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# THE ROLE OF MIRID BUG, *NESIDIOCORIS TENUIS* (REUTER) (HETEROPTERA: MIRIDAE) IN REGULATING POPULATIONS OF APHIDS AND WHITE FLIES ON MARIGOLD, *CALENDULA OFFICINALIS* TREATED WITH DIFFERENT FERTILIZERS.

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## ABSTRACT

Weekly field observations of *Nesidiocoris tenuis* (Reuter) (Heteroptera: Miridae) and its preys, aphids and whiteflies were achieved on marigold, *Calendula offecinalis* (Family Asteraceae) treated with three different fertilizers (organic, bacterial and chemical) during 2012/2013 season.

The populations of the mirid bug on treated plants showed higher mean numbers than untreated; whereas, the mean numbers were the highest in chemical treatment, intermediate in bacterial treatment, while the lowest one was obtained in organic treatment.

On the other hand the populations of aphids and whiteflies, on the fertilized plants showed lower mean numbers than untereated, this may be due to the role of the predatory mirid bug; fed on aphids and whiteflies. All of the three insect species had one peak during the season.

The correlation between the climatic factors (daily range, daily mean of temperature and daily relative humidity) and the three mentioned insect population activities were positive but insignificant, except in the case of the daily mean temperature; it was significant and positive with *N. tenuis* and negatively insignificant with aphid and whitefly populations. Clear negative correlation between *N. tenuis* and aphid population could be found, whil it was slightly negative with whitefly

## INTRODUCTION

Marigold, *Calendula offecinalis* (Family Asteraceae) is one of the ornamental plants used for many purposes; decorative plants in parks and houses, in addition to use the flowers in medicines, coloring cheese with carotene and added to poultry feed. The infestation with piercing sucking insect species especially, tomato bug, aphids and whiteflies causes many damages, significantly affect the appearance of flowering and content of beta carotene and also the quantity of seeds produced by flowers, and also transmitting plant diseases from infected to healthy plants, especially aphids and whiteflies.

Regarding the seasonal variation in numbers of *Bemisia tabaci* due to nitrogenous fertilizers applied as ammonium nitrate; the number of *B. tabaci* was found positively correlated with leaf nitrogen; increased amounts of nitrogen in the plant sap supplies the feeding aphids with the nitrogen necessary for rapid development and multiplication (Joyce 1958 and Shawki 1968).

The melon/cotton aphid, *Aphis gossypii* Glov. (Homoptera: Aphididae), is a polyphagous and cosmopolitan pest with cucurbit crops and cotton as main host plants (York 1992). In northern temperate region *A. gossypii* is often a pest on glasshouse-grown crops (Van Steenis 1992). In integrated pest management in glasshouses aphids have usually been successfully controlled by using the selective insecticide Pirimicarb (Van Steenis 1992). However, reports that *A. gossypii* developed resistance against this chemical (Albert & Merz 1995), have stressed on the need to develop new possibilities of biological control against this pest. Many species of the predatory heteropteran are being used as biocontrol agents in control programmes of agricultural pests (Coll and Ruberson 1998).

Zoophytophagous insects *Nesidiocoris tenuis, (Cyrtopeltis tenuis)* (Heteroptera: Miridae) are a special case of omnivory in which insects can feed on both plants and prey at the same developmental stage.

The mirid bug is an important natural enemy of whiteflies in Mediterranean region. Omnivorous species of this family are major natural enemies of several pests such as whiteflies, in solanaceous field and greenhouse crops (Albajes and Alomar, 1999). Its population trends followed those of whiteflies, showing its role potential in biological control (Sanchez, and Lacasa 2008). The period of higher risk in tomato crops exists when *N. tenuis* reaches its high population peaks and its prey decreases to very low numbers due to predation (Sanchez, 2009). This predator feeding solely on a plant diet seems to have little potential to complete development in the absence of prey (Urbaneja *et al.*, 2005). However, *N. tenuis* adults or nymphs, enclosed on a tomato shoot, initiated the development of necrotic rings on the stem, but the harm was not found significant and these rings were soon disappeared (Arnó *et al.*, 2006).

