SEASONAL APLICATION OF JENTER’S METHOD FOR A SUCCESSFUL
QUEEN BEES’ REARING IN ALBANIA

L. Sena, S. Sena, F. Gjurgji and M. Nikolla
Department of Animal Production, Faculty of Agriculture and Environment, Agricultural University of Tirana, Albania
Correspondence to: Lumturi Sena
E-mail: lumturisena@yahoo.com

ABSTRACT
This research tested the rearing method of Queen Bees according to Jenter’s. Two consecutive planting were realized, respectively on June 24 and July 12, each of these time-periods representing one stage of the experiment.
To implement this research, the strongest bee-colonies of the apiary were used. During each stage of experiment 10 Queen Bees were produced. Their quality was judged and decided based on their growth parameters and performance.
During each stage, the percentage of larvae’s sealing, young Queen-Bees emergence, their time of copulation, their body size, the number of laid eggs were surveyed and measured. At the end of the research, it was concluded that Queen-Bees rearing parameters were better on the first stage of the study, all this due to the sufficient food availability and favourable climate conditions during this period of time. No significant differences were observed for the copulation time between two stages.
During the second stage, the egg production is 27.7% lower than the first stage. The differences in value for the number of laid eggs in each stage are significant. The biggest size of the body-length and the maximum body weight of the Queen – Bees were reached during the June-July period (respectively 271.5 mg and 2.01mm).
However, these parameters have been within the limits during the period of study.

Keywords: Queen Bee, nucleus, cell sealing, queen emergence, method of Jenter

Introduction
The “Carniola” Bee (Apis Mellifera Carnica Pollman) is widely distributed specie all over the Southern Europe, consequently, a great variety of populations and many ecotypes can be observed among them. Many researches performed in due time, (9, 5) indicate that the Albanian bee belongs to the Apis Mellifera Carnica (Carniola) breed. This breed is very well adapted into the country’s climatic conditions and when properly maintained it gives high yield and qualitative products.
Morphologically, this bee still keeps the parameters of cubital index – which helps on judging on the breed’s purity (13) – same as the one of Carniola Bee, but in difference with this breed it shows a lower swarming ability.
Queens’ fertility is a fundamental factor that directly influences on creating strong bee colonies, meanwhile it is a good possibility of having a quiet winter period for the colony, having a healthy colony and a good preventive measure against the different diseases and an efficient use of feed reserves as well, which directly influences on the honey production. (12).

Bee management, first of all means an ongoing process of biological qualities of bee colonies’ aiming better productive capabilities. So, in the future the bee lines with the best biological and productive characteristics should be selected (3).

The existence of a new, vital & vigorous queen with a known pedigree is crucial in having a good honey production in a bee colony. Consequently, a regular/periodical replacement of the queen is a key factor in keeping the colony quiet, hard working and productive (7). Laying capabilities of the queen depend a lot on its age and growing conditions (9).

The reproduction of queens through the swarming
process, which is applied by several bee-keepers, doesn’t improve the heredity basis and leads towards a poor honey production (8).

Queen bee growing should be done only when the circumstances allow a good acceptance of the “grafted” larvae, good growing rate and effective mating flight (11). An important biological peculiarity of the bee family is the ability to grow queens using the new larvae of 1-3 days old age.

The most effective period of time used to grow bee queens in Albania is the one between, May 15th – July 15th and more seldom during August.

Artificial queen growing is in general a qualified job; it is done when the production of a large number of queens is needed.

Based on the above statement, this research was performed in order to study the possibility of rearing bee queens with Jenter’s method (through not moving the larva’s) during the June – August 2005 season.

Determination of the most favourable time to grow queen bees according to Jenter’s method and the identification of its influence on the performance parameters of the young queens.

**Materials and Methods**

The experiment was performed during June 24 – August 19, being divided into two stages, respectively:
- First stage: June 24 – August 05;
- Second stage: July 12 – August 19.

**Experiment’s Description**

The two best bee colonies of the apiary were selected; out of them one served as the supplier while the other one as the recipient/nursing colony. The common practice is to carefully transfer 1-2 day-old worker bee larvae (females) from horizontal worker brood cells in a nearby breeder colony inside of a plastic plate attached to the underside of wooden frames inside cell-building colonies (a process called “grafting”).

