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Effect of Different Host Plants on some Biological Aspects of the Two Sugar Beet Flies *Pegomyia mixta* and *Pegomyia hyoscami* (Anthomyiidae: Diptera)

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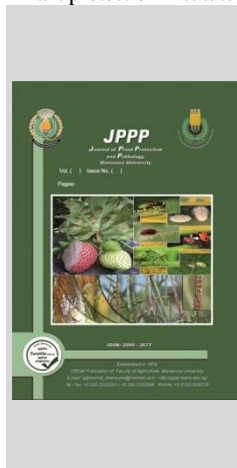
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ABSTRACT

The highest average number of egg-laying of *P. mixta* and *P. hyoscami* were recorded in sugar beet, followed by fodder beet, chard plants and table beet plants. Also, the highest incubation period were recorded in table beet plants. The highest percentage of hatchability in *P. mixta* was in fodder beet plants. As for *P. hyoscami*, it was in sugar beet plants. The shortest larval duration, pupal duration and the total immature stages recorded when reared *P. mixta* on sugar beet plants and presented by 14.1±0.35, 21.9±0.62 and 42.2±0.92 days, respectively. While, when reared *P. mixta* in table beet recorded the highest larval, pupal and total immature stages and presented by 20.9±0.48, 27.5±0.47 and 55.6±0.45 days, respectively. Also, for *P. hyoscami*, the shortest larval duration and pupal duration recorded when reared *P. hyoscami* on sugar beet plants and presented by 11.9±1.61, 17.6±2.46 days but the shortest total immature stages duration recorded when reared *P. hyoscami* on fodder beet and presented by 36.4±2.95 days, respectively. While, when reared *P. hyoscami* in table beet recorded the highest larval, pupal and total immature stages and presented by 17.3±2.35, 22.1±3.00 and 47.7±4.16 days, respectively. The longest longevity was recorded with *P. mixta* females for each host plant and *P. hyoscami* recorded the shortest adult longevity for each host plant. Sugar beet and fodder beet recorded the longest adult longevity.

Keywords: Host plants, biological aspects, *Pegomyia mixta*, *Pegomyia hyoscami*.



INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is one of the most important sugar crops in the world. The Egyptian government encourages sugar beet growers to increase the cultivated area with sugar beet for decreasing the gap between sugar production and consumption (Afifi 2001).

Sugar beet is liable to attack by many destructive insect pests during its different growing stages especially in unsuitable planting dates. So many authors are attracted to study a group of insect pests cause serious problems for growers and cause yield reductions (Bassyouny and Khalafalla 1996 and Ebieda *et al.* 1998).

In recent years, the beet fly, *Pegomyia mixta* has become serious pest of the sugar beet (Mousa 2005, Amin *et al.*, 2008, Abou-EIKassem 2010 and El-Dessouki 2014). Bazazo and Mashaal (2014) found that sugar beet is a main source of sugar, but the pest infestations reduce root quantity and sugar content. (Hurej, 1986 and Mohamed and Al-Adil, 1987) studied the biology of the Anthomyiidae (*P. hyoscyami*) occurring on sugar beet. In Egypt, (El-Ziady and Dimetry, 1970 and Abdel-Moniem *et al.* 2014) described the egg, larvae, pupae and the adult of *P. mixta* and estimated the larval duration, pupal duration, longevity, number of the deposited eggs throughout the life of the insect and the percentage of hatching. (Awadalla *et al.* 2018) studied the effect of different host plants (sugar beet, fodder beet, table beet and chard) on the sugar beet fly, *P. mixta* vill.

MATERIALS AND METHODS

A culture of *P. mixta* and *P. hyoscami* was started in the laboratory from eggs collected from sugar beet, fodder beet, chard and table beet fields. The laboratory conditions were fluctuated temperature ranged from 10.5°C and 16°C with the mean of 13.7°C± 0.17 and relative humidity from 55.5% and 89% with average of 71.6± 1.08%. Eggs were put in the potted host plants till hatching. Formed Pupae were transferred into new Petri dishes and examined daily until adult emergence. Adults were caged as pairs on potted host plants as an oviposition site until the death. The Deposited eggs were removed into Petri dishes until hatching. The larval duration, pupal duration, longevity, number of the deposited eggs throughout the life of the insect and the percentage of hatching were estimated for the two species *P. mixta* and *P. hyoscami*. Data were analyzed using analysis of variance (ANOVA) technique by means of "SPSS" computer software package. The treatment means were compared using Least Significant Differences (LSD).

