*J. Plant Prot. and Path., Mansoura Univ., Vol. 7 (4): 265 - 272, 2016*

# Population Density of The Tortoise Beetle, *Cassida vittata*, Vill. (Coleoptera: Chrysomelidae) and The Role Predators on Sugar Beet at El-beheira Governorate

**Askar, S. I.**
**Department of plant protection, Faculty of Agriculture, Damanhour University**



## ABSTRACT

The study carried out at three districts of El Mahmoudia, Damanhur and Rashid, El Beheira Governorate, Egypt during the two successive seasons 2011/12 and 2012/2013 . Under filed climate, *C. vittata* was appeared in sugar beet as adults with a few numbers in the last week of December, while eggs were appeared week later. the tortoise beetle *C. vettata* in all stages observed high numbers in the second season 2012/13 comparative with season 2011/12. On the other hand, only five species of insect predators were recorded on the sugar beet crop during the survey period. The dominant one of the predators was *C. undecimpunctata* adults which observed with high number and for long time. Temperature was effected negatively significant on *C. vettata* in the first season more than in the second while related humidity not observed any effect in the pest population during the two successive seasons.

**keywords**: sugar beet, population dynamics, predators, ecology, survey

## INTRODUCTION

Sugar beet *(Beta vulgaris* L.) is one of the most important sugar crops and considered the second sugar crop for sugar production in Egypt after sugar cane (Hellal, *et al.*, 2009).

The tortoise beetle, *Cassida vittata* Vill. was considered as one of the most serious and abundant species causing damage in sugar beet crop in Egypt (Guirguis 1985, Mousa 2005, Amin *et al*. 2008, Fouad 2011, and Sherife *et al*. 2013). The tortoise beetle has a single annual generation, occurring during March/May on sugar beet plantation in Egypt, early plantations (during August) received the least density of the beetle's population (Salama and Elnagar, 1992).

Many authors studied the population density of the role predator insects associated sugar beet pests such as, *Chrysopa carnea* (Steph.), *Coccinella undecimpunctata*, *Paederus alfierii* (Koch), *Scymnus* sp and *Cydonia vicina isis* (Mesbah 1991, Ali *et al*. 1993, El-Agamy *et al*. 1996, Shalaby 2001, El-Khouly 2006).This experiment was aimed to study the population fluctuation of *C. vittata* on sugar beet plants and their associated predatory insects. Also, study the Effects of some climatic factors on the population densities of this pest and its predators.

## MATERIALS AND METHODS

The study carried out at three district of El Mahmoudia, Damanhur and Rashid, El Beheira governorate Egypt. Sugar beet was planted in an area of about one feddan dowering the two successive seasons 2011/12 and 2012/13. The experiment area untreated with pesticide and still during the growing period under safety of pesticide application and no chemical control treatments were applied during the investigation period. The samples of 60 plants were chosen randomly (three replicate each one 20 plants). Sampling procedures were started one month after sowing at weekly intervals and continued until the harvest time. Sampling took place weekly by using count directly from each area and using a magnifying glass to count the insect instars and associated predators to estimated population fluctuation of each one of the insect. The data collected during the period ranged between 7/10 and 27/4 of the second tested season. The pest and its predators were counted and recorded. Daily degrees of temperature and relative humidity were obtained from the agriculture meteorological at El Beheira Governorates and calculated as means weekly. The statistical analysis within costat software program (1990) was applied to calculate correlation coefficient factor and Values corresponding calculation between *Cassida vittata* and field condition. On the other hand the predators and field conditions were represented by straight line equation: $\hat{Y} = a + bx\ (x - x`)$ (Golden. 1960).

## RESULTS AND DISCUSSION

**1-Population fluctuation of *C. vittata* and their associated predators on sugar beet during the two seasons 2011/12 and 2012/2013.**

The present studies spend 30 weeks ago during this period Temperature and the relative humidity was recorded. Temperature degree decreased gradually from 23.5C to 13.7 then increased again recorded 20 C in the last week. RH% was record with the degree ranged between 48.6% and 57.7%. *C. vittata* and the role predators on sugar beet were recorded in relation with Temperature and Rh % as the present results which showing in figs. (3). Data in (fig.1) reflected that, *C. vittata* was appeared in sugar beet as adults with few number in 23$^{rd}$ of December, while eggs were appeared week later. At the beginning of January all stage of *C. vittata* were recorded with high number during January and recorded the highest number in 20$^{th}$ January with 291.3 individual eggs/20 plants. *C. vittata* eggs decreased for three weeks then its increased again till it recorded 291.3 individual adults/20 plants. *C. vittata* immature larvae observed with high numbers in 12$^{th}$ of February this number increased and recorded the highest numbers 141.3 larvae/20 plants in 17$^{th}$ of March. Pupae and adults stages were recorded with a few numbers during the survey period with the highest number of 54.7 for pupa and 52.3 for adult/20plants.

On the other hand, only five species of insect predators were recorded on the sugar beet during the survey period (fig. 2). The first one was *syrphus sp* larvae which were observed in the first week with 4

indevedual/20 plants then the number increased gradually and recorded 8 indevedual/20 plants in the last week of the same month. *syrphus sp* larvae disappeared during December and January while the first appearing was in February, march and recorded the highest numbers of 17 indevedual/20 plants in the last week of march. The second predator was *P. alfierii* adult observed for first time after ten weeks from the beginning of the study with 3 individual aduls/20 plants thin the population increased and recorded 24 adults in 10th February. *C. undecimpunctata* adults observed during the survey period except three weeks, beginning its population in high number and recorded the highest number 24 adults and 38 adults in 14th October and 28th April respectively. *orius sp* adults and *C. carnea* were observed also but with fewer number compression with the all predators and disappeared for long period.

