

# QUEEN ACCEPTANCE BY THE BEES NOT THE KEEPER

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**ABSTRACT:** Determining the wants of the honey bee based on the choices they make versus the choices we make as beekeepers. What if the stranger mated queen is not the best choice for re-queening based on what the bees decide not on what is easy to get/ship/produce commercially. We sell mated queens, but the process is most unnatural and counter to what feral or captive bees would do to replace a queen.

Many new beekeepers have problems with new package colonies staying queen right. Often after package install a new colony will be found staging supersedure of the queen that arrived with them. We are curious to know why some colonies accept a queen readily and without question they seem to invite her in and make a spot for her at the table without even asking for credentials. She might not even be a good laying queen, but they decide to take her in and accept her readily as their own. Other colonies refuse the mated queen multiples of times until they have almost doomed themselves.

Curiosity had us wondering if there is a way to test if queen-less colonies have a preference in queen choices. Mated, virgin or grafted cell? If offered, which would they accept most often. Every colony is different, every breed has their own temperament, but on average, is there a clear winner in this question? Is it the mated queen? That is how we sell and ship queens commercially, mated and stranger to the colony they get installed, but is this what the bees prefer or what is easiest for the keeper?

**METHOD:** We tested this hypothesis by removing laying proven queens from 10 colonies, then leaving their source colony queen-less for 24 hours. We then installed those caged mated queens into a different colony than the one they came from using the marshmallow capped cage for slow release to determine if after a 45-day time frame the colony would accept or remove this “new” mated proven queen. If they removed or attempted to remove her within 45 days, the test was considered a “failure.” Conditions of the hives were matched as closely as possible. Ten frame deeps with 1 super well nourished, fed if necessary.

We also installed mated queens from a local breeder into 5 colonies in another apiary 17 miles away from the test apiary. These colonies were left without queens for 24 hrs. Same rules applied to all colonies of mated moved queens, cells and virgins. We used these queens as our control since most often queens are purchased from breeders and shipped out to beekeepers around the region as the most common form of requeening. Of note\*only 5 queens were used for control due to cost of these new queens.

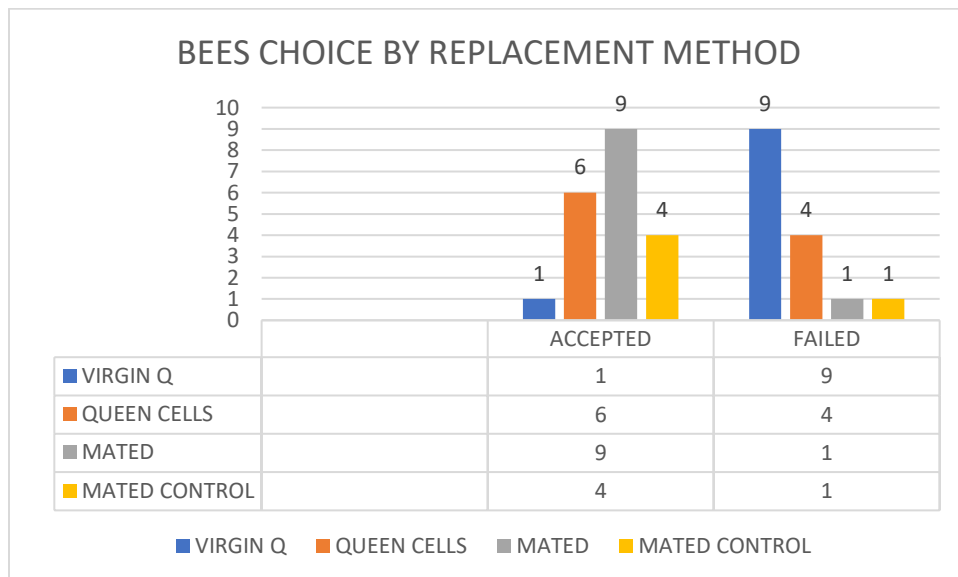
The second group was given 10 virgin queens fresh out of the cell. All were raised in a well-nourished standard deep 5 frame colony with a minimum of 5 frames of brood. The cells were removed from the queen builder and placed into solo cups with 8-10 worker attendants and allowed to emerge into the cup under cellophane with air holes, water and honey feed. These Virgin queens were introduced into colonies in cages with marshmallow caps that took 2-3 days each to be released. Same adoption rules applied as above.

The third group was given queen cells pulled from the same queen builder as the virgin queens, all grafted from the same source queen. These 14-day old cells were introduced to 10 colonies that were deliberately made queen-less for 24 hours prior to installation, with the same rules applying as listed above. Any attempt to remove, destroy or replace the cell or new queen within 45 days was considered a failure.

**RESULTS and BENEFITS:** The purpose of this experiment was to gain understanding of bee preferences regarding queen adoption and acceptance by a colony. We aim to prove that beekeepers have more options for re-queening by using grafted queen cells or newly emerged virgins from a sister colony or another beekeeper in close proximity versus having to purchase a mated queen who may be superseded shortly after installation. Most colonies in the re-queening process make multiples of cells which could be sold, traded and potentially accepted more readily with reduction in cost (on average a new queen runs about \$35.00 in most locales in the US) and reduction of timeline for the process as shipped queens require some delay in sourcing and potential injury during the shipping process.