Hence, the present work was undertaken to study the population fluctuations of the mirid bug *N. tenuis,* aphids and whiteflies on marigold, *C. offecinalis* in relation to plant fertilization and climatic factors, under open field conditions. Also, the effect of *N. tenuis* (as predator) on the population of aphids and whiteflies (as preys).

## MATERIALS AND METHODS

The experiment was carried out in the Horticulture Department farm, Faculty of Agriculture, Al-Azhar University at Nasr-City, Cairo, during 2012/2013 season.

The area of 36 $m^2$ was divided into 12 plots (three plots of 3 $m^2$ for each treatment), the latter three plots were untereated and distributed according to completely random technique. All plots were cultivated with marigold seedlings (three lines/plot and plant space: 30 cm) at 25$^{th}$ of Nov. 2012. The bigning of inspection was at 29$^{th}$ of Jan. 2013, the cultivation practices were done as recommended. Plants didn't received any kind of insecticides throught the season.

Three fertilization treatments were used as soil applications, three plots were chosen randomly for each fertilization treatment and untereated:

1- Chemical fertilizer (NPK): Nitrogen (Ammonium sulfate 100kg/feddan), Phosphorus (Superphosphate 100kg/feddan) and Potassium (Potassium sulfate 50kg/feddan), (The amount used as recommended by the Egyptian Ministry of Agriculture). Added into the soil three times; directly after transplanting, after two weeks and after four weeks.

2- Organic fertilizer: Poultry manure at a rate of 40 $m^3$/feddan, added into the soil, one time, directly before transplanting.

3- Bacterial fertilizer: (*Bacillus spp.*, *Mycorrhiza spp.* and *Azospirillum spp.*), added one time, directly after transplanting as a solution injected into the soil 3ml beside plant root. Untreated plants were free from any fertilizer during the season.

The three insect population densities were recorded weekly during the tested season. Direct count technique [three shoots/plot (shoot=20 cm length)] were used to record numbers of *N. tenuis* (adults and nymphs), aphids (adults and nymphs) and whiteflies (nymphs) on marigold, *Calendula officinalis* (Fam: Asteraceae) under open field conditions. The first inspection was taken one month after transplantation.

Weather factors (daily range, daily mean of temperature and daily mean of relative humidity) were obtained for Cairo area from the internet (www.wunderground.com). The effect on three insect population changes was assumed to be the reflection of the influence of the weather factors prevailing during the past seven days before the date of inspection.

Statistical analysis of the obtained data was followed using ANOVA and partial regression procedues in SAS. (Statistical Analysis System). Mean separation was conducted by using the Duncan multiple range test in SAS (SAS, 1988).

## RESULTS AND DISCUSSION

### 1- The effect of different fertilizers on population fluctuation of *N. tenuis*, aphids and whiteflies.

Data presented in Table (1) indicated that the trend of infestation with the three insects did not vary with the different fertilizers. The infestation with aphid started at the last week of Jan. in untreated plants and all of fertilization treatments, with mean numbers of insects 1.3, 1.7, 0.9 and 1.2 individual/shoot in untreated plants, organic, bacterial and chemical treatments, respectively. while the whiteflies infestation started at the first week of Feb. with mean numbers of insects 0.3, 0.2, 0.1 and 0.4 individual/shoot in the untreated plants and organic, bacterial and chemical treatments, respectively.

2- Organic fertilizer: Poultry manure at a rate of 40 $m^3$/feddan, added into the soil, one time, directly before transplanting.

3- Bacterial fertilizer: (*Bacillus spp*., *Mycorrhiza spp*. and *Azospirillum spp*.), added one time, directly after transplanting as a solution injected into the soil 3ml beside plant root. Untreated plants were free from any fertilizer during the season.

