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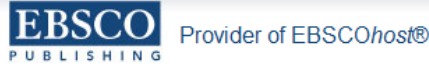
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## Egg Production and Adult Longevity of The Olive Leaf Moth, *Palpita unionalis* Hübner (Lepidoptera:Pyralidae) on Selected Adult Diets

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Survival and egg production data were collected for females of the olive leaf moth, *Palpita unionalis*. Adults were feed on 10% honey solution, a commercial honey bee liquid food, an orange flavored Gatorade®, and distilled water, as a control. It was demonstrated that adult diet was significantly effected olive leaf moth female longevity, the duration of oviposition periods, and fecundity. Female survival was better among those fed by honey solution, honeybee liquid food, gatorade and water then males. Egg fertility was >70% over the moths on sucrose and honey diets and fertility were not effected by adult feeding. Female fecundity was higher in 10% honey fed females as compared to the water fed females.

**Keywords:** *Palpita unionalis*, olive leaf moth, adult diet, longevity, egg production

### Seçilen Ergin Diyetlerinin Zeytin Fidan Kurdu'nun (*Palpita unionalis* Hübner (Lepidoptera:Pyralidae)) Yumurta Verimi ve Ergin Ömrü zerine Etkisi

Zeytin fidan tırtılı, *Palpita unionalis*, ergin dişilerinin canlı kalma oranları ve yumurta verimleri belirlendi. Erginler %10 ballı su, ticari olarak satılan bal arısı sıvı diyeti, portakallı Gatorade® ve kontrol olarak distile su ile beslendiler. Test edilen ergin diyetinin zeytin fidan tırtılıının ergin ömrü, oviposizyon süresi ve yumurta verimi üzerine önemli etkilerinin olduğu belirlendi. Dişilerin ballı su, bal arası sıvı diyeti, Gatorade® ve su üzerinde canlı kalma oranları erginlere oranla daha uzun olduğu tespit edildi. Yumurtaların açılma oranının şekerli ve ballı su içeren diyetlerde >%70 üzerinde olduğu ve ergin beslenmesinin bunun üzerine etkisinin olmadığı belirlendi. %10 ballı su ile beslenen dişilerin yumurta verimi, su ile beslenen dişilerinin yumurta veriminden daha yüksek olduğu tespit edildi.

**Anahtar kelimeler:** *Palpita unionalis*, zeytin fidan tırtılı, ergin diyeti, ömür, yumurta verimi

\* Bu çalışma Çiğdem YILMAZ'ın yüksek lisans tezinin bir kısmını içeren sonuçlardan yararlanılarak hazırlanmıştır.

#### Introduction

The olive leaf moth, *Palpita unionalis* Hübner, is an increasingly damaging pest of olive nurseries. It is a polyphagous pest attacking the genera of *Jasmine*, *Ligustrum*, *Oleae*, *Fraxinus*, *Phyllyrea* (Tzanakakis, 2003 and Athanassiou et al., 2004), Strawberries and Viburnum (Khaganini and Pourabad, 2009). The pest can be present all year round and its larvae damage the leaves, twigs and olive fruits (Figure 1). According to Kovancı et al. (2006) olive leaf moth has a 2 complete and 1 partial generations in Turkey. Many insects accumulate nutrients for reproduction during the larval stage but lepidopteran species feed usually on nectar sources in the adult stage (Chapman, 1998). The composition and availability of adult food sources have an important role in the biology of some butterflies. The utilization of

carbohydrate and aminoacid solutions may have a crucial effect to complete the development of reproductive system. Sugars affect longevity, fecundity and adult weight loss (Murphy et al. 1983). It was described that *Heliconius* butterflies feed on pollen as a source of aminoacid increased fecundity (Gilbert 1972, Dunlap-Pianka et al., 1977). It was shown that the genus *Ephestia* do not require sugar in their diet to increase fecundity and longevity as opposite known for *Pieris rapae* (Norris, 1935) and *Pieris brassicae* (David and Gardiner 1962).

The purpose of this study was to select a good adult diet for use in laboratory rearing. We tested the influence of selected diets on longevity and egg production of the olive leaf moth adults in the laboratory.



Figure 1. The damage of the olive leaf moth larvae on leaves (A) and olive fruit (B and C).

