USING *TRICHOGRAMMA EVANESCENS* AS BIOCONTROL AGENT AGAINST ALMOND MOTH, *EPHESTIA CAUTELLA* (WALKER) EGGS IN STORED DATES

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Abstract

The ability of the parasite, *Trichogramma evanescens* (Westw) for suppression of almond moth eggs of *Ephestia cautella* (Walk.) at three release rates and different depths of stored dates (edible fruits) under laboratory conditions was tested. The results indicated that percent parasitism was greater at all depths when approximately 300 *T. evanescens* wasps were released compared to release of only 100 *T. evanescens.* Meanwhile, parasitism rate was high (78.66 %) at date surface and this value decreased to 52.33, 25.66, 23.0 and 16.33 % at 5, 10, 15 and 20 cm depths, respectively, when used 200 host eggs of *E. cautella*. The results showed also on adverse relationship between host eggs depth and the rate of parasitism. Additionally, the highest release rate of the parasite was the most effective against the eggs of *E cautella* at All depths. These results indicated clearly the possibility of using the parasite *T. evanescens* for suppression of *E. cautella* - population in stored dates.

Key words: *T. evanescens, E. cautella*, biocontrol, depths, stored dates.

INTRODUCTION

The almond moth, *Ephestia cautella* (walk.) is primary pest in cereal based food processing facilities. Typically, control of the pest is undertaken by regular space treatment of infested areas with pesticide. This method is very expensive, as it requires the shut down of the factory and the interruption of the production on process.

Biological control is a very important component of an IPM program. It is an environmentally sound and effective means of reducing or mitigating pests and their effects through the use of natural enemies (predators, parasites and pathogens). Biological control is also relatively permanent, safe, economical and environment friendly (Debach, 1964) and (Hussain, 2008).

Trichogramma spp. are the most important eggs parasitoids of several Lepidopterous pests which widely used as biological control agents. These wasps lay

their eggs in the eggs of many moth species, thus killing the moth eggs (Smith, 1994), and also used as a parasitoid for stored product pests (Prozell *et. al.,* 1994).
The wasps are produced commercially which relatively inexpensive. When moth infestations are detected in the production facility, a mass release of wasps could be undertaken, the release would not require shut down of the production process (Prozell and Schoeller 1998).
The present study was designed to test the response of adult *T. evanescens* to the presence of almond moth eggs positioned at four depths among stored dates by evaluating percentage of host egg parasitism.

MATERIALS AND METHODS

Insects

The egg parasitoids of *Trichogramma evanescens* used in the study were obtained from Bollworms Research Department, Plant Protection Research Institute, A.R.C.The parasitoid was reared on *Ephestia cautella* eggs for one generation in the laboratory before use. *E. cautella* larvae were obtained from fallen date fruits at Faculty of agriculture farm, Cairo University, then reared on a diet consisting of ground wheat, sugar fine, dry yeast and glycerol (65: 10: 10:15 by weight, respectively) at 28 ± 1 ^{0}C and 65 ± 5 RH.

Collection of host eggs

The moths were put in glass cages with gauze lids (mesh width 2 mm). The cages were placed on glass Petri dishes, eggs laid by the moths were fallen through the gauze lids into the Petri dish and collected daily.

Preparation of egg cards

Sound and parasitoid eggs of *E. cautella* were glued on paper strips (2 cm^2. square each card) with different rates, three rates of 100,200 and 300 for the parasitoid and two rates of 100 and 200 for the host eggs

Parasite release

Approximately 300, 200 or 100 parasitoid eggs of *E. cautella* glued on the cards, 12 - 24 hrs before emergence of *T. evanescens* wasps, were put on dates surface inside the glass jars. Also sound host eggs of *E. cautella* (200 / or 100 eggs on cards) were inserted inside the dates at various depths (0, 5, 10, 15 and 20 cm) to investigate the effect of parasite population density and depth of host eggs inside stored dates on the parasitism rate of host eggs.

Test conditions

Experiments were conducted in the laboratory at 28 ± 1 ^{0}C and 65 ± 5 RH.. Tests were triplicated. Experiments were finished when wasps died. Rate of parasitism was determined by counting the number of host eggs which had turned black after 4-7 days.

