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# Population Fluctuation of the Peach Fruit Fly, *Bactrocera zonata* (Saunders) and the Mediterranean Fruit Fly *Ceratitis capitata* (Wiedemann) (Diptera, Tephritidae) on three Grape Varieties in Nubaria , Egypt.

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## ABSTRACT

The population fluctuation of the peach fruit fly (PFF), *Bactrocera zonata* and the Mediterranean fruit fly (MFF), *Ceratitis capitata* on different grape varieties (White grape variety (Sbaror), Red grape variety (Filam) and Black grape variety (Autumn royal) were studied throughout three successive seasons 2014-2016, starting from March to September and represented by catch/trap/ daily of males on three different varieties at Nubaria district. Results revealed that the population density was the most abundant during the third season in the Sbaror, Filam and autumn royal varieties. During the three seasons, the population density of MFF was more than of PFF in all varieties. *Each of B. zonata* and *C. capitata* have one peak on Sbaror and Filam and Autumn royal varieties through period from May to July. Seasonal activity of fruit flies represented by total monthly catch of males on three varieties of grape during three successive seasons recorded the highest peak of seasonal abundance on May during the third season with total monthly catch 1050.8 males/month representing 59.2% , while the total monthly catch of males during the two seasons were more in June were 160.46 and367.3 males/month representing 42.64 and 55% from total population, respectively. Results obtained of seasonal fluctuation of *B. zonata* and *C.capitata* on three varieties grapes represented by total numbers and percentages between varieties were more on Sbaror and Filam than autumn royal where the total population for variety through three seasons 2050.38, 547.84 and 214.79 males, were recorded, respectively. The results showed that the percentage of *C. capitata* was high in the third season than second and first seasons, on the other hand the percentage of *B. zonata* was more in the first season than second and third season in all varieties. The highest total numbers of males on' Sbaror variety was 1335.9, 467.8 and 249.67 males /seasons representing 98.73, 87.96 and 79.80% for C.C and 1.27,12.04 and 20.20% for *B. zonata* of total captured males, during the third, second and first seasons, respectively, while the lowest total number on Autumn royal variety was (96.4,69.4 &48.99 males/season) representing (92.12,75.65& 68.09%) and (7.88, 24.35&31.91 %) for *C.C and B.Z* during third, second and first seasons, respectively. Statistical analysis of variance in 2014 -2016 season showed that combined effect of the weather factors to CTD revealed EV were positively significant, in Sbaror variety, the simple correlation between maximum and minimum temperatures and CTD number were high significant and significant and the percentage of explained variance (E.V %) were high significant and significant were 46.02 and 26.78% for during first year and second year for *B. zonata*. While the simple correlation between and relative humanity and CTD were positive significant for *C. capitata* during the third years. During 2015, the simple correlation between maximum temperatures and CTD number in Filam variety was significant during second year and the percentage of explained variance (E.V.%) were significant its 26.77 and 28.14% for *B. zonata* and *C. capitata*, respectively. In Autumn royal variety, the simple correlation between maximum and minimum temperatures and CTD number were significant and high significant during first season and the percentage of explained variance (E.V.%) were 26.75% for *B. zonata*, respectively.

## INTRODUCTION

Grapevine (*Vitis vinifera* L., Vitaceae ) is a very important crop in the Mediterranean region. More than 40% of the world grapevine production is produced in Mediterranean countries with Italy, France and Spain being the main producers (Roditakis *et al.* (2008). Grape, *Vitis* spp. is one of the oldest types of fruit known to be cultivated in Egypt. The production of grapes in Egypt was a major affair of the Roman state. The grapes are the desired and gracious fruit of different layers. Most of crop is consumed fresh. A portion of the seedless varieties is used for drying and raisin processing, while some are directed to manufacture fresh and fermented juice. Grapes and its products have export potential. The nutritional value of its fruits is due to its easy-to-absorb glucose content as well as its biochemical components of processed minerals. The area cultivated by grapes is about 20% of the total cultivated area. The total area of grapes in Egypt reached 192873 thousand feddans according to the 2013 census and the productive area of which is 164310 thousand feddans producing 8.73 million tons with an average of (1435) tons per feddan. These areas are mainly concentrated in the governorates of Ghrapya, Mania, Nubaria, Manofaya, and there are areas in the newly reclaimed lands in, Matrouh and North Sinai. Family Tephritidae, the true fruit flies, includes about 4000 species arranged in 500 genera. As such, it is the largest families of Diptera and one of the most economically important. Including many commercial fruits. Female flies lay their eggs in the fruits and hatching maggots devour into pulp. Subsequently, secondary infestation with bacterial and fungus diseases frequent and infested fruits drop down (White &Elson–Harries, 1994 and Abdel-Sabour, 2003). Fruit fly is one of the key pests in the production of table grapes in the Western Cape. Two species of fruit fly are involved, viz. Mediterranean fruit fly [*Ceratitis capitate* (Wied).] and Natal fruit fly [*Ceratitis rosa* (Karsch)]. Different species of Family Tephritidae have been accidentally introduced into Egypt. The Mediterranean fruit fly or Medfly, *Ceratitis capitata* (Wiedemann), is one of the most tephritids that infesting more than 350 host plants throughout the world (Liquido *et al*., 1991). while (Swart *et al*.,1976; Autter.1977; Castro 1982;; Elhanan &Roessler,1992; Dhouibi&Fellah 1997; Buonocore *et al*.,1999) fond that Mediterranean fruit fly has been reported as a pest or potential pest of grapevines in South Africa, Brazil, Chile , Venezula , California , Isreal , Tunisina and Italy and various control strategies have been suggested In Egypt , *C. capitata* attacks several host fruits which are available all over the year causing considerable damage which inflicts significantly economic losses to guava, peach, apricot, apple,fig and citrus allover the governorates of in Egypt (Saafan, 1986). During 1990 of the last century, a new fruit pest is the peach fruit fly, *Bactrocera zonata* (Saunder) (Diptera: Tephritidae) attack wide range of fruit species in Egypt, including mango, guava, peach, apricot, apple, citrus as well as some vegetable crops (El-Minshawy *et al.,* 1999 and Hashem *et*

*al.* 2001). This species has become widely spread in the country as well as *C. capitata*. This new pest attracted the attentions of many authors in Egypt, *i.e.* Afia (2007) and Amin (2008).