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Table (1) Weekly mean numbers of the mirid bug *N. tenuis*, aphids and whiteflies per shoot of marigold *Calendula officinalis* Fertilized with three deferent fertilizers during season 2012/2013 at Nassr-City, Cairo.

| Insects | *N. tenuis* (Nymphs & Adults) | | | | Aphids (Nymphs & Adults) | | | | Whiteflies (Nymphs) | | | | Temp. | | R. H. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Untereated | Organ. F. | Bac. F. | Chem. F. | Untereated | Organ. F. | Bac. F. | Chem. F. | Untereated | Organ. F. | Bac. F. | Chem. F. | d.r. | d.m. | |
| 29/1/2013 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.7 | 0.9 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 7.8 | 16.8 | 43.9 |
| 5/2/2013 | 0.0 | 0.4 | 0.1 | 0.1 | 3.3 | 5.2 | 2.7 | 2.5 | 0.3 | 0.2 | 0.1 | 0.4 | 9.3 | 14.3 | 55.9 |
| 12/2/2013 | 0.2 | 0.6 | 0.4 | 0.3 | 5.4 | 7.4 | 6.4 | 7.6 | 1.4 | 1.8 | 1.3 | 2.4 | 7.5 | 16.6 | 48.0 |
| 19/2/2013 | 0.3 | 0.7 | 0.4 | 0.5 | 6.7 | 8.9 | 9.3 | 12.4 | 2.6 | 3.2 | 2.4 | 3.6 | 9.2 | 14.9 | 49.4 |
| 26/2/2013 | 0.6 | 0.9 | 0.8 | 1.3 | 9.2 | 13.8 | 14.7 | 19.1 | 3.8 | 4.6 | 5.7 | 5.2 | 10.7 | 17.6 | 44.4 |
| 5/3/2013 | 0.7 | 1.3 | 1.8 | 2.0 | 11.9 | 17.4 | 19.6 | 21.3 | 4.7 | 5.1 | 5.6 | 6.1 | 10.8 | 18.4 | 52.6 |
| 12/3/2013 | 1.1 | 2.1 | 3.3 | 3.6 | 19.7 | 20.5 | 16.8 | 14.8 | 6.7 | 7.8 | 4.8 | 3.7 | 11.1 | 16.3 | 47.1 |
| 19/3/2013 | 2.1 | 2.4 | 3.9 | 5.0 | 15.3 | 15.4 | 11.4 | 9.3 | 5.8 | 5.4 | 3.3 | 3.1 | 11.6 | 22.1 | 40.7 |
| 26/3/2013 | 2.9 | 4.2 | 5.4 | 6.6 | 14.3 | 10.7 | 9.7 | 8.7 | 5.1 | 4.2 | 2.6 | 2.2 | 12.2 | 18.6 | 50.1 |
| 2/4/2013 | 6.1 | 8.6 | 6.1 | 9.5 | 10.4 | 5.7 | 6.4 | 5.6 | 3.4 | 2.8 | 2.4 | 1.8 | 12.6 | 22.6 | 33.9 |
| 9/4/2013 | 9.8 | 10.0 | 12.7 | 13.0 | 8.0 | 4.5 | 3.3 | 3.4 | 3.2 | 2.1 | 1.3 | 1.0 | 11.5 | 22.3 | 36.9 |
| 16/4/2013 | 10.9 | 12.7 | 15.1 | 14.5 | 5.4 | 3.4 | 2.6 | 2.3 | 2.6 | 1.7 | 1.1 | 0.9 | 11.0 | 19.7 | 53.9 |
| 23/4/2013 | 11.6 | 15.1 | 17.6 | 17.1 | 4.3 | 2.6 | 1.8 | 2.4 | 2.3 | 0.7 | 0.5 | 0.3 | 6.3 | 18.3 | 50.6 |
| 30/4/2013 | 11.5 | 15.3 | 16.7 | 18.8 | 4.1 | 1.5 | 1.2 | 0.9 | 1.6 | 0.4 | 0.5 | 0.3 | 14.3 | 22.9 | 44.0 |
| 7/5/2013 | 14.2 | 14.7 | 17.0 | 19.7 | 3.7 | 1.2 | 1.3 | 0.7 | 1.7 | 0.2 | 0.3 | 0.1 | 15.4 | 26.7 | 40.1 |
| 14/5/2013 | 14.8 | 14.6 | 18.7 | 21.2 | 3.2 | 0.5 | 0.3 | 0.2 | 1.2 | 0.3 | 0.2 | 0.1 | 11.2 | 26.0 | 47.9 |
| 21/5/2013 | 15.4 | 17.0 | 19.5 | 21.4 | 2.2 | 0.4 | 0.2 | 0.3 | 0.5 | 0.2 | 0.3 | 0.0 | 11.6 | 25.4 | 43.4 |
| 28/5/2013 | 13.9 | 13.3 | 17.6 | 16.1 | 1.5 | 0.4 | 0.1 | 0.2 | 0.2 | 0.0 | 0.1 | 0.0 | 12.7 | 27.3 | 42.4 |
| 4/6/2013 | 6.6 | 9.6 | 14.4 | 16.1 | 0.6 | 0.2 | 0.2 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 15.0 | 30.6 | 28.0 |
| Total | 122.7 | 143.5 | 173.5 | 188.8 | 130.5 | 121.4 | 108.9 | 112.9 | 47.5 | 40.7 | 32.7 | 31.2 | | | |
| Mean | 7.2 a | 8.0 a | 9.6 b | 10.5 c | 6.9 a | 6.4 a | 5.7 a | 6.3 a | 2.6 a | 2.5 a | 1.9 b | 2.1 b | | | |

