



# AN ORGANIC MANAGEMENT SYSTEM FOR HONEY BEES

Colony management is critical for the health and productivity of your honey bees. As a beekeeper, you have the privilege and responsibility for ethically managing your colonies so they can thrive. There are diverse responses to the various pest, parasite, and pathogen issues that may arise, so deciding how to respond takes education and training. The use of synthetic chemicals is common among beekeepers, but resistance to these treatments occurs relatively quickly, rendering the treatment useless, and residues of these chemicals are readily found in the wax of treated colonies. A better approach is to use organic\* management practices that avoid synthetic chemicals and employ integrated pest management (IPM) techniques. Beekeeping IPM involves the combination of cultural, mechanical, biological, and chemical controls (see <https://extension.psu.edu/methods-to-control-varroa-mites-an-integrated-pest-management-approach>). Cultural and mechanical controls are effective at delaying chemical treatments, but most colonies require some chemical intervention each year. IPM practices call for using treatments only when a problem reaches a threshold, so regular monitoring is required. In addition, chemical treatments are strategically used in rotation to avoid resistance development.

\*Due to land-use restrictions in the area around your hives, you are not likely to be able to make USDA Certified Organic honey bee products in the United States; see the “Formal Recommendation by the National Organic Standards Board (NOSB) to the National Organic Program (NOP)” at <https://www.ams.usda.gov/sites/default/files/media/NOP%20Livestock%20Final%20Rec%20Apiculture.pdf> for details.

## Practices and Treatments Allowed in an Organic Management System

### Equipment

- Traditional Langstroth or nontraditional
- Standard or small-cell foundation
- Wax or plastic foundation or no foundation
- Solid or screen bottom board
- Wooden or cloth inner cover

### Varroa Mite Mitigation

#### Cultural Controls

- Mite-resistant or tolerant stock
- Brood break

#### Mechanical Controls

- Drone brood removal
- Powdered sugar

#### Chemical Controls

- Hop beta acids
- Oxalic acid
- Formic acid
- Thymol

### Feeding

- Sucrose (syrup, dry, candy board)
- Invert syrup (do not make your own; purchase to avoid lethal accumulation of HMF [hydroxymethylfurfural])
- Honey (as long as you trust the source)



# Step-by-Step Guide to Managing Bees

From 2018 to 2021, researchers at Penn State conducted a side-by-side comparison of three honey bee colony management systems: conventional, organic, and chemical free. The study showed that the organic management system was the most successful in keeping the bees healthy and productive. The organic management system is provided here in detail to serve as an example of a successful organic management system.

## Starting Out

- While we started the colonies with traditional packages, we requeened them with local, Pennsylvania-hardy stock (Figure 1).
- We used standard Langstroth equipment with standard plastic foundation in wooden frames (Figure 2).
- We fed the colonies Pro-Sweet (invert syrup) at a rate of 2 gallons every two weeks until the flow began in late May (Figure 3).
- The goal of the first year was to have a brood nest full of drawn comb. We used all medium boxes and considered the bottom three boxes to be the brood nest.
- We employed drone brood removal by scraping capped drone brood on special drone frames every two weeks (Figures 4 and 5).



Figure 1. Installing packages in hives. Photo credit: Robyn Underwood



Figure 2. Langstroth hives with standard plastic foundation in wooden frames. Photo credit: Robyn Underwood



Figure 3. Feeding Pro-Sweet to the colonies. Photo credit: Robyn Underwood



Figure 4. A frame of capped drone brood. Photo credit: Robyn Underwood



Figure 5. Scraping capped drone brood. Photo credit: Robyn Underwood

- We did not use a queen excluder.
- We kept the entrance reducer at the 4-inch opening and used a mouse guard made from ½ inch hardware cloth at all times, except when the entrance had to be fully open while formic acid treatments were in place (Figure 6).
- We used solid bottom boards (Figure 7).
- We used a wooden inner cover with a notch to serve as an upper entrance. We recommend using a wintering cover (wooden inner cover with 2-inch spacer built in; Figure 8) with the spacer side up at all times. Also, keep the middle hole (meant for a feeder jar) open at all times.
- We removed excess honey prior to the August Varroa mite treatments.



Figure 6. Entrance with a mouse guard in place. Photo credit: Robyn Underwood



Figure 7. Solid bottom board. Photo credit: Robyn Underwood



Figure 8. Wintering cover. Photo credit: Mann Lake Ltd.

