PennState Extension

Honey Bee Insemination: Installing a Queen Using a Push-in Cage

This article is a procedure for installing a honey bee queen using a push-in cage.

Procedure

Queen introduction using a push-in cage increases the likelihood of success.

Push-in cages are particularly useful when introducing instrumentally inseminated queens (Figure 1). A push-in cage allows the queen greater freedom of movement, more contact with workers both inside and outside the cage, access to food, and the ability to lay eggs while remaining safely protected. As the new queen's pheromones spread throughout the colony, they promote beneficial and cooperative behavior among the workers.

A queen in a push-in cage

Figure 1. Instrumentally inseminated queen. Image Credit Kate Anton

Queen mandibular pheromone (QMP) is the most well-known pheromone influencing queen acceptance. However, a queen's pheromonal profile improves when she is laying eggs, as ovarian activation enhances pheromone production, and each oviposition triggers secretion from the Dufour's gland. These higher-quality pheromones signal strong reproductive fitness and elicit particularly positive responses from workers. Therefore, introducing a queen using a push-in cage increases the likelihood of successful acceptance.

What is a push-in cage?

Push-in cages are made of ⅛ inch hardware cloth and can be purchased or made by a beekeeper. The depth and size of the cage are easily customizable. Push-in cages work best with plastic foundation. Wax foundation can be more difficult because it is possible for the bees to access the cage through the other side.

How to make a push-in cage

At Penn State, we recommend push-in cages that are deep enough to accommodate a queen cage and secure the corners with cable ties (Figure 2) or solder. The push-in cage pictured (Figures 2-4) is approximately 4 inches x 6 inches x 1.25 inches, though smaller or larger cages are also effective. Care should be taken to keep the edge straight so that there are no gaps (Figure 3). Positioning the cable ties closer to the top of the cage prevents them from coming in contact with the comb during placement (Figure 4).

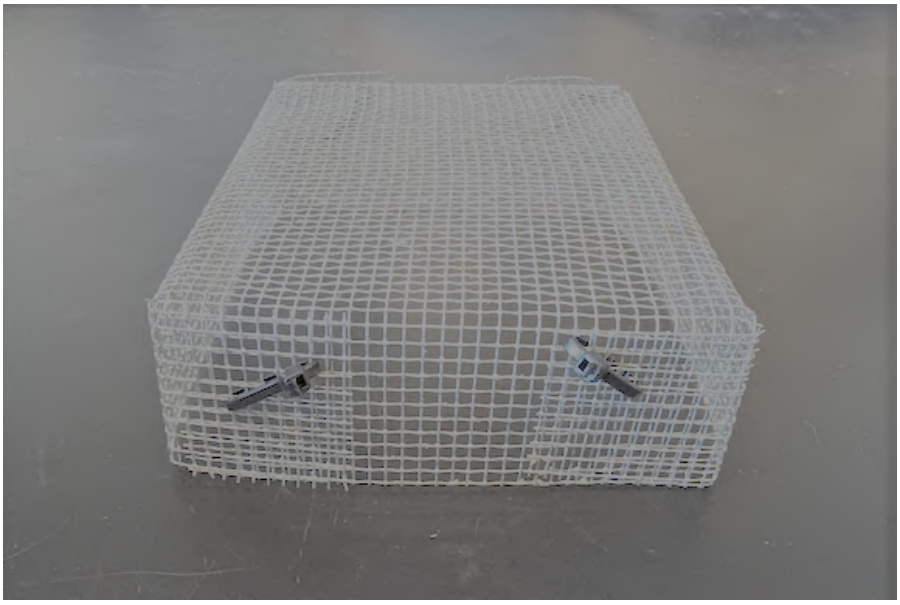

Figure 2. The end of a push-in cage showing the folded, secured corners. Image credit: Kate Anton

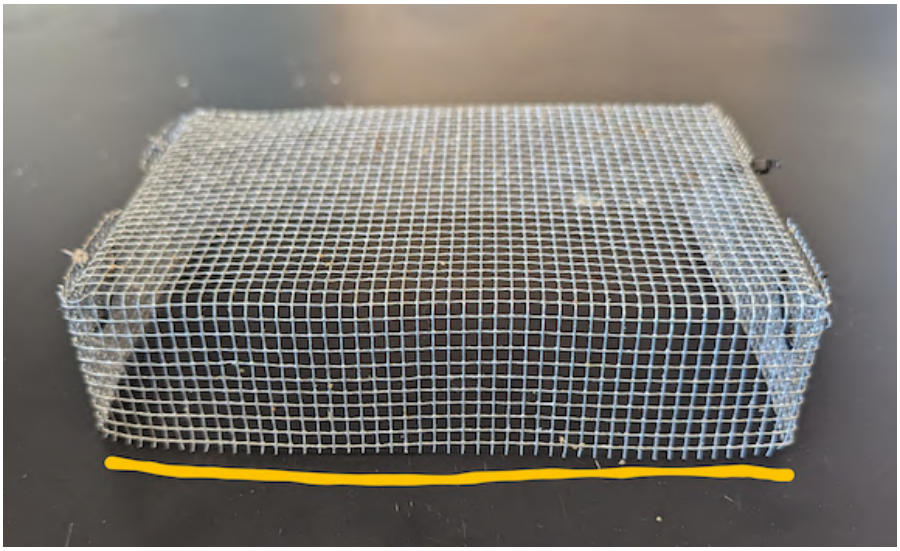

Figure 3. The end of a push-in cage showing the length measurement. Image credit: Kate Anton

