EFFECT OF SOME ARTIFICIAL DIETS HONEYBEE INFESTATION LEVEL WITH ECTOPARASITIC MITE VARROA DESTROYOR

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ABSTRACT

The effect of feeding honeybee colonies with five different diets on the level of Varroa infestation was studied during spring, summer and autumn seasons of 2003.

It could be concluded that the lowest rate of Varroa infestation was noticed in colonies that fed on diet 5 (1 part cooking potatoes : 1 part defatted soya flour) during spring and autumn, while in summer the lowest rate was observed with diet 4 (2 parts bean flour : 1 part date paste : 1 part skimmed milk).

The highest population growth of Varroa destructor was detected during summer with an average of 9.11%, while during spring and autumn seasons the population was nearly similar (7.75% and 7.55%, respectively).

INTRODUCTION

Varroasis is a dangerous pest of honeybee which is caused by the ectoparasitic mite Varroa destructor. Varroa disease causes a serious problem in world beekeeping due to its harmful effect to the insect host (Ritter 1981, Flantids 1987, Fathy and Fouly 1993).

There are many methods for killing mites in bee colonies, several chemical miticides and management techniques are being used to control mites with some success.

The level of Varroa infestation appeared to be related to the availability of feeding and the climatic conditions. Couto and Cotta (1988) stated that the level of Varroa infestation decreased in all the diet fed colonies during the study. While Garcia et al. (1996), found that the feeding on amino acids did not reduce the Varroa infestation. On the other hand, Romanuik and Duk (1983) showed that the average number of live Varroa destructor females per 100 bees was low in the period from April to July. In August, the mean number increased. Also, Otten (1991a) stated that the population growth of Varroa destructor in the colonies showed a seasonal variation, of values in August, September were higher than in October.

Moretto (1995) found that the rate of reproduction and the percentage of fertile females were minimum during June and peaked during November.

The present study deals effect of some artificial diets on honeybee infestation level with ectoparasitic mite Varroa destructor.

MATERIALS AND METHODS

The experiments were carried out at the apiary of the Faculty of Agriculture, Assiut, Al-Azhar University during spring, summer and autumn seasons of 2003.
Experimental colonies (Eighteen F1 Carnio – Egyptian honeybee colonies) were housed in langstroth hives. The colonies were headed by newly mated sister queens and nearly at the same strength. Colonies were distributed at random in six groups (3 colonies in each). Five groups were fed on different diets and the sixth group fed on sucrose syrup (1:1) as control. The diets were offered to the tested colonies at the rate of 100 gm/culture/7 days. Cakes were placed over the brood nest and covered with wax paper.

1-Test diets:

Five test diets were selected according to Hassan (2002): these diets were:

1) 10% Brewers yeast + 3 parts chick pea flour: 1 part skimmed milk.
2) 10%Brewers yeast + 3 parts bean flour: 1 part skimmed milk.
3) 10%Brewers yeast + 2 parts defatted soya flour: 1 part date paste.
4) 2 parts bean flour: 1 part date paste: 1 part skimmed milk.
5) 1 part cooking potatoes: 1 part defatted soya flour.

The control colonies were fed on sugar solution 1:1.

2-Rate of Varroa infestation:

The rate of Varroa infestation was determined twice according to Khater (1992). The first was at the beginning of the experiment. The second was performed at the end of the experiment as follow. About 100 house bees were picked up at random from each experimental colony, and anaesthetized with chloroform. Thereafter, the sample was put in 600 ml beaker, then 250 ml boiling water with a detergent was poured on the bee sample in the beaker. A filtration process was then applied, to separate the detached Varroa mites from the bees' bodies using a glass funnel with a lining of wire screen net. Bees were washed with excess boiling water to ensure complete separation of the mites remaining between bee bodies. Hence, the number of Varroa mites found in the filtrate (V) and the number of bees in the funnel (B) were counted and the rate of infestation was then calculated according to the formula:

\[ \text{% infestation} = \frac{V}{B} \times 100 \]

The rate of Varroa infestation was determined during spring, summer and autumn seasons of 2003.

Statistical analysis:

Data obtained were statistically analysed according to Snedecor and Cochran (1967) method using software costat program. Also, correlation coefficients were determined and discussed statistically.

RESULT AND DISCUSSION

Data listed in Tables 1, 2 and 3 showed the rate of Varroa mites infestation as affected by feeding honeybee colonies on the test diets was carried out before and after the experiment during Spring, Summer and Autumn seasons 2003.
In spring, the rate of Varroa mites infestation before the experiment was: 8.89, 6.71, 8.71, 8.07, 7.48 and 6.66 % in the colonies fed on experimented diets and control, respectively (Table 1). In the end of the experiment, this rate was 5.80, 5.29, 7.10, 5.96 and 1.53 % with decreasing rates being 34.76, 21.16, 18.48, 26.15, and 79.55 % for diets 1, 2, 3, 4 and 5, respectively. The level of Varroa infestation in the control was 7.54 % with increasing rate being 13.66%.