Initially the holding cups were prepared, which after being immersed into wax were fastened in the plastic plate fixed into the frame. After this process the frame was inserted into the supplying hive in order to create the possibility for the bees to polish the cups. 24 hours later, the frame was taken out of the hive, in order to place the isolating net, through which the working bees can pass. Inside the frame the queen was kept and left inside for 24 hours to lay the eggs, after this process the queen was taken out of the frame, the net was removed and the frame was sent back to the hive. 48 hours later, the cups were removed from the “apparatus” to the frame and the frame was placed into the recipient hive.

The nursing hive was prepared 8-9 days in advance. The queen of the nursing colony/hive was taken out in order to avoid having hatched eggs during this time. 48 hours later the selection of the best eggs was done. On the 14th and the 15th day, the nuclei where the queens’ cups will be placed were prepared. In the comb foundation of one frame of the nucleus the queen’s cup was placed, this frame was then placed in the centre of the hive. The nucleus was populated with working bees of the same hive. The prepared nuclei were moved in a distant part of the area, about 10 km far from the apiary, in order to give the queens’ the possibility to mate with drones of other apiaries, but also to avoid the possibility of the working bees to turn back into their own/original hive. The same procedure was repeated during the second phase of the experiment.

In each phase, only 10 eggs per group were selected and used in the experiment, although the number of laid eggs was 20 – 30/group. This selection was purposely so rigid, in order to make sure to have qualitative queens out of the process.

**Fig. 1. Jenter’s method application**

During the technological process of queen bees’ production, the following parameters were recorded (for each of the applied method and phase).

- The timing of queen bee emergence;
- The progress of mating and start of laying;
- Egg production of the mated queens in the nuclei (for each of the applied method and for every phase);
- Body weight of the mated queens (mg);
- Body size of the mated queens.

At the end results were statistically processed with ANOVA
and Descriptive Analyses methods.

Results and Discussion

Queen-Bees rearing parameters:

The time of larva’s sealing

The time of queen bees’ emergence (for each of the experiment’s phase).

In the following Fig. 1 the performance of the above mentioned parameters during the two stages of the experiment is shown.

![Graph showing Queen bees rearing parameters](image)

**Fig. 1.** Queen-Bees rearing parameters

Although as far as the cells’ sealing time is concerned during the second stage, a short delay was observed (9.6 hours only), and the difference is statistically proofed (T-test). An earlier sealing of larvae (at the 6th day), during the first stage is because of the reach pastures, higher environmental temperature and a more favourable air humidity during this season. The available feed supply during this season is mainly used for the benefit of empowering of the bee colonies.

The time of queens’ emerge relates with their (queens’) vitality. At the above shown graph 1, it can be seen that queens’ emergence was earlier. This difference is statistically proofed as well.

Although the differences of this parameter, during the two stages, are statistically proofed (T_{stat} = 1.890, T_{crit} = 1.860) it can be accepted that queens’ emergence time is within the optimal time limits. According to Patricia Greer (7) the queens emerge after a 15 – 17 days incubation time period. According to Boreviç, B (2) larva goes through several changes which end to its transformations at an increased index within 17 days. According to Clive de Bruyn (4) – this happens after 16 days, while according to Thomo et al. (12) after 16-17 days. The total time for the development of a queen is about 15-16 days (6). According to Dedei (5), it results that the adult queens grown during June, compared to the ones grown during July, are better ones as far as their body size and productive parameters is concerned.

Queens’ mating time after their emerging

After the queen cells are introduced to mating nuclei young adult virgin queens begin to emerge from them. These soon fly out of the nuclei to mate with up to 20 different drones (15).