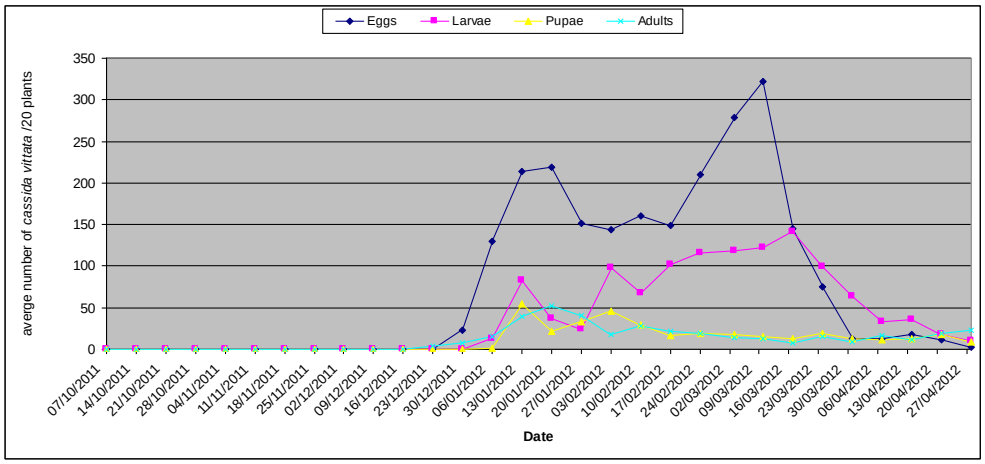


**Fig. 1. Population fluctuation of *C. vittata* immature stages and adult stages during the period ranged between 7th October 2011 and 27th April 2012**

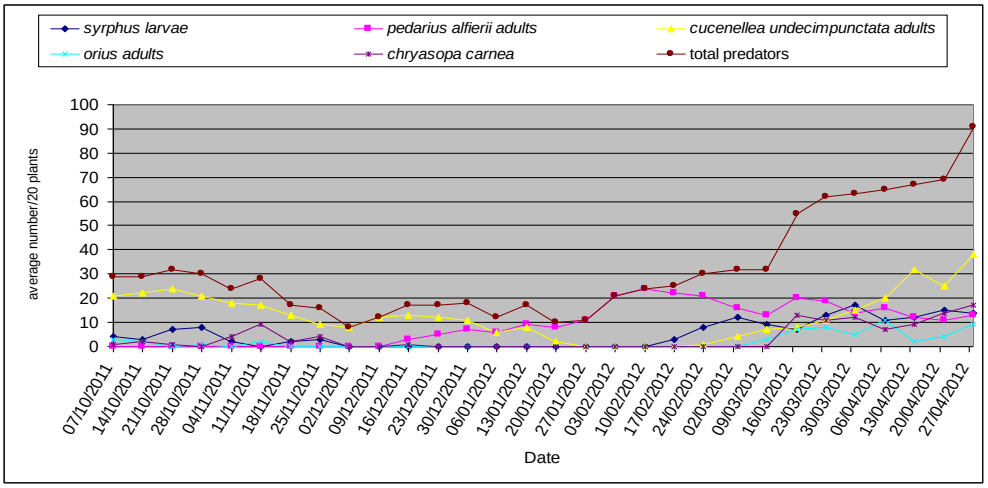


**Fig. 2. Population fluctuation of *C. vittata* predators during the period ranged between 7th October 2011 and 27th April 2012**

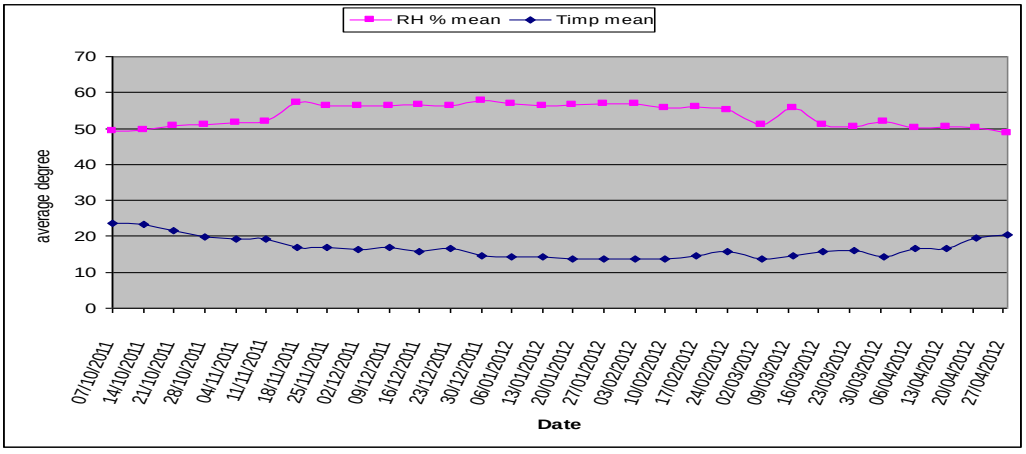


**Fig. 3. The fluctuated Timp. and RH% during the period ranged between 7th October 2011 and 27th April 2012**

As shown in figs. (4,5 and 6 ) *C. vittata* and the role predators were recorded in the second season 2012/2013 in relation with Temperature and the Relative Humidity. The degree of Temperature begin the first week of October with 21.5 then decreased gradually till it recorded 13.6 in the first week of February and increased again recording 22.2C at the end of survey period. RH% recorded with degree ranged between 42 % and 57.1%.

In the beginning of January all stages of *C. vittata* were recorded. *C. vittata* adult increased in the population gradually recording the highest number 98.3 individual /20plants in the second week of march. *C. vittata* egg was observed for first time at the end of December. In 24th February the population recorded the highest number as *C. vittata* egg with 138.3 eggs/20 plants. *C. vittata* larvae was found in high number during February and march recorded the highest number of 138.7 larvae/20 plants in the first week of march. *C. vittata* pupa was recorded in a few number of all stage recorded highest numbers 77.3 pupa/ 20 plants in 10th march.