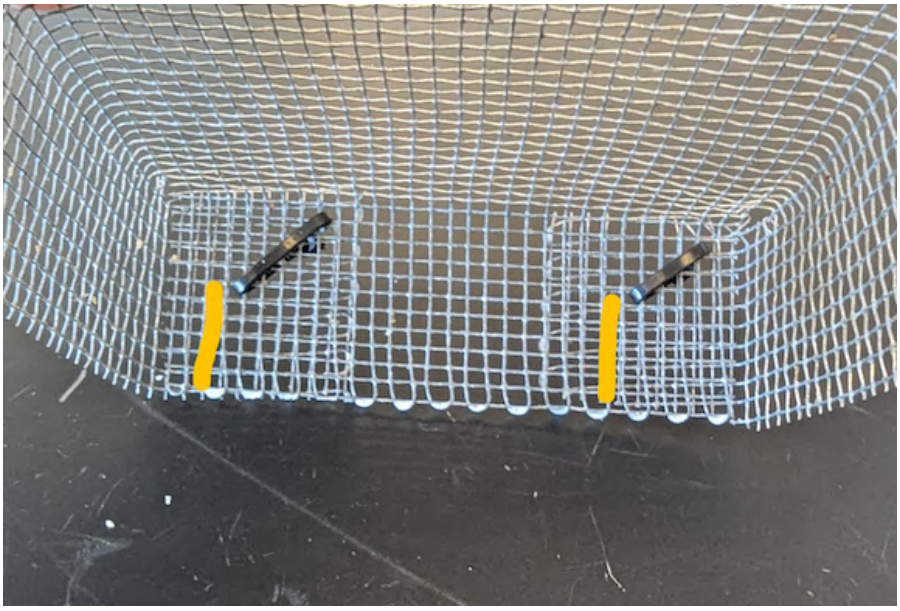

Figure 4. The inside of a push-in cage showing cable tie placement. Image credit: Kate Anton

Push-in cage placement

Select a frame with emerging brood and remove all bees from the section of the frame that will be used for the push-in cage. The ideal placement of a push-in cage is directly over a section of emerging brood and cells, including nectar or honey.

Depending on the depth of your push-in cage, it is possible to place the entire queen cage under the push-in cage after removing the cork or cap (if using a cage with candy, remove the cork from the non-candy end or remove candy) (Figure 5). Alternatively, the frame can be taken inside to safely remove the queen without the risk of her flying, or falling in the hive or underfoot! * If you prefer to be cautious, use a confined space with a low ceiling, such as a vehicle or restroom, so that the queen can be caught if she attempts to escape.

Figure 5. A queen being released from her queen cage into a push-in cage. Image credit: Kate Anton

When installing a push-in cage, make sure that the cage is in contact with the plastic foundation at all edges so the bees are not able to undermine the cage and free the queen. If you prepared your nuc carefully, the queen should be accepted in the event of early release, and she will be unable to take a mating flight because you have installed queen excluder material over the entrance.

If you have two brood frames, place the second frame with brood cells directly opposite the push-in cage with enough space for workers to walk between the cage and brood (Figure 6).

Figure 6. Place the second brood frame opposite the push-in cage with enough space for the workers to tend to the brood and the queen inside the cage. Image Credit Kate Anton

Releasing the queen

5-7 days after placement in the push-in cage, inspect the colony. Check to see if the queen is still inside the cage. Carefully inspect each frame and remove any queen cells and confirm that there are sufficient bees, brood, and food in the hive. If the queen is laying and the workers are calm, the queen may be released. If the queen has not laid eggs yet or the bees seem to be runny or aggressive, put the nuc back together and repeat this process in another 3-5 days. After 10 days, if the queen still has not begun laying eggs and the workers are accepting, she may be released into the colony (Figure 7). In the unlikely event that the colony is still acting aggressively, you may need to make a new nuc and try again.

Figure 7. A queen after release from the push-in cage. Image credit: Kate Anton.

To release the queen, gently remove the cage. Observe the bees to ensure the workers are not aggressive. Reassemble the hive and leave them undisturbed for one week.

If the queen has not laid eggs after 2 weeks, an additional treatment of CO_2 may be administered. To do this, place the queen in a cage, place the cage inside a plastic bag and administer enough CO_2 to make the queen unconscious for about one minute. Allow her to wake up and release her into the hive.

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