

EASTERN MISSOURI BEEKEEPERS ASSOCIATION

July & August (Colony) Hive Management in St. Louis

July marks the start of fall preparations, for honey bees and beekeepers.

Introduction & Resources

We recommend that newbees thoroughly review summer and early fall management in the customary reference books, and also study closely the Fall Management and Varroa Testing guides available from the Mid-Atlantic university extension entomologists at MAAREC <https://agdev.anr.udel.edu/maarec/educational-resources> and from Marla Spivak and Gary Reuter at the University of Minnesota Bee Lab website, <http://www.extension.umn.edu/honeybees/components/freebees.htm>

The recently published revised edition of Caron, Honey Bee Biology and Beekeeping is an essential reference book for beekeepers.





July – August Hive Assessments

A strong, healthy colony with a good queen and adequate stores of honey and pollen, not later than October 15th, are essential to surviving winter and having a strong colony at the time of the first nectar flow. Achieving this goal requires the beekeeper to assess each colony in the summer, after removing honey, and to take appropriate action to correct any problems. The hive examination should assess the queen, population strength, honey stores, the presence of disease, and varroa mite loads. Fall preparations should start before Labor Day. By late September, it is too late to do anything that will significantly help a weak colony survive the winter.

Assessing the Colony in Summer. Assessing colony population in summer is challenging if the upper hive body is full of honey. The burr comb will break when removing frames and separating boxes. Try to make a visual assessment without removing frames if you encounter honey-filled burr comb.

Use caution to avoid injuring your back if you remove a hive body. The upper box may be heavy. Enlist help or take a stand with you, such as a spare hive body, so you don't have to bend and lift as much to remove and replace a heavy box.

The Tech-Transfer team at the University of Minnesota estimates that a frame covered with bees on both sides holds about 2,000 bees.

Colony Population. The condition of the queen, as always, is the most important aspect of the colony. If the queen is healthy, and the colony free of mites and disease, the hive will be “bubbling over” with bees in the upper brood chamber, with bees between every frame and the sidewalls.

If you find that the colony is queenless, failing (drone layer), or the population is low, you must take corrective action. Your choices are to unite the colony with another colony (called “taking your losses in the Fall”), or give the weak colony eggs, bees and brood from another colony to make a queen (51 days until new adult bees), or requeen it with a nuc, or try requeening with a purchased queen. If one of these methods does not work and allow the colony to build up with a laying queen by October 1, you should “retire” the remaining bees, store your comb to save it from the wax moths, and start again next year with a package or nuc. Even if the colony is retired, your comb represents a year of progress that will be lost if the wax moths destroy it.

Honey Stores. The goal for winter honey stores is to assure that by October 15 each colony will have adequate stores for wintering. Stores should be located above and flanking the winter cluster. The stores will be adequate if the upper hive body/bodies have honey “wall to wall,” and there is honey and pollen flanking the cluster in the bottom. “A strong colony going into winter will need around 15 deep frames of capped honey...” according to Dr. James Tew, State Specialist, Beekeeping, Ohio State University. The cluster will move down as it fills the upper boxes in September, and will move up over the course of the winter.

July is the best time to remove honey supers to assure that the colony will build up sufficient stores in the brood chambers from the late summer and early fall nectar flows. If there is insufficient honey, the colony will need supplemental feeding to sustain it. Be ready to feed syrup in September and early October if the upper hive body is not full of honey, or if there is still comb to draw in a new hive. It is often too cold to feed syrup after October 15th.

Mite Tests & Treatment

“Keeping bees healthy requires beekeepers to address mite problems through management techniques such as breeding, colony manipulation, or treatment with miticides. While breeding and manipulation are the first and most important lines of defense, many beekeepers still need to use chemical treatments to keep their colonies alive. No beekeeper enjoys applying chemicals to their hive because it is expensive, time consuming, and may adversely affect bees.

