COMPARATIVE STUDIES ON THE BIOLOGICAL ASPECTS OF TRICHOGRAMMA EVANESCENS AND TRICHOGRAMMA BRASSICAE REARED ON UV- IRRADIATED EGGS OF FACTITIOUS HOSTS

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Abstract

Ultraviolet (UV) was used to sterilize the eggs of Angoumois Grain Moth (AGM), *Sitotroga cerealella* (Olivier), the Mediterranean Flour Moth (MFM), *Ephestia and kuehniella* Zeller to stop the embryonic development inside the eggs to be favorable for parasitism for longer time. This system was developed to prolong the storage capability of the eggs used for rearing the bioagents. Results indicated significant difference between the fecundity of *Trichogramma evanescens* and *T. brassicae* at 25°C (L.S.D at 5% 10.18) reared on AGM and MFM. The data indicated, the highest number of black eggs reached 63.5 and 38.1 when in case of *T. brassicae* and *T. evanescens* on eggs of MFM with UV, respectively. While it reached 31.9 and 16.4 for the same species on the eggs of AGM with UV, respectively.

Key Words: Ultraviolet, embryonic development, cannibalism, storage, fecundity.

INTRODUCTION

The favorable temperature conditions for rearing *Trichogramma* spp. at 25± 1°C, 70± 5% RH, was recorded by (Bigler, 1994 and Gaffar, 2006).The first author who exposed *Corcyra cephalonica* to UV radiation conducted by (Preniere, 1965) to kill the embryos whereas (Zhang et. al. 1991) used the same radiation to sterilize the eggs to be used for rearing *T. ostriniae*. While, Voegele et. al. *1975* studied the conditions of *E. keuhniella* eggs by irrigated it for 4 hours and held at 4°C four days in *T. evanescens* and *T. brasiliensis* in case of rearing program. The present study was conducted to describe the system of UV radiation and to evaluate the exposure of different alternative hosts eggs (MFM & AGM) for UV radiation for using in mass rearing program.

MATERIALS AND METHODS

1. UV Cabinet

The ultraviolet cabinet was composed of four interlocked compartments. The internal one is 30 cm long, 30 cm wide and 60 cm depth. The internal chamber was covered by stainless and contains stainless tray 29 × 29 × 1.5 cm. the distance from tray to starting the UV lamp is 23 cm and, each one contains timer to define the time of exposure and turn off automatically after finish the exposure time. Specifications of the lamp, Model VL-115 G- Tube (Watt) 1X15 W –Wave length (nm) 254- intensity (µ w/cm) 31 was fixed (Fig. 1).

2. Techniques of rearing factitious hosts

The methodology used for rearing *S. cerealella* was mentioned by (Hassan, 1981 & 1994) was followed the improvement methods for rearing *E. keuhniella* was described by (El-Arnaouty, 2001 and Gaffar, 2006), while mass rearing of the parasitoids *Trichogramma* spp. was previously mentioned by (Hoffman *et. al.,* 1995 and Abd El-Hafez, 2001). *E. keuhniella* Zeller and *S. cerealella* (Olivier) were used as alternative hosts for *T. evanescens* and *T. brassicae* colony maintainance. The colony was established with eggs provided by "the Central Laboratory for mass rearing of *Trichogramma* parasitoid at El-Fayoum governorate".

3. Parasite rearing

For efficient mass rearing of *T. evanescens* or *T. brassicae*, host egg sheets (2000 egg) were exposed to adult (100 adults) into 0.4 liter glass jar provided with 10 % sucrose solution for nutrition and covered with cloth-wrapped cotton, as described by (Abd El-Hafez, 2001). These colony was established with parasitoids provided by Central Laboratory for mass rearing of *Trichogramma* parasitoid at El-Fayoum governorate at 25± 1°C, 70± 5% RH and a 16:8h (L:D) photoperiod.

4. Experimental Protocol

The experiment was consisted 8 treatments confined in the same time, each treatment was involved 30 replicates and 30 newly emerged females from the strain reared on *S. cerealella* (less than 24h old) from each species. They were transferred singly to glass tubes provided with a drop of 10 % honey solution on the inner wall as feeding source for the parasitoid females. After that calculate the no. of black eggs for each species (2 treatments) on *E. keuhniella* with UV & without UV irradiated and (2 treatments) on *S. cerealella* with UV & without UV irradiate was calculated.