RESULTS AND DISCUSSION

As shown in Table (1) showed the Effect of different host plants on the female egg-laying and hatchability of *P. mixta* and *P. hyoscami* under the fluctuated laboratory conditions (temperature ranged from 10.5°C and 16°C with the mean of 13.7°C± 0.17 and relative humidity from 55.5% and 89% with average of 71.6± 1.08%). The highest average number of egg-laying of *P. mixta* were recorded in Sugar

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Beet, followed by Fodder Beet and presented by 13.0±0.84 and 11.00±0.63 eggs, respectively. The highest incubation period were recorded in Table beet plants followed by Chard plants and presented by 7.2±0.38 and 6.8±0.38 days, respectively. The percentage of hatchability ranged between 59.1% in table beet and 83.6% in fodder beet plants. As for *P. hyoscami*, the results are somewhat similar to *P. mixta*, The highest average number of egg-laying of *P. hyoscami* were recorded in Sugar Beet, followed by Fodder Beet and presented by 6.6±0.25 and 5.2±0.38 eggs, respectively. The highest incubation period were recorded in Table beet plants followed by Chard plants presented by 8.2±0.66 and 7.6±0.25 days, respectively. The percentage of hatchability ranged between 50.0% in table beet and 69.7% in sugar beet plants.

Data arranged in Table (2) showed the effect of different host plants on the larval and pupal duration as well

Table 1. Effect of host plants on the female egg-laying and hatchability percentage of *P. mixta* and *P. hyoscami* under fluctuated conditions.

Host plants	Pegomyia mixta			Pegomyia hyoscami		
	No. of eggs	Incubation period	% of Hatchability	No. of eggs	Eggs incubation	% of Hatchability
Sugar Beet	13.0±0.84 a	6.2±0.38 c	75.4	6.6±0.25 a	7.6±0.25 b	69.7
Fodder Beet	11.0±0.63 b	6.6±0.25 b	83.6	5.2±0.38 b	6.0±0.32 c	61.5
Chard	8.0±0.45 c	6.8±0.38 b	70.0	3.0±0.45 c	7.6±0.25 b	53.3
Table Beet	4.4±0.40 d	7.2±0.38 a	59.1	1.6±0.40 d	8.2±0.66 a	50.0

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

Table 2. Effect of host plants on the larval and pupal duration of *P. mixta* and *P. hyoscami* under fluctuated conditions.

Host plants	Pegomyia mixta			Pegomyia hyoscami		
	Larval duration	Pupal duration	Total immature stages	Larval duration	Pupal duration	Total immature stages
Sugar Beet	14.1±0.35 c	21.9±0.62 c	42.2±0.92 d	11.9±1.61 c	17.6±2.46 c	37.1±2.91 c
Fodder Beet	15.9±0.24 c	21.7±0.57 c	44.1±0.76 c	12.4±1.69 c	18.0±2.47 c	36.4±2.95 c
Chard	17.9±0.38 b	24.5±0.62 b	49.2±0.58 b	15.7±1.69 b	20.8±2.27 b	44.1±3.17 b
Table Beet	20.9±0.48 a	27.5±0.47 a	55.6±0.45 a	17.3±2.35 a	22.1±3.00 a	47.7±4.16 a

In a column, the average numbers followed by the different letters are significantly differences at 5% level.

As shown in Fig. (1) showed the effect of host plants on the longevity of *P. mixta* and *P. hyoscami*.

The longevity of *P. mixta* female was the longest in host plants which was 12.4, 12.4, 10.0 and 9.8 days in sugar beet, fodder beet, chard plants and table beet, respectively, Meanwhile, the longevity of *P. hyoscami* was 10.6, 11.8, 9.8 and 8.6 days in sugar beet, fodder beet, chard and table beet, respectively. Analysis of variance showed that significant differences among the host plants for both insect pests.

These results are disagreement with El-Ziady and Dimetry (1970) found that the egg stage averaged about 6.3 days in January. When the fly was reared at constant temperatures, maximum numbers of eggs hatched (100%) at 20°C. The three larval instars together lasted for averages of about 19.6 days at 16°C and 10.6 days at 20°C. None of the larvae kept at 30°C completed their development. Red beet was preferred to sugar-beet, and sugar-beet to spinach. The full-fed larvae leave their mines and pupate in the soil. The pupal stage averaged about 24 days in January. Under controlled temperatures it averaged about 100.5 days at 8°C. Abdel-Moniem et al. (2014) found that the incubation period of the egg ranged between 4–5 days with an average of 4.41 ± 0.57 and the percentage of hatchability was 90.56%. Females laid large egg batches (up to 10 eggs in a batch) on large leaves. The larval duration ranges at 8–10 days with an average of 8.22 ± 0.51 days. The duration of