However, many beekeepers apply miticides once or twice a year to reduce mite infestation, often without first checking to see if the mite level is high enough to warrant treatment. Reducing treatments to only those necessary is imperative to keeping costs down, reducing hive contamination, and slowing the development of mite resistance to new miticides.” Spivak and Reuter, *American Bee Journal*, December, 2010.

A first-year colony started from a package or nuc in the spring is not likely to have heavy mite loads. However, testing is necessary to determine if treatment is required. Test often.

Monitoring Varroa Mite Populations

Bee colonies can tolerate a low number of mites, but will decline or die as mite numbers rise. Monitoring (sampling) for Varroa mites enables a beekeeper to detect a colony’s mite population. Accurately assessing and understanding mite population is the basis of an IPM control strategy.

Waiting too long to confirm elevated mite population numbers is risky. A delay in treatment can reduce a colony’s likelihood of survival over the winter and contribute to spreading mites to other colonies.

Beekeepers can assess mite populations during any of the phases of bee/mite population cycles. **Generally, a beekeeper should perform Varroa monitoring assessments at least four times during the year, beginning with the Population Increase phase.**

During the Population Decrease phase, mite levels should be re-checked to confirm that mite numbers are low going into the Dormant phase. During the Dormant phase, sampling should continue, if possible. However, if it is too cold to safely remove and sample bees from the cluster, wait until milder conditions permit sampling.

Also, **repeat sampling AFTER treatment** to confirm the effectiveness of the treatment that was performed.

Aggressively treat colonies whenever sampling results warrant.

Recommended Sampling Methods

Two sampling methods provide the best estimates of mite populations. Both involve removing mites from the bodies of adult bees, then counting the mites to establish a standard percentage measure of mite numbers (i.e., number of mites per 100 adult bees). The recommended sampling methods are the **powdered sugar shake** and the **alcohol or soap wash**.

This section also evaluates alternative sampling methods that are less reliable than those recommended, but are capable of providing, and should only be used as, a secondary confirmation of the Varroa levels indicated by more accurate methods.

See the *Bibliography and Additional Resources* section for journal articles on sampling methods.

Equipment Needed:

- Wide mouth jar, such as quart Mason canning jar
 - Solid lid replaced with modified # 8 screen mesh
 - Powdered sugar, or
 - Alcohol (any of the following): ethanol, ethyl alcohol, or isopropyl (rubbing) alcohol, or
 - Soap: automotive windshield washer fluid
 - White plate, tray, or similar device. (Paper boards or sheets can be used for the powdered sugar shake method.)
 - Water mister (to dissolve powdered sugar)
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Collecting the Sample (Both Methods)

Collect a sample of approximately 300 adult bees from one to three brood-nest combs (avoiding the queen). Three hundred bees are equivalent to about $\frac{1}{2}$ cup of lightly packed bees.

- 1 Mark a wide-mouthed, open neck glass or plastic collection jar with a line at $\frac{1}{2}$ cup.
- 2 Select a brood frame. Look for the queen. If she is present, move her to another frame.
- 3 Collect 300 adult bees directly into the collection jar from a brood frame by moving collection jar downward over adult bees so they fall backwards. Or shake bees directly from two or three brood frames into a larger collecting container (honey bucket, cardboard container, or lipped tray) and scoop up $\frac{1}{2}$ cup of bees and quickly pour them into the quart jar.

Experiment with your collection technique to consistently obtain a 300-bee sample.

The powdered sugar shake method is non-lethal, so the bees may be returned to the hive after testing. With the alcohol or soap wash method, the bees will be sacrificed.