The aim of this work is to study population density of *Ceratitis capitata and Bactorcera zonata* on three different grape varieties under field conditions in Nubaria district.

## MATERIALS AND METHODS

Seasonal abundance of the peach fruit fly *B. zonata* and Med fruit fly *C. capitata*, as well as relationship between the population activity and the prevailing climatic factors in addition to total monthly were studied for three successive seasons (2014, 2015 and 2016). Abundance was based on trap catches in three grape varieties cultivated in the same orchards' 10 feddans for each Sbaror ,Filam and Autumn royal varieties at Nubaria district. The trees of those different varieties were about 10-15 years old. Jackson traps as thirty units 15 traps baited with 4 ml mixture of methyl eugenol (male sex attractant) 90% + sumithion 50% (Fenitrothion insectiside) at a ratio of 8:2 for monitoring of PFF and 15 traps baited with 4 ml of Trimedlure (male sex attractant) 90%+ dichlorophose 10% (DDVP) (as insecticide) 10% for monitoring of MFF were distributed randomly in a grape orchards cultivated with three different varieties. Five trap as replicates were used for each variety for 18 weeks, Sbaror variety on the first week of April till last week of July, Filam variety on the last week of March till third week of July and Autumn royal variety on the first week of May till first week of September. Traps were hung at a shaded side of the tree at about 1.5-2 meters height and injected with the above mixture every 4-6 weeks during summer seasons. Traps were inspected weekly and trap catches were transferred to be captured per trap per day (CTD) in the different grape varieties from last March to first September.

**Statistical analysis:**

To estimate relationship between population of *C. capitata* and *B. zonata* and prevailing climatic factors, day-maximum temperature (D. Max. T.), day minimum temperature (D. Min. T.) and daily mean relative humidity (D.M. R.H.) were obtained from the Central Laboratory for Agriculture Meteorology, Agriculture Research Center. The daily records of each weather factor were calculated as weekly means representing to sampling date. Weather factors were considered over 18 weeks for each crop (*i.e*, Sbaror , Filam and Autumn royal ) which included the ripping stage for each crop. This was included in the multiple regression analysis. The results obtained of the mean numbers of Peach fruit fly and Med fruit fly were statistically analysed by using ANOVA. Mean separation was conducted using L.S.D. in SAS program (SAS Institute, 1988).

## RESULTS AND DISCUSSION

The seasonal abundance of both fruit fly species was studied for three successive seasons (2014, 2015 and 2016 ) starting from last March to first September on three different varieties of grapes Sbaror, Filam and Autumn royal in Nubaria distrit.

**First season 2014:**

Results illustrated in Fig. (1) showed that the population density of PFF was lower than that of MFF in Sbaror, Filam and Autumn royal varieties. It started in low numbers on Sbaror variety (2.1 and 1.2 catch / trap/daily for the *C. capitata* and *B. zonata*, respectively) that recorded at the 15$^{nd}$April and1$^{st}$ April. These low numbers were coinciding with the beginning of the ripping period and emigration of flies previous host such as Valencia orange which was harvested earlier. The population of both species increased gradually to maked one peak on the 17$^{th}$ of June and 8$^{th}$ of July with mean numbers of CTD of 34.61 and7.92 flies for *C. capitata* and *B. zonata*. the increment may be due to the favourable weather conditions specially means of maximum, minimum temperature which were (31.98 and 19.85°C) and (30.25 and 20.99°C), respectively, as well as relative humidity of 75.71 and 71.92%. This period coinciding with the fruit full ripping stage of Sbaror variety. The population density of flies was gradually decreased with the end of Sbaror harvest.

Results obtained in Figure (1) revealed that the seasonal fluctuation of *C. capitata* and *B. zonata* followed the same trend on Filam variety, the population density began with few numbers. Afterwards, population density gradually increased to record only one peak of seasonal abundance on the 27$^{th}$ of May and 17$^{th}$ of June, which represented by CTD of 10.23 and 4.37 flies for *C. capitata* and *B. zonata* where the maximum and minimum temperature means were (29.68°C and 16.89°C) and (31.98 and 19.87°C), respectively, and relative humidity was 70.57 and 75.71%. This period was coinciding with improvement of weather factors as well as full ripping stage of Filam. The population began to decrease gradually till late June with the end of Filam variety harvesting.

In Autumn royal variety (Fig., 1) the population density began to appear with relatively low numbers of CTD values of 0.142 and 0.243 flies for *C. capitata* and *B. zonata* on the 6$^{th}$ of May and10$^{th}$ of June. Then the population for the two species increased gradually forming one peak on the 15$^{th}$ and 27$^{th}$ of June with CTD values of 7.83 and 4.4 flies at maximum and minimum temperature of 33.18, 32.36 and 20.97, 22.33°C and relative humidity of 74.45 and 72.62%, respectively. This period was coinciding with improvement of weather conditions as well as full ripping stage of autumn royal variety. Then the population density gradually decreased with end of autumn royal variety harvesting.

**Second season (2015):**

Data illustrated in Fig. (2) revealed that the population of *C. capitata* and *B. zonata* were more active than that of the first season indicating that the population density of PFF was lower than that recorded for MFF in Sbaror than Filam and Autumn royal varieties. The high population density of flies were

Sbaror variety, it started with relativity low CTD of 1.8 and 0.402 flies for *C. capitata* and *B. zonata* on the 7th of April, 2015. These low numbers in this locality were coinciding with lowest persistence of MFF and PFF population resulting from immigrated flies from intercropped hosts. Then the mean population density of both *C. capitata* and *B. zonata* increased gradually throughout successive inspections and recorded only one peak of seasonal abundance, represented by CTD of 78.8 and 9.8 flies on the 9th and 23th of June, successively. This increase may be due to the improvement of weather conditions, especially the maximum and minimum temperature which recorded 34.87, 32.63°C and 20.3, 22.7°C, respectively, and the relative humidity of 74.57 and 78%, as well as Sbaror variety fruits became in full ripping stage. Data in Fig. (2) showed that the lowest population fluctuations of both fruit flies on Autumn royal variety and the population density was nearly different than that observed in 2014 season , that began with CTD values of 0.23 and 0.5 on the 5st of May and 23th of June, then a gradual increase was observed during July making one peak for each species on the 7st and 14nd July with CTD values of 10.8 and 3.8 flies for *C. capitata* and *B. zonata* at maximum and minimum temperature of 33.46, 30.71 and 22, 22.6°C and relative humidity of 74.71 and 79.29%, respectively. Then the population gradually decreased with end of Autumn royal variety harvesting.

