International Journal of Agriculture and Plant Science
www.agriculturejournal.in
Online ISSN: 2664-7664, Print ISSN: 2664-7656
Received: 28-07-2024; Accepted: 27-08-2024; Published: 11-09-2024
Volume 6, Issue 3, 2024, Page No. 53-60

Population density of *Ceratitis capitata* and *Bactrocera zonata* on some fruit varieties in Nobarya, Behera Governorate, Egypt

Afia Y E, Seham M Elmahdy, Saneya R M Farag
Department of Horticultural Insects Research (HIRD), Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt

Abstract
Current study aimed to study the population density of two serious insects infesting many varieties of fruits; The Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wiedemann) and The peach fruit fly (PFF), *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) on three different fruit varieties; mango (*Mangifera indica* L.) Alfonce var., guava (*Psidium guajava* L.) Baladi var. and grapes (*Vitis vinifera* L.) Red grape (Filam var.). Experiments were carried out during two successive seasons 2022-2023 at Nobarya zone (Behera Governorate) using white Jackson traps starting from March month until November month and data represented by catch/trap/daily of males on the successive three varieties of fruits. During both of the two successive seasons the population density of MFF was more than PFF in both of the three successive of fruits. At the first season 2022 *C. capitata* population increased gradually to reach to the highest peak on the 1st of July with mean numbers of CTD (21.1) flies on mango trees, (25.3) flies on guava trees on 23th of September month, and (32.5) flies on grapes trees on 24th of May month. While for the second successive insect *B. zonata* the population increased gradually to reach to the highest peak on the end of June month with mean numbers of CTD (17.3) flies on mango trees, (13.0) flies on guava trees on 28th of October month also, whereas it was (10.8) flies on grapes trees on 15th of May month. As the same trend was achieved at the second successive season 2023 whereas *C. capitata* population increased gradually to reach to the highest peak on 12th of July month with mean numbers of CTD (25.2) flies on mango trees, (30.5) flies on guava trees on the end of September month whereas it was (35.2) flies on grapes trees on the end of May month. Whereas for the second successive insect *B. zonata* population increased gradually to reach to the highest peak on the 26th of June month with mean numbers of CTD (19.5) flies on mango trees, (15.0) flies on guava trees on the 4th of November month also, whereas it was (11.5) flies on grapes trees on 8th of May month.
Statically analysis show that *C. capitata* and *B. zonata* populations were significantly higher on guava orchards than on that on mango and grapes orchards during both of the two successive seasons of investigation. On the other hand *C. capitata* population was significantly higher than *B. zonata* on both of the three crops; mango, guava and grapes during both of the two successive seasons. Also, there were inversely correlations between *B. zonata* and *C. capitata* populations on both of mango, guava and grapes orchards during both of the two successive seasons; however the correlation coefficient values (r) between their populations were negative.
Statically analysis show also at the first successive season 2022 showed also for the first insect *C. capitata* for mango trees there were highly significant effects between CTD flies of *C. capitata* and maximum, minimum temperatures and no significantly for relative humidity percentage. While for guava trees there were no significantly effects for maximum and minimum temperatures and negative high significantly for relative humidity percentage. While for grapes trees that were negative correlation and insignificant for maximum and minimum temperatures and negative significant correlation for relative humidity percentage. Whereas for the other insect *B. zonata* on mango trees there were effects between CTD flies and maximum, minimum temperatures were high significantly while there were effects with relative humidity percentage no significant. While for guava trees there were no significantly effects for maximum and minimum temperatures and high significant for relative humidity percentage. While for grapes trees that were negative and no significant correlation for maximum and minimum temperatures and negative significant correlation for relative humidity percentage. As the same trend was achieved in the second successive season 2023 in both of the two succsseve insects.

Keywords: *Ceratitis capitata*, *Bactrocera zonata*, mango, guava, grapes, seasonal abundance, weather factors

Introduction

Mango (*Mangifera indica* L.), Guava (*Psidium guajava* L.) and Grapes (*Vitis vinifera* L.) are most popular fruits all over the world and there were cultivated on a wide range especially in Mediterranean countries. Reddy *et al.* (2021) indicated to that mango (*M. Indica*) known as the king of fruits has an attractive taste and fragrance and high nutritional value and indicated also to that mango is commercially important in India where 55% of the global crop is produced in India. Raj *et al.* (2010) [12] indicated to that guava (*P. Guajava*) is one of the most important fruit crops of several tropical and sub-tropical countries. Also, John and Venkat (2009) [7] indicated to that grapes are among the most important fruit crops, and they are high in food value and essential minerals and also used in manufactured into jams, jellies and other table delicacies foods, they also indicated to that mango, guava and grapes are important fruits for human uses and also exporting purposes to many countries around world.
The Mediterranean fruit fly, *Ceratitis capitata* (Medfly) (Diptera: Tephritidae) is one of the most serious pests infesting fruit trees all over the world, Demirel (2020) [4] in Turkey who also indicated to that serious pest causes serious damages to fruit trees. Tiring and Satar (2021) [18] indicated

to that *C. capitata* fruit flies belong to family Tephritidae is one of the most serious groups of insects infesting horticulture crops and it distributed as a wide range all over the world.