5. Data analysis

The count of black eggs was submitted to ANOVA using SAS program (1988).

RESULTS AND DISCUSSION

679

1- Effect of eggs exposure of *S. cerealella* and *E. keuhniella* to UV radiation on some biological aspects of *T. brassicae* and *T. evanescens* which reared on eggs of *S. cerealella* at 25°C.

1.1. Fecundity of *T. brassicae*

When exposed *T. brassicae* on eggs of *E. keuhniella* irradiated and unirradiated UV irradiation or not at 25°C resulted from colony of *T. brassicae* reared on eggs of *S. cerealella* gave high mean number of black eggs of 63.47 and 60.37, respectively. While, they gave less mean numbers of black eggs when the colony of *T. brassicae* exposed on eggs of *S. cerealella* irradiated and unirradiated with UV radiation at 25°C were 31.90 and 21.03, respectively (Fig. 2). Also, results showed that rearing of *T. brassicae* on eggs of *E. keuhniella* exposed or did not expose to UV radiation at 25°C gave high parasitism ratio of 65.58%± 15.62 and 64.39%± 16.02, respectively. While, less parasitism ratio% was obtained when the colony of *T. brassicae* exposed on eggs of *S. cerealella* exposed and did not expose to UV radiation at 25°C where the corresponding values of parasitism were 41.67%± 11.60 and 25.94%± 10.07, respectively (Fig. 3). On the other hand, data revealed that rearing of *T. brassicae* on eggs of *E. keuhniella* exposed and did not expose to UV radiation or not at 25°C gave mortality rate of 30 and 33.33%, respectively. While rearing on eggs of *S. cerealella* exposed and did not expose to UV radiation at 25°C gave 96.67 and 90.00% mortality, respectively (Fig. 4).

Statistical analysis showed significant differences between rearing on different hosts irradiated with UV and other without exposure to UV on the fecundity of *T. brassicae* at 25°C (L.S.D at 5% 10.49).

The obtained results are in agreement with those obtained by Preniere, 1965 who exposed *Corcyra cephaalonica* eggs for 15 min. to UV radiation that killed the embryos, while the treated eggs were continued suitable and acceptable for application of the egg parasitoids, *T. autralicum* Girault.

1.2. Fecundity of *T. evanescens*

Exposure of *T. evanescens* on eggs of *E. keuhniella* exposed and did not expose to UV radiation or not at 25°C resulted from a colony of *T. evanescens* reared on eggs of *S. cerealella* gave high mean number of black eggs of 38.10 and 59.77, respectively. While, the procedure gave less mean number of black eggs when the colony of *T. evanescens* introduced to eggs of *S. cerealella* exposed and without exposure to UV radiation at 25°C, where the numbers of black eggs were 16.40 and 24.30, respectively (Fig. 5). Also, results showed that rearing of *T. evanescens* on

eggs of *E. keuhniella* exposed and without exposure to UV radiation at 25°C gave high parasitism ratio of 47.96%± 16.49 and 61.59%± 12.48, respectively. While, less of parasitism ratio was occurred when the colony of *T. evanescens* introduced to on eggs of *S. cerealella* exposed and without exposure to UV radiation or not at 25°C where the correspondent parasitism ratio were 25.33%± 13.85 and 26.30%± 7.19, respectively (Fig. 6). On the other hand, data revealed that rearing of *T. evanescens* on eggs of *E. keuhniella* exposed or without exposure to UV radiation at 25°C gave mortality % 33.33 and 13.33% mortality, respectively. While rearing carried out on eggs of *S. cerealella* exposed and without exposure to UV radiation at 25°C gave 80 and 30% mortality, respectively (Fig. 7).

Statistical analysis showed significant differences between rearing on different hosts radiated with UV and other without exposure to UV on fecundity of *T. evanescens* at 25°C.

Voegele et. al. (1975), studied the conditions of eggs of *E. kuehniella* by cold and UV radiation in *T. evanescens* and *T. brasiliensis* rearing program. It was detected after these insects were reared through 6 successive generations on eggs irradiated for 4 hours and held at 4°C for days. The fertility of *T. brasiliensis* was even increased by this treatment.