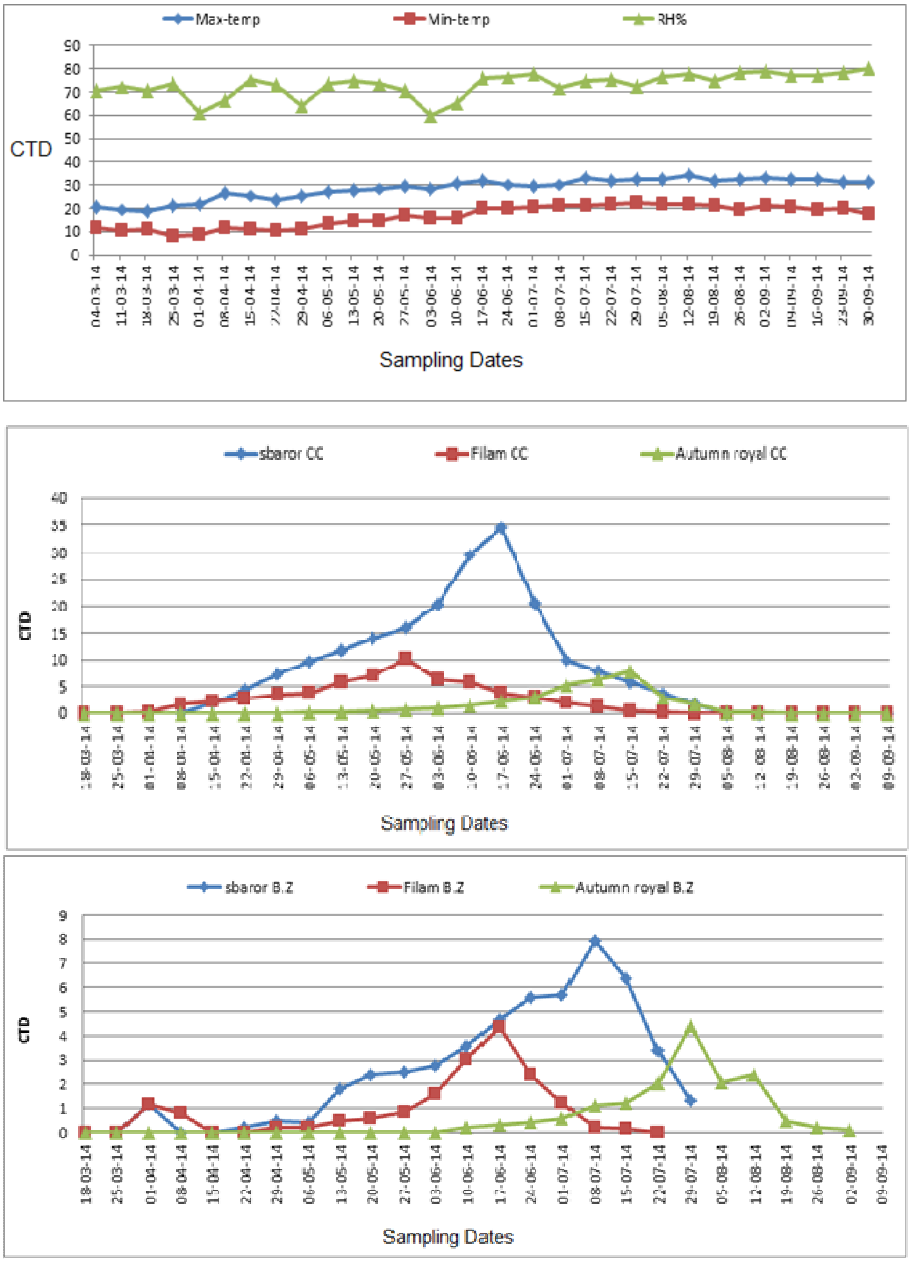


**Fig. 1. CTD of attracted males of *C. Capitata and B. Zonata* on different grape varieties with corresponding means of main weather factors in Nubaria district during 2014 season.**