Also, The peach fruit fly, *Bactrocera zonata* (Saunders) is one of the most dangours pests infesting fruits tree all over the world, White (2000) [19] indicated to that *B. zonata* is one of the important keys of pests which attacks a wide range of fruit trees in Egypt and all over the world such as mango, peach, apple pomegranate, guava and apricot also beside many vegetables crop.

Current study aimed to study population density of both *C. capitata* and *B. zonata* on both of three different fruit varieties, mango, guava and grapes and related with this population fluctuation and weather factors under field conditions in Nobarya zone (Behera Governorate) during both of the two succsseve seasons 2022, 2023. Study was carried out to progress a plan of particular control recommended, population and infestation level was based on the infestation time of that insects during the successive seasons.

Materials and methods

Seasonal fluctuation of both of Mediterranean fruit fly (MFF), *Ceratitis capitata*, and The peach fruit fly (PFF), *Bactrocera zonata* were studied at both of the two successive seasons 2022 and 2023 were recorded on three fruit varieties; Mango (*Mangifera indica* L.), Alfonce var., guava (*Psidium guajava* L.), Baladi var. and grapes *Vitis vinifera* L. Red grapes (Filam var.) and the relationship between the population fluctuation of these insects and the weather factors was recorded for both of the two tested seasons 2022, 2023. Population fluctuation was depended on traps method which catches in both of three different fruit varieties. These trees were cultivated in the same orchard 15 feddan at Nobarya district (5 feddan for each fruit variety), Behera Governorate. These trees of different varieties were nearly at the same age between 15-20 years old for mango and guava and 10-15 years old for grapes. For the *C. capitata* we used fifteen Jackson traps filled with 4 ml mixture of Trimedlure (male sex attractant) 90% and for PFF we used fifteen traps filled with about 4 ml mixture of methyl eugenal (male sex attractant) 90% were distributed randomly in a mango, guava and grapes orchards. Six traps in as replicates were used for each variety form beginning of May to end October for mango, beginning of August to the end of November for guava and beginning of April to end July for grapes (according to fruit stage for every variety). The tested traps were hanged on the shaded side of the planted trees with height about 1.5-2 meters for 18 weeks and supplied with the examined mixture every 4-6 weeks. Tested traps were examined per weekly during both of the two tested seasons 2022-2023; then tested traps were caught and transferred to be captured per trap daily in both of the three examined fruit varieties (each variety have 6 traps; 3 traps for *C. capitata* and 3 traps for *B. zonata*).

Weather factors

Records of main weather factors; maximum and minimum mean temperatures and also mean percentage of relative humidity were obtained locality, Data obtained from Central Laboratory for Agriculture Climate (C.L.A.C.), Ministry of Agriculture to estimate and evaluation the relationship between population fluctuation both of the two successive pests *(C. capitata* and *B. zonata*) and prevailing weather factors. The daily mean records of weather factors were calculated per weekly means presenting and successive weather factors were considered over 18 weeks for each fruit variety (the period contained the ripping stage for each fruit variety).

Statistically analysis

Study contained estimating the related between population fluctuation of *C. capitata* and *B. zonata* and the weather factors during study. Weather factors were recorded; maximum, minimum mean temperatures and mean percentage of relative humidity obtained from Central Laboratory of Agriculture Climate (C.L.A.C.) Giza, Egypt. Mean daily weather factors were recorded and calculated as weekly means presenting. Results obtained both of the total numbers of *C. capitata* and *B. zonata* and mean population percentages were statistically analysed by using (ANOVA) - analysis of variance- in SAS program (SAS Institute, 1988) [16].

Results and discussion

First season 2022

Ceratits capitata

Results obtained and stimulated in Fig. (1), (2) show weekly mean numbers of the first insect *C. capitata* with corresponding means of the temperature degrees and relative humidity percentage. Whereas data obtained show that male of *C. capitata* began to infested mango trees on 3rd of June month with few numbers of CTD was (3.5) flies, while on guava trees the infestation began on the 12st of August month with few numbers of CTD was (1.5) flies, whereas on grapes trees the infestation began on 22th of April month with few numbers of CTD was (3.5) flies. These few numbers of insect coincide with the beginning of the ripping period of fruits and also with the flies emigration from near fruit variety hosts which cultivated in the same area. After that population increased gradually to reach to the first highest peak on the 1st of July with mean numbers of CTD (21.1) flies on mango trees, (25.3) flies on guava trees on 23th of September month, was (32.5) flies on grapes trees on 24th of May month. This increasing due to the suitable weather factors specially mean of temperature (maximum and minimum) which there were (34.7°C and 24.8°C) for mango, (30.8°C and 22.9°C) for guava and (27.5°C and 22.7°C) for grapes respectively, as well as relative humidity of (65.7%) for mango, (61.5%) for guava and (56.7%) for grapes, respectively. These periods were at the same period with fruit full ripping stage of mango, guava and grapes respectively.