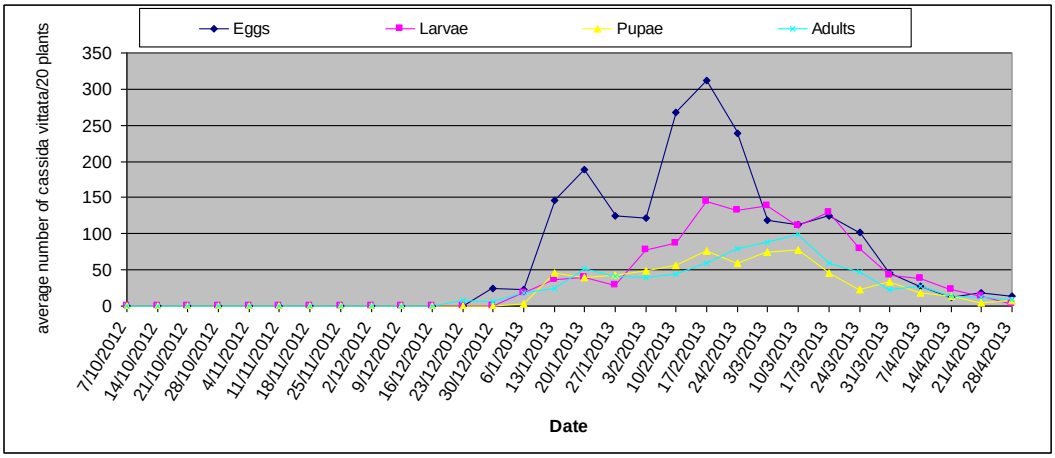


**Fig. 4. Population fluctuation of *C. vittata* immature and adult during the period ranged between 7th October 2012 and 27th April 2013.**

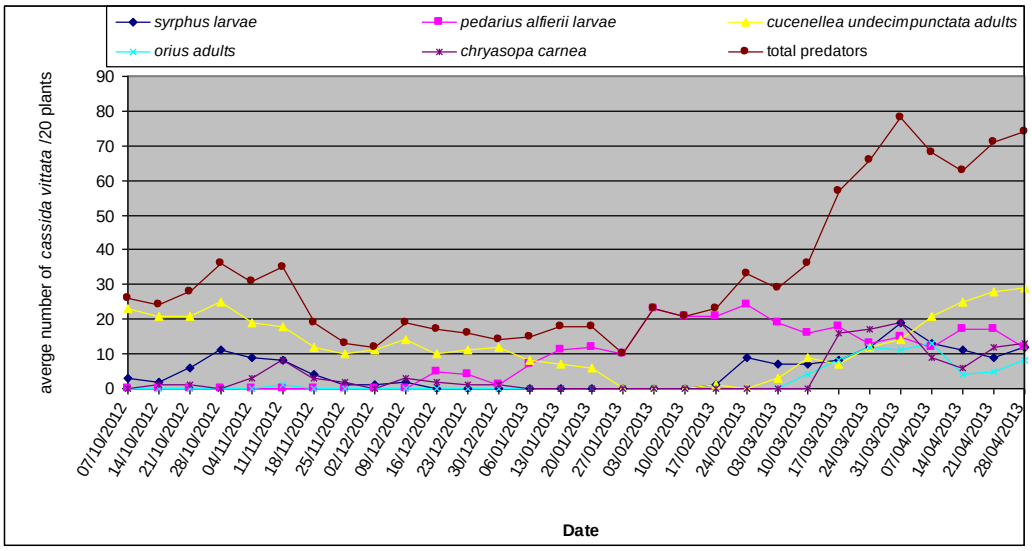


**Fig. 5. Population fluctuation of *C. vittata* predators during the period ranged between 7th October 2012 and 27th April 2013**

Moreover the role predators were recorded; five predators were fund on the tested crop. The important one of the predators was *C. undecimpunctata* adults which observed with high number and for long time. *C. undecimpunctata* was beginning with high numbers and decreased till its disappeared during February then the population increased till it recorded the highest number 29 indveduall/20 plants in the last week of survey period. *P. alfierii* larva was the second predator, observed for first time after 19 weeks of the beginning of survey. *P. alfierii* recorded in high number during February and recorded between 21 and 24 indeveduall/20 plants. *C. carnea* recorded as a few number during the survey period from October to December and disappeared in January and February. *C. carnea* increased population at the last period of survey recorded the highest number of 17 indveduall/20 plants in 24th march. *Syrphus sp* larvae was recorded in 1st