"F" value = 21.81 P= 0.0001 LSD 5% = 0.856 *N. tenuis*

"F" value = 1.10 P= 0.3556 LSD 5% = 1.2308 aphids

"F" value = 5.32 P= 0.0026 LSD 5% = 0.4419 whiteflies

Mean followed by the same letter are not significantly different (P= 0.05; Duncan multiple range test) Duncan, 1955

The incidence of mirid bug *N. tenuis* was often observed at the same date of occurrence whiteflies in all treatments, with mean numbers of 0.0, 0.4, 0.1 and 0.1 individual/shoot in the untreated and organic, bacterial and chemical treatments, respectively.

The peaks of infestation for aphids and whiteflies occurred at the first week of Mar. in each of bacterial and chemical treatments with mean numbers of 19.6 and 21.3 individual/shoot for aphids and 5.8 and 6.1 individual/shoot for whiteflies, respectively, when the mirid bug recorded a few numbers with averages of 1.8 and 2.0 individual/shoot in bacterial and chemical treatments, respectively, (The means of temperature, range of temperature and relative humidity were 18.4C°, 10.6 C° and R.H. 52.6%). While in untreated and organic treatment the peak of aphid and whitefly populations were recorded at the second week of March with mean numbers of 19.7, 20.5 and 6.7, 7.8 individual/shoot for aphids and whiteflies respectively, with low population activity of mirid bug as 1.1 & 2.1 individual/shoot in the untreated and organic treatment respectively, (The means of temperature, range of temperature and relative humidity were 18.3C°, 11.1 C° and R.H. 47.1%), respectively.

Raising population of *N. tenuis* continued in the untreated and all treatments to reach the highest peak in the third week of May, with mean numbers of 15.4, 17.0, 19.5 and 21.4 individual/shoot in the untreated, and the organic, bacterial and chemical treatments, respectively, (The means of temperature, range of temperature and relative humidity were 25.4C°, 11.6 C° and R.H. 43.4%), respectively.

It was observed that the populations of aphids and whiteflies were decreasing with the increasing of the population of mirid bug where their populations reached the lowest mean numbers at the end of the season on $4^{th}$ of Jun with 0.6, 0.2, 0.2 & 0.2 and 0.4, 0.2, 0.1& 0.1 individual/shoot for aphids and whiteflies in untreated and organic, bacterial and chemical treatments, respectively (Table 1).

This reflected the role of the predatory mirid bug in feeding on aphids and whiteflies, which was clearly shown at the second and third weeks of March, when the mean numbers of aphids and whiteflies initiated in decreasing with increasing *N. tenuis* numbers. The predatory mirid bug *N. tenuis* was reported by (Sridhar *et al.* 2012) to be an effective predator of the greenhouse whitefly *B. tabaci* on field-grown tomatoes. Its population trends followed those of whiteflies, showing its potential in biological control (Sanchez and Lacasa, 2008). The bug is reported to prey on the white fly, *B. tabaci* and several other pests including *Tetranychus urticae, Spodoptera litura, Ephestia kuehniella and Tuta absoluta* (Albajes and Alomar, 1999; Urbaneja *et al.*, 2005; Sanchez and Lacasa, 2008; Perdikis *et al.*, 2009; Hughes *et al.*, 2009). Furthermore, *N. tenuis* is known to be a predator of thrips, aphids, whiteflies and spider mites (Kajita, 1978; Yasunaga *et al.*, 1993; Torreno, 1994; Urbaneja *et al.*, 2005).