Bactrocera zonata

Results obtained and stimulated in Fig. (1), (2) show weekly mean numbers of the second insect *B. zonata* with corresponding means of the temperature degrees and relative humidity percentage. Whereas data obtained show that males of *B. zonata* began to infested mango trees on 13th of May month with few numbers of CTD was (0.1) fly, while on guava trees the infestation began on 26th of August month with few numbers of CTD was (1.3) flies whereas on grapes trees the infestation began on the 8th of April month with few numbers of CTD was (0.3) flies. These few numbers of insect coincide with the beginning of the ripping

period of fruits and also with the flies emigration from near fruit variety hosts which cultivated in the same area. After that population increased gradually to reach to the first highest peak on end of June month with mean numbers of CTD (17.3) flies on mango trees, (13.0) flies on guava trees on 28th of October month also, whereas it was (10.8) flies on grapes trees on 15th of May month. This increasing due to the suitable weather factors specially mean of temperature (maximum and minimum) which there were (35.5°C and 25.3°C) for mango, (31.5°C and 22.7°C) for guava and (27.9°C and 23.5°C) for grapes respectively, as well as relative humidity of (65.9 %) for mango, (62.5%) for guava and (56.9%) for grapes, respectively. These periods were at the same period with fruit full ripping stage of mango, guava and grapes respectively.

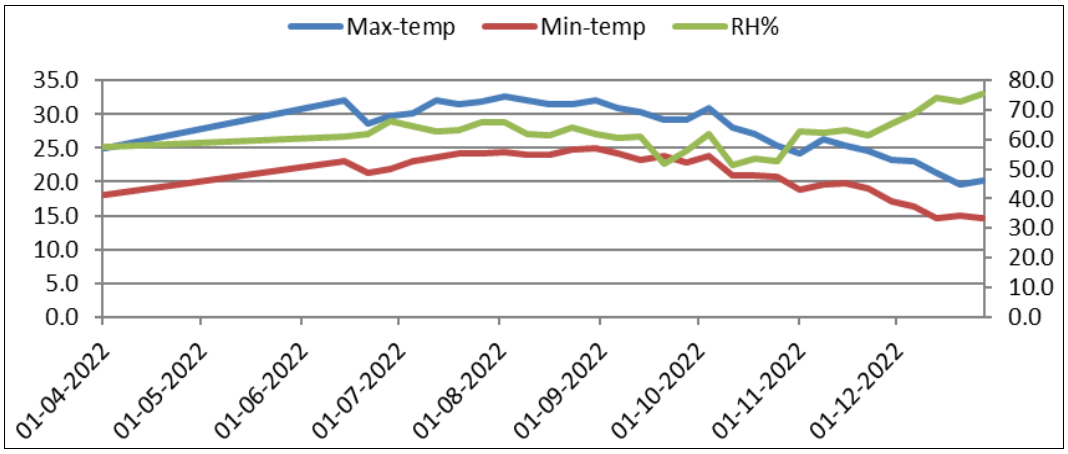
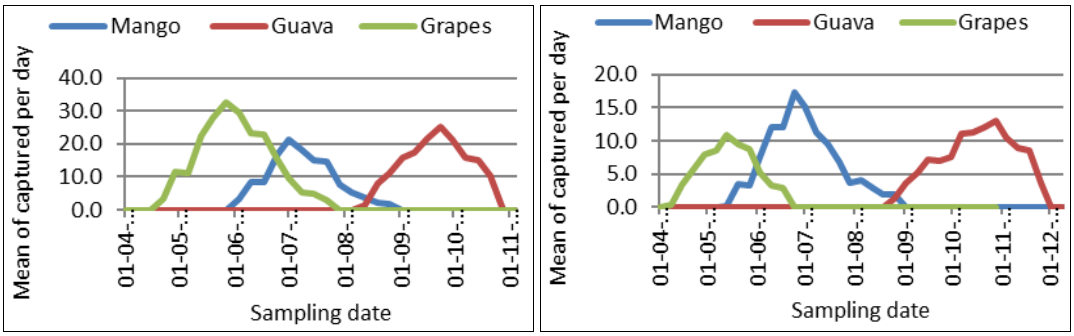


Fig 1: Main weather factors at Nobarya zone, Behera Governorate during season 2022



C. capitata *B. zonata*

Fig 2: Attracted males of the Mediterranean fruit fly (CTD) *C. capitata* and the peach fruit fly (CTD) *B. zonata* on mango, guava and grapes at Nobarya zone, Behera Governorate during season 2022

Second season 2023

Ceratits capitata

Results obtained and stimulated in Fig. (3), (4) show weekly mean numbers of the first insect *C. capitata* with corresponding means of the temperature degrees and relative humidity percentage. Whereas data obtained show that males of *C. capitata* began to infested mango trees on 20th of May month with few numbers of CTD was (1.1) fly, while on guava trees the infestation began on the 5 th of August month with few numbers of CTD was (2.5) flies whereas on grapes trees the infestation began on 8th of April month with few numbers of CTD was (1.8) flies. These few numbers of insect coincide with the beginning of the ripping period of fruits and also with the flies emigration from near fruit variety hosts which cultivated in the same area. After that population increased gradually to reach to the first highest peak on 12th of July month with mean numbers of CTD (25.2) flies on mango trees, (30.5) flies on guava trees on the end of September month whereas it was (35.2) flies on grapes trees on end of May month. This increasing due to the suitable weather factors specially mean of maximum and minimum temperature and ripping stage which maximum and minimum temperature were (32.9°C and 24.8°C) for mango, (31.9°C and 24.9°C) for guava and (27.8°C and 21.9°C) for grapes respectively, whereas relative humidity of (66.9%) for mango, (62.7%) for guava and (54.7%) for grapes, respectively. These periods were as the same times with fruits full ripping stage of mango, guava and grapes, respectively.

