Efficiency of some natural enemies against Ephestia cautella walk

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ABSTRACT

Many insect pests attacking date fruits, among the most important of these insect pests Ephestia cautella which attacks stored dates causing great loss, therefore laboratory studies were carried out to evaluate the role of some natural enemies against eggs and larvae of E.cautella. Data show that release of Chrysoperla carnea larvae on E.cautella eggs reduced the percent of emerged adults to 99.2 %, release of Trichogramma evanscens on E.cautella eggs reduced the percent of emerged adults to 98.6% and release of Bracon hebetor on E.cautella larvae reduced the percent of emerged adults to 98%

Key words: Dates - *Ephestia* – natural enemies.

INTRODUCTION

From the estimated 120 million date palms in the world, over two-thirds are in Arab countries (FAO, 1982). Arab countries possess 70% of the 120 million world's date palms and are responsible for 67% of the global date production. Unfortunately, the date palms grown in the Arab region are under threat of diseases, pests, environmental changes and socio-economic factors. Date palm trees declined in the traditional growing areas. As much as 30% of production can potentially be lost as a result of pests and diseases. Almond moth, *Ephestia cautella* (Walker) is a major pest of stored dates {In Egypt, Gough (1917), Hammad et al. (1966)}, In Iraq, Hussain and Jafar (1966), { In Egypt, Saleh (1974), Abdel Salam and El-Saeady (1982), Ali et al. (2003),and Metwalley et al. (2007)} . Natural enemies has an important roles in supressing this pest, predator, *Chrysoperla carnea* (Steph.) larvae against *Ephestia* eggs, The external larval parasitoid *Bracon hebetor* Fay. (Hymenoptera, Braconidae), against *Ephestia* larvae { Hammad et al. (1982), Cline *et al.,*(1984); Gul and Gulel,(1995), Darwish *et al.,*(2003) and Hameed et al (2010))}and Parasitoid *Trichogramma evanescens* Westwood (Hymenoptera:Trichogrammatidae) against *Ephestia* eggs.{ Lewis and Redlinger (1969), Brower (1983), Brower (1984) Bakri (2008).

The objective of this work is studying the effect and efficiency of Chrysoperla carnea Stephens larvae against Ephestia cautella eggs. Moreover studying the effect and efficiency of Trichogramma evanescens against Ephestia cautella eggs and study the effect and efficiency of Bracon hebetor against Ephestia cautella larvae.

MATERIALS AND METHODS

1 - Efficiency of Ch. carnea Staph. Larvae against E.cautella eggs

- Rearing of Ch. carnea were carried out at the Chrysopa Mass Rearing Unit, Faculty of Agriculture, Cairo University. Culture of *Ch. carnea* larvae were reared on *E. kuehnilla* eggs.
- Dates kept under freeze conditions (Gharib and El-Lakwah, 2007) for two days to kill any insect stages inside dates, then it was put in the plastic jars (30 dates/ jar) under constant laboratory conditions. (Temperature 25±2 degree centigrade & 65% ± 5 R.H.).
- The dates were artificially infested by fresh eggs of *Ephestia cautella* (1000 eggs/jar),
- 10 larvae (2nd larval instar) of *Ch. Carenea* were released in each jar except the control. Each jar was covered with muslin. The experiment consisted of 3 replicates.
- Observations recorded on behaviour and development of *Ch. carnea* larvae and numbers of emerged *E. cautella* adults were recorded. Emergence

percentage (*E. cautella*) and reduction% by (*Ch. carenea*) were determined by using Abbott's formula (Abbott, 1925) to correct mortality%. (Mahfouz and Abou Abou El-Ela, 2011).

$$\text{Mortality\%} = \left(\frac{P - P0}{100 - P0} \right) \times 100$$

Where: P = the mortality per cent of treatment, P0 = the mortality per cent of control.

2- Efficiency of T. evanescens against E. cautella eggs

- Rearing of T. evanescens were carried out at the Chrysopa Mass Rearing Unit, Faculty of Agriculture, Cairo University. Culture of T. evanescens were reared under laboratory conditions on E.kuehnilla eggs.
- Dates (semi dry) were kept under freeze conditions for two days to kill any insect stages inside dates, then it was placed in four plastic jars. Dates artificially infested by E. cautella fresh eggs (1000 eggs/jar) under laboratory conditions. (Temperature 25±2 degree centigrade & 65% ± 5 R.H.)
- The cards (1x1 cm) of T. evancses were put in each jar except the control.
- Each jar was covered with muslin for prevents any parasites from entering. The experiment consisted of three replicates. Observations were recorded on behaviour; development and emergence of the T.evanescens by examining E. cautella eggs under binocular to observe black colour of the holes on the eggs caused by T. evanescens pupae. Newly emerged E. cautella adults were also recorded. Emergence percentage of E. cautella, reduction % by T. evancses and emergence percentage of T. evancses were determined.
- Abbott's formula was used to correct mortality % according to Mahfouz and Abou El-Ela (2011).

3 - Efficiency of B. hebetor against E. cautella larvae

- Bracon hebetor adult were obtained from Chrysopa Mass Rearing Unit, Faculty of Agriculture. Cairo University.
- Dates kept under freeze conditions for two days to kill any insect stages inside dates, and then it was placed in four plastic jars (30 dates / jar).
- The dates artificially infested by E. cautella 1st larval instar (50 Larva / jar) under laboratory conditions. (Temperature 25±2 degree centigrade & 65% ± 5 R.H.)
- After fifteen days, one newly emerging pair of Bracon hebetor was placed in each jar with honey droplets (except the control) and covered with muslin. The experiment consisted of three replicates.
- Observations were recorded on behaviour and development of the B. hebetor. Also, newly emerging E. cautella adults were recorded. Percentage of emergence of E. cautella, reduction % and percentage of emergence of B. hebetor were determined. Abbott's formula was used to correct mortality% (Mahfouz and Abou El-Ela, 2011).