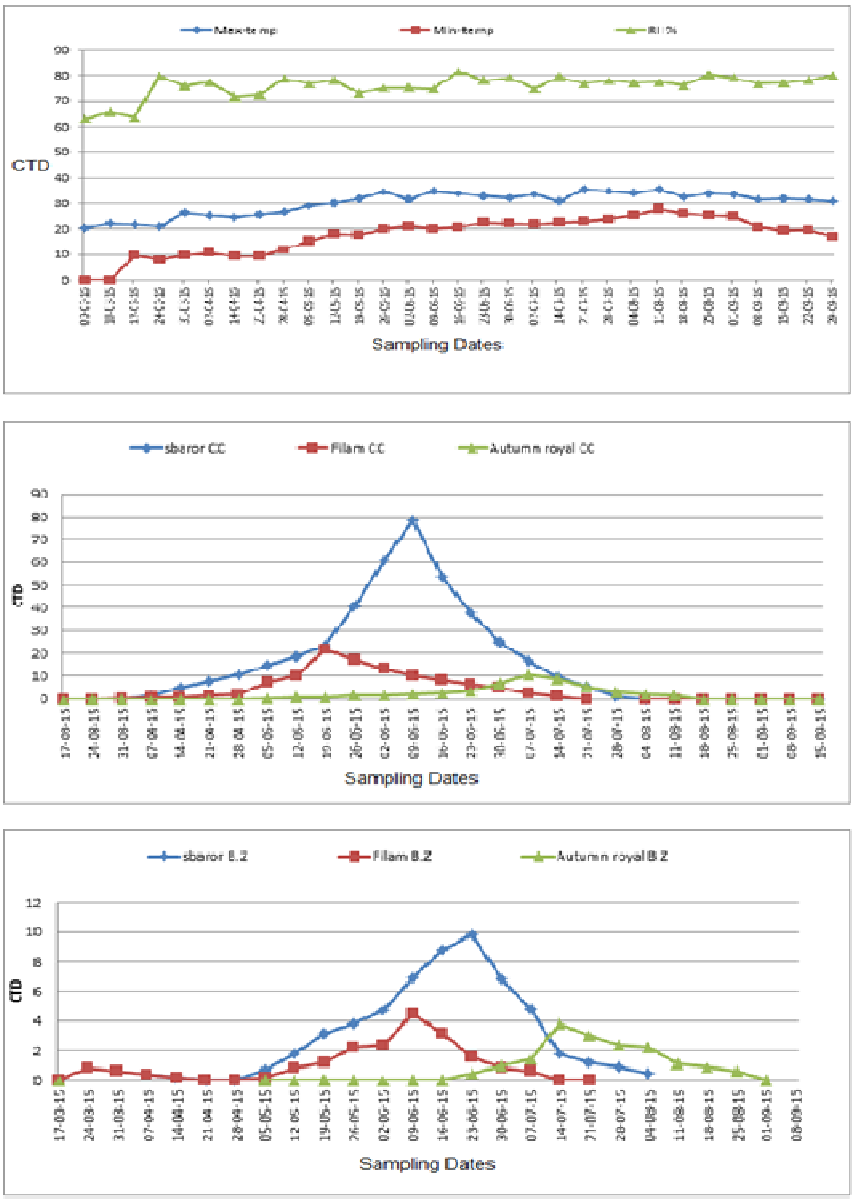


**Fig. 2. CTD of attracted males of *C. Capitata and B. Zonata* on different grape varieties with corresponding means of main weather factors in Nubaria district, during 2015 season.**

**Third season (2016):**

Results illustrated in Fig. (3) indicate that the most active population of *C. capitata* and *B. zonata* was in the third season showing that the population density of MFF was more than that of PFF in the three grape varieties. Concerning the population fluctuation of both flies on Sbaror variety trees, it started with a few numbers of 9.8 and 0.2 flies for *C. capitata* and *B. zonata* on the 5st of April followed by a marked increasing to reach CTD values of 257.55 and 3.2 flies on the 31th of May and 14th of June for *C. capitata* and *B. zonata* where maximum and minimum were 33.29, 31 and 19.9, 24.4°C and relative humidity of 52.6 and 69.35%, respectively. This period was coinciding with improvement of weather factors as well as the full ripping stage of fruits. Then the population density decreased gradually with end of Sbaror variety harvesting. On the other hand, in Filam variety, the first incidence occurred on 23 th of March with relatively low values of flies which probably due to emigration flies from early intercropped hosts such as another fruits. Then, the population gradually increased to make one peak that recorded on the17&24th of May with CTD of 72.8 and 3.8 flies for *C. capitata* and *B. zonata* at maximum and minimum temperature of 33.29& 34.57 and 23.7& 20°C, respectively, as well relative humidity of 67.4 and 53.35%. After that the population decreased until end harvesting.

Results in Fig. (3) Showed that the population density of MFF and PFF appeared with relatively few numbers on autumn royal trees, represented by 0.6 and 0.264 flies for *C. capitata* and *B. zonata* on the 10*th* of May & 21th of June. The population density increased gradually throughout the successive weeks to record one peak of seasonal abundance represented by CTD of 18.6 and 2.4 flies for *C. capitata* and *B. zonata* on the 28th of June and 5st of July at maximum and minimum temperature of 34.29, 31.86 and 24.3 and 24.6°C and relative humidity of 62.2 and 70.7%, respectively, as well as the full ripping stage of fruits. Then the population density gradually decreased

with end of autumn royal variety harvesting.

These data agree with those obtained by Gupta *et al.* (1990) found that traps captured males of *B. zonata* from the 2nd week of April until the 2nd week of November in India, Adult fly populations recorded one peak during fruit maturation in June. Also

Agarwal and Kumar (1999) stated that the average number flies traped was 39.94 and 134.92 flies/trap / week, for *B. dorsalis* and *B. zonata* between, respectively, April and August 1997 in India. Ishtiaq *et al*., (1999) in India observed a peak population of *B. zonata* for winter crop in September, while, it was negligibly in December. Khan *et al.* (2002) reported the maximum numbers of adult catches of *B. zonata* in July and August in mango orchards in Multan, Pakistan. The maximum infestation was recorded on 15 September and 1 October. Mohamed (2002) studied the seasonal fluctuation of *B. zonata* in Sohag governorate and stated that the capture concentrated on August, September and October, while in rest of the year the files disappeared or captured in few numbers. Khan *et al.* (2003) stated that the second fortnight of August and first fortnight of September showed maximum population of *B. zonata* trapped by pheromones in guava orchards. Kawashita *et al.* (2004) reported that *B. zonata* were attracted by methyl eugenol from April to July in Srilanka. In addition, Khalid and Mishkatullah (2007), in Pakistan, monitored *B. zonata* infecsted the fruits with low population level from November to February then increased from March to August. The population recorded one peak in July and August, while minimum level decline was observed in October depending on the host fruit maturity and prevailing temperature.