The obtained results represented in Table (1) showed that the population of the mirid bug on the treated plants with fertilizers showed higher mean numbers than untreated; where they descendingly from chemical treatment, followed by bacterial to organic to reach the lowest population in the untreated plants.

Appling different fertilizers may affect the population densities of the three insects, but these effects were insignificant in case of aphids, perhaps predation of mirid bug for aphids gave this result. However, Shawki (1968) recorded that the increased amounts of nitrogen in the plant sap supplies the feeding aphids with the nitrogen necessary for rapid development and multiplication. The application of potassium to cotton plants reduces the population of insects and mites (Perrenoud 1977). The seasonal variation in numbers of B *tabaci* due to nitrogenous fertilizers applied as ammonium nitrate, the number of B *tabaci* was found positively correlated with leaf nitrogen (Joyce 1958).

It was observed that whiteflies were in increased numbers in the untreated and organic treatment than chemical and bacterial treatments (Table 1).

**2- Effect of biotic and abiotic factors on the population activities of *N. tenuis*, aphids and whiteflies.**

The obtained results presented in Tables (2&3) showed the relations between abiotic factors, (the daily mean of temperature, daily range of temperature and the daily mean of relative humidity, one week before inspection) and the population activity of the three insects, midid bug, aphids and whiteflies. On the other hand the relation between biotic factor, predatory mirid *N. tenuis* and the two insect pests; aphids and whiteflies were tested and they were tested as food for mirid bug. These factors played varied roles in the population fluctuations of them during the season.

Table (2) Mean numbers of mirid bug, aphids and whiteflies per shoot and corresponding climatic factors (as weekly means) on *Calendula officinalis* during 2012/2013 season, at Nassr-City, Cairo.

| Insect | Mdid bug | Aphids | Whiteflies | Temp. | | R.H. % |
|---|---|---|---|---|---|---|
| Date | Nymphs & Adults | Nymphs & Adults | Nymphs | Daily range | Daily mean | |
| 29/1/2013 | 0.0 | 1.3 | 0.0 | 7.8 | 16.6 | 43.9 |
| 5/2/2013 | 0.2 | 3.4 | 0.3 | 9.3 | 14.3 | 55.9 |
| 12/2/2013 | 0.4 | 6.7 | 1.7 | 7.5 | 16.6 | 48.0 |
| 19/2/2013 | 0.5 | 9.3 | 3.0 | 9.2 | 14.9 | 49.4 |
| 26/2/2013 | 0.9 | 14.2 | 4.8 | 10.7 | 17.6 | 44.4 |
| 5/3/2013 | 1.5 | 17.6 | 5.4 | 10.6 | 18.4 | 52.6 |
| 12/3/2013 | 2.5 | 18.0 | 5.8 | 11.1 | 18.3 | 47.1 |
| 19/3/2013 | 3.4 | 12.9 | 4.4 | 11.6 | 22.1 | 40.7 |
| 26/3/2013 | 4.8 | 10.9 | 3.5 | 12.2 | 18.6 | 50.1 |
| 2/4/2013 | 8.1 | 7.0 | 2.6 | 12.8 | 22.6 | 33.9 |
| 9/4/2013 | 11.4 | 4.8 | 1.9 | 11.5 | 22.3 | 36.9 |
| 16/4/2013 | 13.3 | 3.4 | 1.6 | 11.0 | 19.7 | 53.9 |
| 23/4/2013 | 15.4 | 2.8 | 1.0 | 8.3 | 18.3 | 50.6 |
| 30/4/2013 | 15.6 | 1.9 | 0.7 | 14.3 | 22.9 | 44.0 |
| 7/5/2013 | 16.4 | 1.7 | 0.6 | 15.4 | 26.7 | 40.1 |
| 14/5/2013 | 17.3 | 1.1 | 0.5 | 11.2 | 26.0 | 47.9 |
| 21/5/2013 | 18.3 | 0.8 | 0.3 | 11.6 | 25.4 | 43.4 |
| 28/5/2013 | 15.7 | 0.6 | 0.1 | 12.7 | 27.3 | 42.4 |
| 4/6/2013 | 11.7 | 0.3 | 0.1 | 15.0 | 30.6 | 28.0 |
| Total | 157.1 | 118.4 | 38.0 | | | |
| Mean | 8.7±6.9 | 6.2±5.9 | 2.1±1.9 | | | |

