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Comparative study between two beehives in artificial swarming in beekeeping

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Abstract

The majority of beekeepers do not have much knowledge about the importance of raising queens. Which led us to focus on the interest and the advantage of this breeding, which is mainly the gain of the time and the productivity of the colony. To list its advantages, a comparative study was carried out from June 3rd, 2013 to September 3rd, 2013 between two colonies; one introduced a queen ready and the other that she should raise her queen. After three months of weekly interventions, a difference was evoked between the two colonies in the production of honey and in the provisions of the pollen and in the number of bees in the colony. This difference was noticed during the three months of experimentation that was triggered by a month of delay of the bee package slope. Therefore, the introduction of a queen already high in artificial swarming is very necessary to properly manage the bee population and well-controlled time.

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Introduction

A presentation of the historical evolution of apiculture in Algeria has been carried out since the earliest times until the introduction of horizontal hives. The creation and use of a divisible hive type was adapted to the conditions of Algeria, between 1947 and 1950, on the one hand; on the other hand, he described local bees and traditional hives used in the country. Beekeeping is practiced mainly in the north of the country where the honey flora provides honey for most of the year. In southern Algeria, there are more than one million date palms on which, bees can forage(Gilles, 2001). The number of colonies recorded for the year 1988 estimated in 394210 colonies was distributed as follows: in the Center 160100 colonies, in the West 72100 colonies, and in the East 72000 colonies (Sefaoui, 2004). The modern hives used in Algeria are mainly of the Langstroth type with some modifications, related to the very hot climate. These hives provide good harvests of honey. The evolution of honey production shows a clear increase from 2002 to 2010. However, the yield of the colonies remains very low and less than 4 kg per hive (Adjlane, 2011).

The development of beekeeping uses several routes, including the "artificial swarming" and the breeding of queens. The productivity of a colony depends on many factors, but the age and quality of the queen are certainly among the most important (Guerriat, 1996). Swarming is a process of colony division into two populations. Artificial swarming is a way of preventing the colony from swarming when it is already in the process of natural swarming (Tremblay, 2008). The queen becomes sterile after four or five years so the quality decreases over time. The workers do not usually wait for the signs of aging of their mother to proceed with its replacement (by swarming, supercedure) (Gilles, 2007).

Our work aims to show the interest of coupling the techniques used in modern beekeeping by an approach that is not too complicated (artificial swarming and breeding of queens), easy to implement and to quantify their contribution.

Material and methods

Study zone

The study was conducted at the experimental farm of the University of Mascara-Algeria. It ran from June 3rd, 2013 to September 3rd, 2013. The duration of the experiment is almost three months. Eleven visits were made weekly.

Biological material

In this study, packs of bees were used which are commonly used to populate empty hives. The pack of bees is an artificial swarm made up of one or more colonies, which were generally sold in a small box; the queen travels with the bees, isolated in a small special crate.

During our experiment, two packs of bees were used; their weight was estimated at about 1.5 kg. Each was placed in a hive that contains two closed brood frames, two open brood frames of less than three days, two honey frames plus pollen, and four wax frames. When a queen of value is to be introduced, the safest method is to introduce it into a pack of young bees on embossed waxes or on frames built without brood.

Introduction of queens in the hive

The introductory method used in our work is the indirect introduction described by (Sabot, 1980) quoted below. The fertilized queen, placed in a Benton cage with her followers, was introduced into the hive. The cage was placed horizontally between two frames located in the center of the hive. After 24 or 36 h, the cage is turned over and placed vertically. Five days later, the cage was carefully removed using very little smoke (Sabot, 1980). After harvesting the pack of bees and preparing the two hives mentioned above, the beehives were well fenced off, the purpose of this confinement being to prevent the bees from returning to the place from which they were removed (loss of sense memory and orientation).

In our case, the bees were transported to the commune of Sfisef at the Sidi Bel Abbes region, which moves away from the Mascara by 46 km. This was confirmed by the work of (Sabot, 1980) who estimates

that the distance of 1.5 km was sufficient to reorient bees. To carry out this experiment and to determine any kind of failure or shift, the following measures in cm^2were taken into account: The weight of the hive, the development of the brood, the pollen and the honey between the 1st and the 2nd hive.