Powdered Sugar Shake Method

- 1 Add approximately two tablespoons of powdered sugar to the jar.
- 2 Vigorously shake the jar for at least one minute to cover the bees in sugar and dislodge the mites from the bees. To improve the consistency of mite counts, shake the jar for a consistent length of time for every sample.
- 3 Set the jar down and wait three to five minutes. (Rushing the process increases the risk of undercounting the mites.)
- 4 Invert the jar and shake it like a saltshaker, capturing the falling mites onto a clean plate or pan below. Shake the inverted jar until mites stop falling out.
- 5 Spray the powdered sugar deposit in the plate or pan with a water mist to dissolve the sugar.
- 6 Count the mites that remain.
- 7 Add an additional tablespoon of sugar to the jar, shake and roll the bees again for 30+ seconds, and repeat steps 4, 5, and 6 to improve the accuracy of the count.
- 8 Count the number of mites in the plate or pan.
- 9 Calculate the mite number per 100 adult bees. (See *Counting the Mites*)

For best results, sift the powdered sugar through a flour sifter to insure a fine texture. **Do not perform this test in high humidity or during strong nectar flow, because dampness will cause the sugar and mites to adhere to the bees.**

Alcohol or Soap Wash Method

Perform the alcohol or soap wash away from the hive.

- 1 Add enough alcohol (inexpensive rubbing alcohol works well) or soap (use a low-sudsing soap, such as automotive windshield washer fluid) to completely cover the bee sample in the jar. Vigorously shake the jar for at least one minute to cover the bees in sugar and dislodge the mites from the bees. To improve the consistency of mite counts, shake the jar for a consistent length of time for every sample.
- 2 Vigorously shake the jar for at least one minute to dislodge the mites from the bees. To improve the consistency of mite counts, shake the jar for a consistent length of time for every sample. Invert the jar and shake it like a saltshaker, capturing the falling mites onto a clean plate or pan below. Shake the inverted jar until mites stop falling out.
- 3 After shaking, empty the liquid contents into a clear plate or white shallow pan through a mesh screen that traps the adult worker bodies. Count the mites that remain.
- 4 Add more alcohol or soap to the jar and repeat steps 2 and 3. (This increases the accuracy of the count.)

- 5 Count the number of mites in the plate or pan.
- 6 Calculate the mite number per 100 bees. (See *Counting the Mites*)

Counting the Mites (Both Methods)

The goal of mite assessment is to determine the number of Varroa mites per 100 adult bees, expressed as the percentage of infestation.

Counting steps:

- 1 Count the number of mites collected in the plate or pan.
- 2 Divide that number by the number of bees in the sample.
- 3 Multiply by 100 to yield a percentage.

Example:

A beekeeper samples 300 adult bees and counts 12 mites in the pan.

$$12 \text{ mites} \div 300 \text{ bees} = .04 \times 100 = 4\% \text{ (4 mites per 100 adult bees)}$$

To increase the accuracy of the assessment, count the actual number of bees in each sample. As you gain experience with sampling, your sample sizes will become more consistent.

How many colonies to sample for Varroa mites?

If an apiary has fewer than ten colonies, sample each colony. For larger apiaries, sample 300 adult bees collected from one brood frame in a minimum of eight randomly selected colonies in each apiary (or 3 percent to 5 percent of total colonies within multiple apiaries).

Interpreting Sample Findings

When using the recommended powdered sugar shake or alcohol or soap wash sampling methods we suggest using the following guidelines to determine when a colony needs treatment and to evaluate treatment effectiveness:

Figure 2: Treatment Thresholds by Phase

(% = Number of mites / 100 adult bees)

Colony Phase	Acceptable Further control not needed	Caution Control may be warranted	Danger Control promptly
Dormant with brood	<1%	1-2%	>2%

Dormant without brood	<1%	<2-3%	>3%
Population Increase	<1%	<2-3%	>3%
Peak Population	<2%	<3-5%	>5%
Population Decrease	<2%	<2-3%	>3%

Acceptable: Current mite populations are not an immediate threat.

Caution: Mite population is reaching levels that may soon cause damage; non-chemical control might be employed while chemical control may be needed within a month; continue to sample and be prepared to intervene.

Danger: Colony loss is likely unless the beekeeper controls Varroa immediately.

