EFFECT OF HOST AND PARASITOID DENSITY ON the EFFICIENCY OF TRICHOGRAMMA EVANESCENS (WESTWOOD) AND *TRICHOGRAMMA BRASSICAE* (BEZDENKO) (HYMENOPTERA: TRICHOGRAMMATIDAE)

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Abstract

Studies were carried out at Plant Protection Research Institute in 2005 to find out the effect of different host and parasitoid density levels on the efficiency of *Trichogramma evanescens* and *T. brassicae.* Eggs of pink bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) were used as a host for the two *Trichogramma* spp. Three different host densities viz., 150, 300 and 600 eggs of *P. gossypiella* were provided to 2, 4, and 8 females of the two parasitoid species, respectively in glass vials (4x8.5 cm). The highest percentage of parasitism was obtained when *T. evanescens* and *T. brassicae* densities were 8 females and introduced 150 *P. gossypiella* eggs. The percentages of parasitism were 95.27 and 94.27% for the two *parasitoid* species, respectively. Whereas, the lowest percentage of parasitism was obtained when the parasitoid density was 2 females and introduced 600 host eggs, as it was 13.86% for *T. evanescens* and 15.96% for *T. brassicae.* In case of *T. evanescens,* emergence percentages were statistically similar in all treatments and was above 91.73%. Whereas, emergence percentage of *T. brassicae* was decreased to 88.24% when the parasitoid density was 2 females/vial. Female ratio in offspring was higher (67.06%) when *T. evanescens* density was 2 females and decreased insignificantly to 64.84 and significantly to 59.16% when parasitoid density increased to 4 and 8 female/ vial, respectively. As for, *T. brassicae,* percentages of produced females were insignificantly different in all parasitoid densities. The percentage of super parasitism was artless or negligible at all *T. evanescens* densities as, it didn't heighten 2.56%. While *T. brassicae* females exhibited significantly higher percentage of super parasitism (4.58%), when introduced only 150 eggs for all parasitoid densities compared with all other treatments.

Key words: Parasitoid and host density, parasitism efficiency, *Trichogramma evanescens, T. brassicae*

INTRODUCTION

Egg parasitoids of the genus *Trichogramma* are the most widely used natural enemy for biological pest control in the world. Their use is restricted to lepidopterous pest species. These wasps are highly polyphagous, and host selection can be influenced by various chemical and physical cues. The impact of a parasitoid on its host population greatly depends upon its ability to search, find and parasitize hosts and to increase offspring numbers in response to increasing host density. In analytical host-parasitoid models, changes in the density-dependent sex ratio of parasitoids influence the level of host population equilibrium and the stability of the host-parasitoid relationships thus affecting the success of biological control (Waage &Hassell 1982). It is important to identify the form of the parasitoid response to host density in population modeling, from which biological control programmes can be developed (Mills & Lacan 2004). Density-dependent behavior is commonly seen as an essential feature of the searching efficiency or capacity of candidate natural enemies, but it also seems to be the most difficult selection criterion for experimental evaluation (Van Lenteren 1986). At a high host density, the host-finding capacity of a parasitoid female is limited by her egg complement and/or by her handling time. However, in fields with relatively low host densities, and especially when host eggs are laid in clusters, wasps may be foraging a lot on leaves without hosts (Pak *et al.* 1989). Reznik and Umarova ((1991) stated that host density within a habitat proved to be an important factor in host acceptance. It is known that ovipositing females adjust their clutch size and gender according to the rate and quality of the hosts they encounter during their lifetime (Heimpel and Collier, 1996). In the Bollworms laboratory of plant protection Research Institute Egypt, *Trichogramma* is reared on *Pectinophora gossypiella* for experiments and mass reared on the factitious host, *Sitotroga cerealella* for inundative release. During rearing the quality of the produced parasitoids is very important. Parasitoid and host densities are amongst the important factors affecting the quality of the parasitoids. Higher densities of parasitoids may caused super parasitism and thus reducing the fitness of surviving parasite or survivorships Khan *et al* (2004). Whereas, the increasing of host density may caused losing of host and increasing the rearing cost. The aim of the present study was to provide further information for the assessment and improvement of *Trichogramma* spp. effectiveness in biological control. In this paper, the relationship between host and parasite densities and reproductive fitness of *Trichogramma* spp. was investigated by determining how host density affected parasitoid efficacy, which was determined by the percentage of parasitism, percent emergence, and sex ratio.

