea plants at the three tested regions of Khattara, Zagazig and Belbies in both seasons. The influence of relative humidity proved to be significant at Zagazig region and insignificant at the other two regions.

With respect to the correlation between the numbers of insect larvae on bonavia bean and the two tested weather factors, i.e., ambient temperature and atmospheric relative humidity, the statistical analysis of the results in Table (7) clearly reveal that both temperature and relative humidity had highly significant effects on larval abundance at both Khattara and Zagazig regions during the two years of study, except those concerning relative humidity that proved to be insignificant at Khattara and significant at 5% level of probability at Zagazig during the second one only.

In addition, the data arranged in Table (7) demonstrate that the size of the population density of the cowpea pod borer larvae differently affected by the two weather factors under study. In the

first cowpea season of 2001, the total C. D. % ranged between 20.75 and 90.55% at Khattara and Zagazig regions, consecutively, but in the second one of 2002/2003 the range was relatively narrow from 20.06% (Belbies) to 43.89% (Zagazig). With bonavia bean plants, the total C. D. values was the highest (53.41%) at Zagazig region in the first year (2001/2002), but in the second one of 2002/2003 it was obtained at Khattara region (58.85%). The present results clearly reveal that R. H. % was the most effective factor on the pest larvae as compared with temperature on both cowpea and bonavia bean plants except at Zagazig region wherein the influence of temperature surpassed that of relative humidity during the two years of 2001 / 2002 and 2002 / 2003 for bonavia bean and during the second growing season only for cowpea.

The present results are confirmed with the findings of Metwally (1993) who found that 73.13 and 74.63% of the fluctuation in the population of the pyralid borer, *E. Zinckenella* may be due to the daily maximum and minimum temperature and mean relative humidity. The same author added that population could be predicted on the basis of the climatic factors in any planting area.

Table (7): Simple correlation (r), partial regression (b) and coefficient of determination (C.D.) for the number of larvae of the cowpea pod borer *Etiella zinckenella* Tr. infecting cowpea and bonavia bean (lablab) green pods under field conditions at Khattara, Zagazig and Belbeis regions during the two successive seasons of 2001 and 2002 for cowpea as well 2001/2002 and 2002/2003 years for lablab.

Hosts and regions Considered weather factors	Cowpea									Bonavia bean (lablab)					
	Khattara			Zagazig			Belbeis			Khattara			Zagazig		
	r	b	C.D %	r	b	C.D %	r	b	C.D %	r	b	C.D %	r	b	C.D %
	2001 season									2001 / 2002 year					
Ten days mean temp.	0.044	0.68	2.95	0.130	-0.79	6.67	-0.124	-1.06	8.32	0.568**	1.18	14.61	0.690**	1.78	17.32
Ten days mean R. H.	0.183	1.09	12.72	-0.674*	-0.80	63.89	-0.298	-0.37	17.28	-0.549**	-1.66	11.62	-0.600**	-1.96	16.10
Interaction temp. X R.H.			5.08			19.99			9.95			14.20			19.99
Total C.D.			20.75			90.55			35.55			40.44			53.41
	2002 season									2002 / 2003 year					
Ten days mean temp.	-0.149	0.15	0.15	-0.500	1.98	26.18	0.181	0.44	2.35	0.624**	2.05	24.41	0.654**	1.80	18.96
Ten days mean R. H.	0.631	4.32	42.21	-0.122	0.04	1.45	-0.421	-0.28	16.89	-0.387	-1.65	14.99	-0.456*	-1.94	15.72
Interaction temp. X R.H.			1.53			1.22			0.82			19.45			20.17
Total C.D.			43.89			28.85			20.06			58.85			54.85