Table (3) Simple correlation coefficients, partial regression values and explained variance (E.V.) between three tested weather (abiotic) and biotic factors and population activities of midid bug, aphids and whiteflie on *C. offecinalis* during 2012/2013 season, at Nassr-City, Cairo.

| Season | Simple correlation analysis | | | Multeple Partial regression analysis | | | | |
|---|---|---|---|---|---|---|---|---|
| | W. Factor | r. | P. | b. | p. | "F" | Prob>F | E.V. |
| *N. tenuis* | d.r. of Temp. | 0.498 | 0.022 | 0.4775 | 0.601 | 5.15 | 0.01 | 47.60% |
| | d.m. Temp. | 0.636 | 0.002 | 1.1501 | 0.016 | | | |
| | R.H. | -0.237 | 0.302 | 0.3869 | 0.149 | | | |
| | Aphids | -0.477 | 0.029 | -0.3242 | 0.192 | | | |
| | Whiteflies | -0.403 | 0.07 | -0.0878 | 0.301 | | | |
| Aphids | d. r. of Temp. | -0.195 | 0.398 | 0.9601 | 0.295 | 1.8 | 0.178 | 31.00% |
| | d.m. Temp. | -0.438 | 0.047 | -0.4415 | 0.392 | | | |
| | R.H. | 0.257 | 0.261 | 0.118 | 0.665 | | | |
| | *N. tenuis* | -0.477 | 0.029 | -0.3242 | 0.192 | | | |
| Whiteflies | d. r. of Temp. | -0.123 | 0.595 | 0.3465 | 0.274 | 1.3 | 0.312 | 24.50% |
| | d.m. Temp. | -0.372 | 0.097 | -0.1614 | 0.365 | | | |
| | R.H. | 0.192 | 0.405 | 0.023 | 0.806 | | | |
| | *N. tenuis* | -0.403 | 0.07 | -0.0878 | 0.301 | | | |

**A- Effect of weather factors on mirid bug, aphids and whiteflies population activiyies:**

Table (3) shows that the relation between the populations activity of *N. tenuis* and the daily range of temperature is positively significant, with correlation coefficient value (r. = +0.498), while in the daily mean temperature, this relation was highly significant and positive (r. = +0.636). The relative humidity had insignificant negative relation, (r. = -0.237).

That means the daily range of temperature and daily mean of temperature are below the optimal range of population activity and the relative humidity in the optimal range of activity for mirid bug.

The relation between the population activity of aphids and the daily range of temperature is insignificant negative, (r. = -0.195), while the daily mean temperature, was significant negative, (r. = -0.438). The relative humidity had insignificant positive relation, (r. = 0.257). That means the daily mean of temperature are below the optimal range of population activity while the daily range of temperature and the relative humidity were in the optimal range for population activity.

The relation between the populations activity of whiteflies and each of the daily range of temperature and the daily mean of temperature is insignificant and negative, with correlation coefficient values (r. = -0.1230 and -0.3720), while it was insignificant positive in the relative humidity, (r. = 0.1920). That means the three tested factors are in the optimal range of population activity.

(Sanchez *et al.*, 2009) studed that the effect of constant temperature on the development time for eggs and nymphs and female fertility for *Nesidiocoris tenuis* Reuter at 15, 20, 25, 30, 35 and 40 ± 1°C. Based on development, reproduction data and thermal requirements, the optimum temperature range for *N. tenuis* was established as being between 20 and 30°C.