MATERIALS AND METHODS

The experiments were carried out in Bollworms Department, Plant protection Research Institute, ARC, Dokki, Giza, Egypt.

Rearing of insects

Host rearing

Pink bollworm *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) was reared for several generations on modified artificial diet as described by Abd El-Hafez, Alia *et al.* (1982). Ten pairs of freshly emerged moths were confined in glass chimney cage, inside which a piece of cotton wool previously soaked in 10 % sugar solution was suspended to be renewed every 48 hours for moths nutrition. The top and bottom of each cage were covered with screening mesh kept in position by rubber bands for stimulating egg-laying response in the females. Eggs were deposited through the screening mesh on a piece of paper placed upper and under the cage in open Petri-dishes that served as oviposition sites. Cages were maintained at 27±1 °C & 80 ±5 % R. H. and were examined daily for collecting papers containing eggs.

Parasitoid rearing

In the present study, two *Trichogramma* species were reared on pink bollworm, *P. gossypiella* for more than ten generations. These parasitoids are namely *Trichogramma evanescens* Westwood (native strain) and *T. brassicae* Bezdenko imported from Iran in 1998. The reared culture being maintained in the laboratory at 27±1 °C & 80 ±5 % R. H. For rearing the parasitoid, fresh host egg sheets (2000-2500 eggs) were exposed to 100-150 adult females into 0.4-1 liter glass jars provided with 10% sucrose solution for nutrition, and covered with cloth-wrapped cotton kept in position by rubber band.

Experimental techniques

Fresh sheets of *P. gossypiella* eggs, contained eggs at densities of 150, 300 and 600 eggs/ sheet were placed in glass vials (4x8.5 cm) and introduced to 2, 4, and 8 mated females of *Trichogramma* in rotation to have nine treatments for every *Trichogramma* species. The number of replicates were 20 for each treatment but they were divided into four groups for easy handling. After releasing the *Trichogramma* females into the glass vials, vials were covered with muslin cloth tightened with rubber band. These vials were then shifted to incubator with temperature of 27 ±1°C and 80 ±5 % RH. After 4 days percentages of parasitized eggs and super parasitism were recorded. While the percentage of emergence and sex ratio were estimated after adult emergence (8 days).

Statistical analysis

Analysis of variance was calculated for all data (ANOVA) and Duncan's multiple range test was used to separate the means (Snedecor & Cochran 1980).

RESULTS AND DISCUSSION

a- Effect of different host and parasitoid densities on percentage of parasitism

Table (1) showed highly significant differences between the three host densities (F= 436.35& P< 0.0001), highly significant differences between the three parasitoid densities (F= 240.01& P<.0001) and between the two parasitoid species (F= 57.441& P<.0001). The whole mean percentage of parasitism was 61.6% for *T. evanescens,* while this percentage decreased significantly to 50.83% for *T. brassicae* (Table 2). Regardless of host density, the percentage of parasitism by *T. evanescens* females was increased by increasing its density. When the parasitoid density was 2 females/ vial, the average percentage of parasitism was 43.91% and increased significantly to 61.13% and 79.77% by increasing females to 4 and 8/ vial, respectively. In contrast, as the host density increased, as the percentage of parasitism decreased. The mean percentages of parasitism were 88.93, 55.74 and 40.13% when the host densities were 150, 300 and 600 eggs/ vial, respectively. Significantly, the higher percentage of parasitism (95.27%) was obtained when 8 females introduced 150 eggs in the vial, while there were insignificant differences when 2 and 4 parasitoid females introduced the same number of eggs. In case of 300 and 600 host densities, as the parasitoid density increased as the percentage of parasitism increased. As for *T. brassicae*, the average percentage of parasitism was 50.83%. In all host densities, the percentage of parasitism increased by increasing the parasitoid density. On the other hand the at same parasitoid density, the percentage of parasitism decreased significantly by increasing the host density i. e. when the parasitoid density was 8 females/vial and introduced 150, 300 and 600 eggs, the percentages of parasitism were 94.27, 83.19 and 25.3%, respectively. The present results are in agreement with those obtained by Vorgas and Nishida (1982) who reported that the parasitoid species and the relative density of hosts affected the number of parasitized eggs. The percentage of parasitism was independent of host density at low densities of parasitoids and was inversely dependant at high densities. Also Thorpe, and Dively (1985) observed that rates of parasitism were significantly higher at the highest wasp density on all arenas and the effect of host density was not consistent among the arena. Li-SY and Henderson (1993) found that at host egg densities of <20/parasitoid, the number of eggs parasitized significantly increased with egg density ،tending to stabilize at densities above 30 eggs/parasitoid. Khan *et al*, (2004) stated that highest parasitism was obtained from 20 eggs/ female but as the comparison of treatment group showed that different host densities had no significant effect on % parasitism.

