

SEASONAL ABUNDANCE OF PEACH FRUIT FLY, *BACTROCERA ZONATA* (SAUNDERS) WITH RELATION TO PREVAILING WEATHER FACTORS IN UPPER EGYPT

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Abstract: The present investigation was conducted at Shandaweel Agricultural Research Station, Sohag Governorate in three successive years 1999, 2000 and 2001 to study the seasonal fluctuation of *Bactrocera zonata* (Saunders). Traps baited with 2% diamonum phosphate used to caught the peach fly. Through the year, in 1999 the caught fly concentrated at August, September month and October, while in rest of the year the flies disappeared or in few numbers. The same trend mostly had occurred in the second (2000) and third (2001) years.

varied in its significant during the three year, but the efficiency of these factors were maximum temperature came first, minimum temperature and relative humidity came second or third in its efficiency.

Through the three years of the study peach fly have two generations per year the first generation begin in August and ended in September. The second generation began in September and ended in November, the generation time about 42 days. The host fruit which generations built up were mango, guava and citrus fruits.

The prevailing weather factors

Introduction

The peach fruit fly, *Bactrocera zonata* (Saunders) directly infests a wide range of fruits and also a few vegetables in India. Also, in Pakistan and South-East Asia, Citrograph (1984), and the survey in Bangkok area of Thailand showed that *Dacus zonatus* infested fruits of singapore almond, guava and rose apple, these finding showed that *B. zonata* had become one of the major pests of fruits in Thailand (Tigvatan and Arreekul, 1984).

In Pakistan *B. zonata* adult fly were at their peak during fruit maturation in June Qureshi *et al.* (1991). In India traps baited with methyl eugenol and malathion captured males from the 2nd week of Aril until the 2nd week of November during 1986 and 1987. Peak adult activity occurred during the 3rd week of June on apricot, the 4th week of June on plum and the 2nd week of July on peach. Gupta *et al.* (1990). *Dacus zonatus* were found in traps near an international airport in

California in March 1984. Being a polyphagous pest, with reproductive potential, wide climatic tolerance and overlapping of generation, its managements is rather difficult Agarwal and Kumar (1999). The aim of this investigation is to clarify the occurrence and abundant flies through the three years of study with relation to the prevailing weather factors in upper Egypt.

Materials and Methods

The experiment were carried out in an area about 5 feddan cultivated with peach, (*Prunus persica*), guava (*Psidium guajava*), mango (*Mangifera indica*), figs (*Ficus carica*), mandarin (*Citrus sinensis*) and sweet orange (*Citrus sinensis*) at Shandaweel farm Sohag Governorate upper Egypt during the three successive years 1999-2000 and 2001

Seven glass Mcphil traps baited with 2% diamonium phosphate to attract the adult of *Bactrocera zonata* were hanged 1.5 m high in a shadow place of the trees and distributed randomly. The lure were renewed weekly and trapping flies were also recorded at weekly intervals.

Statistical analysis were done as a multi-regression analysis as described by Steel and Torrie, (1980). Meteorological data were obtained from the metcorological Poltin of Agriculture Research Center

Results and Discussion

Data represented in Tables 1, 2 and 3 indicated that the annual totals of peach fruit fly, *B. zonata* caught by using glass Mcphil traps baited with 2% diamonium phosphate during the three successive years of the study were 1961, 2032 and 795 flies.

Figures 1, 2 and 3 illustrate, the relation between $\log(x+1)$ of weekly trapped files and the prevailing (maximum, minimum) temperature and relative humidity

1- The first year of the study, 1999.

Table (1) show that the flies began to appear at June with 5 flies formed 0.26% from the total annual catch, July 4 flies formed 0.2% from the total catch. The catch of August was 455 flies formed 23.2%, while in September the flies catch reached its maximum 844 flies formed 43% from the total annual catch, after that the eatch become 643 flies during October formed 32.79% from the annual catch. November and December catch were 4 and 6 flies formed 0.2 and 0.31% from the annual catch.

The above mentioned date indicate that the *B. zonata* flies found with high density during August, September and October and disappeared completely during January, February, March, April and June.

