

# Maximizing Honey Production

To maximize honey production from colonies of honey bees (*Apis mellifera* L.), it is necessary to add boxes to hives for receiving incoming nectar during major bloom periods. These boxes are called *supers*, and the addition of supers to hives is known as *supering*. Generally, supering increases the room for honey storage while reducing hive congestion and swarming behavior.

Timing of supering is important. Beekeepers who fail to keep up with the storage needs of a colony lose harvestable honey, especially if the failure to provide space causes a swarming event. About 60 percent of the worker population leaves with a swarm, resulting in a break in brood production for nearly 3 weeks during the transition period when a new queen emerges, mates, and begins to lay eggs. Both of these factors greatly reduce the foraging worker force of a colony, and honey production will be greatly diminished.

Alternatively, putting too many supers onto a colony or adding supers near the end of a honey flow could make a colony vulnerable to comb pests like the small hive beetle (*Aethina tumida*) or the greater wax moth (*Galleria mellonella*). The vulnerability results from the addition of combs to a colony that has a diminishing worker population in response to reduced availability of food. Brood production is regulated by incoming food, and colonies naturally decrease in population size during the late spring and early summer as food becomes scarce. Shrinking colonies may be stressed if combs are added because there may not be enough bees to patrol and protect the comb surfaces from hive pests.

## Hive Location

Supering regimes depend on geographic location because the food plants used by bees vary with location. Honey flows (periods of intense floral bloom) vary substantially from north to south in Mississippi. For example, areas abundant in Chinese tallow trees will often produce honey well into July, while other areas will have finished the major spring flow by mid-May to mid-June. This publication highlights issues related to timing of supering and the numbers of supers to add when supering.

One important point is that honey bees regularly forage for food in a 2-mile radius of their hive, which is about 9,000 acres. Probably the most important consideration in getting a major honey crop is where hives are placed. A good location has an abundance of major nectar- and pollen-producing plants (**Table 1**) during the spring, summer, and autumn periods. Wetlands, urban areas, and rural areas with wildflowers in open prairies and pastures or along roadside shoulders/medians and utility rights-of-way can provide harvestable honey. Avoid areas planted in large acreages of pines or conifers because these are food deserts for honey bees. Some agricultural crops like cotton and soybean can provide harvestable honey in highly agricultural areas like the Mississippi Delta during the summer months.

The second-most important factor in determining your honey crop will be the number of colonies kept together in the same bee yard. Generally, if 30–40 percent of the 9,000 acres that surround a bee yard is covered by major nectar- and/or pollen-producing plants that will bloom during the major spring period, as many as 25–40 colonies could be expected to produce harvestable honey. However, experience may be required to know exactly how much surplus honey can be derived from each hive. Some areas may easily produce 90–100 pounds of surplus honey when 25 colonies are kept in the yard. However, if 60 colonies were placed in the apiary, the honey yield could drop to only 30 pounds per hive. Trial and error may be necessary to determine the best numbers of colonies to maximize resources for a particular location.

A key to knowing when to super your hives is knowing the general bloom periods for the major plants (native and introduced) that provide nectar and pollen for your bees. Nectar is a 25–45 percent sucrose solution produced by flowers to attract pollinators to them. Honey bees convert nectar to honey with the addition of enzymes and evaporation of water. Pollen provides the nutrition needed to feed bee larvae that will grow into adult bees. Thus, a key to high honey production is an abundance of both types of incoming food: 1) nectar to be converted into honey and 2) pollen to be converted into new bees that ultimately become foragers or food collectors. The major food plants for honey bees in our state and their bloom periods are provided in **Table 1**.

Generally, the major nectar and pollen plants that bloom from January to mid-March do not contribute to the harvestable honey produced later in the spring and early summer. The reason is that food in late winter and early spring is generally used to grow bee colonies from a low population of 20,000–25,000 bees from the winter cluster to a booming colony of 35,000–60,000 bees needed to take advantage of the primary spring honey flow and produce surplus honey. Although the honey from the flowering plants during this period may not be harvested, it is critically important that these food plants induce rapid colony growth (called spring build-up) ahead of the primary period of spring bloom. Most of the harvestable honey will be produced from nectar-producing plants blooming from April to June. An autumn bloom from late August to November can also provide harvestable honey, but many beekeepers prefer to use the bulk of this autumn honey as food that the bees use to survive the cold winter months.