week of survey and kept its population in a few number till its disappeared after 10 weeks of the beginning of survey till it appeared again in 17th February. *orius sp* adult was recorded in the second week of march and recorded the highest number 13 individuall/20plants in 7th April. El-Dessouki *et al*. (2014) reported that the sugar beet plants were harbored three main insect species i.e. *Cassida vittata*) Vill; *Pegomyia mixta* Vill and *Scrobipalpa ocellatella* Boyd. Four predatory species were associated with the three insect pests *i.e. C. undecimpunctata* L.; *Scymnus* sp., *Paederus alfierii* Koch. and *Chrysoperla carnea* (Steph.). The date nearly seemlier with Al-Habshy, 2013, who reported that, seasonal fluctuations of the population density of *C. vittata* indicated that it has three peaks during the two seasons. The first one peak was noticed on 4th week of March, 2010 / 2011 and 1st week March of, 2011/2012 with total number of 230 larvae / sample and 126 larvae / sample for the two seasons, respectively. The second peak was occurred on 3rd week of April, 2010 / 2011 and 2nd week of April, 2011/2012 with total number of 151 larvae / sample and 133 larvae / sample for the two seasons, respectively. The third peak was observed on 3rd week of May, 2010 / 2011 and, 2011/2012 with total number of 104 larvae / sample and 181 larvae / sample for the two seasons, respectively. Sherief 2013, recorded also in Egypt during two successive growing seasons (2008/2009 and 2009/2010). In the first season, two peaks of *Cassida vittata* larvae and adult represented by 587, 695 larvae/50 plants and 243, 240 adult/50 plants, respectively. While, in the second season, two peaks for larvae were recorded and represented by 664, 2250 larvae/50 plants respectively. In case of adult stage, four peaks were recorded and represented by 64, 216, Sherief 2013, recorded also About natural enemies *Coccinella undecimpunctata* and *Chrysoperla Carnea* appeared in November, 2008/2009 and 2009/2010 but *Paederus alfierii* was observed during January in both seasons. The peaks of the studied predacious insects occurred in February, of the first season almost similar trend was obtained during the second season of study and represented by 270, 522, 132, 159, 302 and 395 predacious, respectively. 420 and 616 adults/50 plants, respectively. Youssef (1994) reported three distinct peaks of *P. alfierii*, two peaks of coccinellid predators and two peaks of *chrysopa carnea* were recorded in September. Shalaby (2001) observed that the population density of coccinellids was high during March, April and May, after that he also found that population density of *C. carnea* was the highest in September plantation. Salama and Elnagar 1992, observed that, population pattern indicates that the insect has a single annual generation, occurring during March/May on sugar beet plantation in Egypt

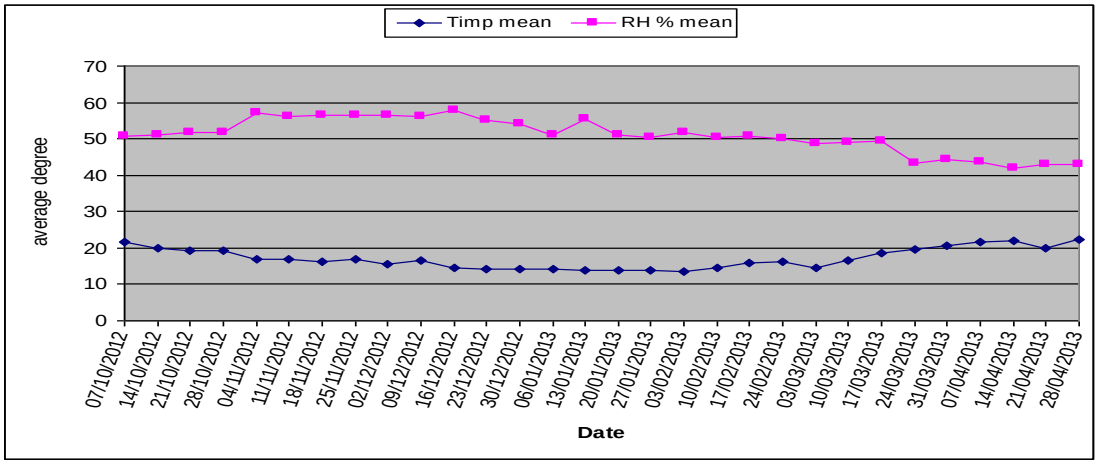


**Fig. 6. The fluctuated timp. and RH during the period ranged between 7th October 2012 and 27th April 2013**

**2-Monthly density of *C. vettata* stages during two successive seasons 2011/12 and 2012/13.**

Table (1) reflected that, the average monthly average numbers of *C. vettata* during survey period, *C. vettata* stages disappeared during October and November in the tested two seasons 2011/12 and 2012/2013. The results indicated also in season 2011/12 significant deference between each of (December & April) and (January, February & March) for *C. vettata* eggs and the highest number of 197.48±0,27 individual/ 20 plants was recorded in march . In the same season larvae, pupae and adults density observed significant deference at all months with the highest numbers of 115.83±0.16, 27.85±0.37 and 36.80±0.18 individual/ 20 plants in March, February and January respectively. In the second season 2012/2013 as shown in table (1), at all months *C. vettata* eggs appeared and the population observed no significant deference between all months except December and April. Moreover in the second season, *C. vettata* larvae, pupae and adults numbers indicated significant deference at all months except February and March. *C. vettata* in all stages observed high numbers in season 2012/2013 comparative with season 2011/2012.

**Table 1. Monthly average numbers of *C. vettata* stages during the two successive seasons 2011/12 and 2012/13 at El Beheira Governorate.**

| Month | 2011/12 | | | | 2012/13 | | | |
|---|---|---|---|---|---|---|---|---|
| | Eggs/20 plant ± S.E | Larvae/20 plant ± S.E | Pupae/20 plant ± S.E | Adults/20 plant ± S.E | Eggs/20 plant ± S.E | Larvae/20 plant ± S.E | Pupae/20 plant ± S.E | Adults/20 plant ± S.E |
| Oct. | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{d}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{d}$±0.00 |
| Nov. | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{d}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $0.00^{d}$±0.00 |
| Dec. | $2.79^{b}$±19.10 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $1.45^{d}$±4.51 | $3.09^{c}$±0.0.70 | $0.00^{c}$±0.00 | $0.00^{c}$±0.00 | $1.75^{d}$0.92 |
| Jan | $178.90^{a}$±0.30 | $39.25^{b}$±0.46 | $27.75^{a}$±0.37 | $36.80^{a}$±0.18 | $120.35^{b}$±0.45 | $30.60^{b}$±0.56 | $32.58^{b}$±0.40 | $34.15^{bc}$±0.46 |
| Feb. | $165.65^{a}$±0.32 | $96.15^{a}$±0.19 | $27.85^{a}$±0.37 | $21.70^{b}$±0.30 | $207.25^{a}$±0.26 | $110.15^{a}$±0.16 | $60.35^{a}$±0.22 | $55.43^{ab}$±0.28 |
| Mar. | $197.48^{a}$±0,27 | $115.83^{a}$±0.16 | $15.43^{ab}$±0.66 | $11.78^{c}$±0.55 | $107.80^{b}$±0.51 | $110.08^{a}$±0.16 | $56.35^{a}$±0.23 | $70.10^{a}$±0.22 |
| Apr. | $11.00^{b}$±4.84 | $24.00^{bc}$±0.76 | $12.30^{bc}$±0.83 | $17.25^{c}$±0.38 | $17.60^{c}$±3.11 | $19.70^{bc}$±0.87 | $10.90^{c}$±1.20 | $15.85^{cd}$±0.98 |
| L.S.D 5% | 79.09 | 27.06 | 15.21 | 9.71 | 81.21 | 25.45 | 19.47 | 23.18 |