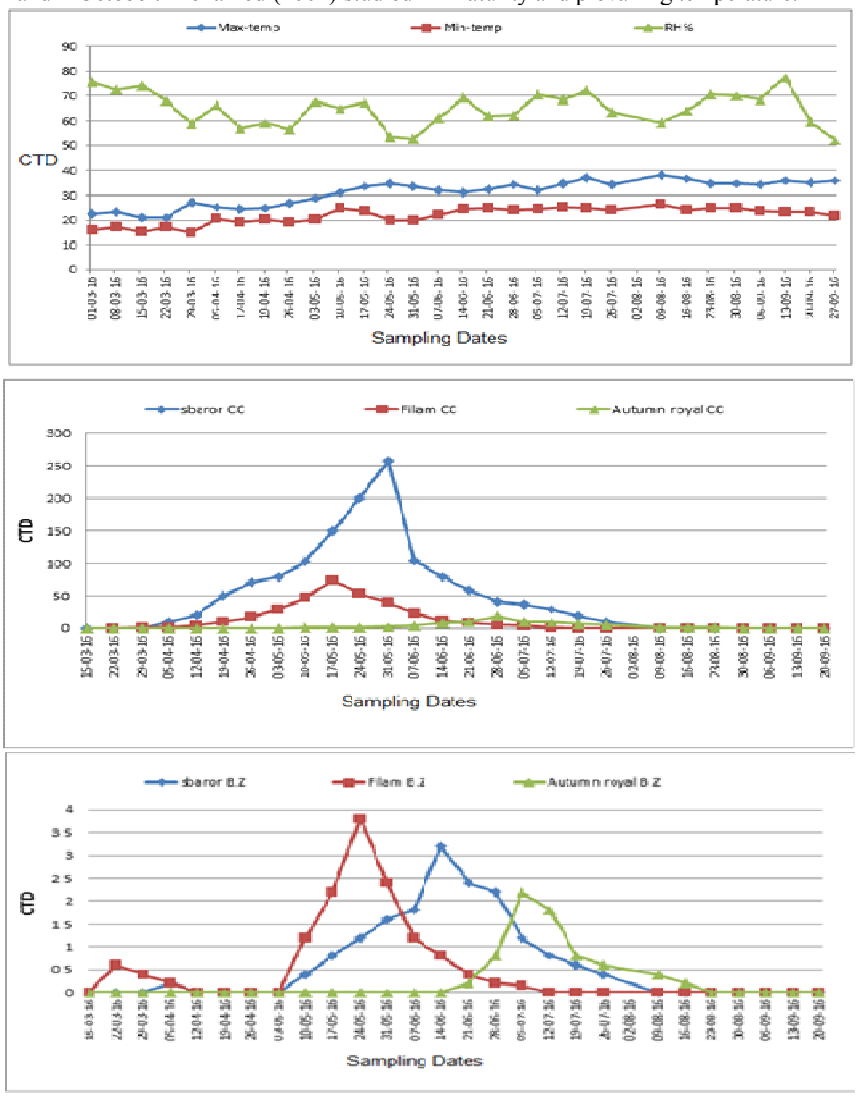


**Fig. 3. CTD of attracted males of *C. Capitata and B. zonata on* different grape varieties with corresponding means of main weather factors in Nubaria district, during 2016 season.**

**Monthly seasonal activity of *B. zonata* and *C. capitata* on three varieties of grape:**

Results obtained were given in graphically illustrated in Fig. (4), these results revealed that population density was more abundant during third season. During March of three seasons a few males were captured, this may be due to that PFF and MFF were overwintered during this month. The population densities increase gradually in successive months to record the make one peak of seasonal abundance on June during the 1st and 2nd seasons with total monthly catch of 160.46 and 367.3 males/month representing 42.64 and 55% from total population, respectively. While the total monthly catch during the three season made the highest peak of seasonal abundance on May was 1050.8 males/ month

representing 59.2% from total population. During this period from March to July population increased found PFF an MFF to attack Sbaror & Failm and Autumn royal trees. These hosts were at blooming and fruiting stages. Then, population density was decreased gradually in the successive months until the end of the season.

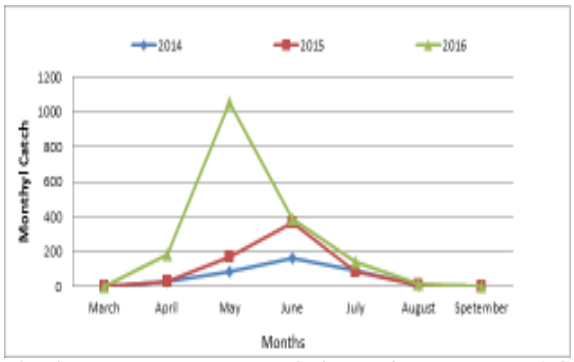


**Fig. 4. Total monthly catch fly/trap of *B. zonata and C. capitata* on three varieties of grapes Nubaria district, Alexandria governorate during three successive seasons (2014- 2016) corresponding means of temperature and percentage of relative humidity**

These results are in agreement with those obtained by Khan and Khan (1987) and Anjum *et al.* (2000) they found that seasonal abundance of *B. zonata* mostly occurred from March to August (especially during the July-August summer monsoon). Saafan *et al.* (2000) reported that throughout the period from September until November 1997 and 1998, the fallen fig fruits produced *C. capitata* and *B. zonata* only. Hashem *et al.* (2001) demonstrated that the peak of *B. zonata* in mango, apple and citrus (mandarin) orchards was in July and November/December, respectively in Egypt. Saafan (2005a, b and c) and Amin (2008) indicated that the PFF population were found significantly in higher numbers during summer and autumn seasons and diminishing during winter and spring seasons in Fayoum governorate. Afia (2007) found that the total monthly catch in Qalyubiya governorate recorded three peaks of seasonal activity. The high abundance of insect population reached the maximum level during summer season (July/ August) and the second peaks was in autumn season (September/November) while the lowest peak (third) was observed during spring season (March/May). Khalid and Mishkatullah (2007) stated that the *B. zonata* recorded low population level from November to February, and increased gradually from March to August. The population peak appeared in July and August, and maximum declined was observed in October depending on the host fruit maturity in Pakistan.

Results presented in Table (1) summarized these results and revealed that population density of *B. zonata* and *C. capitata* irrespective of varieties was more abundant during the third season than the second and first seasons were 1773.7, 666 and 376.31 males/season, respectively and the population density between varieties were more on Sbaror and Failm than autumn royal where the total population for these varieties through three season were 2050.38 ,547.8 and 214.8 males of flies, respectively. While The total numbers of males two fruit flies on' Sbaror variety was the highest as 1318.9, 411.5 and 199.24 males /seasons representing 98.73 ,87.96 and 79.8% for *C. capitata* and 17 ,56.6 and 50.44 males /seasons representing 1.27 ,12.04 and 20.2% for *B. zonata* of total captured males, during the third, second and first seasons, respectively. The results showed the percentage of *C. capitata* was higher during the three seasons, respectively. While the percentage of *B. zonata* was higher in the first season than that of both second and third seasons. Filam and Autumn royal varieties came in the second and third place in this order with totals of males ((328 ,109.3 & 60.23 and 88.8, 52.5 & 33.36 males)) representing (96.07, 84.86 & 77.57% and 92.12 ,75.65 & 68.09%) for *C. capitata* and ((13.4 ,19.5 &17.41and 7.6,16.9&15.63) representing (3.93,15.14 &22.43% and 7.88, 24.35 & 31.91%) and (64.9,47.43&38.57%) and (38.09, 52.57 & 61.43 %) for *B. zonata* during third, second and first seasons, respectively. Statistical analysis of variance showed high significant and significant inside two fruit flies each variety of captured flies during three seasons classified according to time of maturation (F = 284.00 and 944.44), (F= 233.26 and 149.61)& (F= 699.25 and 1763.8) and L.S.D. at 0.05 = (1.212 & 2.387), (32.301 & 0.877) and( 1.165&1.239) for *C. capitata* and *B. zonata* , respectively throughout all varieties