## Supering Hives

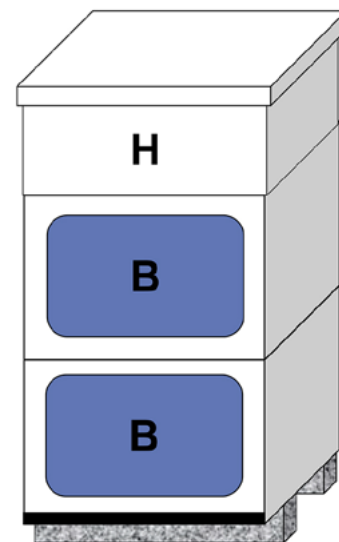
This publication does not address all aspects of early-spring management of honey bees in order to maximize honey production. Instead, it is assumed that the reader already understands that producing the highest honey yields per colony requires young and well-mated queens, management schemes to prevent swarming, and placement of hives near flowering plants that produce abundant nectar and pollen. For more information on overall seasonal management and swarm prevention, see MSU Extension [Publication 2941 Colony Growth and Seasonal Management of Honey Bees](#). To learn more about considerations for hive placement, see MSU Extension [Publication 2937 Choosing an Apiary Location](#).

Quite often, colonies are requeened in the previous autumn so that young queens, which produce strong pheromone signals (which help prevent swarming) and lay eggs at very high rates, are already well-accepted before the onset of a major honey flow. Swarm management can take many forms. Splitting strong colonies to offset crowding is an important strategy. Often making splits involves the delicate balance of taking just enough bees away from a strong colony to deter swarming while not severely hampering the developing foraging worker force. Another important swarm management technique is periodically pulling full honey combs out of the brood chamber and replacing these combs with empty ones. Empty combs give the queen space to lay eggs and keeps the brood nest from becoming honey bound.

Staying ahead of a hive's storage needs is the trick to obtain high yields. Well-established beekeepers will super with boxes containing drawn and empty combs, while new beekeepers may

only have undrawn frames of foundation to place in the honey supers. Obviously, honey bees can store more nectar and store it faster if they do not have to produce combs from foundation. It probably requires energetically about 25 pounds of honey to draw out 10 medium combs of foundation. The wax used to make combs also taps into the nutrition of a colony because the wax is derived from the sterols and fatty acids found in pollen. Producing high amounts of wax drains some of the nutritional components from pollen that are also used to feed bee larvae. Hence, wax production can slow brood production.

Our discussion of supering will begin with a hive conformation in which the brood chamber consists of two deep boxes and the honey supers to be added will be medium boxes (**Figure 1**). There are many different styles of hive management, so try not to focus on the actual hive units; focus more on the additions to the base unit with supering. Additionally, the debate over the utility of a queen excluder to separate honey supers from the brood nest will not be discussed here. The device is designed to restrict the queen from moving into honey supers to lay eggs. Some beekeepers use excluders, and some do not. It is a matter of personal choice. For those who use queen excluders, it is imperative to remove the device at the time of harvest. Too many new beekeepers forget and leave the excluders on the hive well into the winter. This mistake can lead to the death of a queen and eventual demise of the colony during the winter months.



**Figure 1.** Starting hive with brood chamber in two deep boxes and the first honey super already on top of the hive. Supering rule of thumb: when two-thirds of the combs are nearly full of honey and being capped, the next super(s) should be added.

Our starting point assumes that our colony has survived the often-difficult months of January to March when unsettled weather can interrupt periods of good weather that permits foraging for pollen and nectar. Our queen is laying eggs well, and our bee colony has grown to completely cover at least 10–12 deep combs. Additionally, a honey flow has begun, and the bees have completely filled 6 out of 10 combs in the honey super. The bees have begun capping ripened honey in many of these combs. It is definitely time to super while it is still early in the season, but how many supers should be added?

The number of supers to add is really a question of proximity to the peak of the main springtime flow. Experienced beekeepers know the rate of honey accumulation associated with a typical spring in their geographic area, and they often gauge when and how many supers to add based on the progress of the bloom. If that first honey super of our starting hive is filling, and the peak bloom is weeks away, perhaps more than one super can be added (**Figure 2**). At least two supers could be placed on the hive, and in areas with extremely prolific nectar-producing plants, perhaps even more than two supers could be added.

