

A Re-Examination of Double Grafting¹

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ABSTRACT

Double grafting did not produce heavier queens than did single grafting. If weight is a good indicator of queen quality, this study shows that double grafting is not worth the extra effort. Additionally, priming of cell cups before grafting into them did not improve weight of queens, but it did improve cell acceptance in nurse colonies.

INTRODUCTION

THE QUALITY of queens is not only genetically controlled, but also depends on the conditions in which they grow as larvae. Therefore, queen producers want to provide optimum conditions for larvae as they develop. Unfortunately, we don't always know which management procedures enhance queen quality.

Double grafting and cell priming are procedures that were designed to improve queen quality. In double grafting, a larva is grafted into a cell cup in which another larva (now discarded) had been reared for the previous 24 hours. This gives the second larva an immediate, large supply of food and, supposedly, a chance to become a superior queen. Cell priming is the placement of a drop of dilute royal jelly into a cell cup before a larva is grafted into it. This simplifies grafting and reduces dehydration and injury to larvae.

The scientific literature on double grafting is conflicting. Montagner (1962) found that double grafted queens were heavier and had more ovarioles than did single grafted queens. Örsi Pál (1963) said that double grafted larvae received "better treatment" from nurse bees. However, Weiss (1974) found that double grafted queens were not heavier than single grafted queens when both types of cells were reared in the same colony, thereby presenting the nurse bees with a choice of larvae.

Although Weiss's results are convincing, the advantages of double grafted larvae may have been diminished by placing them in a colony with single grafted larvae. Moreover, there are two possible types of single grafted larvae that should be compared with double grafted larvae: namely, those grafted on the first day (those usually discarded) and those of the same age as the double grafted larvae.

In light of the novel biological problems facing American beekeepers, it is important to fully understand the breeding tools at our disposal. Therefore, we ran two tests to compare the effects of double versus single grafting while controlling for nurse bee exposure to different types of larvae. Additionally, we here report a test on the effects of priming versus dry grafting.

Material and Methods

General:

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Six single chamber, queenless, nurse colonies in deep Langstroth equipment were used. Each colony had six combs, and each colony was given fairly equal amounts of honey, pollen, and brood of all ages. Bees were collected from several colonies, stored in a common cage, then distributed from the cage into each hive (after Harbo 1983). About 17,000 bees were put in each hive. Colonies were fed sugar syrup and pollen supplement.

Altogether, 259 queen pupae were reared. We used standard wax cell cups in wooden bases, and each cup was primed with 5-10 mg royal jelly diluted 1:1 with water. Weekly, and before new cups were given to them, each colony was given more brood (sealed and unsealed), and unwanted queen cells on combs were destroyed. All grafted larvae for each test were less than 12 hours old, and only one colony was used as a source for larvae. Except for the test of cell priming, a nurse colony received 20 grafted larvae on two bars (10 cups per bar) in one frame. Queen pupae were weighed to the nearest mg on the eighth day after they were grafted.

Single Versus Double Grafting Choice Test

We compared the weight of queen pupae that had been single grafted with those that had been double grafted. Nurse bees were presented with both types of larvae at the same time. Each of four nurse colonies randomly received one of two groups of larvae (two colonies per group).

The first group was a combination of three larval treatments: single grafted on day 1, single grafted on day 2, and double grafted. All cups were single grafted on day 1, then on day 2 about 1/3 of the cups were replaced with new cups and larvae (single grafted on day 2), and another 1/3 of the larvae were replaced with newly hatched larvae (double grafted); therefore, the double grafted larvae had two controls.

The second group was a combination of only larvae single grafted on day 2 and double grafted larvae. All cups were single grafted on day 1, then on day 2 each cup was either double grafted or replaced with a new cup and larva.

Single Versus Double Grafting in Separate Colonies

We compared the weight of queen pupae that had been single grafted with those that had been double grafted, but this time the larval treatments were in separate colonies. Each of six colonies randomly received one of three larval treatments (two colonies per treatment). The first treatment had only larvae single grafted on day 1. The second treatment had larvae single grafted on day 2. The third treatment had double grafted larvae, in which all cups were single grafted on day 1 then replaced with newly hatched larvae on day 2.

