Optimizing nuclei production: effect of strength and timing

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Introduction

In Canada, there is a growing need to replace and increase colony numbers to satisfy the demand for pollination services and compensate for high winter colony mortality. Producing nuclei (small colonies, each with brood, adult bees, food, and a young queen) is one strategy for establishing new colonies and replacing those that are weak or dead. Although beekeepers around the world commonly engage in this work using various methods, scientific literature on the subject is scarce.

The main objective of our study was to develop a methodology for producing new colonies that is both more structured and better adapted to the challenges facing today's Canadian beekeeping industry.

Materials and Methods

A total of 120 nuclei were produced in 2015 at the CRSAD, Deschambault, according to 2 treatments: date of production and type of boxes, forming 4 different groups (Table 1). Brood development, weight and diseases were monitored from the moment of production until the following spring (2016).

Table 1. Factorial experimental plan, divided in 4 independent groups.

120 nucs produced		**June** after blueberry pollination	**July** after cranberry pollination
		B	**C**
Standard boxes	**s**	30 x 	30 x 
Divided boxes	**d**	30 x 	30 x 

Nucs were composed of 2 frames of capped brood, one frame of food (honey and pollen) taken from mother colonies in Deschambault, and one mated queen. The sister queens were produced at the CRSAD and were selected for their cold-hardiness.

Results and discussion

Summer brood developement

Brood development was estimated by measuring the brood area (Giovenazzo and Dubreuil, 2011). The interaction between the date of production and the type of box over time was significant (F=4.927; Df=1,116; P=0.0284). Groups Cs and Cd, (nucs made in late July) had the fastest rate of development, but had not enough time to develop as well as nucs from group Bs and Bd (nucs from late June). However, number of immature bees at day 1 after production were significantly different between group B and C (F=7.340; Df=1,78; P=0.0190). Brood frames from the mother colonies were selected when the brood area covered at least 60% of the frame, as a beekeeper would do. We hypothesize that mother colonies from June had more brood per frames than the colonies of July. On August 24th, colonies from Bs were the strongest with 23 594 ± 1 266 immature bees.

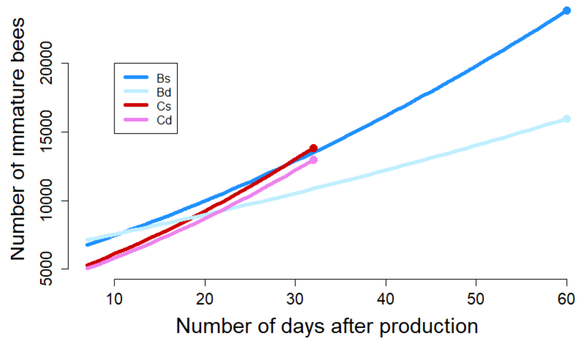

Figure 1. Development of nucs from June 26th, 2015 to August 24th, 2015 for groups Bs and Bp and from July 23rd, 2015 to August 24th, 2015 for groups Cs and Cd.

Spring brood developement

The interaction between the date of production and the type of box was significant (F=6.030; Df=1,78; P=0.0163). On May 25th, group Bs had 25 705 ± 2 939 immature bees, which is about 9 frames of brood. Only group Bs was strong enough for blueberry pollination, approximatively one week later.

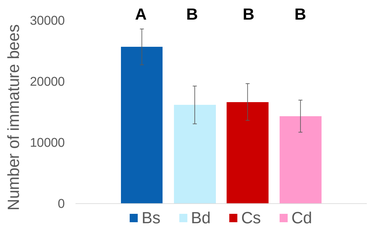

Figure 2. Number of immature bees per group on May 25th, 2016. Same letters are not significantly different at α = 0.05 (Tukey test).

Spring weight gain

On May 11th, nucs from divided boxes were put in standard boxes. Weight gain for spring 2016 was significantly affected by the date of production (F=14.890; Df=1,78; P=0.0002) and the type of box (F=5.520; Df=1,78; P=0.0213).

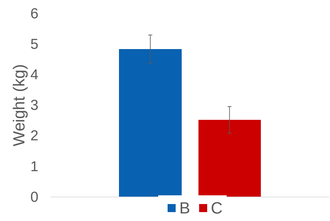

Figure 3. Weight gain (kg) from May 11th to May 25th for groups produced in June (B) vs July (C).

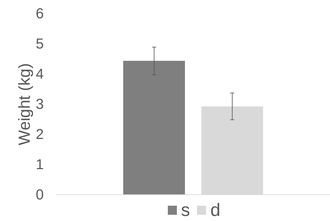

Figure 4. Weight gain (kg) from May 11th to May 25th for groups put into standard boxes (s) vs divided boxes (d).

Survival

Nucs were recorded as alive on May 25th if they had adult bees, brood from all stages and the original queen. The cause of death was also recorded. Survival rate (from 0.60 ± 0.09 to 0.83 ± 0.07) was not influenced by the date of production or the type of box (X^2=2.790; P=0.0949). However, the cause of death was significantly affected by the date of production (X^2=14.19; P=0.0008). Nucs produced in June (group B) died mostly from queen problems. Queens might have been produced too early in the season and might have been poorly mated, resulting in higher mortality. This poor queen quality is consistent with previous findings (Giovenazzo and Bernier, not published).

Conclusion

Two brood frames nucs produced sooner in summer and put in standard boxes have a better potential to become colonies suitable for pollination the following season since they have a better brood development and a higher weight gain.

References

Giovennavo, P. and M. Bernier. Not published. Reproductive characteristics of honey bee queens produced during the beekeeping season.

Giovenazzo, P. and P. Dubreuil. 2011. Evaluation of spring organic treatments against Varroa destructor (Acari: Varroidae) in honey bee Apis mellifera (Hymenoptera: Apidae) colonies in eastern Canada. Experimental and Applied Acarology, 55 : 65 – 76.

Photos: Martine Bernier, Sylvain Gingras and Amélie Bégin.