Table (1): Rate of Varroa mites infestation as affected by feeding honeybee colonies on the test diets during spring of 2003.

<table>
<thead>
<tr>
<th>Diets</th>
<th>Varroa Infestation</th>
<th>Increasing</th>
<th>Decreasing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6.71</td>
<td>5.26</td>
<td>21.16</td>
</tr>
<tr>
<td>3</td>
<td>8.71</td>
<td>7.10</td>
<td>18.48</td>
</tr>
<tr>
<td>4</td>
<td>8.56</td>
<td>5.96</td>
<td>26.15</td>
</tr>
<tr>
<td>5</td>
<td>7.48</td>
<td>1.53</td>
<td>79.55</td>
</tr>
<tr>
<td>Control</td>
<td>6.66</td>
<td>7.57</td>
<td>13.66</td>
</tr>
<tr>
<td>Total</td>
<td>48.53</td>
<td>33.25</td>
<td>180.10</td>
</tr>
<tr>
<td>Mean</td>
<td>7.84</td>
<td>5.54</td>
<td>30.02</td>
</tr>
</tbody>
</table>

* 10% brewers yeast : 3 parts chick pea flour : 1 part skimmed milk.
** 10% brewers yeast : 3 parts bean flour : 1 part skimmed milk.
*** 10% brewers yeast : 2 parts defatted soya flour : 1 part date paste.
**** 2 parts bean flour : 1 part date paste : 1 part skimmed milk
***** 1 part cooking potatoes : 1 part defatted soya flour

Table (2): Rate of Varroa mites infestation as affected by feeding honeybee colonies on the test diets during summer of 2003

<table>
<thead>
<tr>
<th>Diets</th>
<th>Varroa Infestation</th>
<th>Increasing</th>
<th>Decreasing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.50</td>
<td>5.56</td>
<td>58.79</td>
</tr>
<tr>
<td>2</td>
<td>10.82</td>
<td>19.02</td>
<td>75.79</td>
</tr>
<tr>
<td>3</td>
<td>6.73</td>
<td>3.25</td>
<td>51.71</td>
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<tr>
<td>4</td>
<td>14.83</td>
<td>5.64</td>
<td>60.78</td>
</tr>
<tr>
<td>5</td>
<td>14.08</td>
<td>21.93</td>
<td>55.75</td>
</tr>
<tr>
<td>Control</td>
<td>5.17</td>
<td>6.05</td>
<td>17.02</td>
</tr>
<tr>
<td>Total</td>
<td>54.66</td>
<td>70.45</td>
<td>207.35</td>
</tr>
<tr>
<td>Mean</td>
<td>9.19</td>
<td>10.24</td>
<td>34.56</td>
</tr>
</tbody>
</table>

* 10% brewers yeast : 3 parts chick pea flour : 1 part skimmed milk.
** 10% brewers yeast : 3 parts bean flour : 1 part skimmed milk.
*** 10% brewers yeast : 2 parts defatted soya flour : 1 part date paste.
**** 2 parts bean flour : 1 part date paste : 1 part skimmed milk
***** 1 part cooking potatoes : 1 part defatted soya flour

It is clear that the level of Varroa mites infestation decreased for all diets, while in the control, this level increased.

During summer. The results presented in table 2 showed that the rate of Varroa mites infestation before the experiment was a followed: 3.50, 10.82, 6.73, 14.38, 14.08 and 5.17 in the colonies fed on diets 1, 2, 3, 4, 5 and control.
respectively. In the end of the experiment, this rate was 5.56 % for diet 1 (increasing rate = 58.79 %), 10.02 % for diet 2 (increasing rate = 75.79 %), 3.25 % for diet 3 (decreasing rate = 51.71 %), 5.64 % for diet 4 (decreasing rate = 60.78 %), 21.93 % for diet 5 (increasing rate = 55.75 %) and 6.05 % for the control (increasing rate = 17.02 %).

It could be mentioned that feeding colonies on diets 3 and 4 causes decreasing the level of Varroa mites infestation, while feeding colonies on the rest of diets and control increased this rate.