**Table 1. Total numbers and population percentage captured males *C.capitata* and *B.zonata* on three varieties on grapes in Nubaria district during three season(2014-2016).**

| Years | Sbaror | | | | | Filam | | | | | Autumn royal | | | | | Total of varieties |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cc | Bz | Total | percentage | | Cc | Bz | Total | percentage | | cc | Bz | total | percentage | | |
| | | | | C.C | B. Z | | | | C.C | B. Z | | | | C.C | B. Z | |
| 2014 | 199.24c | 50.44 ab | 249.678 | 79.8 | 20.2 | 60.23c | 17.41ab | 77.64 | 77.57 | 22.43 | 33.36c | 15.63a | 48.99 | 68.09 | 31.91 | 376.31 |
| 2015 | 411.5b | 56.3 a | 467.8 | 87.96 | 12.04 | 109.3b | 19.5a | 128.8 | 84.86 | 15.14 | 52.5b | 16.9a | 69.4 | 75.65 | 24.35 | 666 |
| 2016 | 1318.9a | 17c | 1335.9 | 98.73 | 1.27 | 328a | 13.4c | 341.4 | 96.07 | 3.93 | 88.8a | 7.6b | 96.4 | 92.12 | 7.88 | 1773.7 |
| Total | | | 2050.38 | | | | | 547.8 | | | | | 214.8 | | | 2816 |
| F value | *** 284.00 | * 944.44 | | | | *** 233.26 | ** 149.61 | | | | *** 699.25 | ** 177.66 | | | | |
| LSD at 0.05 | 1.2194 | 2.3874 | | | | 32.301 | 0.877 | | | | 1.1647 | 1.239 | | | | |

These results are closely related with those obtained by Hashem *et al.* (2001) demonstrated that the population of *B.zonata* was increased gradually with fruiting and ripening, where the peak of infestation at mango and apple orchards was in July for both flies. While, on citrus (mandarin) orchard was in November/December. El-Gendy (2002) stated that the host preference of peach fruit fly on six hosts depends on the total numbers of males captured by using Jackson trap could be arranged as follows: mango, mandarin , navel orange , suckary orange. Rajitha and Shashidhar (2006a) monitored that population of *B. zonata* recorded 1 and 2 peaks of seasonal abundance during the first and second seasons, respectively, in Dharwad, Karnataka, India, from July 2003 to April 2004.

Rajitha and Shashidhar (2006b) recorded three peaks of seasonal abundance of *B. zonata* at a mango orchard in Dharwad, Karnataka, India, from July 2003 to April 2004. Afia (2007) recognized the host sequence of infestation by *B. zonata* in three Governorates (Fayoum, Qaluybia and Giza) during 2001/2003 according to the weekly captured of males by using Steiner traps as the flowing: mango, guava, Navel orange, mandarin, peach , apricot, balady orange , Valencia orange.

Results presented in Table (2&3) showed that, effect the weather factors: the simple correlation between 27factors of different temperatures, relative humanity and CTD number. 7and 2factors of 27 for *Bactorcera zonata and Ceratitis capitata* were positively significant, in Sabaror variety, the simple correlation between maximum and minimum temperatures and CTD number were high significant and significant were (r=0.678) &(r=-0.769) and (r=0.517) &(r=-0.478) and the percentage of explained variance (E.V %) were high significant and significant were 46..02 and 26.78% for during first year and second year for *B. zonata* . While the simple correlation between and relative humanity were negative significant were (r=-0.567) for *C. capitata* during the third years. During 2015, the simple correlation between maximum temperatures and CTD number in Filam variety was significant (r=0.517) and (r=0.531) during second year and the percentage of explained variance (E.V.%) were significant its 26.77 and 28.14% for *B. zonata* and *C. capitata*, respectively . In Autumn royal variety, the simple correlation between maximum and minimum temperatures and CTD number were significant and high significant (r=0.517 and r=0.659) during first season and the percentage of explained variance (E.V.%) were 26.75% for *B. zonata*, respectively.

From the abovementioned discussion it could be stated that the changes population densities of *B. zonata* and *C. capitata* at the three grape varieties in Nubaria distrit were mostly related to the simultaneous effects of the all factors selected (three weather factors and CTD ) than the single effect of each factor separately. The percentages of explained variance were highly significant or significant and non-significant during 2014 &2015 seasons at the three grape varieties. The remaining unexplained variance were assumed to be due to the influence of other inconsiderable factors (biological, environ-mental, blooming and fruiting stages of the hosts and ripping stage of the fruit).