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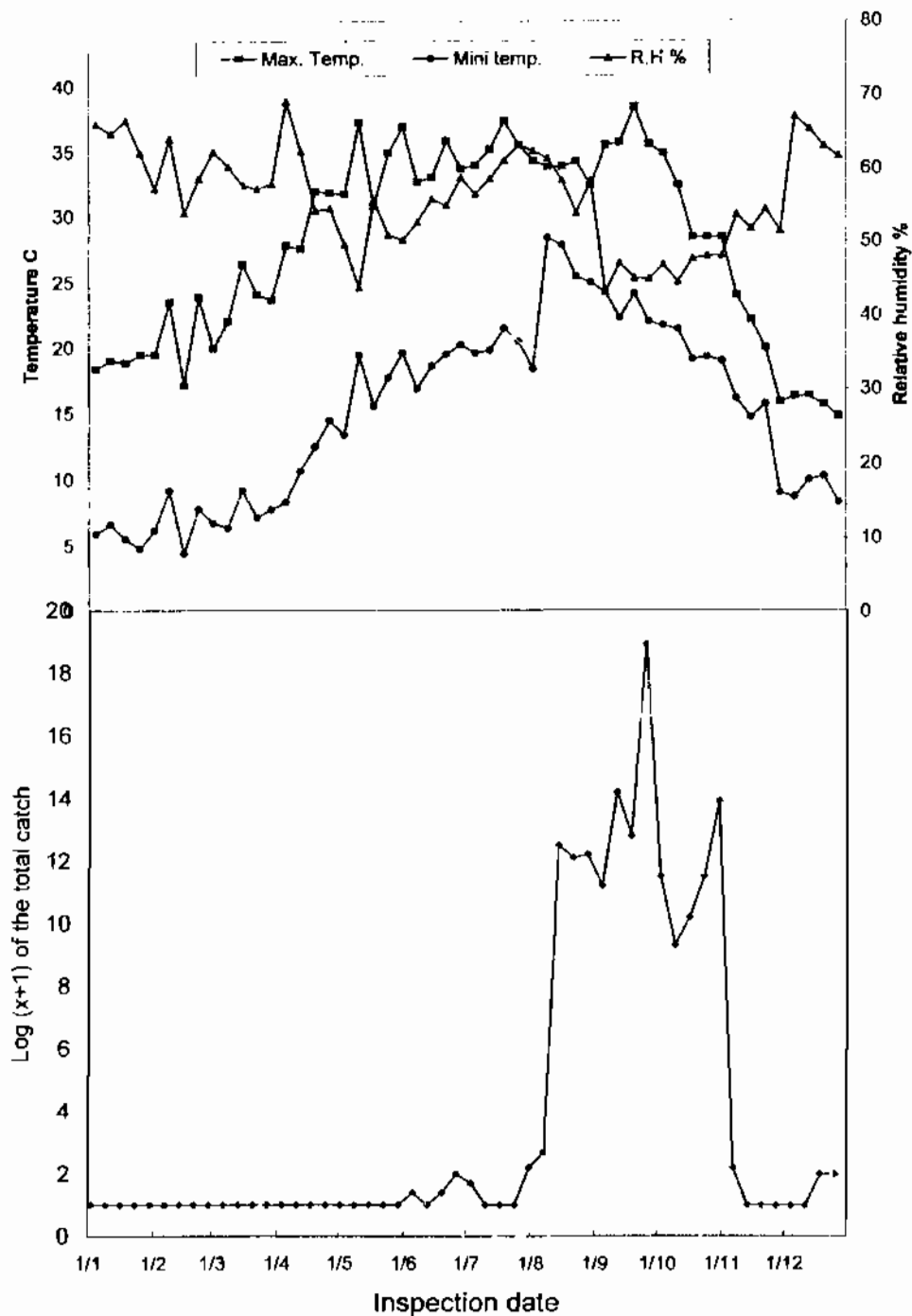


Fig. (1): Seasonal abundance of *B. zonata* as indicated by total catch of 7 Mcphail traps at first year (January to December 1999) above presentation for the weather records at the same period.

Table (1) Monthly adult catch of *B. zonata* during 1999.