Bactrocera zonata

Results obtained and stimulated in Fig. (3), (4) show weekly mean numbers of the second insect *B. zonata* with corresponding means of the temperature degrees and relative humidity percentage. Whereas data obtained show that males of *B. zonata* began to infested mango trees on the 6th of May month with few numbers of CTD was (0.3) fly, while on guava trees the infestation began on the 19 th of August month with few numbers of CTD was (0.5) flies whereas on grapes trees the infestation began on the 1st of April month with few numbers of CTD was (0.5) flies. These few numbers of insect coincide with the beginning of the ripping period of fruits and also with the flies emigration from near fruit variety hosts which cultivated in the same area. After that population increased gradually to reach to the first highest peak on the 26th of June month with mean numbers of CTD (19.5) flies on mango trees, (15.0) flies on guava trees on the 4th of November month also, whereas it

was (11.5) flies on grapes trees on 8th of May month. This increasing due to the suitable weather factors specially mean of maximum and minimum temperature and ripping stage which maximum and minimum temperature were (31.5°C and 23.5°C) for mango, (31.5°C and 24.3°C) for guava and (26.5°C and 21.7°C) for grapes respectively, whereas relative humidity of (65.9%) for mango, (63.7%) for guava and (53.4%) for grapes, respectively. These periods were as the same times with fruits full ripping stage of mango, guava and grapes, respectively.

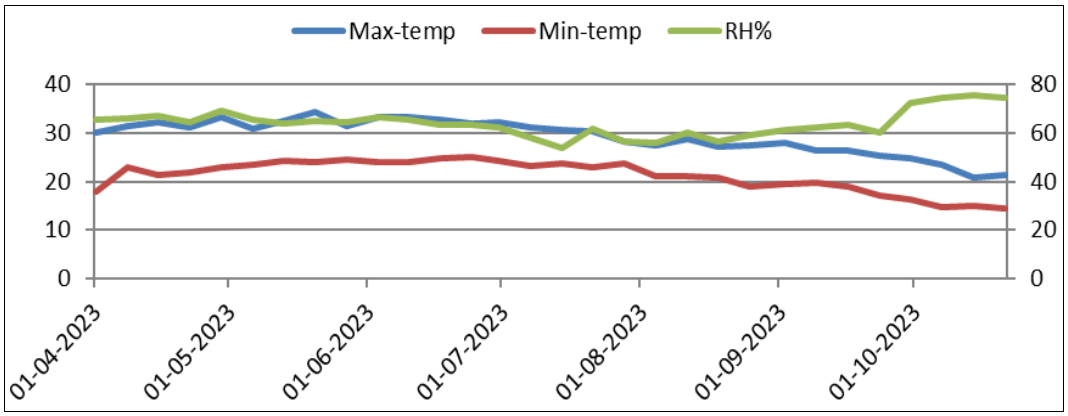
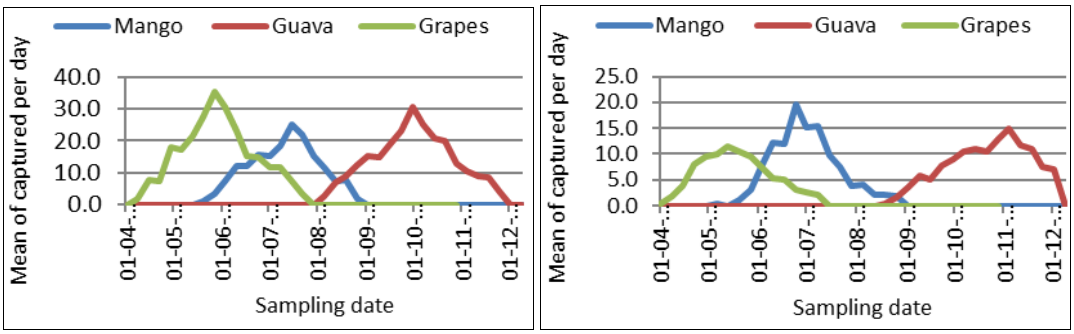


Fig 3: Main weather factors at Nobarya zone, Behera Governorate during season 2023



C. capitata *B. zonata*

Fig 4: Attracted males of the Mediterranean fruit fly (CTD) *C. capitata* and the peach fruit fly (CTD) *B. zonata* on mango, guava and grapes at Nobarya zone, Behera Governorate during season 2023

Effect of weather factors on the population density of *C. capitata*:

Season 2022

Data obtained and tabulated at Table (1) show statistical analysis of effect of the weather factors on the population density of *C. capitata* at Behera Governorate during season 2022 whereas;

In mango the correlation coefficient values between maximum, minimum temperatures, relative humidity percentages and number of CTD were highly significant effects (r =0.733 and r =0.653) for temperature and also no significantly effects (r =0.253) for relative humidity percentage during first season, respectively. The partial regression for the same factors and number of CTD were high significant effects (b =1.085 and b =0.095) for temperature and also, no significant (b =0.309) for relative humidity percentage during first season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (7.25) and the percentage % of the explained variance was (45.7%).

