Effects of Top-Versus Bottom-Supering on Honey Yield

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SUMMARY

Bottom-supering failed to achieve significantly higher honey yields than the less labor-intensive method of top-supering. The experiment was replicated across three apiaries and two nectar flows.

INTRODUCTION

Beekeepers typically employ one of two supering methods during a nectar flow: top-supering or bottom-supering (Fig. 1). Top-supering, placing empty honey supers on top of those already being filled by the bees, is the easiest of the two. However, there may be disadvantages with this method. By placing supers on top of each other, the distance between the hive entrance and the top super increases with each additional super. This may increase the distance a bee must travel in order to be relieved of her nectar load. Top-supering conceivably also increases traffic across capped honey, thereby darkening the comb (Ambrose, 1992). Bottom supering, placing empty honey supers underneath existing supers, is more labor-intensive for the beekeeper since each filled or partially filled super must first be lifted in order for the next super to be added. Another drawback for bottom-supering is that the queen may enter the new super and lay eggs in it unless a queen excluder is used. Nevertheless, the amount of traveling space is reduced compared to top-supering since the new supers are closer to the entrance.

Working in Alberta, Canada, Szabo and Sporns (1994) failed to detect differences in honey yield between colonies that were top-versus bottom-supered. They hypothesized that poor nectar flow conditions during their study obscured possible treatment effects. Thus, we re-examined whether honey yield differs in colonies that are top- versus bottom-supered. The experiment was replicated across three apiaries and two distinct nectar flows typical of northeast Georgia, USA.

MATERIALS AND METHODS

In a one-year field study, we compared honey yield in colonies that were top- versus bottom-supered. The experiment was replicated across three apiaries and two nectar flows (May wildflower and June sourwood) in Habersham County, Georgia. Each colony was configured in one standard Langstroth hive body plus one food super (Illinois dimension, 65/8-inch, 16.8-cm). There were ten experimental colonies per apiary, resulting in 60 experimental units (3 apiaries x 10 colonies per apiary x 2 nectar flows). At the beginning of each nectar flow, colonies within the apiary were equalized with regard to brood, adult bees, and food stores. Each experimental colony within the apiary was then randomly assigned one of two treatments: (1) top-supering, that is, adding empty honey supers successively on top of honey supers already on the hive, or (2) bottom-supering, placing the empty honey super immediately above the food super and beneath honey supers already on the hive (Fig. 1). In each colony there was a queen excluder between the food super and the experimental honey supers. Experimental honey supers were of Illinois dimension and contained fully- drawn comb; each was weighed (kg) and given an identifying number before it was placed on a hive. Supers were added during each nectar flow as it was deemed necessary, according to the amount of incoming nectar, but whenever supering was required, all colonies in the experiment were given one super on that particular day. Thus, the amount of available empty comb space was equalized in the experiment. Volatiles from empty comb are known to affect honey hoarding behavior (Rinderer 1981, Rinderer et al. 1979). Experimental colonies were managed optimally and weak colonies were removed from the study. At the end of each nectar flow, experimental supers were removed and immediately weighed to determine net weight gain of harvestable honey per colony.

ANALYSES

The design was a 2 x 2 factorial treatment arrangement between supering method and nectar flow, blocked on apiary (Proc GLM; SAS Institute 1992). Terms were tested against residual error. Means were separated with a t-test, and lsmeans was used to adjust for non-equal sample sizes. Differences were accepted at the $\alpha \leq 0.05$ level.

RESULTS AND DISSCUSSION

There were no significant differences between supering treatments ($F = 1.9$; df=1, 46; $P = 0.1737$) nor among apiaries ($F = 1.4$; df = 2,46; $P = 0.2510$). Top or bottom-supering did not significantly affect total yield of honey averaged across three apiaries and two nectar flows. Although honey yield was numerically higher when bottom-supering was employed (Table 1), this difference was not statistically significant. There were no treatment interactions with the apiary ($F = 0.6$; df = 2,46; $P = 0.5636$) nor with nec-

Variable	Colony Honey Yield (kg)
Treatment	
Top-Supering	40.0 ± 3.5a (30)
Bottom-Supering	44.5 ± 3.4a (28)
Flow	
Spring	53.7 ± 3.4a (28)
Summer	31.3 ± 2.0b (30)
Apiary	
A	38.0 ± 4.6a (20)
B	44.0 ± 4.1a (19)
C	44.7 ± 4.0a (19)

Table 1. Effects of supering method, nectar flow, and apiary on average colony honey yield. Values are mean ± standard error. Number in parenthesis, *n*. Column means within variable followed by the same letter are not different at the $\alpha \leq 0.05$ level.

tar flow (F = 0.9; df = 1, 46; P = 0.3483). It is noteworthy that yields were significantly higher in the spring flow (F = 32.6; df 1, 46; P = 0.0001). Although Szabo and Sporns (1994) speculated that poor flow conditions during their study may have obscured differences between top- or bottom-supering, we found that bottom-supering did not affect yield in either a strong flow or a moderate one.

The results of this experiment and that of Szabo and Sporns (1994) indicate that bottom-supering, a relatively labor-intensive practice, does not significantly increase honey yield. This seems to be the case in either strong nectar flows or moderate ones. However, beekeepers may still choose to employ bottom- supering for other management considerations such as producing comb honey or drawing out foundation (Crane, 1990).

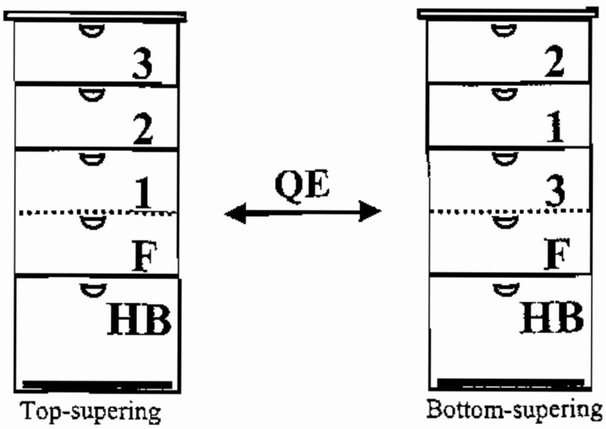

Figure 1. Two methods of progressively supering a colony during a nectar flow. in top-supering (L), the latest empty honey super (3) is simply added on top of those supers already being filled by bees (1 and 2). In bottom-supering (R), the latest super is placed below existing supers. In our study, colonies were configured with one hive body (HB) and a food super (F). QE shows the location of the queen excluder.

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REFERENCES

Ambrose, J. T. (1992) Management for honey production. *In:* Graham, J.M. (Ed.). The Hive and the Honey Bee. Dadant and Sons, Hamilton, Illinois, U.S.A. pp. 601-655

Crane, E. (1990) Bees and beekeeping. science, practice and world resources. Comstock Publishing Associates, Cornell University Press, Ithaca, New York, U.S.A. 614 pp.

Rinderer, T.E. (1981) Volatiles from empty comb increase hoarding by the honey bee. *Animal Behaviour* 29(4): 1275-1276.

Rinderer, T.E., J.R. Baxter, C.E. Carter, Jr., and L.R. Mornhinveg (1979) Empty comb stimulates honey production. *American Bee Journal* 119(1): 40-43.

SAS Institute (1992) SAS/STAT user's guide, version 6. SAS Institute, Cary. North Carolina, U.S.A. 846 pp.

Szabo, T.I. and P. Sporns (1994) A comparison of top and bottom supering on honey quantity and quality. *American Bee Journal* 134(10): 695-696