as the total immature stages of *P. mixta* and *P. hyoscami*. The shortest larval duration, pupal duration and the total immature stages recorded when reared *P. mixta* on sugar beet plants and presented by 14.1±0.35, 21.9±0.62 and 42.2±0.92 days, respectively. While, when reared *P. mixta* in table beet recorded the highest larval, pupal and total immature stages and presented by 20.9±0.48, 27.5±0.47 and 55.6±0.45 days, respectively. Also, for *P. hyoscami*, the shortest larval duration and pupal duration recorded when reared *P. hyoscami* on sugar beet plants and presented by 11.9±1.61, 17.6±2.46 days but the shortest total immature stages duration recorded when reared *P. hyoscami* on fodder beet and presented by 36.4±2.95 days, respectively. While, when reared *P. hyoscami* in table beet recorded the highest larval, pupal and total immature stages and presented by 17.3±2.35, 22.1±3.00 and 47.7±4.16 days, respectively.

the pupal stage was ranged between 15–17 days with an average of 16.57 ± 0.39 days. The average period of pre-oviposition, oviposition and post-oviposition lasted 3.2 ± 0.78, 6.47 ± 0.66 and 4.81 ± 0.52 days, respectively. The female usually lives longer than the male. The longevity of the females of *P. mixta* ranged from 10 to 14 days with an average of 11.76 ± 0.75 days. The number of deposited eggs per female ranged from 40 to 50 eggs with an average of 45.35 ± 2.89 eggs/female.

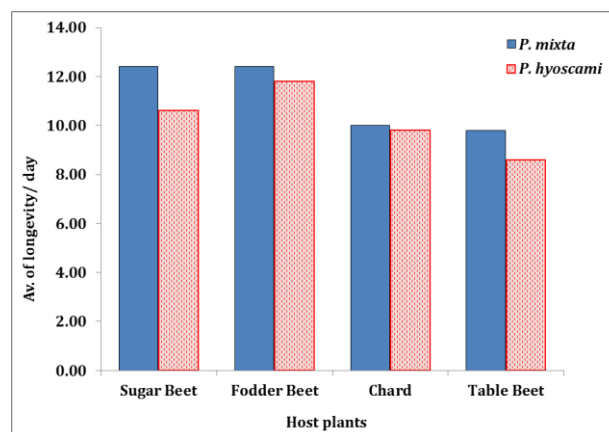


Fig. 1. The effect of host plants on the adult longevity of *P. mixta* and *P. hyoscami*.

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تأثير العوائل النباتية المختلفة على بعض الخصائص البيولوجية لنوعين من ذباب بنجر السكر *Pegomyia mixta* and *Pegomyia hyoscyami* (Anthomyiidae: Diptera)

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تم تسجيل اعلى متوسط لوضع البيض لكلا الحشرتين *Pegomyia mixta* and *Pegomyia hyoscyami* على نباتات بنجر السكر بليه بنجر العلف، السلق و بنجر المائدة. سجلت أعلى فترة حضانة للبيض على نباتات بنجر المائدة. أعلى نسبة فقس للبيض لحشرة (*P. mixta*) سجلت على نباتات بنجر العلف في حين سجلت على نباتات بنجر السكر في حشرة (*P. hyoscyami*). تم تسجيل أقصر مدة للطور اليرقي، طور العذراء و الاطوار الغير الكاملة لحشرة *P. mixta* عند تربيتها على بنجر السكر، في حين سجلت أطول مدة للطور اليرقي، طور العذراء و الاطوار الغير كاملة عند تربيتها على بنجر المائدة. عند تربية حشرة *P. hyoscyami* على نباتات بنجر السكر فقد تم تسجيل أقصر مدة للطور اليرقي و طور العذراء في حين سجل أقل مدة للأطوار الغير كاملة على نباتات بنجر العلف. سجلت أطول فترة للطور اليرقي، طور العذراء وكذلك الاطوار الغير كاملة عند تربية الحشرة على نباتات بنجر المائدة. تم تسجيل اطول عمر لإناث حشرة *P. mixta* لكل العوائل النباتية في حين سجل أقصر عمر لإناث حشرة *P. hyoscyami* لكل العوائل النباتية. وتم تسجيل اطول عمر للحشرتين على بنجر السكر وبنجر العلف.