Table 1: Statistical analysis of effect of weather factors on the population density of *C. capitata* at Behera Governorate during season 2022

Varieties	Variables	Simple correlation		Partial regression		$F_{(0.05)}$	P.	EV%
		r	P.	b	P.			
Mango	Max. Temp	0.7335	0.0003	1.0850	0.0003	7.25	0.0006	45.7%
	Min. Temp.	0.6534	0.0004	0.0950	0.0004			
	R.H. %	0.2534	0.2845	0.3093	0.2361			
	Ripping stage	-				12.31	0.0005	57.4%
	Combined effect	-				7.25	0.0003	68.5%
Guava	Max. Temp	0.2152	0.2354	- 0.5467	0.3571	8.43	0.0021	48.5%
	Min. Temp.	0.2857	0.4231	1.1851	0.2243			
	R.H. %	-0.5324	0.0004	- 0.2437	0.0007			
	Ripping stage	-				10.32	0.0003	75.7%
	Combined effect	-				6.52	0.0041	67.5%
Grapes	Max. Temp	-0.1521	0.7452	- 0.1231	0.7268	9.25	0.0006	55.8%
	Min. Temp.	-0.0457	0.357	-0.2357	0.2342			
	R.H. %	-0.5351	0.0034	-0.3681	0.0032			
	Ripping stage	-				12.31	0.0003	65.4%
	Combined effect	-				7.83	0.0005	75.3%

In guava the simple correlation were no significantly effects (r =0.215 and r =0.285) for temperature and negative significantly (r =-0.532) for relative humidity percentage during first season, respectively. The partial regression were no significantly effects (b =-0.546 and b =1.185) for temperature and negative no significant (b = -0.243) for relative humidity percentage during the second season, respectively. The relation between effect of the three weather factors and number of CTD were significant whereas (F) value was (8.43) and the percentage % of the explained variance was (48.5%).

In grapes the simple correlation were negative correlation and not significant (r =-0.152 and r =-0.045) for temperature and also, negative significant correlation (r =-0.535) for relative humidity percentage during second season, respectively. The partial regression were no significant (b = - 0.123 and b = - 0.235) for temperature and highly significant (b = - 0.368) for relative humidity percentage during the first season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (9.25) and the percentage % of the explained variance was (55.8%).

Effect the plant stage, results of statistical during first and second the weather effect weather factors to the ripping stage of fruit revealed EV as (57.4%, 75.7% and 65.4%) at mango, guava and grapes were high significant.

Effect the combine effect, the results analysis revealed the combine effect of three weather factors and the ripping of fruit were responsible. For the two seasons the percentage of explained variance were (68.5, 61.5 and 75.3%) at mango, guava and grapes respectively, these values were high significant.

Season 2023

Data obtained and tabulated at Table (2) show statistical analysis of effect of the weather factors on the population density of *C. capitata* at Behera Governorate during season 2023 whereas;

In mango the correlation coefficient values between maximum, minimum temperatures, relative humidity percentages and number of CTD were highly significant effects (r =0.534 and r =0.645) for temperature and no significantly effects (r =0.246) for relative humidity percentage during first season, respectively. The partial regression for the same factors and number of CTD were significant effects (b =1.043 and b =0.085) for temperature and also, no significant (b =0.474) for relative humidity percentage during second season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (7.25) and the percentage % of the explained variance was (73.8%).

In guava the simple correlation were no significantly effects (r =0.345 and r =0.272) for temperature and negative significantly (r =- 0.343) for relative humidity percentage during second season, respectively. The partial regression were no significantly effects (b =-0.543 and b =1.148) for temperature and negative significant (b = - 0.235) for relative humidity percentage during the second season, respectively. The relation between effect of the three weather factors and number of CTD were significant whereas (F) value was (7.50) and the percentage % of the explained variance was (57.3%).

Table 2: Statistical analysis of effect of weather factors on the population density of *C. capitata* at Behera Governorate during season 2023

Varieties	Variables	Simple correlation		Partial regression		$F_{(0.05)}$	P.	EV%
		r	P.	b	P.			
Mango	Max. Temp	0.5342	0.0003	1.0435	0.0005	8.35	0.0006	61.7%
	Min. Temp.	0.6457	0.0005	0.0851	0.0004			
	R.H. %	0.2465	0.2546	0.4741	0.1435			
	Ripping stage	__				10.43	0.0003	68.9%
	Combined effect	__				7.25	0.0005	73.8%
Guava	Max. Temp	0.3453	0.2325	0.5431	0.3425	7.50	0.0031	57.3%
	Min. Temp.	0.2721	0.3581	1.1483	0.2324			
	R.H. %	-0.3437	0.0006	- 0.2354	0.0007			
	Ripping stage	__				11.75	0.0004	65.7%
	Combined effect	__				6.36	0.0031	68.3%
Grapes	Max. Temp	-0.1431	0.4572	- 0.1321	0.6453	9.25	0.0007	67.9%
	Min. Temp.	-0.0562	0.3321	-0.2317	0.4231			
	R.H. %	-0.5374	0.0045	-0.3451	0.0015			
	Ripping stage	__				13.52	0.0004	75.3%
	Combined effect	__				6.45	0.0003	79.5%

In grapes the simple correlation were negative correlation and not significant (r =-0.143 and r =-0.056) for temperature and also, negative significant correlation (r =-0.537) for relative humidity percentage during second season, respectively. The partial regression were no significant (b = - 0.132 and b = - 0.231) for temperature and significant (b = - 0.345) for relative humidity percentage during the second season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (9.25) and the percentage % of the explained variance was (67.9%).