2- Comparison between exposure and non exposure eggs of *S. cerealella* to UV radiation on fecundity for *T. brassicae* and *T. evanescens* at 25°C.

Data illustrated in (Fig. 8) showed significant differences between rearing on different hosts irradiated with UV and other without exposure to UV on fecundity of *T. brassicae* and *T. evanescens* at 25°C (L.S.D at 5% 10.18).

Fig. 1. UV Cabinet

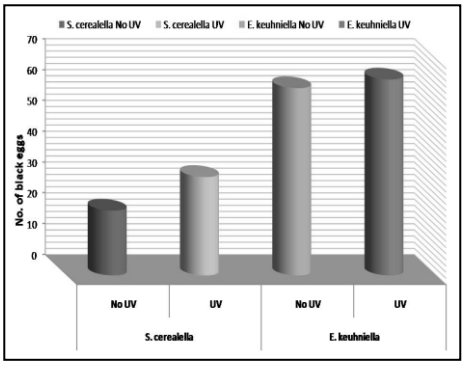

Fig (2): Effect of exposure eggs of different alternative hosts to UV radiation on fecundity of *Trichogramma brassicae* which reared on Eggs of *Sitotroga cerealella* at 25°C

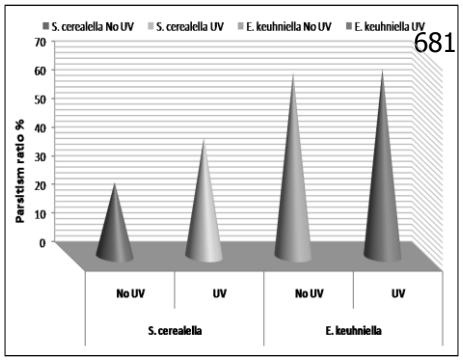

Fig (3): Effect of exposure eggs of different alternative hosts to UV radiation on Parasitism ratio % of *Trichogramma brassicae* which reared on eggs of *Sitotroga cerealella* at 25°C

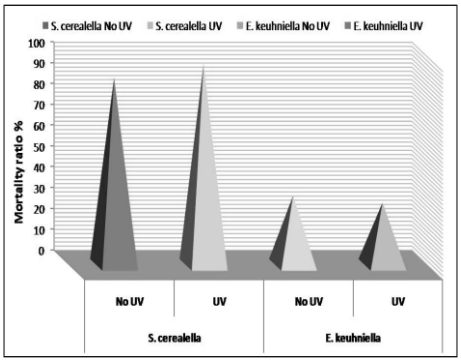

Fig (4): Effect of exposure eggs of different alternative hosts to UV radiation on mortality ratio % of *Trichogramma brassicae* which reared on eggs of *Sitotroga cerealella* at 25°C

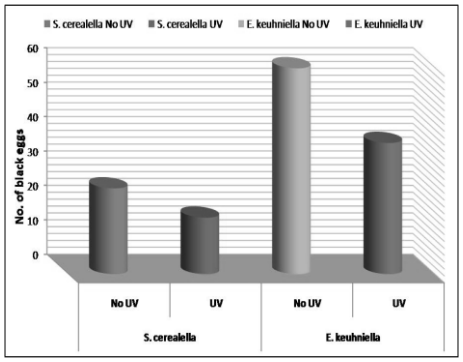

Fig (5): Effect of exposure eggs of different alternative hosts to UV radiation on fecundity of *Trichogramma evanescens* which reared on eggs of *Sitotroga cerealella* at 25°C

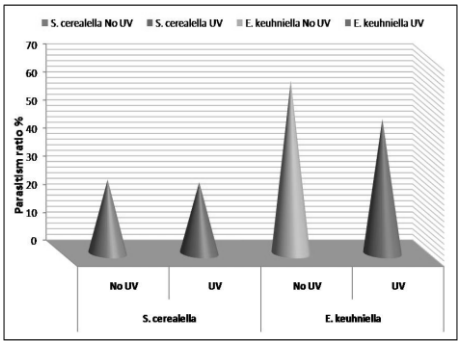

Fig (6): Effect of exposure eggs of different alternative hosts to UV radiation on parasitism ratio % of *Trichogramma evanescens* which reared on eggs of *Sitotroga cerealella* at 25°C