Statistical analysis

The obtained results were statistically analyzed according to Fisher (1950) and Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

The results given in Table (1) and illustrated in (Fig 1) Showed that when, 100 *T. evanescens* were released, percent of parasitism averaged highest at 0 cm depth (78.66 %), since the parasitoids were released on the surface of the dates fruits. Data showed also that average parasitism decreased to (52.33, 25.66, 23.0 and 16.33 %) at 5, 10, 15 and 20 cm. depths, respectively. Percent of parasitism was greater at all depths when 300 *T. evanescens* were released (averaged 91.37, 85.33, 45.0, 38.66 and 36.0 % at 0, 5, 10, 15 and 20 cm. depths, respectively) than the rate of 100 *T. evanescens*. The effect of host egg depth on the number of eggs parasitized was highly significant. These results agree with Brower (1990) who proved that depth was the most important factors in influencing the numbers of host eggs parasitized, being more important than the release rate. A highly significant effect between release rate and number of eggs parasitized at each depth was detected (Table 1). Finally, significantly more eggs were parasitized in each depth at the 300 release rate than at the 100 release rate, meanwhile 200 release rate was intermediate effect.

The trend was the same in the 100 host egg parasitism (Table 2) and (Fig.2). The difference between a high and low release rate produced significantly greater egg parasitism at all four host egg depths. Overall the 300 release rate was much more effective than the 100 release rate.

At the surface at stored dates (0 cm) more host eggs were parasitized. The differences were not significant at (0 cm) in 100, 200 and 300 parasitoid release rate but there were significant at 10, 15 and 20cm depths and highly significant at 5 cm depth (Table 2) and (Fig. 2). These results agree with Lewis and Redlinger (1969), who stated that distribution of the parasite on the commodity were most effective on or near the surface where most eggs are laid. Schoeller and Prozell (2011), reported that inundative release of the eggs parasitoids are necessary and that effectiveness is reduced on thick cloth with long strand. *Trichogramma* release units have to be

placed directly on the cloth to be protected. The results and the findings of others (Knipling and MeGuire, 1968) indicate that mass rearing of *T. evanescens* may be efficacy for suppression of moth population in tamr fruits storage.

Our results indicated that, *T. evanescens* is very promising as biocontrol agent against the almond moth, *E. cautella* in stored dates.

Table 1. Parasitism % of *Trichogramma evanescens* on two hundred *E. cautella* eggs at three release rates and different depths between dates fruits.

Depths	**100 parasite**	**200 Parasite**	**300 parasite**	**F. value**	**L.S.D. 0.05**
0.0 Cm	78.66 b A	88.0 ab A	91.33 a A	*	9.96
5.0Cm	52.33 C B	70.33 b B	85.33 a A	**	10.75
10.0 Cm	25.66 b C	28.66 b C	45.0 a B	*	13.13
15.0 Cm	23.0 b CD	25.33 b D	38.66 a B	*	8.91
20.0 Cm	16.33 b D	19.66 b D	36.0 a B	**	9.48
F. value	***	***	***		
L.S.D. 0.05	8.85	6.57	12.47		

Means in each column followed by different letters are significantly different from each other at P **<** 0.05 **(Duncan's test)**

*Capital letters =Different Significant between various depths .

* Small letters = Different Significant between release rates .

Table 2. Parasitism % of *Trichogramma evanescens* on hundred *E. cautella* eggs at three release rates and different depths between dates fruits

Depths	**100 parasite**	**200 Parasite**	**300 parasite**	**F. value**	**L.S.D. 0.05**
0.0 Cm	87.33a A	91.66 a A	94.33 a A	NS	9.51
5.0 Cm	67.66 b B	88.0 a A	88.0 a A	***	9.53
10.0 Cm	30.33 b C	39.33 b B	52.0 a B	**	10.42
15.0 Cm	26.33 b CD	34..66 ab B	45.0 a B	**	16.54
20.0 Cm	18.0 c D	29.66 b B	40.0 a B	**	9.10
F. value	***	***	***		
L.S.D. 0.05	10.337	9.67	11.105		

Means in each column followed by different letters are significantly different from each other at P **<** 0.05 **(Duncan's test)**

*Capital letters =Different Significant between various depths .

* Small letters = Different Significant between release rates .