Months	Adult catch		Temperature °C			R.H %
	catch	% from the total	Max.	Mini.	Mean	
Jan. 99	0	0	19.08	5.83	12.46	63.26
Feb	0	0	21.14	7.03	14.09	59.68
March	0	0	24.79	7.75	16.27	60.40
April	0	0	30.75	12.75	21.75	55.09
May	0	0	34.94	18.09	26.22	50.11
June	5	0.26	33.33	18.81	26.07	55.47
July	4	0.2	35.28	19.96	27.62	60.33
August	455	23.20	33.63	26.67	30.15	58.00
Sept.	844	43.00	36.30	23.17	29.74	44.99
October	643	32.79	30.52	20.21	25.37	46.99
Nov.	4	0.2	22.43	9.86	16.15	52.79
Dec.	6	0.31				
Total	1961	100				

Table (4) declared that there is a highly significant correlation between the caught number of flies and the maximum temperature. no-significant correlation with minimum temperature and a negative non-significant correlation with relative humidity.

Table (4) represent that the three weather factors are responsible for 35.97% to the change occur on the flies density. The maximum temperature is the first factor in efficiency responsible for 28.9684%, while the second factor is relative

humidity responsible for 6.4666% and the third factor is the minimum temperature responsible for 0.5361% from the change in flies density.

2- The second year of the study, 2000.

The catches obtained were represented in Table (2) and the climatic records prevailed during the period was shown in the same table. The whole records are illustrated in Figure (2) it can be noticed from Table (2) that the flies catch over all

the year 2032 flies. The flies disappeared completely during February, May, June, July and December, while during January, March and April the flies catch are in few numbers consisting 1.64% from the total annual catch. The number of flies increased gradually

in August 30 flies formed 1.48%, September 623 flies formed 30.66%, while at October the catch of flies reached its maximum 1252 flies formed 61.11% from the total catch. The catch of November decreased again to 112 flies formed 5.51% from the total catch.

Table (2) Monthly adult catch of *B. zonata* using during 2000

Months	Adult catch		Temperature °C			R.H %
	catch	% from the total	Max	Mini.	Mean	
Jan. 2000	2	0.01	11.85	9.33	10.59	64.24
Feb	0	0	21.47	5.72	13.58	62.11
March	5	0.25	26.46	7.71	17.09	57.78
April	8	0.39	33.67	16.27	24.97	63.06
May	0	0	33.84	15.69	24.77	50.32
June	0	0	40.15	24.14	32.15	52.17
July	0	0	40.29	23.95	32.12	55.65
August	30	1.48	33.98	25.68	29.83	60.16
Sept.	623	30.66	34.93	24.34	29.64	50.34
October	1252	61.61	32.23	18.42	25.33	46.57
Nov	112	5.51	27.49	13.07	20.28	43.69
Dec.	0	0	24.82	10.95	17.89	44.95
Total	2032	100				

Table (4) show that the correlation between catch flies and maximum temperature was highly significant, where a positive non-significant with minimum temperature and a negative non-

significant correlation with relative humidity. The prevailing weather factors, maximum, minimum temperature and relative humidity are responsible for 39.4% from the change happened on population of