On the other hand as shown in table (2), the monthly average numbers of the role predators reflected that, highest numbers were recorded for *C. undecimpunctata* adults and observed at al survey months in the tested two seasons. *Serphus sp* numbers was recorded $13.00^{a}$±0.15 indvedwal/20 plants in March 2012 and 2013 in significant deference with all survey month. *P. alfierii* not observed in the first and the second month at each tested season, but it observed with the highest numbers in February. *orius sp* and *C. carnea* were recorded the highest numbers in April in each season.

**Table 2. The monthly average numbers of the role predators on sugar beet during the two successive seasons 2011/12 and 2012/13 at , El Beheira governorate**

| month | 2011/12 | | | | | 2012/13 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Serphus sp larvae± S.E | pedarius alfierii larvae± S.E | C. undecimpunctata adults± S.E | Orius sp± S.E | C. carnea± S.E | Serphus sp larvae± S.E | P. alfierii larvae± S.E | C. undecimpunctata adults± S.E | Orius sp± S.E | C. carnea± S.E |
| Oct. | $5.50^{c}$±0.35 | $0.00^{e}$±0.00 | $22.00^{b}$±0.19 | $1.50^{b}$±1.48 | $1.00^{c}$±3.36 | $5.50b^{c}$±0.56 | $0.00^{e}$±0.00 | $22.50^{a}$±0.15 | $0.00^{b}$±0.00 | $0.50^{c}$±0.09 |
| Nov. | $1.75^{d}$±1.09 | $0.00^{e}$±0.00 | $14.25^{c}$±0.29 | $0.50^{b}$±4.44 | $4.75^{bc}$±0.71 | $5.50^{bc}$±0.56 | $0.00^{e}$±0.00 | $14.75^{b}$±0.23 | $0.25^{b}$±0.15 | $4.00^{bc}$±1.01 |
| Dec. | $0.00^{d}$±0.00 | $2.25^{e}$±0.90 | $11.13^{cd}$±0.37 | $0.00^{b}$±0.00 | $0.25^{c}$±13.44 | $0.75^{d}$±4.12 | $1.88^{e}$±1.02 | $11.63^{bc}$±0.29 | $0.00^{b}$±0.00 | $1.50^{c}$±2.70 |
| Jan | $0.00^{d}$±0.00 | $8.50^{d}$±0.24 | $4.00^{ef}$±1.03 | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 | $0.00^{d}$±0.00 | $10.00^{d}$±0.19 | $5.25^{d}$±0.64 | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 |
| Feb. | $2.75^{d}$±0.69 | $22.00^{a}$±0.09 | $0.25^{f}$±16.42 | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 | $2.50^{cd}$±1.24 | $22.25^{a}$±0.09 | $0.25^{e}$±13.36 | $0.00^{b}$±0.00 | $0.00^{c}$±0.00 |
| Mar. | $10.75^{b}$±0.18 | $16.38^{b}$±0.12 | $8.00^{de}$±0.51 | $4.13^{a}$±0.54 | $6.13^{b}$±0.55 | $9.38^{ab}$±0.33 | $16.75^{b}$±0.11 | $8.00^{cd}$±0.42 | $5.88^{a}$±0.43 | $8.50^{ab}$±0.48 |
| Apr. | $13.00^{a}$±0.15 | $13.00^{c}$±0.16 | $28.75^{a}$±0.14 | $6.50^{a}$±0.34 | $11.75^{a}$±0.29 | $11.25^{a}$±0.27 | $14.50^{c}$±0.13 | $25.75^{a}$±0.13 | $7.50^{a}$±0.34 | $10.00^{a}$±0.40 |
| L.S.D 5% | 2.83 | 3.01 | 6.10 | 3.29 | 4.99 | 4.59 | 2.83 | 4.96 | 3.77 | 6.01 |

In table (3). Data showed the effect of each one of temperature and related humidity on *C. vettata* stages number which appearance as Correlation value , simple and multi regression equation. Temperature was effected significant negative on *C. vettata* in the first season more than in the second while related humidity not observed any effect in the pest population. Table (4) showed that, *C. vettata* don't significant simple affected with each one of the observed predators except *P. alfierii* larvae which observed high significant effect on *C. vettata* eggs in season 2011/12. However, both correlations in the two seasons were not significant except *P. alfierii* which effected on the eggs (table 4). On the other hand, as shown in table (5), *P. alfierii* larvae and *C. undecimpunctata* adul were significant affected with temperature and relative humidity in season 2011/20, while all predators don't observed any response in the tested seasons. *Shalaby*,2014 reported that, The correlation between *C. carnea* population and temperature was negative, but in case of relative humidity was positive. Table (5) reflected also, Relative humidity and the temperature effete on *C. undecimpunctata* in season 2011/12 this effect not observed in the second season.

