

Influence of Feeding with Some Host Plant Types on Certain Biological Activities of Beetle *Scolytus amygdali* Guér (Coleoptera: Scolytidae)

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ABSTRACT

The results based on certain biological aspects showed that plum branches were the more attractiveness to *Scolytus amygdali* Guér beetles, while the pear branches were the least attractiveness. The beetles rearing on plum constructed the longest egg gallery, deposited the highest number of eggs and gave the highest number of progeny, while the reared on pear built the shortest length of egg gallery, laid the least number of eggs and produced the least progeny. The longest duration of generation occurred for the beetles reared on apple branches, while that reared on pear and plum appeared the shortest duration. On the other hand, the beetles reared on peach appeared the longest period of adult emergence, while the shortest period occurred on apple branches.

Keywords: *Scolytus amygdali*, Coleoptera, Scolytidae, biological activities

INTRODUCTION

The shot-hole borer, *Scolytus amygdali* Guér, is considered one of the most serious scolytid bark beetles in Egypt. The beetles of this pest attack many fruit trees causing severe damage to the trees and reduction of yield. Some investigators conducted different works on *S. amygdali* beetle including: Survey, biology, ecology and control studies, such as: Willcocks (1924), Nour (1963), Alfieri (1976), Abd Allah (1978 & 1983) and Girgis (1987), Batt (1989), Kinawy *et al.* (1991), Tadros (1994), Tadros *et al.* (2007) and El-Assal *et al.* (2009). The food is one of main factors effecting the growth and biological aspects in different organisms.

The aim of the present work is to study the effect of feeding by different host plants on some biological activities of *S. amygdali* beetles (initial infestation, number of deposited eggs, length of egg gallery, number of emerged beetles/ female, duration of generation and the period of emergence).

MATERIALS AND METHODS

This work was carried out in the wood borers and termites Dept., Plant Protection Research Institute, Agriculture Research Centre, Ministry of Agriculture, El-Dokki, Giza, Egypt.

Infested branches with *Scolytus amygdali* Guér beetles were collected from almond, apple, apricot, peach, pear, pecan and plum orchards at Minufya Governorate, these branches were always kept throughout the period of this study carried out from early April to late of September during 2016 under lab. Conditions (25.4-32.5°C and 67.8-73.8 RH) in plastic containers (90 x 50 cm.), covered with muslin cloth. The adults emerged from these branches were used in the following studies:

a. Initial infestation (Entrance holes):

Five healthy cuttings (10 x 2 cm.) from each of the above mentioned hosts were placed together in a glass jar (18 x 12 cm), making 20 of these jars from each host. Sixty couples of newly emerged beetles were released in each jar, and by daily inspection was made until the beetles died, the numbers of entrance holes in cuttings of each host were counted and recorded.

b. Other biological aspects :

Thirty healthy cuttings of each host (10 x 2 cm.) were placed each in a glass jar (12 x 6cm), and was exposed to one couple of newly emerged beetles. After egg laying took place (death of female beetles), the bark above entrance

galleries of 15 cuttings/ host was removed carefully the length of egg gallery was measured and the number of laid eggs/female was recorded. The other 15 infested cuttings/ host were left until the new beetles emergence, the duration of generation, number of emerged beetles per female and length of emergence period on each host were determined.

RESULTS AND DISCUSSION

The feeding of *S. amygdali* beetles on some different hosts revealed various effects on certain biological aspects of this insect. These effects show in the following points:

1-The effect on the initial infestation :

Data presented in Table (1) showed that the initial infestation of *S. amygdali* varied within the tested hosts. Plum cuttings were the most favourite host. It attracted the highest number of beetles (average 14.1 ± 1.8 beetles), while pear cuttings attracted the least number (average 3.95 ± 1.5 beetles). The rest of hosts recorded almost the same level of attractiveness.

Statistical analysis Snedecor and Cochran (1990) revealed four significant groups, L.S.D = 2.46, (Table 1), the seven hosts could be dissendingly arranged according to their attractiveness to the beetles as follows: plum trees, pecan, almond apple, peach and apricot, while pear trees were the least susceptible host of all. These results are in agreement with Svihra and Volney (1983), who stated that *Scolytus multistriatus* March. females demonstrated more distinct preference to English and Siberian elm than Chinese one either in attacking bolts or in establishing their egg-galleries.

2-The effect on female fecundity and gallery length:

The highest number of deposited eggs was laid by female beetles reared on plum cuttings (Av. $72.87 + 6.20$ eggs), while the least fecundity was recorded from that reared on pear cuttings (Av. $29.83 + 3.90$ eggs). The remaining five hosts received almost similar number of eggs (Av. 54.6-46.6 eggs). The mean number of deposited eggs could be arranged into three significant groups, L.S.D = 17.53 Table (2).

