Queen Quality

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For decades beekeepers in the U.S. have been able to purchase commercially reared and mated quality honeybee queens. Occasionally, a batch of queens from an individual producer might have been sub par, but those occasions were exceptions rather than the rule. Recently, consumers seem to be having more difficulties with their queens.

Acceptance still seems to be normal, but retention of fully functioning queens seems to be less than normal. Skips in brood rearing, drone layers, and queenlessness seem to be more frequent. In this article, I will try to describe what actions should lead to producing a quality queen and what factors may be involved in reducing that quality.

The potential quality of a new queen depends, first, upon the stock from which she will be reared. Commercial bee breeders have large numbers of colonies from which they select stocks that meet their individual criteria of what represents a good colony. Criteria vary among producers. In order to determine which stocks may be best for your purposes, purchase limited numbers of queens from various producers and run side by side comparisons in your apiaries.

The second most important factor in rearing a quality queen is getting her off to a great start. It is important that the larvae be fed queen jelly for as long as possible for queens to reach their full potential. Grafting 0 to 24 hour old larvae is best. Grafting should take place in an environment with the temperature and relative humidity kept similar to that in the brood chamber. Larvae that are chilled, over heated, or dehydrated will not develop normally. Right after grafting, the larvae should be moved into the cell starters or builders. Covering the grafted larvae with a damp cloth until they are in the colonies is a good practice. Contamination of beeswax cell cups into which the larvae are grafted can be a problem. Many beekeepers have converted over to plastic cups to reduce that problem.

Cell builders, starters, and finishers should be set up in such a manner that the larvae are placed into an abundant population of nurse bees that are far enough away from a queen that they will attempt to rear all the cells. Nurse bees range in age from 9 to 12 days post emergence. Thus, replacement young bees always have to be available to the colony in order to provide adequate nurse bees. Production of royal jelly depends entirely upon the availability of copious amounts of pollens or pollen substitutes. Lack of pollens leads to smaller, less well fed larvae and queens. Also, nurse bees lose their body reserves of stored nutrients and become much more susceptible to disease, parasites, and insecticides when forced to rear brood with too little protein in the hive. At least two other factors have been demonstrated to inhibit production of royal jelly by nurse bees: 1. Infection by *Nosma apis* (nosema disease) and 2. Infestation by *Acarapis woodi* (tracheal mite). Thus, it is critical that every precaution be taken to keep diseases and parasites under control.

Capped queen cells are moved to mating nuclei, where they will emerge, mature, mate, and start laying. Queen cells are less susceptible to rough handling on day 9 than on day 10, but they

should be handled very carefully at all times. During transportation to the mating nuclei it is a good idea to try to keep the cells at brood nest temperature. Getting too cold or too hot ruins potential queens. There should be adequate worker bees in the nuclei to keep the queen cell covered and warm. The worker population should contain a substantial number of 9 to 12 day old nurse bees to provide the royal jelly necessary to allow the queen to develop normally to maturity. Around a week after the queen emerges she will fly out of the nucleus to mate with 12 to 20 drones, then return and begin laying in a few days. It is critical to have adequate workers in the nucleus to keep the queen warm so that millions of sperm, which she will use over the next year or two, will migrate into her spermatheca. Again, having copious amounts of pollens or pollen substitute is critical for rearing a healthy queen. Similarly, the nurse bees must be free of nosema disease and tracheal mites in order to provide an abundance of food for the queen.

Additionally, it is very important that the worker bees in the nuclei are not shedding tracheal mites. Similar to workers, queen bees are most susceptible and attractive to tracheal mite infestation during the first few days following emergence. While we don't know exactly what effects tracheal mites have on queen bee performance, studies by Dr. Scott Camazine and his research team have shown a correlation between tracheal mite infestation and: 1. Lighter weight queens, 2. Smaller ovaries and, 3. Fewer sperm in the spermatheca.

The availability of drones is another factor that may not be receiving enough attention. In some cases, a mating yard may contain 1,000 or more queens, each of which requires 12 to 20 drones to be fully mated. Without special planning, it is easy to run short on drones. A few producers put frames of combs drawn from drone foundation into the colonies surrounding their mating yards. But, most producers rely on drones from the bottoms and edges of regular combs, from surrounding beekeepers' hives or from feral colonies to provide adequate drones for proper queen mating. Obliteration of feral colonies by tracheal and *Varroa* mites has reduced the drone populations in most areas very significantly.

Once the queens are laying, they are removed from the nuclei, placed into queen cages with candy and attendants, and prepared for shipment to the customers. To protect the queen, the screen mesh should be finer than that of window screen. Also, attendant bees should be free of nosema disease and tracheal mites. Some producers are requested or required to put Apistan queen tabs in the queen cages. A few refuse to do it; others do it reluctantly. Prolonged exposure to even 1% fluvalinate can be detrimental to queens. Recently, queen producers have been shipping large numbers of queens in screened, sturdy cardboard boxes that hold many small queen cages and quantities of loose, bulk worker bees that serve as their attendants. This newer system has met with mixed results, so it is too soon to rate its effectiveness.

Once at the post office or shipping depot, nearly anything can happen. Queens can be over heated, chilled, left out in the sun for hours (desiccated), banged around in baggage compartments, and exposed to insecticides. Often, the post office or shipping hub fails to contact the customer when the queens arrive and they may sit in storage for days. It is surprising that the queens come through as well as they do.

The customer has some things to do to help protect the queens, too. When they arrive, they are likely to be short on water. Separate the queen cages, give each one a drop of water that can be

reached but does not wet the candy and make it sticky, and move them to a cool, dark place (may be covered to make them dark). Prepare the recipient colonies in advance by providing a source of sugar syrup to each colony. This will keep the older workers busy, and it is the old workers that are most likely to reject a new queen and gnaw at her in her cage. Hopefully, the colony into which the queen is being introduced is free of nosema disease and tracheal mites. If not, it may only be a matter of time before the queen becomes infected or infested. Usually, a queen is superseded within a month if *Nosema* infects her. We aren't sure, yet, what the consequences of tracheal mite infestations are to a queen, but they are very likely to be detrimental.

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