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STUDY REGARDING THE TRIGGERING FACTORS OF *Apis mellifera carpatica* SWARMING PHENOMENON

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Abstract

Swarming is the natural phenomenon that involves the reproduction of the bee species. The name swarm comes from one of the phases of the multiplication process that takes place in the form of a multitude of flying bees, with one or more queens and drones, forming in the air a globular shape, "swarm", on their way from the hive to the temporary or permanent destination. The study follows the importance of the favoring and the determining factors of Apis mellifera carpatica bees swarming, in order to develop good management strategies and describes the stages of the swarming phenomenon, from the preparation for swarming to leaving the hive. The main factors that led to the swarming of the four bee families were the overcrowding in the hive, the blockage of the hive with honey and pollen and the poor management of the apiary.

Key words: *apiary, favoring and determining factors, swarming.*

INTRODUCTION

Swarming is one of the most complex events that occur in the world of bees. Studying the stages of the swarming phenomenon and its triggering factors is especially important for the development of new management strategies for the apiary (Zacepins et al., 2015). For beekeepers, the swarming phenomenon represents on the one hand a loss, given the economic implications of the phenomenon, but also, being a frequently used way of breeding bee colonies. It may be also associated with risks for diseases (Dumitru et al., 2020; Zacepins et al., 2021).

Swarming does not have to take place every year. It corresponds to the need to propagate the species and to fill the gaps caused by the natural mortality. Swarming requires a long preparation and it happens only in a context of abundance and euphoria (Getz et al., 1982).

In Romania, bee colonies reach a maximum of development in mid-June. The queen's egg laying is constantly progressing since January, when the days start to become longer. The decline begins in July, when the days decrease in duration. In mid-October, the queen ceases to lay eggs. The preparation for winter period begins with the last hatching taking place in November (Antonescu, 1979).

The first stage of the swarming begins with the rearing of the queens. The queen cells are built nine or ten days before the swarm leaves. During the following days, the queen lays eggs in these cells (Bencsik et al., 2005).

In the second stage of the swarming, the colony splits into two parts: one part of the colony flies away with the queen, and the other part stays behind and rears another queen (Gilley et al., 2005).

There is an ongoing need for further studies regarding this complex phenomenon, including its triggering factors. The beekeepers need to come with new ways to improve the management of the apiary, as bees begin to become endangered due to the excessive use of pesticides, the over industrialization of the agriculture and the continuous expansion of the urban areas (Gardi et al., 2015; Spivak et al., 2005).

Therefore, the aim of the study was to examine the phases of the swarming phenomenon, as well as to identify the factors involved in triggering the swarming of honey bees.

MATERIALS AND METHODS

The study was conducted in Negoesti, Calarasi County, between March 2019 and March 2021 and was carried out on seven bee colonies belonging to a stationary apiary. All the queen bees used in the study belong to the *Apis mellifera carpatica* species (Lipan (Buescu) et al., 2021).

During this study, the factors that led to the swarming of the bee families were identified and described. The activity of the apiary was recorded with the help of a beekeeper's notebook. Only natural swarms were taken into account and were analyzed. The letters A, B, C, D, E, F and G were used in order to identify the hives as easily as possible.

The hives were organized into two main categories: the first category consists in the type of the food that was given to the bee colonies at the end of the winter and the second one is based on different management actions. Hives A, C and D were given protein cakes at the end of the winter to stimulate the development of bee families and hives B, E, F and G were given caloric cakes.

The honey was not extracted from the hive E after the sunflower harvest, this action led to the blockage of the hive with honey and pollen, the lack of space being a favorable condition for triggering the swarming phenomenon. The queen cells that were previously identified in the hive G. were not broken when their presence was notified. The presence of swarming hives indicates the entry of bees into the swarming fever.

RESULTS AND DISCUSSIONS

There has been a faster development of the families that have been fed with proteic cakes. The egg-laying of the queens in the hives A, C and D has intensified and the number of nursing bees and worker bees has almost doubled. This has been observed during the periodic inspections of the apiary.

Figure 1. One day old eggs, workers bee and the queen bee (original)

The spring of 2019 has registered high temperatures compared with the previous years (30ºC on 25.03.2019). This shortened the period between the flowering of rapeseed and acacia crops, with the two of them overlapping. The intense harvesting of pollen and nectar led to the growth of the colonies.

The rainy days that followed led to a lack of activity in the hive and overcrowding. Consequently, the bee colony went into swarming fever.

On 13th of May the hive D swarmed, being followed two days later by hive A. After a few attempts the hive A was recovered. It should be noted that the bee families belonging to the hives A and D are those that entered the winter period stronger than those in the hives B, C, E, F and G.

In the first stage of the swarming, the bees began bearding, this behavior being followed by the fast flying in front of the beehive.

In the second stage of the swarming, the swarm chose to sit on a tree branch that was approximately 30 meters away from the hive. It should be noted that the cluster of bees sat on a high branch positioned at a distance of about 4 meters from the ground.

Figure 2. Primary swarm - hive A (original)

The swarm was recovered by placing it in an empty hive. This maneuver was performed by shaking the branch on which the swarm was located.

In the presence of abundant sources of food, the harvesting has intensified. The frames were filled with pollen and honey, limiting the space for laying eggs.

Figure 3. Cells filled with honey and pollen (original)

In order to demonstrate the role of the limited space on swarming, it has been decided to postpone the extraction of honey in the hive. This led to the blockage of the hive with honey and pollen. As a result, the bees began to build queen cells and went into swarm fever. The swarming started around 1pm and ended at 2.30 pm.

The last swarming that took place during the study was caused by keeping the queen cells filled with larvae intact in the hive G.

Figure 4. Queen cell with queen bee larvae (original)

After the pre-swarming behavior that was showcased in the early hours of the afternoon, the hive G swarmed. An attempt was made to track the swarm, but its recovery was not possible. An inspection of the hive followed, which revealed the presence of empty queen cells.

CONCLUSIONS

The main factors that led to the swarming of the four bee colonies were the overcrowding in the hive, the blocking of the hive with honey and pollen and the poor management of the apiary. It should be noted that no precise delimitation can be made between the determining factors and the predisposing factors, as they are closely linked.

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