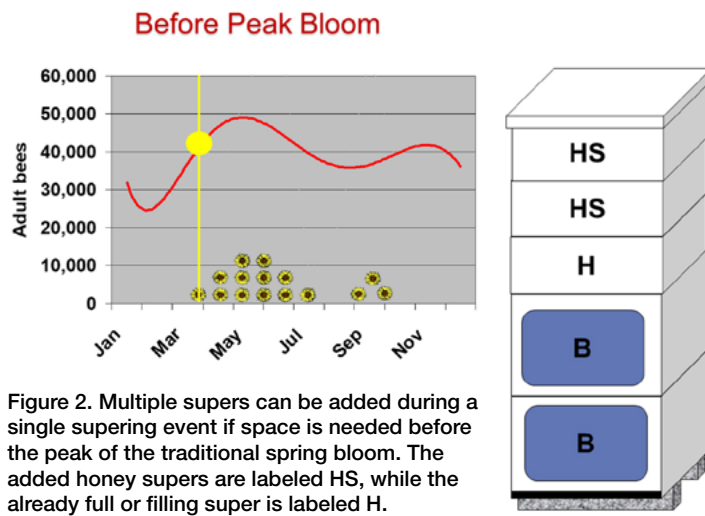


Figure 2. Multiple supers can be added during a single supering event if space is needed before the peak of the traditional spring bloom. The added honey supers are labeled HS, while the already full or filling super is labeled H.

Another frequent question is, “How should supers be added—above or below the existing almost full or filling super(s)?” Top supering refers to placing the new boxes above the nearly full super of honey, while bottom supering is placing the empty supers beneath the full box of honey. There seems to be an endless debate about which of these techniques yields the most honey, but there is little published scientific evidence that one method is better than the other. Therefore, it becomes a matter of personal choice. Significantly less lifting of heavy boxes of honey is involved with top supering, which is why people with hundreds to thousands of hives prefer that technique.

As always, a primary concern with adding empty combs to a colony of bees is whether that space will be adequately protected by the bees to prevent oviposition by small hive beetles or greater wax moths. This is rarely a problem for strong and growing colonies when the peak of spring bloom is yet to occur. Strong colonies will be able to patrol the added space. Of course, adding two empty boxes of comb to a colony of bees during the summer dearth could be a disaster. Colonies naturally decline in size during a dearth of incoming food, and it is likely that much added space will stress the bees and allow comb pests to get a foothold in the hive.

Suppose our starting unit (**Figure 1**) that needs supering is actually found at the peak of our main springtime honey flow. Should we super at all? Can the hive take multiple supers? There are no hard and fast rules here, but generally, supering will be required, and more caution asks us to use perhaps only a single empty super at this time (**Figure 3**). As in the previous scenario, the number of supers added depends on proximity to the peak bloom, but it also depends on the nectar-producing plants. In Starkville (northeast Mississippi), the main spring flow depends on privet and clovers. These are prolific nectar producers; however, they are not at the same level of production as Chinese tallow. If supering is required at peak flow in Starkville, the addition of one box may be adequate given that there may be only a few days to a week left in the main pulse of bloom. However, someone in a heavy Chinese tallow area (e.g., Jackson, Mississippi) may choose to add multiple supers even when they suspect that they are already at the peak of the honey flow.

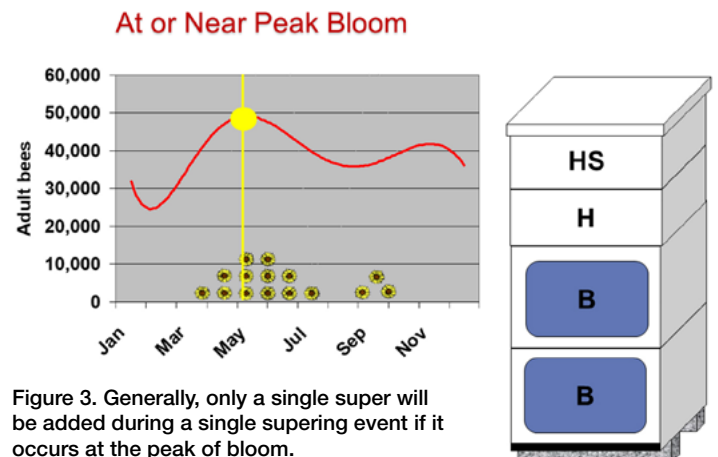


Figure 3. Generally, only a single super will be added during a single supering event if it occurs at the peak of bloom.