**Table 3 . Correlation value , simple and multi regression equation between C. vettata and (temperature & relative humidity)**

| 2011/12 | | 2012/13 | |
|---|---|---|---|
| **Linear regression equation for temperature** | **Correlation value** | **linear regression equation for temperature** | **Correlation value** |
| Eggs = 444 - 21.9 Timp. | -0.64** | Eggs = 281 - 13.0 Timp. | -0.4* |
| Larvae = 190 - 8.95 Timp. | -0.54** | Larvae = 143 - 6.27 Timp. | -0.35* |
| Pupae = 57.1 - 2.70 Timp. | -0.54** | Pupae = 96.8 - 4.45 Timp. | -0.46* |
| Adults = 55.0 - 2.53 Timp. | -0.53** | Adults = 101 - 4.57 Timp. | -0.43* |
| Linear regression equation for related humidity | | linear regression equation for related humidity | |
| Eggs = - 458 + 9.94 RH % | 0.31 | Eggs = -227 – 3.20 RH % | -0.17 |
| Larvae = 27 + 0.23 RH % | 0.02 | Larvae = 212 - 3.41 RH % | -0.33 |
| Pupae = - 42.4 + 1.01 RH % | 0.21 | Pupae = 101 – 1.55 RH % | -0.27 |
| Adults = - 45.6 + 1.08 RH % | 0.24 | Adults =135 - 2.16 RH % | -0.35* |
| multi regression equation | | multi regression equation | |
| Eggs = 982 - 27.9 Timp. - 8.15 RH % | | Eggs =897 - 21.2 Timp. - 9.41 RH % | |
| Larvae = 890 - 16.7 Timp. – 10.6 RH % | | Larvae = 605 - 12.4 Timp. - 7.05 RH % | |
| Pupae = 151 – 3.75 Timp. – 1.42 RH % | | Pupae = 348 - 7.78 Timp. - 3.84 RH % | |
| Adults = 125 - 3.31 Timp. – 1.07 RH % | | Adults = 409 - 8.64 Timp. - 4.70 RH % | |

**Table 4. Correlation value , simple and multi regression equation between *C. vettata* and the role of associated predators**

| 2011/2012 | | 20012/2013 | |
|---|---|---|---|
| **Linear Regression equation** | **Correlation value** | **linear Regression equation** | **correlation value** |
| Eggs = 77.4 - 0.28 *S. corollea* larvae | -0.016 | Eggs = 75.8 - 2.35 *S. corollea* larvae | -0.137 |
| Larvae = 26.0 + 2.67 *S. corollea* larvae | 0.311 | Larvae = 32.3 + 1.12 *S. corollea* larvae | 0.119 |
| Pupae = 11.6 + 0.018 *S. corollea* larvae | 0.007 | Pupae = 22.2 + 0.019 *S. corollea* larvae | 0.004 |
| Adults = 12.7 - 0.044 *S. corollea* larvae | -0.018 | Adults = 22.5 + 0.50 *S. crolea* larvae | 0.089 |
| Eggs = 11.2 + 7.16 *P. alfierii* adults | 0.595*** | Eggs = - 3.8 + 7.29 *P. alfierii* adults | 0.685 |
| Larvae = - 4.35 + 4.84 *P. alfierii* adults | 0.831 | Larvae = - 6.92 + 4.86 *P. alfierii* adults | 0.83 |
| Pupae = 1.30 + 1.15 *P. alfierii* adults | 0.653 | Pupae = - 2.09 + 2.63 *P. alfierii* adults | 0.821 |
| Adults = 4.15 + 0.920 *P. alfierii* adults | 0.548 | Adults = - 0.26 + 2.73 *P. alfierii* adults | 0.788 |
| Eggs = 161 - 6.73 *C. undecimpunctata* adults | -0.665 | Eggs = 149 - 6.81 *C. undecimpunctata* adults | -0.665 |
| Larvae = 70.7 - 2.49 *C. undecimpunctata* adults | -0.507 | Larvae = 82.3 - 3.52 *C. undecimpunctata* adults | -0.624 |
| Pupae = 20.1 - 0.667 *C. undecimpunctata* adults | -0.452 | Pupae = 48.8 - 2.11 *C. undecimpunctata* adults | -0.683 |
| Adults = 19.4 - 0.551 *C. undecimpunctata* adults | -0.39 | Adults = 50.9 - 2.06 *C. undecimpunctata* adults | -0.618 |
| Eggs = 85.8 – 5.17 *Orius sp* adults | -0.162 | Eggs = 65.6 - 0.88 *Orius sp* adults | -0.04 |
| Larvae = 33.9 + 2.91 *Orius sp* adults | 0.189 | Larvae = 33.1 + 2.27 *Orius sp* adults | 0.186 |
| Pupae = 11.8 - 0.067 *Orius sp* adults | -0.015 | Pupae = 21.3 + 0.47 *Orius sp* adults | 0.07 |
| Adults = 12.3 + 0.110 *Orius sp* adults | 0.025 | Adults = 22.4 + 1.21 *Orius sp* adults | 0.168 |
| Eggs = 97.6 - 6.07 *C. carnea* larvae | -0.321 | Eggs = 72.1 - 2.15 *C. carnea* larvae | -0.139 |
| Larvae = 37.5 + 0.54 *C. carnea* larvae | 0.059 | Larvae = 36.2 + 0.48 *C. carnea* larvae | 0.056 |
| Pupae = 12.3 – 0.180 *C. carnea* larvae | -0.065 | Pupae = 24.1 - 0.460 *C. carnea* larvae | -0.099 |
| Adults = 12.9 – 0.124 *C. carnea* larvae | -0.047 | Adults = 25.6 - 0.151 *C. carnea* larvae | -0.03 |
| multi regression equation | | multi regression equation | |
| Eggs = 90.3 + 5.67 (S. c) larvae+ 4.56(P. a) larvae- 4.80 (C. u) adul - 1.35(O.sp)- 5.86 (C.c) | | Eggs =68.9 + 1.34 (S. c). larvae + 5.46 (P. a) larvae- 4.29 (C. u.) adul - 0.44(O.sp) - 2.02 (C.c) | |
| Larvae = 26.5 + 3.19 (S. c) larvae + 3.01 (P. a) larvae - 2.34 (C. u) adul + 0.33 (O.sp)- 0.38 (C.c) | | Larvae = 31.8 + 3.24 (S. c) larvae +3.20(p. a) larvae - 2.85 (C. u.) adul + 0.76 (O.sp) - 1.51(C.c) | |
| Pupae = 3.44 - 0.412 (S. c) larvae + 1.32 (P. a) larvae- 0.034 (C. u.) adul - 0.78 (O.sp)+ 0.070 (C.c) | | Pupae = 20.7 + 1.56 (S. c) larvae+ 1.84 (P. a) larvae - 1.48 (C. u.) adul + 1.01 (O.sp) - 1.84 (C.c) | |
| Adults = 6.84 - 0.501 (S. c) larvae + 1.02 (P. a) larvae - 0.077 (C. u.) adul - 0.12 (O.sp) + 0.037 (C.c) | | Adults = 24.9 + 1.99 (S. c) larvae + 1.66 (P. a) larvae - 1.68 (C. u.) adul + 2.44 (O.sp) - 2.52 (C.c) | |

