



**Effect of using Pritchardia dates honey as a nutritive source on the quality of
Trichogramma evanescens (Hymenoptera: Trichogrammatidae)**

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Abstract:

Experiments were carried out to determine the effects of date's honey of Pritchardia spp. palm as a new nutritive source for adults of *Trichogramma evanescens* (Westwood) (Hymenoptera: Trichogrammatidae). Certain nutritive solutions were tested (pure bee honey, pure sugar cane honey, 10% sucrose solution and water compared with this new source. Fecundity, longevity, percentage of parasitoid emergence, percentage of females in progeny and general productivity were investigated. Obtained results revealed that, parasitoids fed on Pritchardia date honey parasitized the highest number of *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) eggs (65.2 egg/female), lived longest period (6.05 days) and recorded the highest adult emergence (97.45%) comprising the highest ratio of females in progeny (78.45%). Control females parasitized the lowest number of *S. cerealella* eggs (30.7 eggs/female), they lived the shortest life span (1.75days), and resulting in the lowest adult emergence (77.1%) comprising the lowest percentage of females in progeny (61.95%). Generally, feeding trichogrammatids on Pritchardia date honey resulted in the highest productivity (49.85 females/female, while the lowest productivity (14.66 females/female) was calculated from the unfed ones.

Introduction

Feeding of adults is an important factor in *Trichogramma evanescens* (Westwood) (Hymenoptera: Trichogrammatidae) mass rearing in laboratory to ensure the production of high quality parasitoids. The choice of the

nutritive source is usually based on trials and errors (Wackers, 2005). Many authors relied on sugar or bees honey (Abd Elhafez *et al.*, 1999; Gurr and Nicol, 2000 and Karimi and Hatami, 2010), others relied on sugar cane honey as a diet for adults of *T.*

evanescens (Siam *et al.*, 2014). Pritchardia palms draw my attention with its ripe fallen fruits (dates) in huge amounts, their dates are locally edible as they are delicious and sweet. From the point of view that aiming to exploit the surrounding environmental sources and saving expenses of mass rearing, the date's honey of those palms was used to nitrify adult parasitoids, however no data regarding the nutritional composition of that kind of dates are available. This work was carried out to investigate the effect of introducing Pritchardia dates honey as a new nutritive source for adults on the fitness components of *T. evanescens* in order to high light its potential.

Materials and Methods

Experiments were conducted at Fayoum Laboratory, Plant Protection Research Institute, Agricultural Research Center. Experiments were conducted at $25\pm 2^{\circ}\text{C}$ and $70\pm 5\%$ R.H. *T. evanescens* was reared on *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) eggs.

1. *Sitotroga cerealella* rearing:

S. cerealella rearing method was a modification of that reported by Hassan (1995) where soft wheat was chosen as the rearing medium.

2. *Trichogramma evanescens* rearing:

Fresh *S. cerealella* eggs < 24hrs old were put on self-adhesive paper cards (21×15) and exposed to *T. evanescens* adults in transparent jars (2 liters capacity) provided with the nutritive source and covered with cloth wrapped cotton kept in position by rubber band. Parasitized eggs cards were kept in clean jars.

3. Preparation of Pritchardia dates honey:

Ripe fruits were collected, washed with water, and then the outer cover of the fruit is pulled off the stone seed, and then weighed. About one kilogram of the dates is covered with one liter of water in a wide pot, boiled on low heat with stirring with a wooden spoon until the mixture thickened. The thick, boiled mixture poured through two mesh cheese cloth. The cloth squeezed well to retrieve more juice as possible from the

cooked date mixture. Then it was returned to heat till be thicker cooled and kept in a refrigerator.

4. Experimental technique:

This experiment was conducted to investigate the effect of Pritchardia date honey on the fitness components of *T. evanescens* as an alternative nutritive source. The nutritive sources were, water, bee honey, sugar cane honey, sugar solution and Pritchardia date honey. Unfed females were the control. For each tested nutritive source, twenty newly emerged females were released individually in rearing glass vials (4×8.5cm) containing about 70 *S. cerealella* eggs. Each vial was provided with a droplet of the tested diet (about 2ml of each nutritive source) put on a piece of filter paper with a thin dissecting needle. Unfed females were left as control. All vials were checked daily to observe mortality and longevity of females. Parasitized eggs were counted as fecundity. The percentage of emerged adults and produced females in progeny were determined. General productivity was calculated according to Tshernyshev and Afonina (1995).