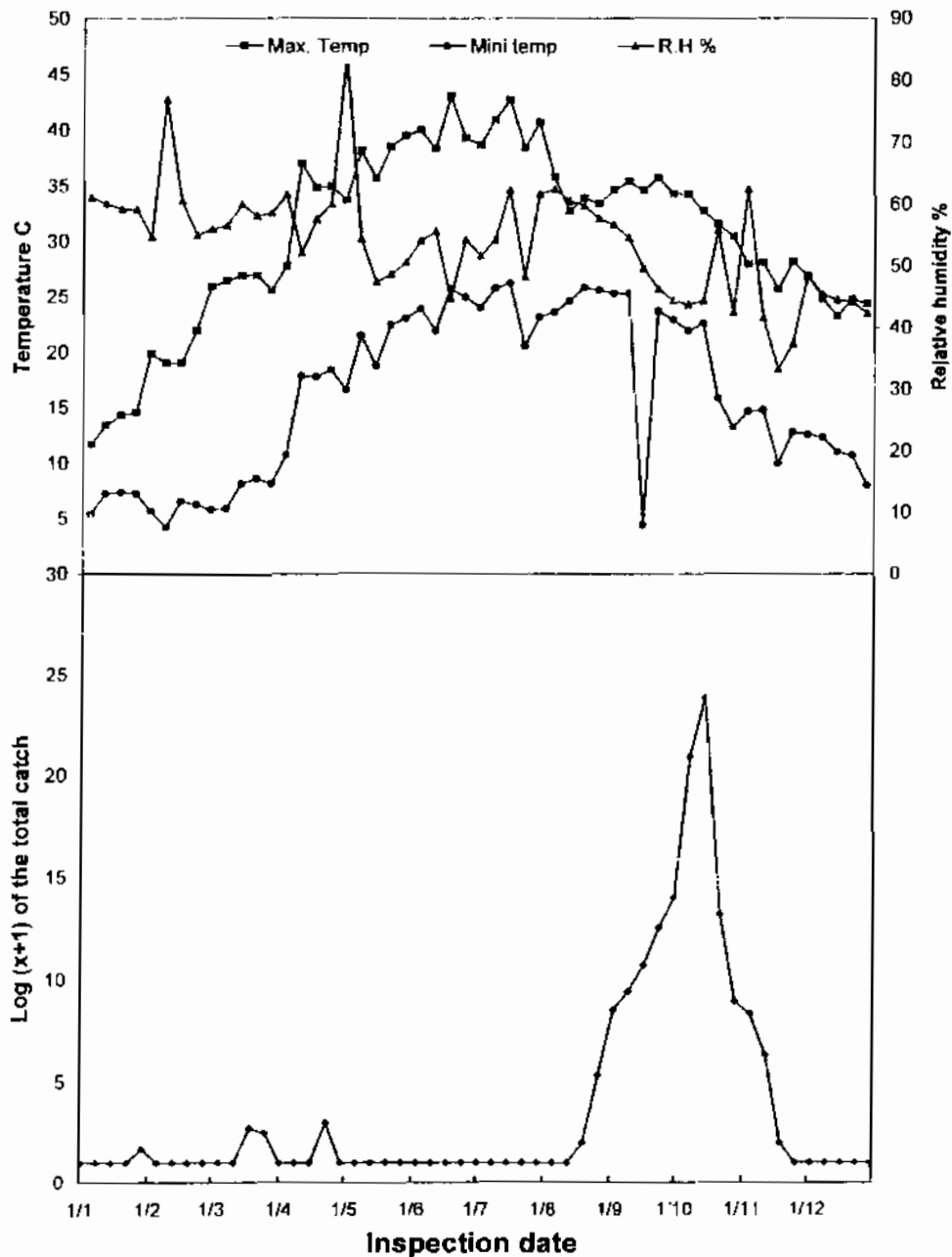


Fig. (2): Seasonal abundance of *B. zonata* as indicated by total catch of 7 Mcphail traps at second year (January to December 2000) above presentation for the weather records at the same period.

flies. The first factor in efficiency is maximum temperature responsible for 36.529%, the second factor in efficiency is minimum temperature

responsible for 1.5767% and the third factor in efficiency was relative humidity responsible for 1.2953%

Table (3) Monthly adult catch of *B. zonata* during 2001.

Months	Adult catch		Temperature °C			R.II %
	catch	% from the total	Max	Mini.	Mean	
Jan 2001	4	0.50	24.30	9.09	16.70	44.32
Feb	10	1.23	24.60	8.85	16.73	37.93
March	6	0.76	29.61	13.47	21.54	44.02
April	6	0.76	33.40	15.23	24.32	39.23
May	13	1.64	36.38	18.92	27.65	44.43
June	0	0	37.78	21.02	29.40	46.86
July	0	0	36.15	22.08	29.09	63.89
August	100	12.58	31.69	14.99	23.34	50.03
Sept	472	59.37	25.82	18.49	22.16	56.72
October	140	17.61	32.30	16.8	24.55	52.0
Nov	38	4.78	25.50	10.4	17.95	56.0
Dec.	12	1.51	21.50	6.8	14.15	57.0
Total	795	100				

3- The third year of the study, 2001.