When mite levels are below 2 percent the mite numbers are considered to be reasonably low, so immediate control is not needed. If sampling was done after treatment, this low level means that the treatment was successful in reducing the mite population below damaging levels.

When mite levels are between 3 percent and 5 percent, further control efforts may or may not be needed or the beekeeper may decide to wait a week or so before taking another sample. The variable rate of 3 to 5% is based on beekeeper risk tolerance – a 3 percent level represents a lower risk of mite damage or colony loss compared to 5 percent or higher levels.

When mite levels are above 5 percent, apply mite control immediately, using a proven, effective, seasonally appropriate treatment method (See table, Control Options by Seasonal Phase, below). If post-treatment tests show that mite numbers remain above 5 percent after treatment, apply another control chemical or method without delay.

Recommendations on when to treat, and at what percent infestation rate to treat, have recently changed. Beekeepers should stay current with future changes based on new research findings. Older recommendations often suggested waiting until higher infestation levels (10 percent to even 20 percent) before treating, whereas current recommendations emphasize treatment thresholds of 2 percent, 3 percent, or 5 percent.

Colony Losses Associated with Varroa Mite Levels

Various studies have found that winter colony losses increase with higher levels of Varroa mite infestation. Losses can be expected even at a 3 percent infestation, and can increase rapidly with higher infestation levels. Some colony losses are inevitable, but treatment of Varroa can keep losses at sustainable levels for most beekeepers.

Use Caution When Interpreting Assessment Results

Be very careful interpreting results from any single sampling technique. Inexperience with sampling procedures will affect results. Mite infestations vary from one colony to the next. The same level of mite infestation poses different risks during different phases of the bee/mite annual cycle.

Sample Often

Sampling several times throughout the year helps reduce sampling error and increase confidence in sampling results. Frequent sampling can detect mite increases at critical times of the season.

For example, mite populations can rapidly surge after honey harvest, or when colonies stop rearing brood and adult bee population decreases. This is a time when the colony must be healthy enough to successfully rear more bees to survive the Dormant phase. A single sample may not detect a rapid transition of mites from brood to adult bees during this period. A good rule of thumb is "If in doubt, resample."

It is also important to sample after treatment to assess control effectiveness.

Alternate Sampling Methods for Varroa Assessment

While the two most accurate ways to determine numbers of Varroa mites present during any seasonal phase of a honey bee colony are the powdered sugar shake method and the alcohol or soap wash method, some beekeepers continue to use methods that are less efficient and less accurate. The Honey Bee Health Coalition does not recommend relying on the methods identified in the following table.

Less Reliable Sampling Methods

Method	Concern
Ether Roll	<ul style="list-style-type: none">• Only detects 50 to 60 percent of mites.• Material is highly flammable.
Drone Brood Assessment	<ul style="list-style-type: none">• Difficult to interpret results of percent of brood infested.• Drone brood is not always present when sampling is needed.
Visual Inspection of Mites on Adults	<ul style="list-style-type: none">• Unless mites are on thorax or top of abdomen, they are not easily seen.• Finding mites on adults indicates that a high total mite population already exists.
Sticky (debris) Board	<ul style="list-style-type: none">• Ants or other scavengers might remove mite bodies and interfere with estimates.• Difficult to interpret number of mites per hour or per day to estimate total mite population.

Effective Mite Treatments

EMBA recommends using a “soft,” organic chemical control for warm weather treatment, such as Apiguard, Apilife Var or formic acid strips in summer. Apivar (amitraz) is also highly effective. Oxalic acid may be used during broodless periods later in the season. Close down screen bottom boards during treatment.

Ineffective Mite Treatments

- Neither low-dosage mineral oils nor additional acids, such as lactic acid, nor use of food stimulants or supplements have been proven to be effective treatments for Varroa mite control.
- The use of small cell “natural” comb for the rearing of smaller bees, drone brood removal, screen bottom boards and powdered sugar are ineffective for Varroa control.
- The use of non – registered chemicals or using any chemical control contrary to the label directions violates both federal and state laws and should not be used for treating bee colonies.
- Other methods that beekeepers may read or hear about need to be adequately tested before adoption and should only be used with caution. Always check for efficacy during and after use.