REFERENCES

- Abul-Nasr, S. and A. M. Awadalla (1957). External morphology and biology of the bean pod-borer, *Etiella zinckenella* (Treit.). Bull. Soc. Entom., Egypt, **41**: 591-620.
- Aenar, N. G. and H. M. Eid (2001-2003). Monthly report of Agricultural meteorology. Agricultural Research Center, Central Management of Agricultural Guidance, Ministry of Agricultural and lands Reclamation, Egypt.
- Fisher, R. A. (1950). Statistical method for research workers. II Rev. ed. Oliver and Boyed, London.
- Harakly, F. A. and M. A. H. Assem (1980). Ecological studies on the truly pests of leguminous plants in Egypt. I. Biting and chewing pests. (c. f. RAE, **68**: 223-238).
- Hattori, M. (1988). Host plant factors responsible for oviposition behaviour in the limabean pod borer, *Etiella zinckenella* Treitschke. Journal of Insect Physiology, **34** (3): 191-196.
- Helaly, M. M. (1978): Contribution to the study of the morphology, biology, ecology and control of the bean pod – borer, *Etiella zinckenella* (Tr.) (Lepidoptera: Phycitidae). Ph.D. Thesis, Jassy University, Romanin (Summary in English Language: 41pp.)
- Hirano, K., E. Budiyanto, N. Swastika, H. Suherdis and S. Winarni (1992). Causes of the season changes in population density of soyabean pod borers in Java, Indonesia. Jaro, Japan Agricultural Research Quarterly, **26** (2) : 130-138.
- Islam, W.; K. N. Ahmed and O. I. Joarder (1984). Timing and extent of damage caused by insect pests of green gram, (*Vigna radiate* L.) in Bangladesh. Crop – Protection, **3** (3): 343-348.
- Ismail, I. I.; S. H. Fouad and E. A. El-Shazly (1990): Effect of two host plants on the biology of *Etiella zinckenella* (Treit.). Annals of Agric. Sc. Moshtoher, **28** (3): 1775-1782.
- Jaglan, M. S. ; Sucheta and K. S. Khokhar, (1995). Description of varies life stages of *Etiella zinckenella* (Treit.) (Lepidoptera: pyralidae). Crop Research Hisar, **9** (1): 129-134.
- Kilimnik, A.N.; Yu. V. Belousov and A. A. Fedorov (1996): Preliminary results of agrofaunistic monitoring of soyabeans in an agroecosystem of the maritime lowland steppe. Nauchnoe Obespechenie Agropromy-shlennogo Kompleksa No. 88 : 93.

- Larson, A. O. (1926). Observations on the characteristic injury caused by the lima bean pod borer, *Etiella zinckenella* Treit. and other insects with which its injury is confused in California. *Journal of Economic Entomology*, 19 (October, 26) : 699-703.
- Metwally, S. A. G. (1993). The effect of planting date and certain climatic factors on the fluctuation of *Etiella zinckenella* Treit. infesting cowpea in Qalyobia Governorate Bulletin of the Entomological Society of Egypt , No. 71: 1-7.
- Naito, A. and Harnoto (1984). Ecology of the soyabean pod borer, *Etiella zinckenella* Treit. and *Ettiella habsoni* ; Butler. Contributions, Central Research Institute for Food Crops, Bogor, No. 71 : 15-33.
- Ritchie, J. M.; A. Polaszek ; S. Abeyasekera ; E. M. Minja and P. Mviha (2000). Insect pest incidence in seed crops of pigeon pea genotypes in on-farm trials in southern Malawi. International chickpea and pigeon pea Newsletter, No. 7 : 50-52.
- Segarra- Carmona, A. and P. Barbosa (1990). Influence of patch plant density on herbivory levels by *Etiella zinckenella* Treit. (Lepidoptera: Pyralidae) on *Glycine max* and *Crotalaria Pallida*. *Environmental Entomology*, 19 (3): 640-647.
- _____ (1992). Host-plant patches as islands; effects of patch size, patch extinction and seasonality of a herbaceous tropical legume (*Crotalaria pallida* Ait) on a pod borer *Etiella zinckenella* (Treit.) and its parasitoids. *Insect Science and its application* , 13 (5) : 709-718.
- Subba Rao, P. V.; A. V. Rangarajan and A. Azeez Basha (1976). Record of new host plants for some important crop pest in Tamil Nadu. *Indian Journal of Entomology*, 36 (3): 227-228.
- Talekar, N. S. and B. S. Chen (1983). Seasonality of insect pests of soyabean and mungbean in Taiwan. *Journal of Economic Entomology*, 76 (1):34-37.
- Wang, J. L. and G. Q. Song (1984). A preliminary report on *Etiella zinckenella* Treit. *Insect knowledge*, 21 (6): 252-254.
- Yang Caixia and Gao-Liyuan (1997). A preliminary study of the pod attacking insect pests for the sand fixing plant species *Caragana korshinskii* in Ninigxia Ningxia *Journal of Agricultural and Forestry Science and Technology*, No. 5 : 7-8.