Effect of weather factors on the population density of *B. zonata* Season 2022

Data obtained and tabulated at Table (3) show statistical analysis of effect of the weather factors on the population density of *B. zonata* at Behera Governorate during season 2022 whereas;

In mango the correlation coefficient values between maximum, minimum temperatures, relative humidity percentages and number of CTD were highly significant effects (r =0.651 and r =0.564) for temperature and also no significantly effects (r =0.231) for relative humidity

percentage during first season, respectively. The partial regression for the same factors and number of CTD were high significant effects (b =1.046 and b =0.071) for temperature and also, no significant (b =0.307) for relative humidity percentage during first season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (6.45) and the percentage % of the explained variance was (47.9%).

In guava the simple correlation were no significantly effects (r =0.231 and r =0.281) for temperature and negative significantly (r =- 0.521) for relative humidity percentage during first season, respectively. The partial regression were significantly effects (b = -0.612 and b =1.153) for temperature and negative no significant (b = -0.232) for relative humidity percentage during the first season, respectively. The relation between effect of the three weather factors and number of CTD were significant whereas (F) value was (9.23) and the percentage % of the explained variance was (45.9%).

In grapes the simple correlation were negative correlation and not significant (r =-0.131 and r =-0.056) for temperature and also, negative significant correlation (r =-0.431) for relative humidity percentage during first season, respectively. The partial regression were no significant (b = - 0.135 and b = - 0.264) for temperature and significant (b = - 0.351) for relative humidity percentage during the first season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (10.21) and the percentage % of the explained variance was (63.9%).

Season 2023

Data obtained and tabulated at Table (4) show statistical analysis of effect of the weather factors on the population density of *B. zonata* at Behera Governorate during season 2022 whereas;

Table 3: Statistical analysis of effect of weather factors on the population density of *B. zonata* at Behera Governorate during season 2022

Varieties	Variables	Simple correlation		Partial regression		$F_{(0.05)}$	P.	EV%
		r	P.	b	P.			
Mango	Max. Temp	0.6512	0.0004	1.0461	0.0004	6.45	0.0005	47.9%
	Min. Temp.	0.5643	0.0005	0.0713	0.0005			
	R.H. %	0.2317	0.2321	0.3071	0.2214			
	Ripping stage	__				11.25	0.0006	59.4%
	Combined effect	__				7.13	0.0004	67.3%
Guava	Max. Temp	0.2311	0.2156	- 0.6121	0.4521	9.23	0.0013	45.9%
	Min. Temp.	0.2815	0.5213	1.1534	0.3672			
	R.H. %	-0.5214	0.0015	-0.2327	0.0015			
	Ripping stage	__				12.42	0.0005	67.2%
	Combined effect	__				6.11	0.0034	69.3%
Grapes	Max. Temp	- 0.1311	0.6521	- 0.1358	0.6321	10.21	0.0007	63.9%
	Min. Temp.	- 0.0562	0.4562	- 0.2641	0.3211			
	R.H. %	- 0.4317	0.0021	- 0.3512	0.0041			
	Ripping stage	__				13.42	0.0004	71.8%
	Combined effect	__				6.45	0.0006	72.5%

Table 4: Statistical analysis of effect of weather factors on the population density of *B. zonata* at Behera Governorate during season 2023

Varieties	Variables	Simple correlation		Partial regression		$F_{(0.05)}$	P.	EV%
		r	P.	b	P.			
Mango	Max. Temp	0.6321	0.0004	1.0762	0.0006	9.15	0.0007	63.1%
	Min. Temp.	0.7211	0.0006	0.0813	0.0005			
	R.H. %	0.2397	0.2121	0.4071	0.1143			
	Ripping stage	__				12.23	0.0012	67.5%
	Combined effect	__				7.15	0.0016	68.3%
Guava	Max. Temp	0.2321	0.3571	- 0.5431	0.4327	9.11	0.0004	59.7%
	Min. Temp.	0.2762	0.4289	1.1892	0.3421			
	R.H. %	- 0.4389	0.0015	- 0.3251	0.0016			
	Ripping stage	__				10.25	0.0015	67.2%
	Combined effect	__				7.42	0.0046	69.7%
Grapes	Max. Temp	- 0.2321	0.5421	- 0.1342	0.5782	7.54	0.0006	65.9%
	Min. Temp.	-0.0356	0.4332	- 0.2521	0.6541			
	R.H. %	-0.4372	0.0015	- 0.3347	0.0033			
	Ripping stage	__				11.32	0.0015	70.8%
	Combined effect	__				6.93	0.0024	72.5%

In mango the correlation coefficient values between maximum, minimum temperatures, relative humidity percentages and number of CTD were highly significant effects (r =0.632 and r =0.721) for temperature and also no significantly effects (r =0.239) for relative humidity percentage during second season, respectively. The partial regression for the same factors and number of CTD were high significant effects (b =1.076 and b =0.081) for temperature and also, no significant (b =0.407) for relative humidity percentage during second season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (9.15) and the percentage % of the explained variance was (63.1%).