Table 1. Results from three-factor analysis of variance, host density (Hd), Parasitoid density (Pd), the two species of parasites and the interaction between them.

Source of variance	Percentage of parasitized eggs		Percentage of emergence		Sex-ratio		Super-parasitism	
	F-value	P-value	F-value	P-value	F. value	p. value	F. value	P-value
Hd	436.354	0.0000***	1.013	0.3655^{ns}	17.722	0.0000***	30.129	0.0000***
Pd	240.012	0.0000***	0.533	0.5881^{ns}	5.367	0.0056**	22.467	0.0000***
Two parasites	57.441	0.0000***	0.820	0.3666^{ns}	4.879	0.0288*	23.065	0.0000***
Hd X Pd	9.560	0.0000***	1.017	0.4003^{ns}	7.777	0.0000***	2.867	0.0276*
Hd x parasite	9.946	0.0001***	1.139	0.3228^{ns}	3.187	0.0442*	22.047	0.0000***
Pd x parasite	6.212	0.0025**	0.595	0.5527^{ns}	10.480	0.0001***	1.566	0.2146*
Hd x pd x parasites	26.720	0.0000***	1.004	0.4074^{ns}	3.149	0.0162*	4.032	0.0026**

P- values followed by ns are insignificant, * are significant, ** very significant and*** highly significant.

Table 2. The Effect of both host density and parasitoid density on the percentage of parasitized *P. gossypiella* eggs by *T.* evanescens and *T. brassicae.*

Host density / Parasite density	150	300	600	Mean ± SD	L.S.D.
			T. evanescens		
2	82.40^{bA}± 16.78	35.47^{cB}± 10.80	13.86^{cC}± 1.35	43.91^{c}± 31.16	10.598
4	89.11^{abA}± 8.09	54.67^{bB}± 9.54	39.6^{bC}± 9.83	61.13^{b}± 22.86	8.426
8	95.27^{aA}± 3.73	77.09^{aB}± 7.97	66.93^{aC}± 10.18	79.77^{a}± 14.08	7.128
Means ±SD	88.93^{A}± 11.86	55.74^{B}± 55.18	40.13^{C}± 23.42	61.60± 27.72	4.946
L.S.D	10.05	8.723	7.532	4.946	
			T. brassicae		
2	43.93^{bA}± 16.34	23.6^{cB}± 3.78	15.96^{bB}± 3.90	27.83^{c}± 15.33	9.064
4	91.2^{aA}± 8.71	53.53^{bB}± 14.16	26.48^{aC}± 10.94	57.07^{D}± 29.18	10.545
8	94.27^{aA}± 3.85	83.19^{aB}± 9.51	25.30^{aC}± 2.73	67.59^{d}± 31.32	5.625
Means ±SD	76.47^{A}± 25.69	53.44^{B}± 26.59	22.58^{C}± 8.12	50.83± 30.98	4.849
L.S.D	10.019	9.256	6.241	4.849	

Means in the same column followed by different small letters, or in a row by different capital letters are significantly different.

Table 3. The effect of host and parasitoid densities on the percentages of emerged Progeny.