Table (3) indicate that 795 flies were caught during the third year, 2001. The caught flies distributed through the year months, January 4 flies, forming 0.5% of the total annual catch, February 10 flies,

forming 1.23%, April 6 flies, forming 0.76%, May 13 flies, forming 1.64%, June and July no flies were caught. August represents an increase of the caught flies with a number of 100 flies forming 12.58%. The maximum catch was 472 flies, forming 59.37% during September. The number of

flies catch began to decreased from October 140 flies, forming 17.61%, November 38 flies, forming 4.78%, while December caught 12 flies, forming 1.51%.

The correlation between the number of flies catch and the prevailing weather factors shown in Table (4). There is a highly significant negative correlation with the maximum temperature, while positive non-significant correlation with the minimum temperature and relative humidity.

The three weather factors were responsible for 35% from change in population density of the flies. maximum temperature represent the first responsible for 19.61%, minimum temperature represent the second responsible for 9.38%, and relative humidity come the third responsible for 6.01% from the change occurred in the population density of the flies.

The above discussed results of three years of study are in partial agreements with those of Agarwal and Kumar (1999). Also, Gupta *et al.* (1990) who found that *B. zonata* fluctuated from the 2nd week of April until the 2nd week of November. Mohamed (1993) found that the three weather factors were responsible for 27.98% in the change in Medfly population.

Generations :-

1- The generations of the first year of the study (1999):

Table (5) and Figure (1) shows that there are two generation through the year, the first one began at 14/8 until 18/9/1999, the generation time was 35 days with 156 flies per week and the available host fruit were mango and guava. The prevailing weather factors were maximum temperature mean was 33.04 °C, minimum temperature mean was 24.83 °C, the mean temperature 29.93 °C and the relative humidity mean 50.95%.

The second generation was from 25/9/1999 until 6/11/1999 with generation time 41 days, with abundant flies 167.33 per week. The available host fruits were guava and citrus, the prevailing weather factors were mean of the maximum temperature 35.36 °C, minimum temperature mean 23.12 °C, the mean temperature 29.24 °C and the mean of relative humidity was 55.57%.

2- The generation of second year of the study (2000):

Table 5 and Figure 2 show that there are two generations also, the first one from 19/8 until 30/9/2000, the generation period was 42 days with 93.29 abundant flies per week, the prevailing weather factors means were maximum temperature was 37.57 °C, minimum temperature 24.74 °C, and mean temperature 29.66 °C and relative humidity mean 52.75%. The available host fruits were mango and guava.

Table (4) Multi factor-regression analysis between weekly catch of *B. zonata* and the prevailed weekly Max. temp. (x_1), Mini Temp (x_2) and R.H. % (x_3) during the three years of study.

Year of study	Variable weather factor	Correlation coefficient		Coefficient determination RSQ	Relative efficiency	
		r	R			
1999	Max. temp	0.5078193**	0.5665	0.3597	28.9684	1 st
	Mini temp.	0.2577957			0.5361	3 rd
	R.H. %	-0.1532277			6.4666	2 nd
2000	Max. temp	0.5938347**	0.6212	0.3940	36.529	1 st
	Mini temp.	0.3226347*			1.5767	2 nd
	R.H. %	-0.00096649			1.2953	3 rd
2001	Max temp	-0.5316176**	0.5347	0.3500	19.6138	1 st
	Mini temp	0.1051284			9.3774	2 nd
	R.H. %	0.00383725			6.0083	3 rd

* Significant at the 0.05 level of probability.

** Significant at the 0.01 level of probability.

Table (5) Number and time of *B. zonata* generations according to the weather factors during three seasons (1999 – 2000 - 2001) at Sohag Governorate.

Seasons	Generations	Abundance peaks	Peaks time		Temperature means			R.H. % mean	Abundance mean flies/weeks	Suitable hosts
			From	To	Max.	Mini.	Mean			
1999	1 st	1 st	14/8	18/9	35.04	24.83	29.93	50.95	156	mango and gauava
	2 nd	2 nd	25/9	6/11	35.36	23.12	29.24	55.57	167.33	gauava and citrus
2000	1 st	1 st	19/8	30/9	34.57	24.74	29.66	52.75	93.29	mango and gauava
	2 nd	2 nd	7/10	18/11	30.10	16.60	23.13	46.23	194.9	gauava and citrus
2001	1 st	1 st	11/8	22/9	29.2	17.24	23.22	54.09	47.57	mango and gauava
	2 nd	2 nd	29/9	10/11	29.46	15.52	22.49	52.59	59.57	gauava and citrus