Tracking the hive

Monitoring the hive requires a specific step by the following steps:

Smoking: it was to put the bees in rustle but not too abundant and even to avoid the total disorganization of the bunch.

The opening of the hive: we must avoid sudden gestures, clashes, crunches. This opening can be partial, limited to a few frames.

The clearance of the frame: located on the shore and in any case outside the party supposedly occupied by the brood so as not to risk injuring the queen.

Clearance of the following frame: Each frame was raised slightly after detachment using the frame lifter, moved away from its neighbor taking advantage of the space freed by the removal of the first frame, out of the hive for the first time. Then, the hive was examined and was introduced with respecting the order and the direction in which he was.

At the end of the visit, replace the first frame stored in the remaining available interval and close the hive.

Results and discussions

The weights of frames and hives

During the scheduled visits, all observations noted at the two hives were recorded (Table 1). After moving the hives in the initial visit, on June 03, 2013 (D0), and thus redirecting the bees in a manner mentioned above, the weight gain of frames, hives and even empty hives was carried out in the 1st visit, June 18, 2013 (D15). An offset was noted from the 1st visit until June 18th, which was initially scheduled on June 11th (D8). This shift was due to climatic disorders.

Table 1. Weighing of Frames and Beehives.

Parameter	Beehive weight	Frame 01	Frame 02	Frame 03	Frame 04	Frame 05	Frame 06	Frame 07	Frame 08	Frame 09	Frame 10	Total frames	Package weight
(1st hive) (g)	21600	300	1400	1400	1200	-	1600	600	2300	1800	-	10600	1500
(2nd hive) (g)	23400	-	1400	1400	1900	1900	19000	1000	400	1400	1010	12310	1590

The weight gain was made using an electronic scale, the operation was carried out in perfect climatic conditions, quickly and carefully to avoid the risk of losing the brood. In frames 05 and 10 (1st hive) and frame 01 (2nd hive) there was only embossed wax, while the rest of the frames contain honey, pollen, closed brood and open brood. During the 3rd visit, we found that the 2nd hive is orphaned.

This results in a decrease in the supply of honey and pollen. These signs are similar to those cited by (Guerriat, 2003), who asserts that the external signs that an orphan hive was thought to be reduced activity, different behavior of bees. During the 4th visit, we noticed that there are many drone cells, which confirms the orphanage of the 2nd hive.

According to the results obtained from the 8thvisit, there was no intervention in the 1st hive because of the looting problem.

Looting was defined as follows: a bite, excitement and death in front of the flight holes. By looting, bees and beekeepers are taking damage and it is not just the one where looting has begun that is taking damage.

The brood

The result was very clear in the histogram (Fig. 1).it was concluded that in the first hive (package with a queen) the queen began to lay as of the D22 (2nd visit), while the 2nd hive (package without queen) noted that the new queen (queen high) began to lay as soon as the D50 (6th visit) so a delay of laying of 28 days, which is huge with disastrous consequences on the future of the colony thus compromising all the performances. This delay is also penalizing in countries where the duration of honey is short as the case of Algeria.

Pollen

There was an increase from D22 to D31 followed by a decrease to D43, then an increase, these results are consistent with the results of the brood which has undergone an acceleration from D22 to D31 and a decrease to J43 then an increase, which concerns the 1st hive.

While the same results are obtained in the 2nd hive (Fig. 2). From the results shown in the Fig. 2,an increase was noted from D50 to D64 then a decrease until D72 and then an increase. These variations were also consistent with brood variations, which may be influenced by the amount of pollen supplies.