**B- Effect of the predatory mirid bug *N. tenuis* on aphids and whiteflies populations:**

Statistical analysis showed that there is a negative relationship between the mean numbers of mirid bug *N. tenuis* and both of aphids and whiteflies infesting *C. offecinalis*, (Table 3).

The relation between the populations activity of aphids and the predatory mirid is significant and negative, with correlation coefficient value (r. = -0.477). While the relation between the populations activity of whiteflies and the predatory mirid is insignificant negative (r. = -0.4030).

These mean that decreasing in the populations of aphids and whiteflies may be due to the increasing in the population of predatory mirid, which feed in its mature and immature stages on the diferent stages of aphids and whiteflies.

It was observed that aphids population activity was below the optimal range for the population activity of mirid bug (as preys) while whiteflies numbers were in the optimal range for mirid bug.

On the other hand, the effect of mirid bug as predator on the population activity of aphids, the relation was negative and significant (r = -0.477), while in case of whiteflies this relation was negative but insignificant (r = -0.403). That means aphids population was below the optimal range, but whiteflies population was in the optimal range of mirid bug population activity.

It could be observed also from (Table 3) that the explained variance of biotic and a biotic factors affecting mirid bug population activity was 47.6% from the effect of all factors affecting the population, while biotic and abiotic factors tested in this investigation on aphids and whiteflies populations gave 31.0% and 24.5% of the effect (Table 3).

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**دور بقة الطماطم (HETEROPTERA: (MIRIDAE) *NESIDIOCORIS TENUIS* (REUTER)**
**فى تنظيم مجاميع المن والذباب الابيض على نبات الاقحوان *CALENDULA OFFICINALIS* المعامل بمخصبات زراعية مختلفة.**

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تمت دراسة تأثير بعض المخصبات الزراعيه المختلفة والتى تضاف إلى نبات الاقحوان على تعداد ثلاثة حشرات تصيب تلك النباتات التى تستخدم لأغراض عدة أهمها الزينة فى الحدائق العامة والمنازل. وهذه الحشرات هى: بقة الطماطم المفترسة والمن والذباب الابيض.

تلعب حشره بقة الطماطم دوراً فى تنظيم تعداد حشرات المن والذباب الابيض بتغذيتها على أفراد تلك الحشرات حيث أنها تقوم بدور المفترس الحشرى وذلك فى جميع أطوار حياتها (حوريات وحشرات يافعة).

حيث أثبتت النتائج أنه عند زيادة أعداد حشرات بق الطماطم فإن أعداد كل من حشرات المن والذباب الابيض قد تأثرت وكان هذا التأثيرسلبياً ومعنوياً على تعداد حشرات المن بينما كان سلبياً غير معنوى على تعداد حشرات الذباب الأبيض.

واثبتت النتائج ايضا أن إضافة ثلاث مخصبات زراعية مختلفة (عضوية - كيماوية – بكتيرية) ومقارنتها النباتات التى لم تعامل بأى من المخصبات الزراعية كان لها تأثير على أعداد الحشرات الثلاثة (بقه الطماطم - المن - الذباب الابيض) ولكن هذا التأثير لم يكن معنوياً على المن بينما كان التأثيرمعنوياً على تعداد الذباب الابيض وعالى المعنويه على بقة الطماطم مما يوضح أن المفترسات تتأثر بتسميد النبات مثل الأفات وقد يكون هذا التأثير غير مباشر حيث يزيد من تعداد الفرائس أو يقللها.

كما أوضحت النتائج أن العوامل البيئية خاصة الحرارة كان لها تأثير إيجابى معنوى على بقة الطماطم بينما كانت الحرارة المتوسطة ذات تأثير سلبى ومعنوى على تعداد المن. أما بقية العوامل فكانت فى حالاتها المثلى للنشاط فى حالة الذباب الأبيض فكانت العوامل الجوية الثلاثة فى حالاتها المثلى لنشاط المجموع. أما عن تأثير حشرات المن كغذاء لبقة الطماطم فكان ذو تأثير سلبى ومعنوى، أما الذباب الأبيض فكان تأثيره سلبياً وغير معنوى بمعنى ان تأثير بقة الطماطم كمفترس على المن سلبى ومعنوى أما تأثيرها على الذباب الابيض فكان سلبى وغير معنوى.