## Varroa Mite Management

- We visited and inspected our colonies every two weeks to monitor queen status, watch for diseases and pests, and check the status of food stores (Figure 9). We fed the colonies or added supers, as needed.
- We scraped capped drone brood each visit.



Figure 9. Hive inspection. *Photo credit: Robyn Underwood*

- We conducted a Varroa mite alcohol wash in the field every four weeks using ½ cup of bees (see <https://lopezuribelab.com/varroa-mite-monitoring/>).

- A treatment threshold of four mites in a wash (exceeding 1 percent infestation) was used to trigger the need for a mite treatment (Figure 10). If one colony in the apiary was at this threshold, all of the colonies in that apiary received a treatment.



Figure 10. Varroa mites in a filter. *Photo credit: Robyn Underwood*

### In the Spring (April to May)

- We applied oxalic acid (OA; dribble or vapor) when the 1 percent threshold was exceeded.
  - OA dribble treatment (Figure 11; see also <https://lopezuribelab.com/oxalic-acid-treatment-protocols/>).



Figure 11. Supplies for an oxalic acid dribble treatment. *Photo credit: Robyn Underwood*

- We used 3 percent OA in 1:1 simple syrup (35 grams of crystals in 1 liter of syrup can treat 20 colonies).
- We dribbled 5 milliliters of solution onto each seam of bees in the brood chamber (maximum of 50 milliliters per hive).
- OA vapor treatment (Figure 12).
  - We used ¾ teaspoon of crystals.
- Treatment was repeated once per week for three weeks.



Figure 12. Applying oxalic acid vapor treatment. *Photo credit: Robyn Underwood*

### In the Summer (June to Mid-August)

- We applied formic acid when the 1 percent threshold was exceeded.
  - Formic Pro pads (Figure 13).
    - The entrance to the hive was fully open.
    - We applied two pads per hive, placed on the top bars of the second medium box, unless there were fewer than 10 frames of bees, when only one pad was used (this was rare).
    - We ensured the forecasted ambient temperature would not reach 92°F during the first 72 hours after the pads were put in place.



Figure 13. Formic Pro pads. *Photo credit: Robyn Underwood*

## In the Fall (Mid-August)

- All colonies were treated, regardless of mite levels.
  - If they had not been treated with formic acid yet that year, we applied a formic acid treatment, as described above.
  - If they had already been treated with formic acid, we applied an Apiguard (thymol) treatment (Figure 14). Apiguard was added twice, on day 1 and day 14, at a rate of 50 grams of gel per treatment, then left for an additional four weeks.



Figure 14. Apiguard application. *Photo credit: Steve Berner*

## In Late Fall (September to October)

- If the threshold was still exceeded six weeks after the mid-August treatment (which happened in one out of three years), colonies were treated using OA vapor (1 gram) or dribble (3 percent) three times at one-week intervals.

## Winter Preparation

- In mid-August, we broke the colonies down to their winter size: three medium boxes.
- In late September/early October (six weeks after treatment began), we weighed each hive. Our equipment—with three medium boxes, bottom board, inner cover, and lid—weighed about 60 pounds without any stored food, so we aimed for a total weight of 120 pounds, or 60 pounds of stored food.
- We fed the colonies according to their weight. One gallon of Pro-Sweet weighs over 10 pounds; so, using 10 pounds per filled feeder as our general guide, we fed them by the gallon only as much as they needed to get to 60 pounds of stored food.
- We added a 1-inch Styrofoam piece the size of the inner cover between the inner cover and the lid (telescoping cover).
- We ensured all hives had a secure mouse guard in place. We used ½ inch hardware cloth stapled over the 4-inch entrance.
- After the six-week check and weigh visit, we did not disturb the colonies, except to feed.
- In December, we returned to the apiary to treat the colonies with OA vapor (as described above, but with a temperature range limitation of 37–55°F and only one treatment, no repeats) and added dry or slightly moistened sugar as emergency feed. Sugar was placed in a circle around the central hole in the space provided by the wintering cover.
- We returned once each month to check for life and add sugar, as needed, approximately 3–4 pounds at a time.
- In mid-March, we added a third of a pollen patty (UltraBee). We added a second third of a patty two weeks later if they had consumed the first.

We hope you have great success in keeping your bees healthy and thriving.

We want to hear from you! Email [rmu1@psu.edu](mailto:rmu1@psu.edu) with comments about your successes and challenges following this protocol.



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## [extension.psu.edu](https://extension.psu.edu)

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