العوائل النباتية والتقلبات الموسمية لحشرة دودة قرون اللوبيا التي تصيب القرون الخضراء للوبيا والبلاب في محافظة الشرقية، جمهورية مصر العربية

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أجريت دراسات حقلية خلال عامين متتاليين في الفترة من ٢٠٠١ إلى ٢٠٠٣ لخصر العوائل النباتية لحشرة دودة قرون اللوبيا في ثلاث مناطق مختلفة في محافظة الشرقية وهي فاقوس، الزقازيق وبلبيس وبالإضافة إلى ذلك، درست التقلبات الموسمية لهذه الحشرة على كل من نباتات اللوبيا والبلاب نتيجة للتغيرات الحادثة في درجة الحرارة والرطوبة النسبية للهواء الجوي خلال موسمين متتاليين لزراعة اللوبيا صيفياً في عوامي (٢٠٠١ و ٢٠٠٢) وفي الفترة من ٢٠٠١ إلى ٢٠٠٣ في حالة نباتات البلاب وذلك في مناطق الخطارة الزقازيق وبلبيس على العائل النباتي الأول ومنطقتي الخطارة والزقازيق على العائل النباتي الثاني وكانت النتائج المتحصل عليها كما يلي:

١- من ١٦ عائلاً نباتياً من الفصليتين البقولية والصلبية، وجد أن الحشرة تصيب نباتات اللوبيا، اللسياب، البسلة، فول الصويا، الفول البلدى، الفاصوليا والعدس واتضح أن البلاب، اللوبيا وفول الصويا هي أكثر العوائل إصابة بالحشرة مقارنة بالعوائل الأخرى، بينما كانت الفاصوليا، البسلة والعدس هي أقل العوائل إصابة. تبين عدم إصابة قرون الحلب، الترمس المصرى، السيسان المصرى، السنط المصرى (العربي) والفتة وهي من النباتات البقولية وكذلك عدم إصابة القرنبيط، الفجل، الخرجير والكر وهي من النباتات الصليبية بهذه الحشرة.

٢- تواجدت يرقات الحشرة على قرزن اللوبيا في الأسبوع الثالث من شهر يونية خلال موسمي ٢٠٠١ و ٢٠٠٢ م في منطقة الخطارة وبعدها تقلبت أعدادها لتظهر ٢، ٤ ذروات نشاط في كل من الموسم الأول والثاني، على التوالي. وأيضاً ظهرت إصابة القرون في منطقة الزقازيق في الأسبوعين الثالث والرابع من شهر يونية حيث أظهر نشاط الحشرة ٤ ذروات في موسم ٢٠٠١ م وذروتين في موسم ٢٠٠٢ م. بينما في منطقة بلبيس، بدأ ظهور الحشرة في القرون في الأسبوع الثاني لشهر يونية ولها ذروة و ذروتين للنشاط خلال الموسمين الأول والثاني، على التوالي.

٣- بدأ ظهور الحشرة على نباتات اللباب النامية برباً في منطقة الخطارة في اليوم الرابع والثامن من شهر مايو وأظهرت ٤ و ٦ ذروات لنشاط التعداد أثناء موسمي ٢٠٠١ / ٢٠٠٢ و ٢٠٠٢ / ٢٠٠٣، على التوالي. بينما في منطقة الزقازيق، تواجدت اليرقات الأول مرة في السابع والسادس عشر من شهر يونية لكل من عوامي ٢٠٠١ و ٢٠٠٢ م، على الترتيب، وبعدها تقلبت أعدادها التوضح ٥ و ٦ ذروات نشاط أثناء العامين الأول والثاني، على التوالي.

٤- بخصوص تبين تواجد الحشرة في المناطق المختلفة على نباتات اللوبيا والبلاب، أوضحت النتائج أن تعداد الحشرة كان أعلى وفرة بما يعادل مرتين في منطقة الخطارة مقارنة بما هو موجود في منطقتي الزقازيق وبلبيس.

٥- فيما يتعلق بتأثير عوامل الطقس (درجة الحرارة والرطوبة النسبية) على الكثافة العددية لليرقات، من الممكن استنتاج أنه في حالة نباتات اللوبيا، كان للرطوبة النسبية تأثيراً أعلى مقارنة بدرجة الحرارة في مناطق الخطارة، الزقازيق وبلبيس. وعلى العكس من ذلك، إستجابات يرقات الحشرة في القرون الخضراء لنباتات اللباب بطريقة مختلفة للتغيرات الحادثة في عاملي الطقس تحت الدراسة حيث كان التأثير عكسياً في كل من منطقتي الخطارة والزقازيق.