**(S. c) =*S. corollea*, (P. a) =*P. alfierii*, (C. u) =*C. undecimpunctata*, (O.sp)=*Orius sp*, (C.c)=*C. carnea***

Sherief, 2013 revealed that the correlation coefficient between total numbers of larvae and adult of C. *vittata* and maximum, minimum temperature was positive and high significant (r1= 0.841**, 0871**), (r2= 0.838**, 0.878**), in the first season respectively, and it was (r1= 0.593**, 0.793**), (r2= 0.583**, 0.872**) in the second season, respectively. Whereas, it was negative and high significant with minimum relative humidity (r4=-0.527**, -0.553**), (r4=-0.581**, -0.568**), respectively during the two seasons. El-Dessouki *et al.* 2014 observed that. *C. undecimpunctata*, Scymnus spp. And *P. alfierii* on sugar-beet plants observed after of *P.* mixta and *S. ocellatella* appearance and most probably these predators were fed on other hosts before attacking these insect pests such as aphids and lepidopterous larvae.

**Table 5. Correlation value , simple and multi regression equation between the role predators and (temperature mean & relative humidity mean)**

| 2011/12 | | 2012/13 | |
|---|---|---|---|
| **linear regression equation for temperature** | **Correlation value** | **linear regression equation for temperature** | **Correlation value** |
| *S. crolea* larva = - 1.35 + 0.378 Timp. | 0.196 | *S. crolea* larva = - 12.9 + 1.08 Timp. | 0.569 |
| *P. alfierii* adult = 35.4 – 1.57 Timp. | -0.551** | *P. alfierii* adult = 18.2 - 0.534 Timp. | -0.175 |
| *C. undecimpunctata* adult = - 32.3 + 2.67 Timp. | 0.79*** | *C. undecimpunctata* adult = - 32.7 + 2.71 Timp. | 0.853 |
| *Orius sp* adult = - 1.97 + 0.231 Timp. | 0.214 | *Orius sp* adult = - 7.83 + 0.600 Timp. | 0.41 |
| *C. carnea* larva = - 4.86 + 0.501 Timp. | 0.277 | *C. carnea* larva = - 9.79 + 0.818 T Timp. | 0.389 |
| Total predators = - 5.1 + 2.21 Timp. | 0.295 | Total predators = - 45.0 + 4.67 Timp. | 0.612 |
| *S. crolea* larva = 74.4 – 1.29 RH % | 0.196 | *S. crolea* larva = 41.9 - 0.721 RH % | -0.652 |
| *P. alfierii* adult = 11.2 - 0.040 RH % | -0.551** | *P. alfierii* adult = 62.9 - 1.05 RH % | -0.593 |
| *C. undecimpunctata* adult = 137 - 2.32 RH % | 0.79*** | *C. undecimpunctata* adult = 40.8 - 0.554 RH % mean | -0.3 |
| *Orius sp* adult = 37.3 - 0.659 RH % | 0.214 | *Orius sp* adult = 34.2 - 0.629 RH % | -0.739 |
| *C. carnea* larva = 63.0 - 1.11 RH % | 0.277 | *C. carnea* larva = 40.6 - 0.720 RH % | -0.588 |
| Total predators = 323 – 5.41 RH % | 0.295 | Total predators = 220 - 3.68 RH % | -0.828 |
| multi regression equation | | multi regression equation | |
| *S. crolea* larva = 130 - 1.08 Timp. - 1.99 RH % | | *S. crolea* larva = 22.5 + 0.612 Timp. - 0.541 RH % | |
| *P. alfierii* adult = 168 - 3.04 Timp. – 2.01 RH % | | *P. alfierii* adult = 124 - 1.94 Timp. - 1.62 RH % | |
| *C. undecimpunctata* adult = 41.2 + 1.86 Timp. – 1.11 RH % | | *C. undecimpunctata* adult = - 53.8 + 2.98 Timp. + 0.322 RH % | |
| *Orius sp* adult = 62.1 - 0.480 Timp. - 0.971 RH % | | *Orius sp* adult = 31.9 + 0.073 Timp. - 0.607 RH % | |
| *C. carnea* larva = 93.2 - 0.586 Timp. – 1.49 RH % | | *C. carnea* larva = 32.4 + 0.259 Timp. – 0.644 RH % | |
| Total predators = 495 - 3.33 Timp. - 7.58 RH % | | Total predators = 158 + 1.99 Timp. - 3.09 RH % | |

## REFERENCES


Al-Habshy, A. Z. N. (2013): The economic injury level of *Cassida vittata* (vill.) on sugar beet plnts. Egypt. Acad. J. Biolog. Sci., 6(2): 159 – 168

Ali, F. A., M. A. Samy, F. E. El-Adl and S. M. Ibrahim (1993): Effect of planting dates on the infestation ration of the main insect in sugar-beet fields. J. Agric. Sci., Mansoura Univ., 18 (6): 1805- 1812.

