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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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 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-ElKassem 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. hyoscami) 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 will.

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±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±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
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 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.

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

<table>
<thead>
<tr>
<th>Host plants</th>
<th>Pegomyia mixta</th>
<th>Pegomyia hyoscami</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of eggs</td>
<td>Incubation period</td>
<td>% of Hatchability</td>
</tr>
<tr>
<td>Sugar Beet</td>
<td>13.0±0.84 a</td>
<td>6.2±0.38 c</td>
</tr>
<tr>
<td>Fodder Beet</td>
<td>11.0±0.63 b</td>
<td>6.6±0.25 b</td>
</tr>
<tr>
<td>Chard</td>
<td>8.0±0.45 c</td>
<td>6.8±0.38 b</td>
</tr>
<tr>
<td>Table Beet</td>
<td>4.4±0.40 d</td>
<td>7.2±0.38 a</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Host plants</th>
<th>Pegomyia mixta</th>
<th>Pegomyia hyoscami</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larval duration</td>
<td>Pupal duration</td>
<td>Total immature stages</td>
</tr>
<tr>
<td>Sugar Beet</td>
<td>14.1±0.35 c</td>
<td>21.9±0.62 c</td>
</tr>
<tr>
<td>Fodder Beet</td>
<td>15.0±0.24 c</td>
<td>21.7±0.57 c</td>
</tr>
<tr>
<td>Chard</td>
<td>17.9±0.38 b</td>
<td>24.5±0.62 b</td>
</tr>
<tr>
<td>Table Beet</td>
<td>20.9±0.48 a</td>
<td>27.5±0.47 a</td>
</tr>
</tbody>
</table>

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 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 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.
**Pegomyia mixta** and **Pegomyia hyoscamy (Anthomyiidae:Diptera)**

To affect the nutrients of the plant, different types of the Pegomyia fly have been recorded on sugar beet. Pegomyia mixta (Diptera: Anthomyiidae) is known to feed on the leaves of sugar beet, causing damage to the yield and quality of the crop. P. mixta is a significant pest of sugar beet, and its control is essential to ensure crop production.

**REFERENCES**