Host ensity / Parasite density	150	300	600	Mean ± SD	L.S.D.
			T. evanescens		
2	94.69^{aA}± 3.26	92.9^{aA}± 4.49	91.73^{aA}± 5.35	93.11^{a}± 4.47	4.079
4	95.83^{aA}± 1.99	93.49^{aAB}± 4.09	91.92^{aB}± 4.63	93.75^{a}± 3.97	3.440
8	93.75^{aA}± 2.84	92.71^{aA}± 4.52	94.34^{aA}± 1.58	93.60^{a}± 3.17	2.947
Means ±SD	94.76^{A}± 2.97	93.04^{AB}± 4.23	92.66^{B}± 4.21	93.94± 3.87	1.971
L.S.D	2.5196	4.0098	3.839	1.971	
			T. brassicae		
2	83.31^{bB}± 7.57	88.77^{bAB}± 5.76	92.64^{aA}± 4.26	88.24^{b}±	5.522
4	94.66^{aA}± 2.93	94.92^{aA}± 3.24	95.9^{aA}± 4.06	95.16^{a}± 3.38	3.159
8	95.35^{aA}± 1.93	96.04^{aA}± 1.89	92.3^{aB}± 4.05	94.57^{a}± 3.18	2.582
Means ±SD	91.11^{B}± 7.29	93.95^{AB}± 5.02	93.62^{A}± 4.31	92.66± 5 73	2 2195
L.S.D	4.422	3.642	3.786	2.219	

Means in the same column followed by different small letters, or in a row by different capital letters are significantly different.

Table 4. The effect of host and parasites densities on mean percentage of emerged females Sex-ratio (Means ± SD).

Host ensity / Parasite density	150	300	600	Mean± SD	L.S.D.
T. evanescens					
2	78.85^{aA}± 7.53	61.98^{aB}± 6.62	62.34^{abB}± 4.39	67.06^{a}± 9.31	6.150
4	67.75^{bA}± 8.59	61.99^{aA}± 6.62	64.77^{aA}± 5.62	64.84^{a}± 7.18	6.861
8	56.31^{cB}± 3.99	62.69^{aA}± 4.94	58.49^{bB}± 2.73	59.16^{b}± 4.69	3.881
Means ±SD	66.97^{A}± 10.88	62.22^{B}± 5.88	61.87^{B}± 4.99	63.69± 7.96	3.219
L.S.D	6.798	5.946	4.287	3.219	
T. brassicae					
2	66.13^{aA}± 4.87	56.37^{aC}± 4.75	61.98^{aB}± 2.69	61.49^{a}± 5.74	4.1065
4	64.46^{aA}± 6.46	56.41^{aB}± 3.97	62.93^{aA}± 5.02	61.28^{a}± 6.299	5.260
8	64.93^{aA}± 6.81	60.26^{aA}± 3.69	62.79^{aA}± 2.64	62.66^{a}± 4.94	4.601
Means ±SD	65.18^{A}± 6.04	57.68^{B}± 4.41	62.57^{A}± 3.51	61.81± 5.6[illegible]	2.609
L.S.D	6.071	4.050	3.528	2.609	

Means in the same column followed by different small letters, or in a row by different capital letters are significantly different.

Table 5. Percentage of super parasitism (Mean±SD) resulted from different host and parasitoids densities.

ostdensity / Parasite density	150	300	600	Mean± SD	L.S.D.
T. evanescens					
2	1.39^{aB}± 0.54	3.19^{aA}± 0.94	3.11^{aA}± 0.35	2.56^{a}± 1.06	0.811
4	1.75^{aA}± 0.81	1.07^{bB}± 0.27	0^{bC}± 0	0.93^{b}± 0.87	0.603
8	1.73^{aA}± 0.33	1.5^{bA}± 0.57	0^{bB} ± 0	1.08^{b}± 0.87	0.45
Means ±SD	1.62^{A}± 0.58	1.92^{A}± 1.12	1.04^{B}± 1.52	1.53±	0.351
L.S.D	0.726	0.806	0.247	0.351	
T. brassicae					
2	5.595^{aA}± 3.27	2.04^{aB}± 0.93	1.69^{aB}± 0.41	3.45^{a}± 2.49	2.436
4	5.03^{aA}± 1.89	1.15^{bB}± 0.14	1.15^{bB}± 0.39	2.44^{b}± 2.15	1.375
8	3.11^{aA}± 1.68	1.13^{bB}± 0.53	0.86^{bB}± 0.45	1.70^{b}± 1.43	1.288
Means ±SD	4.58^{A}± 2.49	1.78^{B}± 1.09	1.24^{B}± 0.53	2.53± 2.16	0.969
L.S.D	2.938	0.765	0.51	0.969	

Means in the same column followed by different small letters, or in a row by different capital letters are significantly different.