### Materials and Methods

A stock colony was initiated with insects obtained from infested olive shoots and leaves collected in Çanakkale province. Rearing was conducted under controlled conditions at  $24 \pm 1^\circ\text{C}$ , 65 % RH and with 16:8 (L:D) photoperiod in the laboratory. The larvae were kept in 30 x 18 x 7 cm tubberware containers with fresh olive leaves. Larval food was changed every other day by inserting to new plants. The obtained pupae were transferred into cages covered with a white organza cloth until adult emergence. Pupae were sexed according to Genc (2005) based on external morphology. Then, 24h-old adults (1 female:1 male) were transferred a cylindrical plexiglass containers used as cages (30 x17 cm) covered by a circular piece of filter paper at the bottom (Figure 2). Adults were kept in the cages until death. Olive shoots were placed in the cages, and replaced every other day to stimulate oviposition. On the other hand, interior wall of each container was covered with a stretch wrap as oviposition substrate. Adult diet souces were offered to the insects after soaked with a piece of cotton ball in a small petri dish. A virgin female of the olive leaf moth was caged with a male and fed with a one of four diets: 1)10%

honey solution, 10% honey by volume in distilled water, 2) a commercial honey bee liquid food, containing 30–36% saccarose, 27–30%, glucose, 37–40% fructose, and pH 4-6 ([www.ariyemi.com](http://www.ariyemi.com)), 3) orange flavored Gatorade® , a commercial thirst quencher drink, and 4) distilled water, used as a control.

A total of 3 replicate cages with 1 female:1 male per cage were used for each adult diet treatment. The cages were examined daily to record adult mortality and to remove and record eggs. During the experiment, dead males were replaced with live ones. The olive leaf moth eggs were held at  $24 \pm 1^\circ\text{C}$  until hatching. After the adults had died, the average longevity of females and males were determined for each cage. The following biological parameter were determined adult longevity and duration of oviposition. The fecundity was calculated from the mean percentage of eggs laid during the entire life of female. Egg viability was assessed from the mean number of hatched larvae from all treatments. The nonparametric Kruskal-Wallis test was used to separate multiple means after the initial test indicated a significant treatment effect.



Figure 2. A view of experimental cages of the olive leaf moth (*Palpita unionalis*).

### Results and Discussion

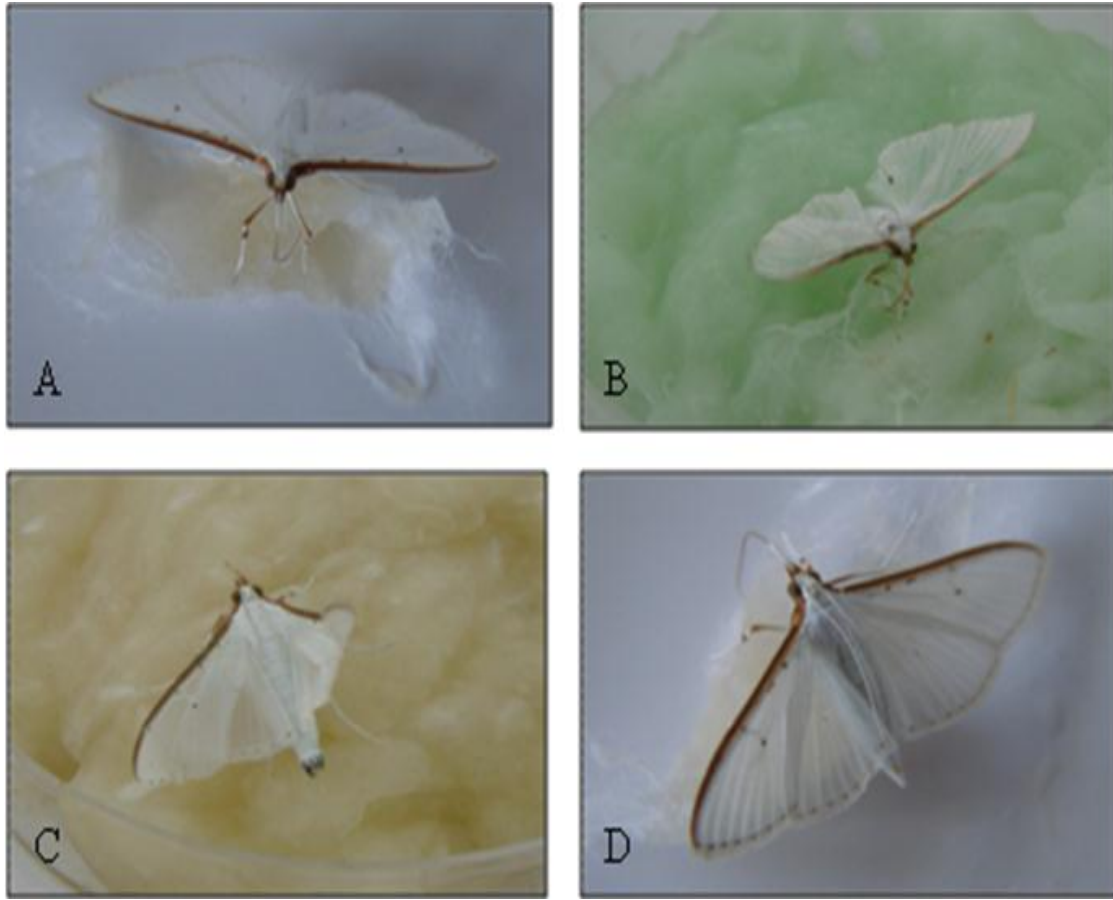
Adult diet was significantly effected olive leaf moth female longevity, the duration of oviposition periods, and fecundity (Tablo 1 and Figure 3). Carbohydrates in the diet significantly increased these parameters over a water diet. Female longevity was greatest among those fed by honey solution, the honeybee liquid food (Tablo 1), gatorade and water then males. Survival on the water diet was short. Oviposition duration was longer on females fed on adult diets than water-only diet. Significant differences in egg production were also found among adults fed on different diets (Tablo 1). The fecundity was higher among those fed the carbohydrate diets. Females on the