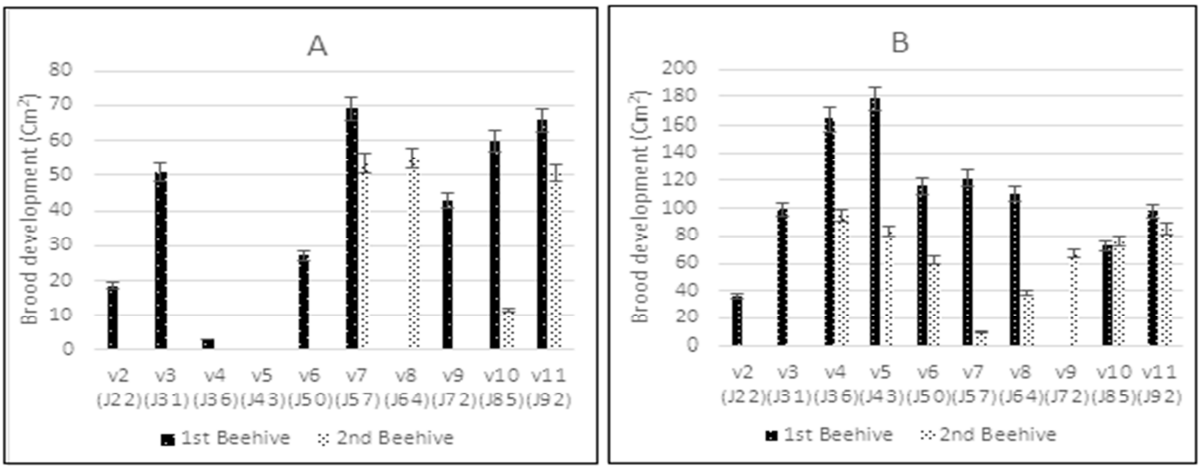

Fig. 1. Evolution of the open (A) and capped brood (B) during the experimental period.

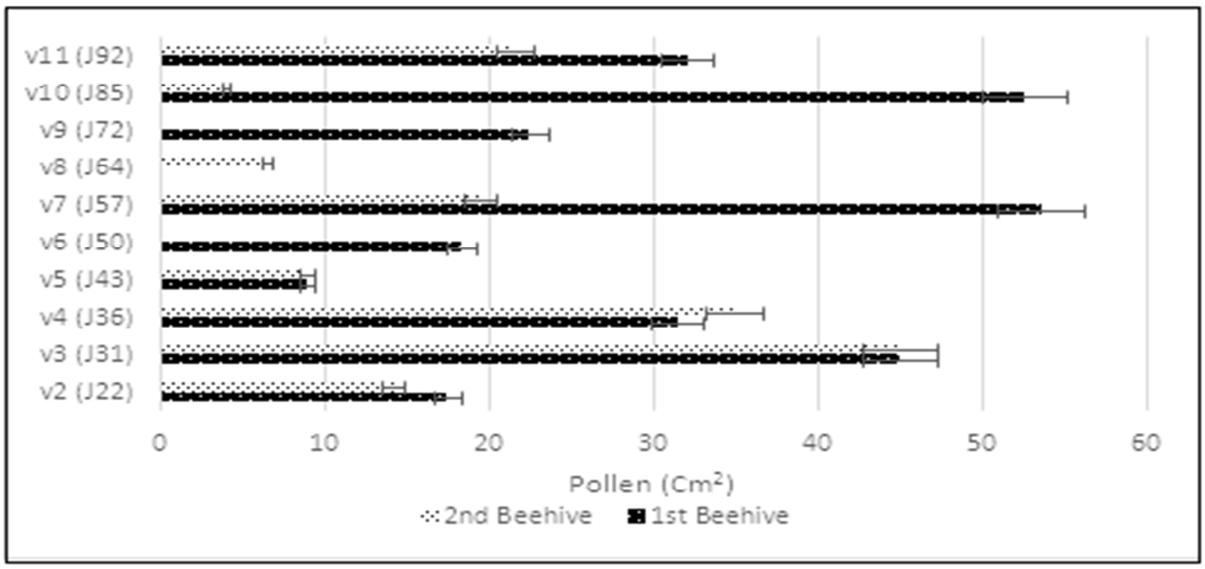

Fig. 2. Evolution of Pollen during the experimental period.

According to Jacobs (2004), a situation of quantitative deficiency in pollen leads to a decrease in brood care. Some larvae were underfed. The cells where they grow were poorly capped. The youngest larvae were eliminated leaving only the older ones, who no longer need to consume pollen. If the deficiency is prolonged, all the larvae will see their care decrease.