The influence on the percentage of progeny emergence

Table (1) showed that there were insignificant differences between host densities, parasitoid densities and the two parasitoid species in the percentage of emergence. The average percentage of emergence was 93.94% for *T. evanescens* and 92.66% for *T. brassicae* (Table 3). In all host and *T. evanescens* densities, the percentage of emergence were above 91.7%. As for *T. brassicae*, the percentage of emergence reduced to 83.31 and 88.24% when 2 females/ vial introduced 150 and 300 *P. gossypiella* eggs, respectively. Man while, the percentages of emergence were above 92% in the remainder densities,. Khan *et al* (2004) recorded low percentage of emergence at 5, 10, 20 and 40 eggs of *Sitotroga cerealella* as it was 88.89, 83.49, 77.38 and 80.2%, respectively. And they stated that, there was no significant effect on the percent emergence of *Trichogramma* by the host density although 5 eggs had the highest percentage of emergence.

b- The impact on the percentage of emerged females (sex-ratio)

Table (1) showed highly significant differences between host densities (F=17.72, P<.0001, also showed very significant differences between parasitoid densities (F=5.367, P< 0.006), and exhibited significant difference between the two parasitoid species (F= 4.879, P< 0.029).The mean percentage of females in *T. evanescens* was 63.69% whereas, it was 61.81% for *T. brassicae*. Regardless of *T. evanescens* density, the greatest percentage of female (66.97%) was produced when the host density was 150 eggs/ vial, this percentage decreased significantly to 62.22 and 61.87% when host density was increased to 300 and 600 eggs/ vial, respectively. At host density of 150 eggs/ vial, *T. evanescens* produced the highest percentage of female (78.85%) when the parasitoid density was 2 females/vial. This percentage reduced significantly to 67.75% and 56.31% when the parasitoid density increased to 4 and 8 females/ vial at the same level of the host density, respectively. When the host density was 300 eggs/ vial, there were insignificant differences between the three parasitoid densities. At host density of 600 eggs/ vial, there were insignificant differences between the density of 2&4 or between 2&8 parasitoid female on the percentage of produced females (table 4).

sity/ female. Whereas, it was in contrast with Babault and Pinturau (1984), as they reported that the proportion of female increased with increased of parasitoid density. Also Kon and Henderson (1993) reported that early deposited eggs turned to be females while the subsequent progeny is mostly males and added that, as the number of available *S. cerealella* eggs reduced as the possibility of females in the colony increased.

c-Effect of different host and parasitoid densities on % super parasitism

Salt (1934) defined superparasitism by "occurrence of more parasitoids of a single species on a host" and he added that wasps generally selected larger hosts for superparasitism and could distinguish between large and small hosts. But under some conditions as the scarcity of rearing host or high density of the parasitoid, it may occur instinct error between females and oviposit on or into a host that has been previously parasitized. El Sharkawy (1998) indicated that eggs of *P. gossypiella* and *Sitotroga cerealella* eggs supported the developing of a single larva and rarely two. Moreover, when more than two larvae developed per small host egg, either all the developed pupae died or one developed to successfully emerged adult. So superparasitism considered undesired property in parasitoids used in biological control field. In the present study, the percentage of superparasitism was significantly higher in *T. brassicae* (2.53%) than in *T. evanescens* (1.53%). In case of *T. evanescens*, there were insignificant differences between 150 and 300 host densities as the percentage of superparasitism were 1.62 and 1.92, respectively. This percentage decreased significantly to 1.04% when host density increased to 600 eggs/vial (LSD=0.351& F=13.332). For unknown reason, the percentage of superparasitism was higher (2.56%) when the parasitoid density was 2 female/vial, and this percentage decreased significantly to 0.93 and 1.08%, when the parasitoid density increased to 4 and 8 females/vial, respectively (LSD=0.351& f=53.46). In case of *T. brassicae*, regardless of parasitoid density, the highest percentage of superparasitism (4.58%) occurred when the host density was 150 host eggs/vial and decreased to 1.78 and 1.24% when host density increased to 300 and 600 eggs/ vial, respectively (LSD= 0.969& F=27.753). As previously mentioned in *T. evanescens*, the highest percentage of superparasitism (3.45%) occurred when the parasitoid density was 2 females/ vial, and this percentage decreased significantly to 2.44 and 1.70% (LSD=0.969& F=6.605) when parasitoid density increased to 4 and 8 females/ vial, respectively. The present results are appropriate with that of Li-SY and Henderson (1993) as they found that superparasitism occurred at 5-10 eggs/parasitoid, but was rarely observed at densities above 20 eggs. The mean number of progeny per wasp increased significantly with host density, while the clutch size decreased significantly. El Sharkawy (2002) concluded that when *T. evanescens* and *T. brassicae* were reared at 25° C, the mean number of parasitized eggs were 77.83 and 61.33 eggs/ female, and they led them at the first 3, 4 days from its longevity respectively. From the present and prior studies, it could be concluded that 8 females are suggested for about 150 host eggs, and it should be renewed daily for 3 days to *T. brassicae* and 4 days for *T. evanescens* to have high percentage of parasitism, high percentage of emergence, high percentage of females, and to avoid or reduce the percentage of superparasitism.