Although in the second stage, the queens’ mating time delays with 0.8 days, (19.2 hours), these differences are statistically non significant (for T_{stat} = -1.633). These differences correlate with the environmental temperature, precipitations, strength of the hive (nucleus), feeding and hive’s positioning. This parameter was influenced by the hives’ entrance orientation as well. During the first stage, the major part of the hives has been oriented towards the East, which has made the queens to start their mating flights earlier. While the delayed mating of queens during the second stage, relates with the coincidence of rainfalls in that time. According to the literature’s sources, the queen makes its “mating flight” at 7-10 days age. The weather conditions
might hinder the queens’ mating flights (9). The queens can successfully mate during one or several “mating flights” within the same day or within a few days.

However, the mating time of the queens for both stages of the experiment, remains within the optimal time limits.

**Egg production from the queens**

At the end of each stage the laid eggs by the queens were counted in each nucleus. The generation measurements was done through the perforated net frames; each rectangular perforation was 5 x 5 cm, containing 100 cell combs each. In our research, which covers a time frame of two months, a regular curve of egg production was observed. During the first stage, a maximum egg production was observed, mainly due to an abundant feed availability, strong colonies and favourable weather conditions. During the second stage, the egg production decreased at the level of 27.7% (the pollen’s availability decreases substantially). It needs to be highlighted that the differences for the number of laid eggs during the two stages are significant ($T^{stat} = 4.346$).

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In general, to be considered a “good quality queen” the one should have a large body weight, well developed ovaries, a large number of ovarioles in their ovaries and higher numbers of spermatozoa within the semen sack (14). Other researches indicate that this bee larvae development is diverted to queen larvae development (16).

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**Body size of the mated queens**

At the end of each stage, the body length of each queen was measured.

From the Table 1, it can be seen that the queens produced during the first stage are evidently superior as far as the body length is concerned and this superiority is statistically significant. This relates mainly with the abundant and qualitative feeding of the queens’ larvae.

**Body weight of the mated queens**

At the end of each experiment’s stage the queens were weighed with an analytical balance. The maximum body weight of the queens is achieved during the first stage.

The statistical data processing demonstrated that the value differences between the two stages are significant ($P \leq 0.5$).

The higher body weight during the first stage is because of more favourable conditions. According to researches’ results performed in Albania (5), the most appropriate time for this purpose coincides with the second decade of May until beginning of July. Although the body weight differences from one stage to the other one, it is still observed that the queens’ body weight in each stage remains within the optimal parameters. The average body weight of the queens can be compared with the ones of literature’s sources (1, 2, 9, 10, 14), according to which this weight varies within the limits of 180-325 mg.

**TABLE 1**

Summary of the progress of rearing and performance parameters of the mated queens (M ±SD)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stage I</th>
<th>Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>The time of larva’s sealing</td>
<td>6.0 ± 0.667</td>
<td>6.4 ± 0.516</td>
</tr>
<tr>
<td>The time of queen bees’ emergence</td>
<td>16 ± 0.667</td>
<td>16.4 ± 0.516</td>
</tr>
<tr>
<td>Queens’ mating time after their emerging</td>
<td>10.2 ± 0.632</td>
<td>11 ± 2.0</td>
</tr>
<tr>
<td>Egg production from the queens</td>
<td>2350 ±189.73</td>
<td>1700 ±189.73</td>
</tr>
<tr>
<td>Body size of the mated queens</td>
<td>2.01 ±0.088</td>
<td>1.91 ± 0.088</td>
</tr>
<tr>
<td>Body weight of the mated queens</td>
<td>271.5 ± 10.554</td>
<td>236.5 ± 6.258</td>
</tr>
</tbody>
</table>
At the Table 1, it can be clearly seen that the queens reared according to the Jenter’s method were more superior during the first stage, considering both their growth and their performance parameters.

Conclusions

a) Queen-Bees rearing parameters
   The best results in queens’ rearing according to Jenter’s method were achieved during the end of June – beginning of July period (S.1), because of rich pastures and optimal weather conditions, both of them influencing in strengthening of the bee colonies;

b) Queens’ mating time after their emerging
   During the first stage, the tendency towards an earlier queens’ mating was observed. The mating time of the queens involved in this research was within the optimal parameters;

c) Performance Parameters
   The egg production in the nucleuses, queens body size and body weight resulted to be higher during the first stage of the experiment.

REFERENCES