Pollen stored in honeycomb cells was safe. It was mainly eaten by worker bees during the first days of their life and was used by them to feed brood of developing larvae (Burgett *et al.,* 2009). Nectar and pollen were the only food sources for bees producing honey so the fluctuation of the curve may also be due to honeydew (sweet exudation that appeared in summer on the buds and leaves of some trees).

Honey

The results show that the evolution of colonies was influenced by the intake of nectar and honeydew, which was confirmed by our results (Fig. 3). An increase was showed from D22 to D31, then a decrease again.

These results were similar to those of brood. With a superiority in the 1st hive compared to the 2nd hive. Honey presented the role of reserve for this breeding of young (larvae) (Maurice, 1951). Indeed, heat and drought tend to increase the temperature inside the hive.

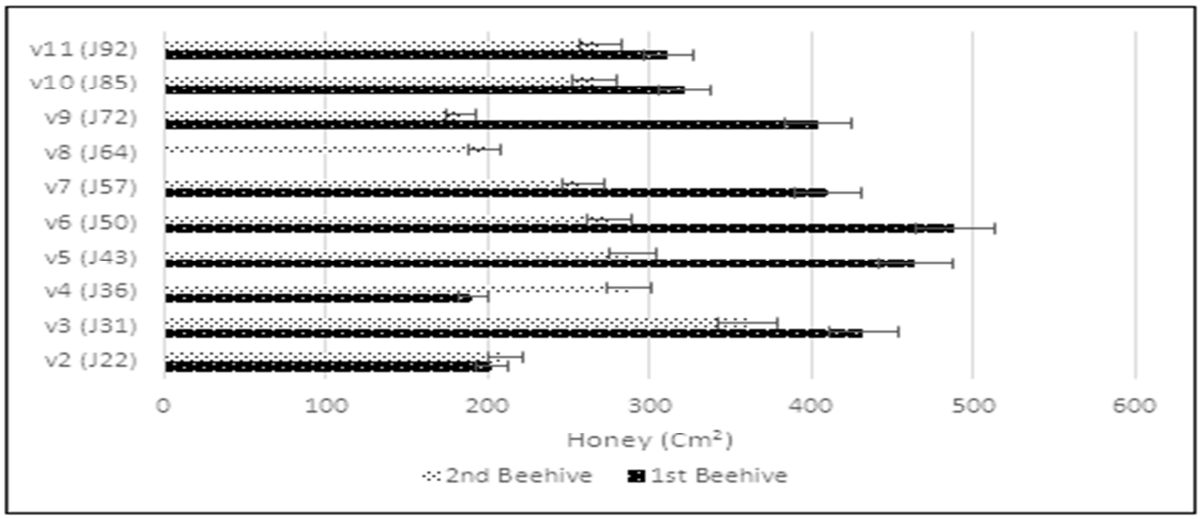

Fig. 3. Evolution of Honey during the experimental period.

Bees actively fight themselves by venting, but for this ventilation, they need a fuel that is honey. If, therefore, all honey was removed from a colony at the approach of summer, on the pretext that the bees were not cold, they were deprived of all means of defense (Maurice, 1951).

Honey also played the role of a flywheel for rearing larvae in the event of a sudden cessation of the honey flow. One will be surprised at this moment of the enormous consumption, which was done in the hive. Honey, even important, separated by periods of drought ultimately produce only derisory crops, this was what happens unfortunately too often in our climate. So that the harvest was good, it required a continuous honeydew for several weeks or several months from which the practice of transhumance hives (Maurice, 1951).

According toDaniel (2002),Bees produced honey that serves as a food supply for the colony during periods when there were no flowers, or the climate was not favorable. In tropical countries, bees must survive when there are no flowers, during periods of drought, or when bees cannot foraged because of rain or other weather conditions.

Conclusion

After conducting weekly visits for three months, the results show that the package of bees that it has undergone a queen introduction is better at all the parameters of development (colony development and provisions) and that it was 28 days ahead of the second pack of bees that she should raise her queen alone.

Therefore, the beekeeper must include the breeding of queens in his technicality to increase the productivity of his livestock in periods less productive (Drought) and to take full advantage of the honey.

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