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تأثير كثافة كل من الطفيل والعائل على الكفاءة التطفلية لترايكوجراما أيفانسيس وترايكوجراما براسيكا

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تم دراسة تأثيركلا من كثافة الطفيل وكثافة العائل على كفاءة كل من طفيل الترايكوجراما ايفانسنس وطفيل ترايكوجراما براسيكا في التطفل على بيض دودة اللوز القرنفلية. وقد تم استخدام ثلاث كثافات للعائل (١٥٠و ٣٠٠و٦٠٠ بيضة) قدمت الى ٢و ٤ و ٨ اناث من كلا الطفيليين ليصبح لدينا تسعة معاملات لكل طفيل ولكل معاملة عشرين مكرر ة . وقد تم الحصول على أعلى نسبة تطفل (٩٥,٢٧ و ٩٤,٩٢%) لكلا الطفيليين على التوالي عندما كانت كثافة الطفيل ٨ أنثى / ١٥٠ بيضة من بيض العائل. بينما تم الحصول على أقل نسبة تطفل عندما كانت كثافة الطفيل ٢ أنثى /٦٠٠ بيضة من بيض العائل حيث كانت ١٣,٨٦ و ١٥,٩٦% لكل من ترايكوجراما ايفانسنس وترايكوجراما براسيكا ،على التوالى. أما نسبة الخروج لترايكوجراما ايفانسنس فكانت احصائيا غير مختلفة معنويا وكانت كلها تزيد عن ٩١,٧٣% ولكن في حالة ترايكوجراما براسيكا انخفضت هذه النسبة عامة الى ٨٨,٢٤% عندما كانت كثافة الطفيل ٢ أنثى/أنبوبة . وكانت نسبة الإناث في النسل الناتج مرتفعة (٦٧,٠٦%) عندما كانت كثافة ترايكوجراما ايفانسنس ٢ أنثى/ أنبوبة وانخفضت هذه النسبة انخفاضا غير معنويا الى ٦٤,٨٤%ومعنويا الى ٥٩,١٦% عندما زادت كثافة الطفيل الى ٤و ٨أنثى/أنبوبة ،على التوالي. بينما كانت نسبة الاناث غير مختلفة معنويا في حالة ترايكوجراما براسيكا وذلك في كثافات الطفيل المختلفة. أما نسبة التطفل المتزايد فكانت قليلة في حالة ترايكوجراما ايفانسنس ولم تتعدى ٢,٥٦% أما في حالة ترايكوجراما براسيكا فكانت هذه النسبة مرتفعة معنويا (٤,٥٨%). ومن هذه الدراسة يمكن التوصية بأن ١٥٠ بيضة من بيض العائل تقدم لـ ٨ أناث من الطفيل بشرط أن تستبدل يوميا لمدة ثلاث أيام في حالة ترايكوجراما براسيكا وأربعة أيام في حالة ترايكوجراما ايفانسينس وذلك على أساس أنه اذا تم قسمة ال ١٥٠ بيضة على الـ٨ أناث سيصبح نصيب كل أنثى ما يقرب من ال ١٩ بيضة يوميا وحيث أنه من الدراسات السابقة قد تم التوصل الى أن متوسط عدد البيض المتطفل عليه لترايكوجراما براسيكا و ترايكوجراما ايفانسنس كان ٦١,٣٣ & ٧٧,٨٣ بيضة تضعهم أنثى الطفيل في ٣ :٤أيام الأولى من حياتها ،على التوالى. وبذلك يمكن الحصول على أعلى نسبة تطفل وأعلى نسبة خروج للنسل الناتج وأعلى نسبة إناث و تجنب التطفل المتزايد أو على الأقل تقليله.