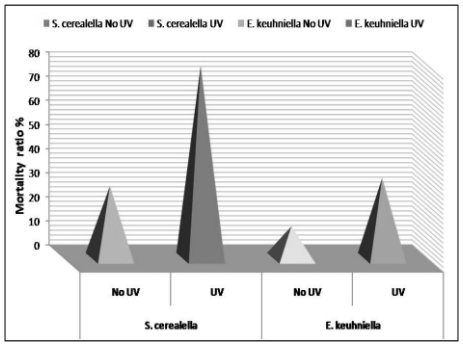

Fig (7): Effect of exposure eggs of different alternative hosts to UV radiation on mortality ratio % of *Trichogramma evanescens* which reared on eggs of *Sitotroga cerealella* at 25°C

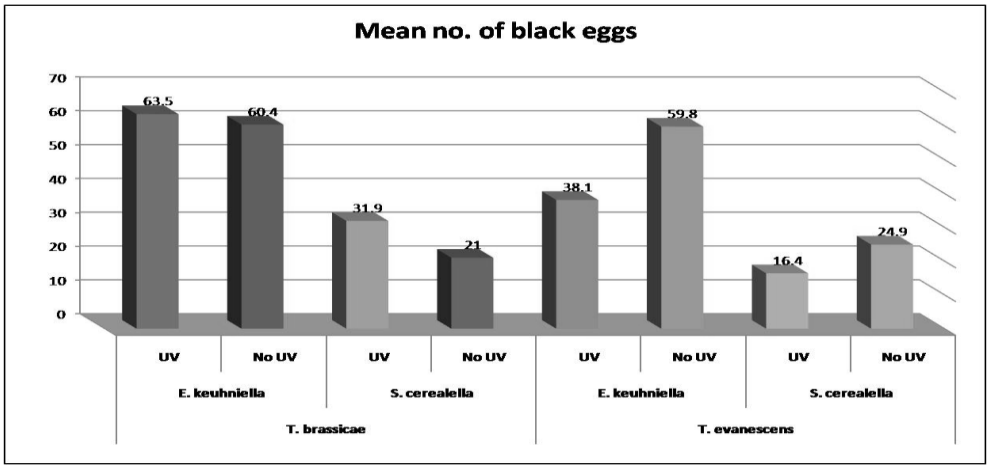

Fig. 8. Comparison between exposure and non exposure eggs of S. cerealella to UV radiation on fecundity for *T. brassicae and T. evanescens* at 25 ^{o}C.

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دراسات مقارنة على الخصائص البيولوجية لنوعى التريكوجراما ايفانسيز وتريكوجراما براسيكا نميت على بيض العوائل البديلة عرض للآشعة الفوق بنفسجية

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الهدف من استخدام التعقيم بالأشعة فوق البنفسجية لبيض فراشة الحـبوب *S. cerealella* وفراشة دقيق البحر الأبيض المتوسط *E. keuhniella* هو تثبيط تطور النمو الجنينى داخل البيض حتى يكون مفضل لوسط التطفل لفترة طويلة. يستخدم هذا النظام المتطور لإطالة القدرة التخزينية للبيض المستخدم فى تربية الآعداء الحيوية . وقد أشارت نتائج تعريض البيض أو عدم التعريض للأشعة فوق البنفسجية الى وجود فروق معنوية ما بين التربية على بيض فراشة الحبوب وفراشة دقيق البحر الأبيض المتوسط وذلك على القدرة التناسلية لنوعى التريكوجراما محل الدراسة هما تريكوجراما ايفانسيز وبراسيكا على درجة حرارة 25°م. حيث أشارت النتائج أن أعلى متوسط عدد للبيض الأسود وصل الى 36.5 و 38.1 عند تربية تريكوجراما براسيكا و ايفانسيز على بيض فراشة الدقيق المعرض للـ UV، على التوالى. بينما وصل الى 31.9 و 16.4 عند تربية تريكوجراما براسيكا و ايفانسيز على بيض فراشة الحبوب معرض للـ UV، على التوالى.