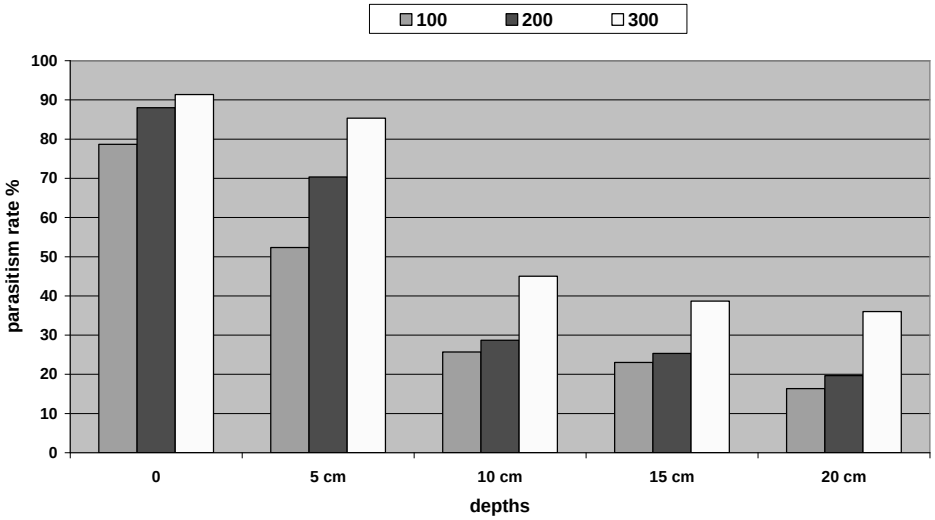

Fig. 1. Ability of *Trichogramma evanescens* to reach of *E. cautella* eggs (using two hundred eggs) at three release rates and different depths between dates fruits

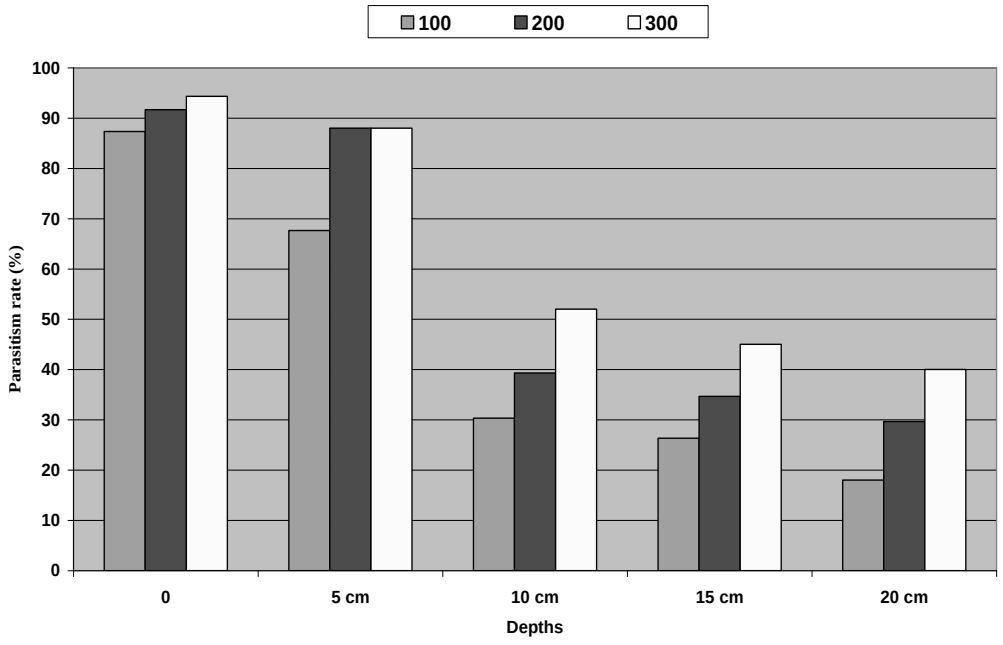

Fig. 2. Ability of Trichogramma evanescens to reach of E. cautella eggs (using hundred eggs) at three release rates and different depths between dates fruits