$\text{GP} = \text{rate of emergence} \times \text{rate of produced females in progeny} \times \text{fecundity}$

Analysis of variance (ANOVA) was used to process data and means were separated by Duncan's multiple range test (Duncan, 1955).

Results and Discussion

1. Effect of nutritive sources on fecundity:

Tested nutritive sources affected significantly the fecundity of *T. evanescens* females ($P < 0.05$). The lowest fecundity was 30.7 ± 0.41 parasitized eggs with unfed females, while droplets of water increased slightly the fecundity to 33.35 ± 0.54 parasitized eggs. Sugar solution, honey bee and sugar cane honey raised female's fecundity to 44.1 ± 0.66 , 55.25 ± 0.69 and 59.95 ± 0.41 eggs respectively. The highest fecundity was recorded with females fed on Pritchardia date honey 65.2 ± 0.74 eggs (Table,1).

2. Effect of nutritive sources on longevity:

Longevity of females was significantly affected with the tested nutritive sources ($P < 0.05$). The shortest life span was recorded with unfed females 1.75 ± 0.14 days. While, water and sugar solution fed females lived 2.55 ± 0.11 and 3.05 ± 0.88 days resp. This gradually increased by feeding females with bee honey and sugar cane honey reaching 4.65 ± 0.19 , 5.35 ± 0.17 days respectively. While, Pritchardia dates honey caused the longest life span 6.05 ± 0.11 days (Table,1).

3. Effect of nutritive sources on percentage of adults' emergence:

Percentage of off spring emergence was significantly different with all the tested nutritive sources ($P < 0.05$). The highest percent of adult emergence was recorded from parasitoid females fed on Pritchardia dates honey $97.45 \pm 0.19\%$ followed by those from cane honey diet ($95.1 \pm 0.35\%$), meanwhile, bee honey or sugar solution diets showed close rates of off spring emergence $91.1 \pm 0.46\%$ and $92.65 \pm 0.29\%$ respectively. Unfed females gave the lowest adult emergence $77.1 \pm 1.13\%$, but access of water increased the percentage of off spring emergence $81.45 \pm 0.82\%$. (Table,1)

Table (1): Effect of different nutrition sources on fitness components of *Trichogramma evanescens* reared on *Sitotroga cerealella* eggs

| Nutrition source | Fecundity Mean±SE | Longevity Mean±SE | Emergence% Mean±SE | Female % Mean±SE |
|-------------------------|----------------------|----------------------|-----------------------|---------------------|
| Unfed | 30.7 ± 0.41^f | 1.75 ± 0.14^f | 77.1 ± 1.13^f | 61.95 ± 0.78^e |
| Water | 33.35 ± 0.54^c | 2.55 ± 0.11^c | 81.45 ± 0.82^c | 71.85 ± 0.51^d |
| Honey bee | 55.25 ± 0.69^c | 4.65 ± 0.19^c | 91.1 ± 0.46^d | 73.85 ± 0.17^c |
| Sugar cane honey | 59.95 ± 0.41^b | 5.35 ± 0.17^b | 95.1 ± 0.35^b | 77.75 ± 0.34^b |
| Sugar solution 10% | 44.1 ± 0.66^d | 3.05 ± 0.88^d | 92.65 ± 0.29^c | 71.3 ± 0.29^d |
| Pritchardia dates honey | 65.2 ± 0.74^a | 6.05 ± 0.11^a | 97.45 ± 0.19^a | 78.45 ± 0.28^a |

Means within columns followed by different letters are significantly different at the $p < 0.05$ level by Duncan's multiple range test

4. Effect of nutritive sources on female percentage:

Produced female percentage in progeny was significantly different among the tested nutritive sources ($P < 0.05$). The highest females ratio 78.45 ± 0.28 was recorded in progeny from Pritchardia dates honey fed females, followed by those resulted from cane honey fed females $77.75 \pm 0.34\%$. Water and sugar solution produced nearly the same percentages of produced females in progeny $71.85 \pm 0.51\%$ and $71.30 \pm 0.29\%$ resp. Among the treatments, parent females fed on bee honey produced $73.85 \pm 0.17\%$ females in progeny and the lowest produced females' ratio

$61.95 \pm 0.78\%$ was produced from unfed females (Table,1).