**Table 2. Simple correlation and regression values between the weather factors relation with capture males trap daily(CTD) of the Peach fruit fly, *Bactercera Zonata* on different grape varieties in Nubaria distrit during 2014-2016 season.**

| Grape | Year | Variable | Simple correlation | | Partial regression | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | R | P | b | P | F | P | EV % |
| Sbaror | 2014 | Temp. max. | 0.67841 | 0.002 | 3.69 | 0.002 | 13.64 | 0.002 | 46.02 |
| | | Temp. min. | 0.76687 | 0.0002 | 4.78 | 0.0002 | | | |
| | | RH % | 0.3267 | 0.1858 | 1.38 | 0.1858 | | | |
| | 2015 | Temp. max. | 0.51747 | 0.0278 | 2.42 | 0.0278 | 5.85 | 0.0278 | 26.78 |
| | | Temp. min. | 0.47776 | 0.0449 | 2.18 | 0.0449 | | | |
| | | RH % | 0.28724 | 0.2478 | 1.2 | 0.2478 | | | |
| | 2016 | Temp. max. | 0.4212 | 0.0817 | 1.86 | 0.0817 | 3.45 | 0.0817 | 17.74 |
| | | Temp. min. | -0.05488 | 0.8288 | -0.22 | 0.8288 | | | |
| | | RH % | -0.43494 | 0.0713 | -1.93 | 0.0713 | | | |
| Filam | 2014 | Temp. max. | 0.40547 | 0.095 | 1.77 | 0.095 | 3.15 | 0.095 | 16.44 |
| | | Temp. min. | 0.31474 | 0.2033 | 1.33 | 0.2033 | | | |
| | | RH % | -0.09815 | 0.6984 | -0.39 | 0.6984 | | | |
| | 2015 | Temp. max. | 0.51744 | 0.0279 | 2.42 | 0.0279 | 5.85 | 0.0279 | 26.77 |
| | | Temp. min. | 0.39657 | 0.1032 | 1.73 | 0.1032 | | | |
| | | RH % | 0.04549 | 0.8578 | 0.18 | 0.8578 | | | |
| | 2016 | Temp. max. | 0.4212 | 0.0817 | 1.86 | 0.0817 | 3.45 | 0.0817 | 0.1774 |
| | | Temp. min. | -0.05488 | 0.8288 | -0.22 | 0.8288 | | | |
| | | RH % | -0.43494 | 0.0713 | -1.93 | 0.0713 | | | |
| Autumn royal | 2014 | Temp. max. | 0.51718 | 0.028 | 2.42 | 0.028 | 5.84 | 0.028 | 26.75 |
| | | Temp. min. | 0.65939 | 0.0029 | 3.51 | 0.0029 | | | |
| | | RH % | 0.18058 | 0.4733 | 0.73 | 0.4733 | | | |
| | 2015 | Temp. max. | 0.22182 | 0.3764 | 0.91 | 0.3764 | 0.83 | 0.3764 | 4.92 |
| | | Temp. min. | 0.41622 | 0.0858 | 1.83 | 0.0858 | | | |
| | | RH % | 0.17197 | 0.495 | 0.7 | 0.495 | | | |
| | 2016 | Temp. max. | 0.07283 | 0.774 | 0.29 | 0.774 | 0.09 | 0.774 | 0.53 |
| | | Temp. min. | 0.34523 | 0.1606 | 1.47 | 0.1606 | | | |
| | | RH % | 0.33525 | 0.1738 | 1.42 | 0.1738 | | | |

These data are in agreement with those obtained by Abu-Manzar and Srivastava (2004a) reported the population of *B. zonata* showed a significant correlation with minimum temperature during 2002. The maximum and minimum relative humidity and rain was negatively and in significantly correlated during both years, except with minimum relative humidity and rain during 2003 in cue-lure and rain during 2003 in methyl. However Afia (2007) found that the weather factors were not the main driver for the population dynamics of both fruit flies in different corps at three governorates and for sure, weather factors are main players (with other environmental and agricultural procedures) in providing appropriate stage of host for fruit flies (*i.e.* mature or ripening of fruit hosts) but it might not be the main controller for fruit flies population dynamics. Thus, the availability of alternate fruit host and appropriate host stage for infestation are limiting factors for pest abundance. Amin (2008) In Egypt found that the weather factors were apparent during periods of critical temperature, particularly during winter months in which population of *B. zonata* reduced to its minimal numbers. Also during summer months, the peach fruit fly was found to be adversely by such temperature increasing over optimal range (30°C). Khalaf, *et al.,* (2011) found that the

number of pest was higher in 2010 compared to 2009, but the high temperature degree 45-51C in August 2010 caused decreasing the population density of *Ceratitis capitata,* (Wiedemann). EL-Fatih *et al.* (2016) in Egypt studied plant age and some weather factors on *Aphis gossypii* (Glover) population on four some vegetables, they found the effect weather factors are firstly affect the plant growth which makes the plant more palatable for infestation, so plant phenology as plant age took over the effect weather factors mathematically.

**Table 3. Simple correlation and regression values between the weather factors relation with capture males trap daily (CTD) of the Med fruit fly, *Ceratitis Capitata* (Wed) on different grape varieties in Nubaria distrit during 2014-2016 season.**

| Grape | Year | Variable | Simple correlation | | Partial regression | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | R | P | B | P | F | P | EV % |
| Sbaror | 2014 | Temp. max. | 0.4244 | 0.0792 | 1.87 | 0.0792 | 3.51 | 0.0792 | 18.01 |
| | | Temp. min. | 0.27629 | 0.2671 | 1.15 | 0.2671 | | | |
| | | RH % | 0.01189 | 0.9626 | 0.05 | 0.9626 | | | |
| | 2015 | Temp. max. | 0.41111 | 0.0901 | 1.8 | 0.0901 | 3.25 | 0.0901 | 16.9 |
| | | Temp. min. | 0.26079 | 0.2959 | 1.08 | 0.2959 | | | |
| | | RH % | 0.01456 | 0.9543 | 0.06 | 0.9543 | | | |
| | 2016 | Temp. max. | 0.15324 | 0.5438 | 0.62 | 0.5438 | 0.38 | 0.5438 | 2.35 |
| | | Temp. min. | -0.3445 | 0.1615 | -1.47 | 0.1615 | | | |
| | | RH % | -0.56699 | 0.0141 | -2.75 | 0.0141 | | | |
| Filam | 2014 | Temp. max. | 0.21736 | 0.3863 | 0.89 | 0.3863 | 0.79 | 0.3863 | 4.72 |
| | | Temp. min. | 0.04382 | 0.8629 | 0.18 | 0.8629 | | | |
| | | RH % | -0.16331 | 0.5173 | -0.66 | 0.5173 | | | |
| | 2015 | Temp. max. | 0.53051 | 0.0235 | 2.5 | 0.0235 | 6.27 | 0.0235 | 28.14 |
| | | Temp. min. | 0.35747 | 0.1453 | 1.53 | 0.1453 | | | |
| | | RH % | -0.23644 | 0.3449 | -0.97 | 0.3449 | | | |
| | 2016 | Temp. max. | 0.35521 | 0.148 | 1.52 | 0.148 | 2.31 | 0.148 | 12.62 |
| | | Temp. min. | 0.10934 | 0.6658 | 0.44 | 0.6658 | | | |
| | | RH % | -0.22957 | 0.3595 | -0.94 | 0.3595 | | | |
| Autumn royal | 2014 | Temp. max. | 0.08947 | 0.724 | 0.36 | 0.724 | 0.13 | 0.724 | 0.8 |
| | | Temp. min. | 0.35224 | 0.1517 | 1.51 | 0.1517 | | | |
| | | RH % | 0.00801 | 0.9748 | 0.03 | 0.9748 | | | |
| | 2015 | Temp. max. | 0.09999 | 0.693 | 0.4 | 0.693 | 0.16 | 0.693 | 1 |
| | | Temp. min. | 0.05827 | 0.8183 | 0.23 | 0.8183 | | | |
| | | RH % | 0.01493 | 0.9531 | 0.06 | 0.9531 | | | |
| | 2016 | Temp. max. | -0.20977 | 0.4035 | -0.86 | 0.4035 | 0.74 | 0.4035 | 4.4 |
| | | Temp. min. | 0.1787 | 0.478 | 0.73 | 0.478 | | | |
| | | RH % | 0.07525 | 0.7666 | 0.3 | 0.7666 | | | |