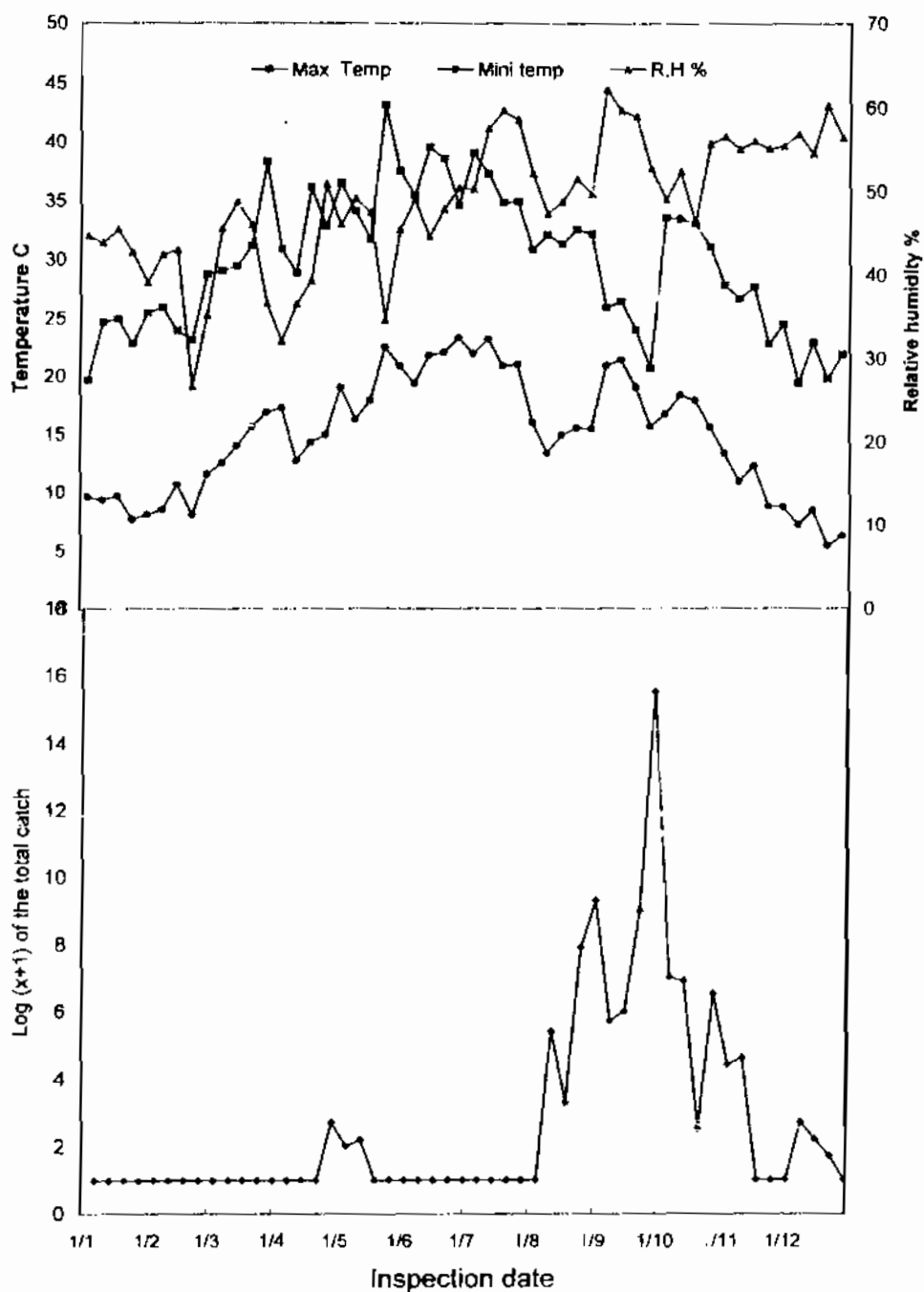


Fig. (3): Seasonal abundance of *B. zonata* as indicated by total catch of 7 Mcphail traps at third year (January to December 2001) above presentation for the weather records at the same period.