RESULTS & DISCUSSION

1- Efficiency of Ch. carnea Staph. Larvae against E. cautella eggs

Data in Table (1) revealed the efficiency of Ch. carnea larvae against E. cautella eggs. After 30 to 45 days from artificial infested dates by E. cautella eggs., the percentage of adult emergence of E. cautella ranged from 0.1 to 0.2% with an average of 0.13±0.06% and reduction per cent ranged from 98.7 to 99.4% with an average of 99.2±0.4%. This is compared with untreated jar (control) where emerged adults of E. cautella percentage was 15.7% and mortality was 84.3%, where infestation and nutrition was observed outside and inside 30 dates fruits. Reduction% by of Ch. carnea larvae reached to 99.2±0.4%. Also there were nine Ch. carnea larvae reached to third nymph instar and only three of them reached the pupal stage. Statistical analysis showed that there were significant differences between treatments and the control.

These results indicated that Ch. carnea larvae had great influence on E. cautella eggs.

2 - Efficiency of T. evanescens against E. cautella eggs

After 30 to 45 days from artificial infested dates by E. cautella eggs, the percentage of emerged adult of *E. cautella* ranged from 0.1 to 0.4% with an average of 0.3±0.2% from eggs treated by *T. evanescens* with reduction percentage ranged from 97.8 to 99.5% with an average of 98.6±0.9%. In case of control the percentage of emerged *E. cautella* adults was 18.3% with 81.7% reduction. Infestation and nutrition was observed outside and inside dates fruits. Emergence percentage of *T. evanescens* ranged from 36 to 72% with an average of 50.7±18.9%. Table (2).

Statistical analysis showed that there were significant differences between treatment and control.

These results indicated that T. evanescens adults had great influence on E. cautella eggs.

These results are in accordance with those reported by Bakri (2008), Brower (1983 and 1984).

Bakri (2008) found that one day old egg of E. cautella was the most suitable age for parasitoid T. evanescens at different rates followed by the two days old and the least suitable one was the three days old.

3 -Efficiency of Bracon hebetor against Ephestia cautella larvae

Data presented in Table (3) revealed the effect of Bracon hebetor on E. cautella 3rd-5th larval instar.

After 30 to 45 days from artificial infested dates by E. cautella eggs, the percentage of emerged adult of E. cautella ranged from 0 to 6% with an average of 2±3.5%, parasitism percentage (reduction %) of B. hebetor ranged from 94 to 100% with an average of 98±3.5%. In case of control, percentage of emerged E. cautella adults was 100% and zero mortality. Emergence percentage of B. hebetor ranged from 36 to 87% with an average of 66.7±27.02%.

Statistical analysis showed that there were significant differences between treatment and control

These results indicated that B. hebetor had great influence on of E. cautella larvae, especially on 3rd, 4th and 5th larval instars.

These results agreed with Dawood (1967) who reported that a braconid parasite, Microbracon hebetor Say., was recorded as an internal and external parasite of E. cautella. Also, Keever et al. (1985) reported that Bracon hebetor Say. is a gregarious ectoparasitoid and an important biological control agent of several Lepidopteran stored product pests due to its rapid growth and development rates.

All the previous results indicated that use of Ch. carnea larvae and T. evanescens adults in controlling E. cautella eggs, as well as use of B. hebetor in controlling E. cautella larvae may be useful as a part of an integrated tamr pest management program based on biological agents.

Statistical analysis showed that there were no significant differences between the three treatments (Ch. carnea larvae, T. evanescens and Bracon hebetor) in controlling E. cautella eggs and larvae where F value was 0.237 and P value >0.05 (Table 4).

Means in each columns followed by different letters are significantly different from each other at $p < 0.05$.

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Tables

Table (1): Efficiency of *Ch. carnea* (Staph.) Larvae against *E. cautella* eggs.

Treatments	Number of eggs	Number of *Chrysoperla carnea* larvae	Emerged *E cautella* adult%	Reduction%	T value	P Value
Means	1000	10	o.1-0.2 0.13±0.06	98.7- 99.4 99.2±0.4	31.9	p<0.05
Control	1000	0.0	15.7	84.3		

Table (2) : Efficiency of *T. evanescens* against *E. cautella* eggs.

Treatment	No. of host eggs	No. of *Trichogramma evanescens*	Emerged *E. cautella* adult%	Reduction %	Emerged *Trichogramma evanescens%*	T value	P value
Mean±S.E.	1000	Card (1× 1 cm) (500 eggs)	0.1 – 0.4 0.3±0.2	97.8-99.5 98.6±0.9	36 – 72 50.7 ±18.9	16.9	P<0.05
Control	1000	0.0	18.3	81.7			

Table (3): Efficiency of *B. hebetor* against *Ephestia cautella* larvae

Treatments	No. of host larvae	No. of *Bracon hebetor*	Emerged *E. cautella* adult%	Reduction%	No. of emerged *Bracon hebetor*	T value	p value
Mean±S.E.	50	2 (Male+female)	0 – 6 2±3.5	94 – 100 98±3.5	36 – 87 66.7±27.02	24.5	P<0.05
Control	50		100	0.0			

Table (4): Statistical variance between the three treatments (*Ch. carnea* larvae, *T. evanescens* and *Bracon hebetor*) in controlling *E. cautella* eggs and larvae.

Treatments	The natural enemies			F. value	P. value
	Ch. Carnea	*T. evanescens*	*B. hebetor*	0.237	P> 0.05
Reduction%	99.2±0.4 a	98.6±0.9 a	98±3.5 a		