We wrote to and asked Professor Marla Spivak for her input and estimation of how this experiment should be run and her predictions on the conclusions. We set up the experiment much as she recommended. All of the bees were located in one apiary over approximately 8 acres except the control colonies. They were not necessarily the same “source of bees” as she recommended since we planned to use full sized colonies for some of these tests versus nucs, but we did use queen cells and newly hatched virgin queens from the same queen grafts. We did incorporate ten nucs into the experiment as well. The bulk of the experiment occurred on one farm. A control group located away from the apiary. She noted that in her experiments/experience more often than not a virgin queen moved to a new colony would fail or be replaced and that the mated queens would be more readily accepted.

The results we found were quite surprising. Contrary to our original thinking, the virgin queen group did the worst for overall acceptance by colonies in our apiary. (See chart)





Above is one of the Virgin Cell hatching cups we used to allow open hatching with a few sister attendants in the cup taking care of the cells

The Virgin queen group way underperformed what we had originally anticipated they would. Given that most openly mated queens start out in this state-fresh out of the cell. They walk around the hive giving off their own pheromones and then head out on mating flights once ready to fly. It obviously does matter to the bees where this virgin came from, as most were replaced in short order. It is possible that there was some complication during the grafting process but cells from those same grafts took better than half of the time. We can only assume it is due to the queens being unmated virgins from another mother not their own or as my mentor pointed out, it could also have been from a lack of return from mating flights. Unfortunately, there is not a deliberate way for us to test or account for this number. Another theory we did not have time to test was the nature of her release. Since these virgin queens were caged, they did not get to walk the hive and release pheromones to the colony directly after hatching as they were caged. I hypothesize this method could have reduced acceptance due to lack of pheromone released to the whole colony/hive. I plan to test this theory in the spring. For this experiment, virgin queens were not a suitable replacement for queen loss, as Professor Spivak noted was her experience.

The Queen Cells in the second group had moderate acceptance of the cells and replaced just under half of the queens over the 45-day time frame. At 60% overall acceptance which seems about average for this area and time of the year. The bulk of our experiment time was accomplished after the spring nectar flow and through the dearth of summer when resources were scarce so there may be some variability in success rates if these tests were conducted at the beginning of the year during the spring nectar flow when the bees seem to be more concerned with foraging and considerably less concerned with the movement of queens/cells/etc. within the hive.



My first attempt at Queen grafting



Relatively good acceptance rate 22 of 30

Next, we tested mated queens and their acceptance rates. Mated queens are mostly widely available through commercial sellers and local associations whose members produce queens for some recompense. The cost is steep but this seems to be the bees overwhelmingly preferred choice for re-queening should the need arise.

Of the ten colonies that we re-queened using mated queens from the same apiary that had simply been pulled and shifted to another colony, 9 of the “mated” queens remain at present. Fully functioning and thriving. Winter preparations have begun in earnest as the fall nectar flow in Maryland has come on.



We expected our control group to do well as this is how we have seen, sold and commercially managed requeening for some time. (See chart) Of the 5 queens from the breeder placed in the apiary 17 miles from our home location, 4 remain viable, 1 queen from this group was labeled as “failed,” but only because the colony swarmed which we considered technical replacement of the original queen.

Full disclosure, the temperatures in Southern Maryland, and much of the eastern seaboard in fact through the months of July and August 2021 were just incredible. Heat in excess of 95 degrees and humidity above 90% during the bulk of our experiments run time caused some problems with our production colonies as well as our experimental hives. Nucs made using the Pro nuc box (which we absolutely love) had a significantly harder time regulating temperatures with only 3 frames of bees- which is our standard queen mating nuc size. We had 5 colonies and queens perish on day 1 of our experiment when they were placed in the sun over the afternoon until we could get them installed into their source experiment colony. It was a bit disheartening to place queen cells on frames in the morning and come back in the afternoon to find the bees all dead in the bottom of the box as this was something we had not experienced before. The next day, we moved cells the same way, but placed the nucs in the



shade of the trees. We had our typical success using the shade to help keep everyone cool. We did have discussions with others who have used the pro nuc box as we did for mating nucs and they seemed to think it was more than likely robbing. We disproved this hypothesis quickly as several of the nuc boxes had full frames of untouched honey and no torn wax capping on the bottom of the box. This left us concerned that our data would be a bit skewed but the process after installation was typical on day 2 with the shaded bees so we called the 5 colonies lost to unforeseen act of mother nature and beekeeper error (lack of paying full attention to the temperature for the day that led to the bees' demise.)

Overall, this was an enlightening experiment which proved without a doubt that the way queens are openly mated and sold as such to be released in cages or by direct means is indeed the bees' preferred method of sorting out a new queen in a pinch. Of course, we prefer to let colonies requeen themselves as much as possible but often times that is simply not an option. Most who find themselves in a situation where their hive is queen less and needing to purchase a queen do so more often at the end of the season or after going an extended period without inspecting the colony with no hope of recovering except by means of purchasing a mated laying queen. Remarkably, the bees prefer this method for the fastest most reliable means of re-establishing themselves for viability. We are supposing that most beekeepers also prefer this method because it is the fastest least labor-intensive way to get a colony back on track. From queen less to queen right in about 3 days. Cost for the new mate queens is negligible at around \$35.00 US on average and with a 90% success rate, this method assures most beekeepers they will have a colony for the future.