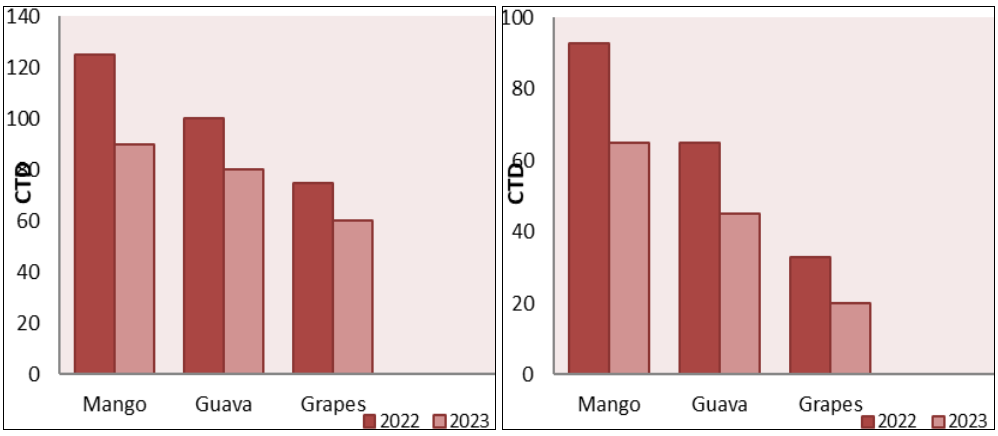
In guava the simple correlation were no significantly effects (r =0.232 and r =0.276) for temperature and negative significantly (r =-0.438) for relative humidity percentage during second season, respectively. The partial regression were no significantly effects (b =-0.543 and b =1.189) for temperature and negative significant (b = -0.325) for relative

humidity percentage during the second season, respectively. The relation between effect of the three weather factors and number of CTD were significant whereas (F) value was (9.11) and the percentage % of the explained variance was (59.7%).

In grapes the simple correlation were negative correlation and not significant (r = -0.232 and r =-0.035) for temperature and also, negative significant correlation (r = -0.437) for relative humidity percentage during second season, respectively. The partial regression were no significant (b = - 0.134 and b = - 0.252) for temperature and significant (b = -0.334) for relative humidity percentage during the first season, respectively. The relation between effect of the three weather factors and number of CTD were highly significant differences whereas "F value" was (7.54) and the percentage % of the explained variance was (65.9%).

Results obtained and illustrated in Fig. (5) show comparison between the population number of both of the two successive insects; *C. capitata* and *B. zonata* on the successive three different fruits; mango, guava and grapes (by total numbers of males / season captured by Jackson traps) whereas there were baited at Nobarya zone, Behera Governorate during the two successive seasons 2022, 2023. Whereas for the first successive insect *C. capitata* the population number of that insect in mango in both of the two successive seasons was higher than guava and grapes whereas there were (125.3&93.2) for mango; (100.5&83.7) for guava and (75.4&60.3) for grapes in the two seasons respectively. And also for the second successive insect *B. zonat*a data obtained and illustrated in Fig. (5) show that population number of that insect in mango in both of the two successive seasons was higher than guava and grapes whereas there were (93.7& 65.8) for mango; (65.8&46.7) for guava and (35.5&20.4) for grapes in two seasons respectively.

Obtained results were agreement with those obtained by Tiring and Satar (2021) [18] who indicated to the highest population of *C. capitata* were recorded during period of June to July and also that population fluctuation of *C. capitata* was related with presence of ripe fruit. Khan and Khan (1987) [9] in Pakistan referred also to that *C. capitata* infestation occurred and increased from period March to August especially during period from the July to August. Also Amira *et al.* (2018) [3] in Egypt indicated to that the highest peak of the fruit fly populations were recorded during the period from 4th week of October to the 3rd week of November. Also Mohammed (2003) in Egypt indicated to that *C. capitata* was active all over the year except the period of the cold weather and was affected by weather factor changes. Manrakhan and Price (2000) [10] in India indicated to that fruit availability and temperature degrees had significant effects on *C. capitata* population on mango crops. Also, Khalid and Mishkatullah (2007) [8] in Pakistan indicated to that *C. capitata* infested fruits with low population numbers level from November month to February month then increased from March to August and the population had one peak in July and August months. Also, Rana *et al.* (1992) [13] indicated to that the activity of *C. capitata* males in India was in a high peak between the period from July to August month which coincided with the maturity of guava fruits. Whereas Afia (2007) [1] indicated to that the weather factors were not the main driver for the population dynamics of Mediterranean fruit flies in different corps. Ghanim (2009) indicated to that the peach fruit fly, *Bacterocera zonata* (Saunders) infested many fruit trees and affected on their productivity whereas it causes serious damages to these fruit trees. Agarwal and Kumar (1999) [2] studied effect of weather parameters on population dynamics of peach fruit fly, *Bacterocera zonata* (Saunders) and indicated to that serious insect were conducted during April- August in northern Bihar, India and maximum fly populations were observed during the third week of June (357.0 flies/trap) whereas the lowest numbers were observed during the last week of August (14.3 flies/trap), and fly populations showed a positive correlation with maximum and minimum temperatures, rainfall and a negative correlation with relative humidity. Rashid and Muhammed (2017) [14] in Pakistan studied the occurrence and seasonal abundance of fruit fly, *Bacterocera zonata* Saunders in relation to meteorological factors and indicated to that fruit fly which belonging to the genus Bactrocera are among the major pests of fruits worldwide and this serious pest of fruit causing severe losses to the fruit production and quality. Also, Seham *et al.* (2023) [17] studied population fluctuation of Meditettanean fruit fly, *Ceratitis capitata* on three fruits varieties; mango, pomegranate and navel-orange and indicated to that insect had two peaks on mango; on mid-July and on the third week of August, and also it had two peaks on pomegranate; on the third week of August and the other peak on the end of September month while it had only one peak on navel-orange on the third week of October month. Jena *et al.* (2023) [6] studied population dynamics of *Bactrocera zonata* on mango trees, *Mangifera indica* and indicated to that insect had one peak on mango trees on the second half of June month.