As is typical of any beekeeping situation, there is always a gray area. Your starting unit (**Figure 1**) may be found after the peak of the primary spring flow but perhaps days to weeks before a well-defined dearth of bloom that marks the beginning of summer in some places. Does it need a super? In a typical year, supering after

the peak of the spring bloom is not required in Starkville because the nectar availability drops rapidly. Additionally, the brood nest constricts as the queen's egg production slows, and the bees begin to back-fill the brood nest with incoming nectar (**Figure 4**). That freed up space in the brood nest is usually adequate for receiving the last nectar of the ending spring flow. The colony will not feel congested, and the threat of swarming has long passed.

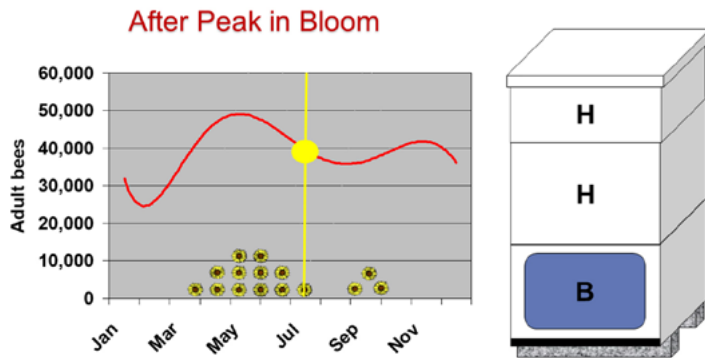


Figure 4. Supering is usually not necessary if the colony has a nearly full super after the peak of bloom. In a typical summer, the brood nest constricts and the nectar from the declining spring flow will be stored in the brood nest.

## Harvesting Honey

Most beekeepers leave honey supers on top of a hive for weeks to allow full ripening and conversion of all stored nectar into capped honey. In the Starkville area, it is fairly typical for beekeepers to harvest their spring honey crop in early July, which means that some of the harvestable honey has been on colonies since April. The result is a blend of honey from all floral sources in the extracted honey.

Some beekeepers like to extract different color grades of honey separately. For example, early-season honey tends to be water white (or clear) in our area, while honey produced later in the spring and early summer tends to be amber. Some customers prefer clear honey, and beekeepers accommodate them by harvesting the clear honey before amber honey from other sources gets added to the hive. This separation of different types of honey will necessitate multiple harvesting events.

The specific procedures and options for obtaining a honey crop will be discussed in an upcoming MSU Extension publication. The emphasis here will be on an outline of the general procedure with a particular focus on treatment of wet combs after extraction of the honey and comb storage after a honey flow.

In order to remove honey supers from hives, the adult bees need to be removed from the boxes of honey. There are many ways

of doing this, including repelling the bees from the boxes using chemicals applied to the top of the hive and using blowers to dislodge bees from the boxes. The traditional method of brushing adult bees from combs is also an option for the small-scale beekeeper.

Once bees are removed, extract the combs of honey immediately. Boxes of honey cannot be housed for more than 24 hours before eggs of the small hive beetle (SHB) (*Aethina tumida*) or the greater wax moth (*Galleria mellonella*) begin to hatch on the unprotected combs. See MSU Extension [Publications 2825 Small Hive Beetle](#) and [3195 Minor Pests of Honey Bees in Mississippi](#). These pests will begin eating into the honey comb, and SHB larvae can quickly ruin boxes of honey with their slimy feces.

After extraction, prepare wet combs for long-term storage, especially if the major spring honey flow is nearing an end. Although spinning combs in an extractor tends to remove most of the honey, they are often sticky with residual honey. Beekeepers often place newly extracted supers back onto colonies for 1–2 days to give the bees time to lick the comb surfaces clean. This results in dry combs that are now ready for storage.

It is important that beekeepers prevent robbing events when putting wet supers onto hives and removing the dry comb supers from them. Move quickly and keep bee exposure to sticky combs to a minimum when moving in the apiary. This usually means that combs must be kept in sealed stacks that do not allow robber bees access to the wet combs.

To prepare for long-term storage, cycle dry combs through freezers to kill any SHB or greater wax moth eggs. Generally, either single combs or whole supers of dry combs are placed into freezers for several days to kill the eggs of comb pests. Some beekeepers have large walk-in freezers, and they store all unused combs in those freezers until they are needed again. Most beekeepers don't have large freezers, so they freeze a few boxes of comb at a time in a chest freezer.