REFERENCES

1. Brower, H. John. 1990. Host locating ability of *Trichogramma pretiosum* (Riley) in inshell peanuts under laboratory conditions. J. Agric. Ent. 7 (4): 265-272.
2. Debach,p. 1964. Success, trends and future possibilities and biological control of pests and weeds. New-York Reinhold, pp : 673-713.
3. Duncan, D.B. 1955. Multiple rang and multiple F-test. (Biometrics, 11:1-42).
4. Fisher, R.A. 1950. Statistical methods for research workers. 11 Rev. Ed. Olive 4 r and Royd, London.
5. Hussain, H.B.H. 2008. Using some safe methods in controlling certain insect pests of stored dates. Ph.D. Thesis, Fac. Agric. Al-Azhar Univ.
6. Knipling, E.F. and Jr. MeGuire. 1968. Population models to appraise the limitations and potentialities of *Trichogramma* in host insect populations. USDA, Agric. Rec. Service Tech. Bull.et 1387: 44 pp.
7. Lewis, W. J. and L. M. Redlinger. 1969. Suitability of eggs of the almond Moth, *Cadra cautella* of various ages for parasitism by *T. evanescens.* Am. Entomol. Soc. Am. 62: 1482 – 1484.
8. Prozell, S., G. Wiedenman and S. A. Hassan. 1994. The egg parasitoid *Trichogramma evanescens* as a potential biological control agent against the Indian meal moth *Plodia interpunctella* (Lep. :Pyralidae). ((*Trichogramma* and other egg parasitoids)) 4th International Symposium :, Les Colloques de I 'INRA, 73:131-132.
9. Prozell, S. and M. Schoeller. 1998. Insect fauna of a bakery, processing organic grain and applying *T. evanescens*. Westwood. Integrated Protection of stored products IOBC Bulletin 21:39-44
10. Schoeller, M. and S. Prozell. 2011. Biological control of cultural heritage pest Coleoptera and Lepidoptera with the help of parasitoid Hymenoptera. J. of Entomol.o and Acarological Ser. 11. 43 (2):157-168.
11. Smith, S.M. 1994. Methods of timing of release of *Trichogramma* to control Lepidopteran pests. In: Weinberg, E.,Hassan,S.A.(Eds.) Biological control with egg parasitoid. CAB International, Biddles L td., Guildford and king' s Lymn, pp. 113-143.

استخدام طفيل التريكو جراما كعامل مكافحة حيوي ضد فراشة البلح العامري في البلح المخزون

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تم وضع بيض فراشة البلح العامري علي أعماق مختلفة داخل التمر المخزون وذلك تحت الظروف المعملية حيث تم وضع كروت البيض لفراشة البلح العامري بأعداد 100 ، 200 بيضة وذلك علي سطح التمر و علي أعماق مختلفة هي 5 ، 10 ، 15 ، 20 سم داخل ثمار التمر ثم تم وضع كروت الطفيل بمعدلات مختلفة 100 ، 200 ، 300 طفيل وذلك علي سطح ثمار التمر وذلك في نفس اليوم المتوقع لخروج الطفيل الكامل وذلك لتقدير النسبة المئوية للتطفل علي بيض فراشة البلح العامري.

ويمكن تلخيص النتائج المتحصل عليها فيما يلي:

النسبة المئوية للتطفل كانت أعلي في كل الأعماق وذلك عندما تم إطلاق 300 طفيل إذا ما قورنت بمعدل إطلاق 100 طفيل – النسبة المئوية للتطفل كانت أعلي عندما تم وضع كروت بيض الفراشة علي سطح التمر 78.66 % بينما انخفضت إلي 52.33 ، 25.66 ، 23، 16.33 % وذلك علي أعماق 5 ، 10 ، 15 ، 20 سم علي الترتيب وذلك عند وضع 200 بيضة للعائل.

وقد لوحظ نفس الاتجاه في النتائج عند استخدام المعدلات المختلفة للإطلاق في حالة استخدام 100 بيضة للعائل.

أظهرت النتائج أيضا أن الاختلاف بين أعلي وأقل معدل إطلاق للطفيل كان عالي المعنوية حيث أعطي معدل الإطلاق 300 طفيل أعلي معدل تطفل وذلك في كل الأعماق المختبرة إذا ما قورنت بمعدل إطلاق 100 طفيل.

وبناء علي ذلك يمكن استخدام طفيل التريكو جراما كعامل مكافحة حيوي ضد فراشة البلح العامري في البلح المخزن.