Amin, A. H.; A. Helmi and S. A. El-Serwy (2008): Ecological studies on sugar beet insects at Kafr El-Sheikh Governorate, Egypt. Egypt J. Agric. Res., 86 (6): 2129 -2139.

El-Agamy, F. M., S. M. I. Metwally, R. El-Sufty and A. Youssef. (1996): The relationship between population fluctuations of some important insect pests of sugar-beet and their insect predators at Kafr El-Sheikh Region. J. Agric. Res., Tanta Univ., 22(1): 69-76.

El-Dessouki, S.A.; S.M. EI-Awady; K.A.M.H. El-Khawass; A.H. Mesbah 2014: Population fluctuation of some insect pests infesting sugar beet and the associated predatory insects at Kafr El-Sheikh Governorate: Ann. Agricu. Scie. (2014), 59(1), 119-123

El-Khouly, M. I. I. (1998): Ecological studies and control of the tortoise beetle, Cassida vittata Villers in sugar beet ecosystem. Ph. D. Thesis, Fac. Agric, Al-Azhar Univ., 183 pp.

El-Khouly, M. I. I. (2006): Population Fluctuations of the Beet Fly, *Pegomyia mixta* Vill. and the tortoise beetle. *Cassida vittata* (Vill) in relation to certain associated natural enemies in sugar beet fields at Kafr El-Sheikh Governorate, Egypt. Egyptian j. biolo. pest control, 16(1): 25-28.

Fouad, H. A. M. (2011): Control some pests infesting sugar beet in Sharkia Governorate. M. Thesis, Fac. Agric, Mansoura Univ., 172 pp.

Golden, C.H. (1960): Methods of statically analysis. M.c. Graw Hill, London. Guirguis, G. Z. (1985): Studies on certain insects attacking sugar-beet in Western Desert, Egypt. Ph. D. Thesis, Fac. of Agric, Menoufiya Univ., 277 pp.

Hellal, F.A., Taalab, A. S. and Safaa, A. M. (2009): Influence of nitrogen and boron nutrition on nutrient balance and Sugar beet yieldgrown in calcareous Soil: Ozean J. Appl. Scie. 2(1), 1-10

Mesbah, A. H. (1991): Ecological and biological studies on parasites and predators of some insects at Kafr El-Sheikh Region. M. Sc. Thesis, Fac. Agric. Tanta Univ., 127 PP.

Mousa, E. A. M. (2005): Studies on sugar beet main insects and their safety control methods. Ph. D. Thesis, Fac. Agric, Mansoura Univ., 302 pp.

Salama R. A. K. and S. Elnagar (1992): The tortoise beetle, *Cassidavittata* Vill. (Col., Chrysomelidae) ,a possible pest of sugar beet plantations in Egypt. J. Appl. Entomol.. (113), 1-5: 88–92.

Shaheen, F. A. H. (1992): Efficiency of field spray insecticides against some sugar beet pests, in Relation to their Effect on yield And sugar content. J. Agric. Sci. Mansoura. Univ. 17(11): 3642-3647.

Shalaby, G. A. M. (2001): Ecological studies on some important sugar beet pests and natural enemies and their control. Ph. D. Thesis, Fac. of Agric, Kafr El-Sheikh, Tanta Univ., 141 pp.

Sherife, E. A. H., A. A. A. Said, F. A. H. Shaheen and H. A. M. Fouad (2013): population fluctuation of certain pests and their associated predator insects on sugar beet in Sharkia Governorate, Egypt. Egypt. J. Agric. Res., 91 (1): 139-150

Youssef, A. E. 1994. Studies on certain insects attacking sugar beet. Ph. D. Thesis, Fac. of Agric, Kafr El-Sheikh, Tanta Univ., 134 pp.

## الكثافة العددية لحشرة خنفساء البنجر (*Cassida vittata*, Vill. (Coleoptera: Chrysomelidae والمفترسات الموجودة على بنجر السكر فى محافظة البحيرة

**سلامه ابراهيم عسكر**
**كلية الزراعة- جامعة دمنهور**

اجريت الدراسة في ثلاثة مراكز هي المحمودية ودمنهور ورشيد من مراكز محافظة البحيرة- مصر خلال موسمين ٢٠١٢/٢١١ و٢٠١٣/٢٠١٢. تحت ظروف المناخ الحقلي ظهرة الحشرة الكاملة لخنفساء البنجر بأعداد ضئيلة في اخر اسبوع من شهر ديسمبر في محصول البنجر بينما ظهر طور البيضة بعد ظهور الحشرات الكاملة بأسبوع. اظهرت النتائج تواجد خنفساء البنجر لأعداد اكثر في موسم ٢٠١٣/٢٠١٢ مقارنة بالأعداد في موسم ٢٠١٢/٢٠١١. على الجانب الاخر وجد فقط خمس انواع من المفترسات الحشرية في محصول البنجر خلال فترة الحصر. المفترس ابو العيد ذو الاحد عشرة نقطه كان المفترس السائد والاكثر انتشارا حيث تواجد بأعداد كثيرة لفتره زمنية طويلة. وكان لدرجة الحرارة تأثير إيجابي على تعداد حشرة خنفساء البنجر في الموسم الاول عن الموسم الثاني بينما الرطوبة النسبية لم يكن لها أي تأثير على تعداد خنفساء البنجر.