Mites have developed resistance to the synthetic chemical miticides, Apistan and Coumaphos, and are no longer recommended, except as a last resort. U.S. EPA recently approved a formulation of amitraz, known as ApiVar, which has proved effective in tests, while leaving no significant residues in wax.

Nosema

Nosema ceranae is declining as a threat to the colonies. If nosema is a concern, you may treat with fumagillin mixed in heavy syrup (2 sugar:1water) per manufacturer’s instructions. But note that a recently published study found that ceranae was not controlled by fumagillin, and that “The current application protocol for fumagillin may exacerbate N. ceranae infection rather than suppress it.” Huang W-F, Solter LF, Yau PM, Imai BS (2013) Nosema ceranae Escapes Fumagillin Control in Honey Bees. PLoS Pathog 9(3): e1003185. doi:10.1371/journal.ppat.1003185

How to Prevent Winter Losses

Honey bee colonies die over the winter because: 1) they starve; 2) there are too few bees; or 3) they are suffering from parasitic mite syndrome (PMS). The summer inspections should address these elements.

Food Stores: In order to avoid starvation, there should be comb and honey above and on the sides of the cluster during the winter. If you have a lot of foundation in the upper hive body, consolidate the frames with comb in the center of the box, over the cluster, and start feeding now with heavy syrup (2 sugar:1 water, by weight or volume) to draw out the undrawn foundation. Continue feeding until the foundation is drawn and full of syrup. (The bees will draw comb well while being fed in September, in my experience.)

Colony Population: In evaluating a colony, it is necessary to know how many frames of bees and brood there are. Going into fall, we want the adult cluster on a minimum of 6 frames, and brood on 4 frames. Do not be concerned in the fall about the brood pattern. It is futile to try to judge brood patterns in the fall. When bees are getting ready for winter, the brood may be scattered around. Do not try to judge it as we did in the spring.

Katie Lee, a leader of the University of Minnesota Midwest Honey Bee Tech Transfer Team, recommends counting frames of bees when the colony is opened, and estimating colony population based on a rule of thumb of 2000 bees per covered frame.

Mites and Disease: You must assess the health of both the adults and the brood. Observe the adults and brood for signs of disease. Are the workers' wings deformed? (A sign of Deformed Wing Virus, an indication of parasitic mite syndrome.) Is the larvae shrunken or deformed? These would be mite treatment indications. The larvae should be pearly white, not yellow or brown.

Other Management Considerations

The Queen: A young, healthy queen is a requirement of successful overwintering. If your queen is old, defensive, or failing, requeen now. After Labor Day there is an acceptance risk that could jeopardize survival going into winter. In July and August, there are many weeks left before cold weather and clustering.

Pollen: There is probably more pollen in the colony than you realize, and they will bring a lot more in over the next several weeks. They have been using pollen to rear brood. Brood rearing stops about Oct 1. The bees will bring in pollen during the late summer, fall, and winter, and there will be lots of fresh pollen around in the spring.

Pollen substitutes and supplements are applied to boost brood production in the spring, but it is becoming popular in the fall too. I don't think it can hurt to apply it in the fall, so long as the patty is placed slightly off center in the upper hive body, where it will not interfere with the cluster rising to the hole in the inner cover to gain heat during cold weather.

Honey in Supers: If you have a bit of honey in your supers and don't want to extract it, you can feed it back to the bees. Remove the queen excluder. Place the honey super above the inner cover. The bees should take the uncapped honey down into the brood chambers.

On a cool morning (under 55 degrees), the bees will be in the cluster below the inner cover, and will not be in the super. You can take your clean super off then, and store it. If honey remains, leave the super out, far enough away as not to incite robbing in the yard, and the bees will clean it out.