When supers with dry comb are removed from the freezer, they are most frequently stored in stacks with insect repellent crystals of para-dichlorobenzene (Paramoth) placed within the stacks. Strictly follow the label directions for safe use of the repellent. The repellent has to be refreshed periodically because it slowly sublimates into the air over long periods. Remove boxes of dry combs from stacks and air them out for a day or so before adding to a colony of bees that needs combs for storing honey in the next big honey flow.

## Summary

- ▶ Locate hives near abundant blooming plants throughout the entire year.
- ▶ Keep a minimal number of hives at any one location.
- ▶ Young queens lay more eggs and grow larger worker bee populations that are needed to forage for food and produce honey.
- ▶ Swarm prevention is essential for highest honey yields.
- ▶ When 6 out of 10 combs in a honey super are full and being capped, it may be time to add another super.
- ▶ Add supers based on the amount of incoming nectar normally expected during the next few weeks of bloom.
- ▶ If supering occurs before peak bloom, multiple supers can be added.
- ▶ If supering after the peak bloom, you may need only one additional super or even no supers if it is very late in the season.
- ▶ Extracting honey from combs often leaves the combs coated with a residue of honey, making them wet to the touch.
- ▶ Wet combs must be licked dry by honey bees before being processed for long-term storage.
- ▶ Freeze the dried combs in order to kill comb pest eggs before the boxes of comb are stacked for long-term storage.
- ▶ Paramoth is an insect repellent used in stacks of stored comb to keep comb pests from laying eggs on the combs within the stack.
- ▶ Air out combs from stacks with a repellent for a day or two before putting them onto colonies of honey bees.

**Table 1. Important nectar and pollen sources for honey bees in Mississippi.**

The following is a list of plants producing nectar and/or pollen for honey bees. Bloom dates for plants in northern Mississippi may be 2–4 weeks later than the same plants in southern Mississippi. Weather patterns may cause bloom times to vary as much as 2 weeks, but the succession of blooming plants listed below should be correct in most years. Some of the less important food plants have been omitted. Those plants blooming in January, February, and March are significant because they supply early nectar or pollen, which is used for brood production and spring build-up, not necessarily for surplus honey that will be harvested.

Common name	Genus and/or species	North Mississippi approximate bloom date	South Mississippi approximate bloom date	N = nectar P = pollen
hazel alder, tag alder	<i>Alnus serrulata</i>	Late Jan–Feb	Jan 5–Feb 15	P
red maple	<i>Acer rubrum</i>	Feb 1–Mar 10	Jan 25–Feb 15	N/P
henbit	<i>Lamium</i> (2 sp.)	Feb 1–Mar 15	Jan 20–Mar 1	N/P
wild mustard	<i>Brassica kaber</i>	Mar 10–Mar 30	Mar 1–Mar 20	N/P
eastern redbud	<i>Cercis canadensis</i>	Mar 10–Mar 31	Feb 15–Mar 15	N/P
elm	<i>Ulmus</i> sp.	Feb 15–Mar 1	Jan 15–Feb 5	P
spring titi*, black titi, buckwheat tree	<i>Cliftonia monophylla</i>	not present	Feb 15–April 10	N/P
fruit bloom	apple, pear, etc.	Mar 1–Mar 30	Feb 15–Mar 15	N/P
willow	<i>Salix</i> sp.	Mar 25–Apr 10	Mar 10–Mar 30	N/P
Hawthorne	<i>Crataegus</i> sp.	very little	Mar 15–Mar 30	N/P
springbeauty, Virginia springbeauty	<i>Claytonia virginica</i>	Mar 10–Mar 25	Mar 1–Mar 20	N/P
white clover*	<i>Trifolium repens</i>	Mar 10–June 30	Mar 1–June 30	N/P
crimson clover	<i>Trifolium incarnatum</i>	Mar 15–Mar 30	Mar 1–Mar 15	N/P
blackberry*	<i>Rubus</i> sp.	Mar 15–Apr 30	Mar 5–Apr 20	N/P
hairy vetch*, winter vetch	<i>Vicia villosa</i>	Mar 25–Apr 30	Mar 15–Apr 15	N/P
wild plum	<i>Prunus</i> sp.	Mar 25–Apr 10	Mar 15–Mar 30	N/P
huckleberry	<i>Gaylussacia</i> sp.	early April	Mar 20–Apr 25	N/P
wild cherry	<i>Prunus</i> sp.	Apr 1–Apr 15	Mar 20–Apr 10	N/P
sweet gum	<i>Liquidambar</i> sp.	Apr 10–Apr 25	Mar 25–Apr 10	P
black locust*	<i>Robinia pseudoacacia</i>	Apr 10–Apr 20	Apr 5–Apr 15	N/P
tupelo gum, water or swamp tupelo	<i>Nyssa</i> sp.	Mar 20–Apr 15	Mar 10–Apr 30	N/P
black gum, black tupelo	<i>Nyssa sylvatica</i>	Apr 20–May 5	Apr 10–May 1	N/P
tulip or yellow poplar*	<i>Liriodendron tulipifera</i>	Apr 20–May 10	Apr 5–Apr 25	N/P
highbush gallberry*	<i>Ilex coriaca</i>	not present	Apr 5–Apr 25	N/P
American holly	<i>Ilex opaca</i>	Apr 20–May 10	Apr 5–Apr 15	N/P
yaupon holly*	<i>Ilex vomitoria</i>	Apr 25–May 15	Apr 5–Apr 15	N/P
American persimmon	<i>Diospyros virginiana</i>	Apr 25–May 10	May 1–May 10	N/P