water-only diet was laid eggs significantly less than that of the olive leaf moth fed honey, honeybee liquid diet and gatorade. Fecundity of females fed on Gatorade diet was moderate but it provided good longevity for adults (Tablo 1) and oviposition duration. Most of the eggs were deposited two to three days after eclosion. Egg fertility was >70% over the moths on sucrose and honey diets. Fertility of eggs from water fed females was similar to that of eggs from carbohydrate fed moths, but adult mortality was also greatest on water fed diet. Infertility was significantly greater among those eggs oviposited by honeybee liquid food adults (Tablo 1). The life time fertility was similar on females fed on water-only diet averaged 75 % and 73% on honey diet.

Tablo 1. Effects of adult diet on olive leaf moth longevity, oviposition, fecundity, and fertility (mean±SE) (n=3)

Biological parameter	10% Honey	Honeybee liquid food	Gatorade®	Distilled water
Longevity (days)				
Male	9.1±1.7 a	8.2±1.5 a	7.4±1.8 b	5.6±0.3 c
Female	12.2±0.6 a	10.4±1.2 b	12.7±0.6 a	8.0±0.4 c
Days ovipositing	11.6 ± 0.5 a	9.5±1.3 b	13.0±1.5 a	4.3±0.6 c
Fecundity	509.3±75.0 a	465.0±61.0 b	248.3 ±35.6 d	311.3±31.2 c
Egg fertility (%)	73.2±6.3 a	46.7±3.1 c	51.9±4.0 b	74.7±8.3 a

Means followed by the same letter within a row are not significantly different, Kruskal-Wallis test ( $\alpha=0.05$ ).



**Figure 3.** Selected olive leaf moth adult diets A) 10 % honey, B) honeybee liquid food, C) Gatorade®, D) distilled water.

The requirements of food sources during adult stage was also observed for several other lepidopterans species fed on several sugar sources (Tisdale and Sappington, 2001) but, sometimes adult feeding is not always required or some sugar sources can be toxic to the adult stage (Jordao et al., 2010). However, it has been shown that carbohydrates supply additional food that helps the vitellogenin synthesis and egg development, so increase fecundity (Savopoulou-Soultani et al., 1998, Tisdale and Sappington, 2001)

Diets play an important role in egg production and female longevity (Nation, 2001 and Chapman, 1998). Generally the performance of the moths on the honey diet was consistently good. Similar data on longevity of females reared on honey solutions was found by Rogers and Marti (1996) and (1997). Tisdale and Sappington (2001) showed that carbohydrate in the adult diet can increase

lifetime fecundity. In this study, the performance of the olive leaf moth on moderately priced Gatorade and honeybee liquid diet was also good. Honey diet is relatively inexpensive, and our data suggests that it can be considered good diets for maintaining laboratory colonies of moths.

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