Similarly, the longest egg gallery (Av. $20.4 + 3.3$ mm) occurred in plum, while the shortest (Av. $12.97 + 3.0$ mm) occurred on pear. In other hosts the averages varied between 14.50 -17.22 mm, Table (1). The effect of host plant on the length of egg gallery was insignificant. Highly significant positive relationship ($r = 0.89$) between the length of egg gallery and the number of deposited eggs, the

increase in length of egg gallery led to an increase in the egg laying capacity ($b = 2.89$).

These results are in agreement with Janjua and Samual (1941), who mentioned that *S. amygdali* infest almond, apple and quince trees and the female beetle deposit 50-70 eggs. Also, Abd-Allah (1978) who found that *S. amygdali* female, reared on almond branches laid from 37 to 85 eggs (av. 61.47 eggs). El-Assal et al., (2009) found that fertile female of *S. amygdali* beetle reared on apple branches laid between 33-82 eggs during the fifth successive generations.

3-The effect on female progeny (number of emerged beetles)

Results in Table (2) showed that the females reared on plum cuttings gave the highest number of progeny (Av. 50.3 + 5.3 beetles), followed by pecan (48.15 beetles), almond (45.68 beetles), apple (43.1 beetles), peach (23.0 beetles), apricot (21.7 beetles) and pear (19.6 beetles). L.S.D. Value (11.24) indicate that plum, pecan, almond and apple are grouped in one level, while peach, apricot and pear in another level of host suitability, Table (2).

4-The effect of on the duration of generation

Data presented in Table (3) revealed that the longest duration of generation of *S. amygdali* beetle occurred when reared on apple branches (Av. 88.5 + 2.7 days), while the shortest duration occurred on pear and plum cuttings (55.15 + 2.5 and 53.85 + 3.1 days, respectively). Four significant groups (L.S.D.=8.29) for duration of generation were recorded. Abd-Allah (1978) reported that total life cycle for *S. amygdali* on almond branches was between 31-178 days, while Tadros (1999) found that total life cycle duration of this beetle was 42.7-147.2 days when reared on peach branches, whereas Tadros et al., (2007) reported that total life cycle duration of *S. amygdali* beetle ranged 42.3-160 days when the beetles were reared on apricot branches.

5-The effect of length of emergence period

The longest period of adult emergence occurred on peach (29.3 + 3.6 days), while the shortest period was on apple branches (11.7 + 1.8 days). Three significant groups (L.S.D.=8.12) for beetle emergence periods on different hosts were obtained, Table (3).

Table 1. Numbers of adult entrance holes and length of egg gallery constructed by *Scolytus amygdali* Guér beetles reared on different host trees, under laboratory conditions of 25.4-32.5°C and 67.8-73.8 RH.

| Host trees | Number of adult entrance holes | | Length of egg gallery/mm | |
|------------|--------------------------------|---------------|--------------------------|--------|
| | Av. ± s.e. (Range) | Groups | Av. ± s.e. (Range) | Groups |
| Plum | 14.10 ± 1.80 (9-20) | a | 20.40 ± 3.30 (6-39) | d |
| Pecan | 11.22 ± 1.30 (7-14) | | 17.22 ± 2.25 (5-37) | |
| Almond | 10.15 ± 1.60 (5-13) | b | 16.14 ± 2.9 (6-32) | |
| Apple | 7.20 ± 1.90 (2-12) | | 14.53 ± 2.70 (5-39) | |
| Peach | 6.55 ± 1.60 (3-11) | c | 14.50 ± 2.50 (5-25) | |
| Apricot | 5.60 ± 1.80 (2-13) | | 16.67 ± 3.10 (5-47) | |
| Pear | 3.95 ± 1.50 (2-9) | d | 12.97 ± 3.01 (5-54) | |
| F. | 35.47 | | 3.15 | |
| L.S.D. | 2.46 | Insignificant | | |

Table 2. Numbers of deposited eggs and number of emerged beetles per female of *Scolytus amygdali* Guér beetles reared on different host trees, under laboratory conditions of 25.4-32.5°C and 67.8-73.8 RH.

| Host trees | Number of deposited eggs/female | | Number of emerged beetles/female | |
|------------|---------------------------------|--------|----------------------------------|--------|
| | Av. ± s.e. (Range) | Groups | Av. ± s.e. (Range) | Groups |
| Plum | 72.87 ± 6.20 (23-138) | a | 50.27 ± 5.30 (21-118) | a |
| Pecan | 54.6 ± 5.30 (22-30) | | 48.15 ± 4.80 (19-110) | |
| Almond | 49.20 ± 4.50 (21-128) | | 45.18 ± 4.20 (17-108) | |
| Apple | 47.70 ± 4.80 (20-127) | | 43.07 ± 4.60 (17-104) | |
| Peach | 47.20 ± 4.50 (16-86) | b | 23.00 ± 2.80 (14-38) | b |
| Apricot | 46.60 ± 5.10 (11-116) | | 21.70 ± 2.20 (14-27) | |
| Pear | 29.83 ± 3.90 (6-84) | | 19.60 ± 2.70 (11-37) | |
| F. | 10.67 | | 20.91 | |
| L.S.D. | 17.53 | | 11.24 | |