Common name	Genus and/or species	North Mississippi approximate bloom date	South Mississippi approximate bloom date	N = nectar P = pollen
Chinese privet*	<i>Ligustrum sinense</i>	May 1–May 15	Apr 10–Apr 25	N/P
sabal or palm palmetto	<i>Sabal palmetto</i>	May 1–June 1	Apr 15–May 15	N/P
rattan vine*, Alabama supplejack crossvine	<i>Berchemia scandens</i>	May 1–May 20	Apr 10–Apr 25	N/P
low bush gallberry*	<i>Ilex glabra</i>	not present	May 5–May 20	N/P
common milkweed	<i>Asclepias syriaca</i>	May 10–May 21	Apr 15 – Apr 30	N/P
poison ivy	<i>Toxicodendron radicans</i>	May 15–May 30	Apr 25–May 10	N/P
poison oak	<i>Toxicodendron oubescens</i>	May 15–May 30	Apr 25–May 10	N/P
sumac*	<i>Rhus</i> sp.	June 1–July 10	June 20–Aug 30	N/P
summer titi*†, ironwood	<i>Cyrilla racemiflora</i>	not present	June 1–June 30	N/P
sourwood*	<i>Oxydendrum arboreum</i>	June 1–July 15	little present	N/P
Chinese tallow*, popcorn tree	<i>Triadica sebifera</i>	June 1–June 20	June 10–June 30	N
upland cotton*	<i>Gossypium hirsutum</i>	June–Aug	June–Aug	N/P
peppervine*	<i>Ampelopsis</i> sp.	June 15–July 30	June–July 30	N/P
coastal sweetpepperbush	<i>Clethra alnifolia</i>	not present	June 30–July 30	N/P
blue vervain*, swamp vervain	<i>Verbena hastata</i>	June 15–August	July–Sept	N/P
knotweed or smartweed	<i>Polygonum</i> sp.	July–Sept	not known	N/P
soybean*	<i>Glycine max</i>	July 1–Aug 31	does not produce	N/P
redvine	<i>Brunnichia ovata</i>	July 15- Aug 15	July 1–July 30	N
goldenrod*	<i>Solidago</i> sp.	Aug 25–Sept 30	Oct 1–Oct 30	N/P
white boneset*	<i>Eupatorium serotinum</i>	Aug 25–Sept 15	not known	N/p
Spanish needle	<i>Bidens alba</i>	Sept 1–Sept 30	not known	N/P
beggarslice (ticks)*	<i>Hackelia virginiana</i>	Sept 1–Sept 30	not known	N/P
asters*	<i>Aster</i> sp.	Sept 20–frost	Oct 5–frost	N/P
eastern smokebush*, sea myrtle, groundsel bush	<i>Baccharis halmifolia</i>	Sept 20–Oct 10	Oct 10–Oct 30	N/P

\*Indicates that a surplus of honey may be produced if environmental conditions are right.

†Toxic. Causes purple brood.

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