The second generation from 7/10 to 18/11/2000, the generation period was 42 days, the prevailing maximum temperature mean was 30.10 °C, minimum temperature mean 16.60 °C, the mean temperature 23.12 °C, and relative humidity mean was 46.23%. The abundant flies per week was 194.9 flies and the available host fruits were guava and citrus.

3- The generations of the third year of the study (2001):

Table 5 and Figure 3 show that there are two generations, the first one from 11/8 until 22/9/2001, the generation time 42 days, the abundant flies per week were 47.57 flies, the available host fruits were mango and guava, the means of weather factors, maximum temperature was 29.20°C, minimum temperature 17.24 °C, temperature mean 23.22 °C and relative humidity was 52.59%.

The second generation from 29/9 until 10/11/2001, it take 42 days, the abundant flies per week was 59.57 flies, the available host fruits were guava and citrus. The prevailing weather factors means were maximum temperature 29.46 °C, minimum temperature 15.52 °C, mean temperature 22.49 °C and relative humidity 52.59%.

Several authors reported that the peaks of abundance of the flies may refer to be true generations Hanna, (1947) and Selim, (1965) Qureshi,

et al. (1993) stated that egg hatch increased significantly with temperature from 15 to 25 °C (51 and 91.3%, respectively) and then to 0 at 35 °C. No larvae completed development at 15 or 35 °C. Mohamed (2000) studied the threshold of development to immature stages of *B. zonata* and he found that egg and larvae did not developed at 10 °C, while pupae did not developed at 11.7 °C. This means that the temperature are responsible to build up of *B. zonata* generations.

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التواجد الموسمي لذبابة الخوخ *Bactrocera zonata* وعلاقتها مع الظروف الجوية السائدة في مصر العليا

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معهد بحوث وقاية النبات

اجريت هذه الدراسة في محطة البحوث الزراعية بجزيرة شنديل التابعة لمركز البحوث الزراعية في محافظة سوهاج في ثلاثة اعوام متتالية هي ١٩٩٩ ، ٢٠٠٠ ، ٢٠٠١م بغرض دراسة التواجد الموسمي لذبابة الخوخ . وقد استعمل في هذه الدراسة مصائد تحتوي على طعم جاذب %٥ داي أمونيوم فوسفات وقد أظهرت الدراسة أن معظم الذباب يكون متواجد خلال اشهر اغسطس ١٩٩٩م (٤٥٥ ذبابة مكونة ٢٣,٢% من إجمالي العام) وسبتمبر (٨٤٤ ذبابة مكونة ٤٢%) شهر أكتوبر (٦٤٣ ذبابة مكونة ٣٢,٧٩%) ثم خلال عام ٢٠٠٠ شهر أغسطس (٣٠ ذبابة مكونة ١,٤٨%) سبتمبر (٦٢٣ ذبابة مكونة ٣٠,٦٦%) شهر أكتوبر (١٢٥٢ ذبابة مكونة ٦١,٦١%) نوفمبر (١١٢ ذبابة مكونة ٥,٥١%) وفي السنة الثالثة ٢٠٠١م اغسطس (١٠٠ ذبابة مكونة ١٢,٥٨%) سبتمبر (٤٧٢ ذبابة مكونة ٥٩,٢٧%) أكتوبر (١٤٠ ذبابة مكونة ١٧,٦١%) نوفمبر (٣٨ ذبابة مكونة ٤,٧٨٤٣%).

الظروف الجوية السائدة اختلفت معنويا خلال الثلاث اعوام ولكن جاء عامل الحرارة العظمى هو العامل الاوّل في الأهمية خلال الثلاث اعوام يأتي بعده الحرارة الصغرى والرطوبة النسبية حيث ناتى العامل الثانى والثالث فى الأهمية.

خلال الثلاث اعوام ظهر أن لهذه الآفة جيلين متداخلين خلال العام خلال اشهر أغسطس وسبتمبر وأكتوبر ونوفمبر ومدة الجيل حوالى ٤٢ يوما وأن العوامل التى تصاحب هذه الأجيال هي المانجو والجوافة والموالح.