Table 3. Duration period of generation and Length of emergence period of *S. amygdali* beetles reared on different host trees under laboratory conditions of 25.4-32.5°C and 67.8-73.8 RH.

| Host trees | Duration period of generation | | Length of emergence period | | |
|------------|-------------------------------|--------|----------------------------|----------------------------|--------|
| | Duration of generation (days) | | Host trees | Length of emergence (days) | |
| | Av. ± s.e. (Range) | Groups | | Av. ± s.e. (Range) | Groups |
| Apple | 88.50 ± 2.74 (85-92) | a | Peach | 29.30 ± 3.60 (5-42) | a |
| Peach | 80.10 ± 2.90 (36-90) | | pecan | 25.41 ± 2.80 (8-38) | |
| Pecan | 79.20 ± 2.80 (39-91) | b | Plum | 21.50 ± 2.70 (11-30) | |
| Almond | 70.25 ± 2.40 (37-86) | | Almond | 21.15 ± 3.40 (9-32) | |
| Apricot | 65.30 ± 4.10 | c | Pear | 21.00 ± 3.20 (7-38) | b |
| Pear | 55.15 ± 2.50 (41-62) | | Apricot | 18.80 ± 3.30 (5-42) | |
| Plum | 53.85 ± 3.10 (36-83) | d | Apple | 11.65 ± 1.80 (7-16) | c |
| F. | 47.22 | | F. | 8.38 | |
| L.S.D. | 8.29 | | L.S.D. | 8.12 | |

Besides, fore-mentioned measures on the effect of feeding on some biological aspects, this work clearly showed that the emerged beetles reared on different host plants differed also in morphological measurements concerning size of beetles (length and width).

The averages of lengths and widths of emerged beetles took the same trend for all host plants, the largest size of resulted beetles were obtained when female beetles were reared on plum, while smallest size produced from the female reared on pear. Three significant groups were obtained for each length (L.S.D. = 0.180) and width (L.S.D. = 0.080) of beetles, Table (4).

Table 4. Size of resulted beetles from *S. amygdali* female reared on different hosts, under laboratory conditions of 25.4-32.5°C and 67.8-73.8 RH.

| Host trees | Length of beetle (mm) | | Width of beetle (mm) | |
|------------|-----------------------------|--------|----------------------------|--------|
| | Av. + s.e. (Range) | Groups | Av. + s.e. (Range) | Groups |
| Plum | 2.10 + 0.16 (1.76-2.28) | a | 0.84 + 0.08 (0.68-0.96) | a |
| Pecan | 1.98 + 0.021 (1.7-2.25) | | 0.79 + 0.08 (0.66-0.94) | |
| Almond | 1.95 + 0.020 (1.70-2.24) | | 0.78 + 0.09 (0.65-0.95) | |
| Apple | 1.93 + 0.17 (1.60-2.24) | b | 0.77 + 0.08 (0.64-0.92) | b |
| Peach | 1.85 + 0.19 (1.52-2.16) | | 0.75 + 0.09 (0.60-0.92) | |
| Apricot | 1.83 + 0.31 (1.44-2.24) | c | 0.73 + 0.14 (0.48-0.92) | c |
| Pear | 1.71 + 0.24 (1.32-2.12) | | 0.69 + 0.09 (0.56-0.84) | |
| F. | 8.40 | | 6.58 | |
| L.S.D. | 0.180 | | 0.080 | |

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تأثير التغذية ببعض أنواع العوائل النباتية على بعض النشاطات البيولوجية لخنفساء قلف الحلويات *Scolytus amygdali* Guér (Coleoptera : Scolytidae).
أيمن رمضان البسيوني ، محمد عبد الغنى بط و عبد الغنى محمد بط
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - جيزة - مصر

تشير نتائج هذا العمل معتمدة على بعض النشاطات البيولوجية لخنفساء *Scolytus amygdali* عند تربيتها على بعض أنواع العوائل النباتية (البرقوق ، البيكان ، اللوز ، التفاح ، الخوخ ، المشمش ، الكمثرى) إلى الآتى : * كانت أفرع البرقوق الأكثر جذباً لخنفساء *S. amygdali* يليها البيكان ثم اللوز بينما كانت الكمثرى والمشمش هي الأقل جذباً للخنفساء . * الخنافس المرباه على البرقوق شيدت الانفاق الأطول لوضع البيض ووضعت العدد الأعلى للبيض وقد أنتجت الخنافس المرباه على البرقوق والبيكان واللوز أعلى عدد من الذرية الناتجة ، بينما الخنافس المرباه على الكمثرى كانت أقل هذه المظاهر . * سجلت أطول مدة جيل للخنفساء المرباه على أفرع التفاح يليها الخوخ ثم البيكان ، بينما المدة الأقصر للجيل ظهرت على الكمثرى والبرقوق .. في حين أن الخنافس المرباه على أفرع الخوخ أظهرت أطول فترة خروج يليها البيكان ثم البرقوق ، بينما سجلت الفترة الأقصر على أفرع التفاح .