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## تذبذب التعداد لذباب ثمارالفاكهة علي أصناف العنب المختلفة في منطقة النوبارية

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تم دراسة التوزيع الموسمى لذباب الفاكهة علي مجموعة أصناف من العنب "سيرور" صنف العنب ابيض وصنف عنب أحمر "فيلم" وصنف عنب ألأسود "اوتوم رويل" لمدة ثلاثة أعوام متتالين (2014 – 2016) فى منطقة النوباريه. بدات من شهرمارس الى شهر سبتمبرفى ثلاثة أصناف من العنب وتمثل معدل رصد/المصايد /اليومى لذكور الحشرات خلال الثلاث أعوام . أظهرت النتائج تعداد الحشرات بيكون أعلى فى السنة الثالثة فى ثلاث أصناف وكذلك التعداد بذبابة ذبابة الفاكهة أعلى من ذبابة الخوخ فى ثلت أصناف العنب خلال ثلاث مواسم الدراسة، وأثبتت النتائج أن كل من ذبابة الفاكهة وذبابة الخوخ لها قمة نشاط واحدة على كل صنف من الأصناف المختلفة للعنب فى الفترة من شهر مايو الى شهريوليو . أشارت النتائج ان النشاط الموسمى للذباب الفاكهة معتمدا على التعداد الشهرى على ثلاث اصناف العنب لثلاث سنوات أن أعلى قمة نشاط للتعداد كان خلال شهر مايو 1050,8 ٪ ذكور/شهروتمثل النسبة المئوية 59,2 ٪ من التعداد وأما السنة الثانية والثالثة كانت فى شهر يونيو 160,45 و 367,3 ٪ ذكور/شهر وتمثل النسبة المئوية 64,24 و 55 ٪ من التعداد على التوالى . النتائج المتحصل عليها من تقلبات التعداد خلال ثلاث سنوات على الأصناف المختلفة تظهر ان التعداد الكلى كان أعلى فى صنف سيرور و فيلم عن اوتوم رويل 2050,38 و 547,84 و 214,79 ٪ ذكور على التوالى . وأوضحت النتائج النسبة المئوية لحشرة ذبابة الفاكهة كانت أعلى خلال الموسم الثالث عن الموسم الثانى والاول على التوالى , من ناحية أخرى النسبة المئوية لذبابة ثمار الخوخ كانت أكثر في الموسم الأول عن الموسم الثاني والثالث في جميع الأصناف . اما التعداد الكلى بالنسبة لصنف سيرور كان 1335,9 و 467,8 و 249,67 ٪ ذكور/موسم تمثل 98.73 و 87.96 و 79.80 ٪ خلال الموسم الثالث والثانى والاول على التوالى بالنسبة لذبابة الفاكهة اما ذبابة ثمارالخوخ كانت النسبة المئوية 20,20 و 12,04 و 1,27 ٪ ذكور من التعداد الكلى للمواسم الثالثة على التوالى . بينما صنف اوتوم رويل كان اقل تعداد 96,4 و 69,4 و 48,99 ٪ ذكور وتمثل النسبة المئوية لحشرة ذبابة الفاكهة و ذبابة ثمار الخوخ ( 92,12 و 75,65 و 68.09 ٪ ) و ( 7,88 و 24,35 و 31,91 ٪ ) خلال السنة الثالثة والثانية والأولى على التوالى . أثبت التحليل الإحصائي لمواسم الدراسة ان هناك تاثير معنوى بين العوامل الجوية مجتمعة مع قراءة المصائد فى صنف سيرور وعوامل الارتباط البسيط بين درجة الحرارة العظمى والصغرى كانت تاثيرها معنوى جدا وبالنسبة للعوامل الجوية المجتمعة كانت النسبة المعنوية مرتفعة ونسبتها 46,02 و 26,78 ٪ خلال السنة الأولى و السنة الثانية بالنسبة لذبابة ثمار الخوخ. بينما كان تاثير معنوى بالنسبةلارتباط البسيط والرطوبة النسبية بالنسبة لذبابة الفاكهة خلال السنة الثالثة . خلال السنة الثانية فى صنف فيلم كان تاثير الارتباط البسيط على درجة الحرارة العظمى وقراءة المصائد تاثير معنوى موجب و كانت النسبة المئوية للفروق مجتمعة 26,77 و 28,14 ٪ بالنسبة لذبابة ثمارالخوخ والفاكهة على التوالى . اما صنف اوتوم رويل كان تاثير معنوى جدا بين درجة الحرارة العظمى والصغرى وتعداد الذكور وكانت النسبة المئوية 26,75 ٪ بالنسبة لحشرة ذبابة ثمار الخوخ خلال السنة الأولى .