5. Effect of nutritive sources on general productivity (GP):

The highest general productivity of *T. evanescens* 49.85 females/female was recorded with the nutrition of Pritchardia date honey followed by those fed on sugar cane honey 44.33 females/female. Low GP 19.52 females/female was recorded from females fed on water. Adding sugar solution increased females GP to 29.13 females/female, while bees honey raised GP to 37.17 females/female. On the other hand, the general productivity was drastically reduced to 14.66 females/female when parent mothers were unfed, Figure (1).

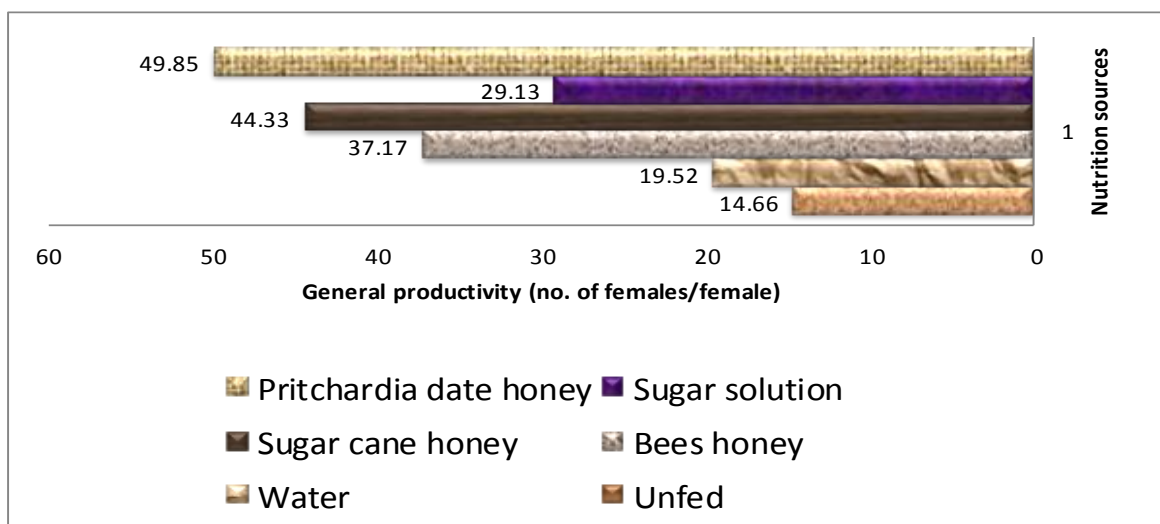


Figure (1): General productivity of *Trichogramma evanescens* females fed on different nutrition sources

In this study, and from the point is that, one must exploit the surrounding environmental resources which are represented in Pritchardia palms in the gardens with its fallen ripe dams in huge amounts; those dams are rounded, small and black, with delicious and sweet taste. Pritchardia dams is commonly edible by human being, so, thinking about the using it to serve as an alternative or supplemental nutrition source for *T. evanescens* parasitoids in the laboratory, as it is available and cheap source of carbohydrates to improve their fitness components. Pritchardia palm belongs to the family: Areaceae which is a botanical family of perennial climbers, shrubs and trees commonly known as palm trees, it is of enormous economic importance for human beings. Some authors work on the nutritional characterizations of fruits obtained from that family, they reported that they had a relevant concentration of nutrients and bioactive compounds with importance for human health. (Lescano *et al.*, 2018). This could be coincided with our results which was represented in the highest fecundity of *T. evanescens* females fed on Pritchardia dates honey, survival the longest life days, the highest emergence percentage comprising the highest ratio of produced females in progeny. In addition, results of this work revealed that, cane honey fed females survived long days with large number of parasitized *S. cerealella*

eggs resulting in high percent of off spring emergence with high rate of females ratio in progeny, those results are in consistence with those of (Siam *et al.*, 2014) who conducted experiments on feeding *T. evanescens* females on different nutritive sources for high quality parasitoids production. They demonstrated that, feeding females on cane honey recorded high percentage of off spring emergence over 96% from the highest number of parasitized host eggs with the highest sex ratio of females in progeny over 78.18%. In addition, (Abd Elhafez *et al.*, 1999) and (Salijoqi and Khajjak, 2007) supported our results, they confirmed that bees honey fed females parasitized high number of host eggs with the high number of off spring emergence and high rate of produced females in progeny.

It is concluded that the Pritchardia date honey could serve as a very cheap nutritive source, followed by cane honey and bees honey as a favorable nutritive source to adult parasitoid in laboratory mass rearing for a sustainable and efficient *T. evanescens*.

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