C. capitata *B. zonata*

Fig 5: Total number of male captured of *C. capitata* and *B. zonat*a in three different fruit varieties during the two successive seasons at Nobarya, Behera Governorate

References

1. Afia Y. Comparative studies on the biology and ecology of the two fruit flies, in Egypt, *Bacterocera zonata* (Saunders) and *Ceratitis capitata* (Wiedemann). Ph.D. Thesis, Fac. Agric. Cairo. Univ. Egypt, 2007.
2. Agarwal M, Kumar P. Effect of weather parameters on population dynamics of peach fruit fly, *Bacterocera zonata* (Saunders). Entomon,1999:24(1):81-84.
3. Amira A Negm, Nashat A Ali, Ali A Amin. Seasonal Occurrence of Fruit Flies and Their Infestation Rates on Pomegranate. Fruits at Assuit and Fayoum Governorates. Egypt. Acad. J. Biolog. Sci.,2018:11(2):41–54.
4. Demirel N. Population fluctuation and infestation rates of Ceratitis capitata (Wiedemann) (Diptera: Tephritidae) on different pomegranate varieties in Hatay (Turkey). Turkish Journal of Agriculture - Food Science and Technology,2020:8(10):2144-2147
5. Ghanem N. Studies on the peach fruit fly, *Bacterocera zonata* (Saunders) (Tephritidae, Diptera). Unpublished Ph. D. Thesis, Fac. Agric., Mansoura Univ, 2009.
6. Jena M, Patel S, Mohapatra B. Population dynamics of *Bactrocera zonata* (Saunders) (Diptera: Tephretidae) on *Mangifera indica* (L.) and correlation with weather parameters. International Journal of Environment and Climate Chang,2023:12(12):708-714
7. John M, Venkat P. Unravelling the relationship between grapes and health. The journal of nutrition,2009:139(9):1783-1787
8. Khalid M, Mishkatullah S. Population dynamics of three species of genus *Bacterocera* (Diptera: Tephritidae: Dacinae) in BARI, Chakwal. Punjab Pakistan Journal of Zoology,2007:39(2):123-126.
9. Khan R, Khan M. A comparative morphological study on third instar larvae of some *Dacus* species (Tephritidae: Diptera) in Pakistan. Pakistan J. of Scientific and Industrial Research,1987:30:534-538.
10. Manrakhan A, Price N. Mango production and fruit fly populations and damage in backyards in Mauritius. Proceedings of the Indian Ocean Commission Regional Fruit Fly Symposium, 2000, 35-39.
11. Mohamed A. Effect of constant temperatures on the development of the Mediterranean fruit fly, *C. capitata* (Diptera: Tephritidae). Assiut J. Agric. Sci,2003:31(2):329-339.
12. Raj M, Asthana P, Jaiswal U. Biotechnological advances in guava (*Psidium guajava* L.): recent developments and prospects for further research. Trees,2010:24:1-12.
13. Rana J, Parkash O, Verma S. Biology of guava fruit fly infesting guava in Haryana and influence of temperature and relative humidity on its incidence variety. Research Hisar,1992:5(3):525-529.
14. Rashid A, Muhammed N. Occurrence and seasonal abundance of fruit fly, *Bactrocera zonata* Saunders (Diptera: Tephritidae) in relation to meteorological factors. Pakistan Journal of Zoology,2017:49(3):345-351.
15. Reddy V, Young J, Korivi M. Nutritional composition and bioactive compounds in three different parts of mango fruit. International Journal of Environmental Research and Public Health,2021:18(2):741-749.
16. SAS Institute. SAS User`s Guide, Ver. 6.03. SAS Institute Inc., Cary, North Carolina, 1988.
17. Seham M, Afia Y, Mahenaz A. Population fluctuation of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) infesting three fruit varieties in Alexandria governorate, Egypt. Journal of Plant Protection and Pathology, Mansoura University,2023:14(12):399-404
18. Tiring G, Satar S. Annual population fluctuations of Mediterranean fruit fly in the eastern Mediterranean region of Turkey; problem of non-marketing fruit. Phytoparasitica,2021:49(5):807-817.
19. White I. Identification of peach fruit fly, *Bacterocera zonata* (Saunders), in the eastern Mediterranean. The Natural History Museum London, UK, 2000, 1-21.