In autumn, data indicated the rate of Varroa mites infestation in the beginning of the experiment was as follows: 6.74, 6.00, 9.68, 9.08, 9.27 and 4.55 % for diets 1, 2, 3, 4, 5 and the control, respectively. In the end of the experiment, this rate was 1.58 % for diet 1 (decreasing rate = 76.56 %), 2.61 % for diet 2 (decreasing rate = 56.55 %), 6.05 % for diet 3 (decreasing rate = 37.40 %), 4.92 % for diet 4 (decreasing rate = 45.61 %), 1.88 % for diet 5 (decreasing rate = 79.72 %) and 5.31 % with the control (increasing rate = 16.70 %). (Table 3).

<table>
<thead>
<tr>
<th>Varroa infestation</th>
<th>Varroa Infestation %</th>
<th>Increasing</th>
<th>Decreasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diets *</td>
<td>Before experiments</td>
<td>After experiment</td>
<td>----</td>
</tr>
<tr>
<td>1**</td>
<td>6.74</td>
<td>1.58</td>
<td>----</td>
</tr>
<tr>
<td>2**</td>
<td>6.00</td>
<td>2.61</td>
<td>----</td>
</tr>
<tr>
<td>3***</td>
<td>9.68</td>
<td>6.06</td>
<td>----</td>
</tr>
<tr>
<td>4****</td>
<td>9.08</td>
<td>4.92</td>
<td>----</td>
</tr>
<tr>
<td>5*****</td>
<td>9.07</td>
<td>1.88</td>
<td>----</td>
</tr>
<tr>
<td>Control</td>
<td>4.55</td>
<td>5.00</td>
<td>15.75</td>
</tr>
<tr>
<td>Total</td>
<td>45.32</td>
<td>22.36</td>
<td>16.75</td>
</tr>
<tr>
<td>Mean</td>
<td>7.56</td>
<td>3.67</td>
<td>2.78</td>
</tr>
</tbody>
</table>

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** 10% brewers yeast : 3 parts bean flour : 1 part skimmed milk.
*** 10% brewers yeast : 2 parts defatted soya flour : 1 part date paste.
**** 2 parts bean flour : 1 part date Paste : 1 part skimmed milk
***** 1 part cooking potatoes : 1 part defatted soya flour

It is worth noting that the level of Varroa infestation decreased in all the tested diets, while this level increased in control colonies (Table 3).

Analysis of data revealed highly significant differences between treatments in before and after the experiment. Also found highly significant differences between means and inter treatments during spring, summer and autumn seasons.

The highest rate of Varroa infestation was detected during summer with an average of 9.11%. While this rate during spring and autumn seasons was nearly similar (7.75 and 7.55 %, respectively). In this respect, Otten (1991a) stated that the population growth of Varroa jacobsoni in the colonies showed a seasonal variation, of valued in August, September were higher than in October. Also, Rovaniuk and Duk (1983) showed that the average number
of live Varroa destructor females per 100 bees was low in the period from April to July but in August the mean number increased. On the contrary, Affi (1998) stated that the reproductive rate (RR) of Varroa Jacobsoni was higher during spring.

Generally, it could be concluded that the highest decreasing rate of Varroa infestation was observed in the colonies fed on diet 5 during spring and autumn. While in summer the highest decreasing rate was noticed for diet 4. Obtained results are in accordance with those of Couto and Cotta (1988) who stated that the level of Varroa infestation decreased in all the colonies fed the test diets. On the contrary, Garcia et al. (1986) stated that feeding colonies on amino acids did not reduce the Varroa infestation.

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تأثير بعض البيئات الصناعية على مستويات إصابة نحل العسل بطفيل الفاروا

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تظهر هذه الدراسة بمنح كلية الزراعة بأسيوط جامعة الأزهر بجامعة الزراعة بغرض دراسة تأثير

البيئة على مستويات إصابة نحل العسل بطفيل الفاروا. في طوانين نحل العسل وذلك لدراسة

فصول الربيع والصيف والخريف لعام 2002 م.

وتظهر النتائج بصفة عامة أن أعلى تخطيط في مستوى الإصابة لحذف المرة في الطوانين.

التي تناولت على البيئة الطازجة رقم 5 (1) جزء دقيق صغير مزروع

الدشبي. وذلك خلال موسم الربيع والخريف. بينما في فصل الصيف لوحظ أن أعلى تخطيط في

مستوى الإصابة كان في الطوانين التي تناولت على الوجه رقم 4 (2) جزء دقيق قليل بلدي:

أجزاء عينة 1 جزء كنفر معتدي.

ولاحظ أيضاً أن أعلى مستوى للإصابة بالفاروا كان خلال فصل الصيف بمتوسط قدره

9.11 %، بينما في موسم الربيع والخريف كان معدل الإصابة بمتوسط تقريب (7.75% 7.75)

على التوالي.)