Honey Bee Nutrition and Feeding

The 3 W's of feeding your honey bees. Learn when to feed, what to feed, and why you might need to feed your bees in different situations.

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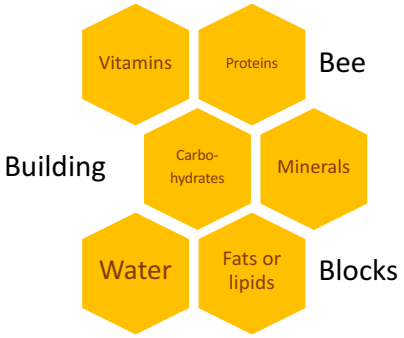
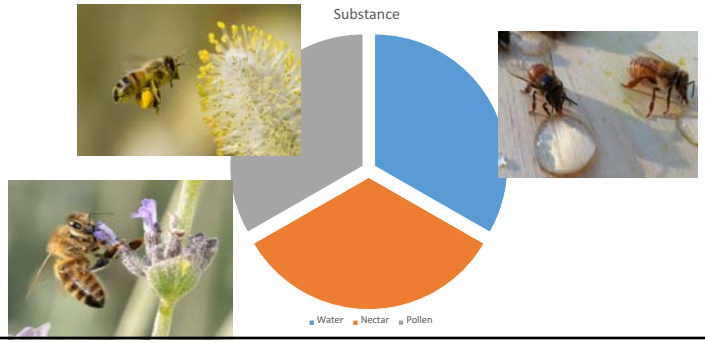
Nutritional Requirements of the Honey Bee for Normal Growth and Development



Honey bees gather 3 substances to satisfy their nutritional requirements. Lack of one or more of these can lead to population reduction or death.



A colony of honey bees needs water for several functons:

- To maintain body fluid homeostasis in the adult bees
- For the consumption of nurse bees to produce jelly for feeding the larvae
- Offer diluted honey to brood when diluted nectar is not available
- Thermoregulation - To cool the nest on hot days; to humidify the nest to prevent desiccation of the brood in dry climates

- Water is mostly obtained through nectar. These are times when the colony's nectar collection is low:
  - Cold weather or a dearth of nectar-bearing flowers
  - Its water consumption is high because of a high demand for brood food
  - Its water consumption is high because of a strong need to perform evaportive cooling
- Foraging is regulated according to the current demand in the colony. Colonies do not maintain large water stores in their nests.
- Reservoir bees are clusters of workers with swollen crops containing dilute nectar on the periphery of a colony's broodnest after intense water collection.

The Beekeeper's Role in Bee Nutrition

A beekeeper's task is to be able to:

- ascertain the nutritional status of a colony;
- determine the immediate floral conditions, predict the floral conditions for the near future and;
- determine a course of action to ensure his/her goals are achieved.

Feed with an intended objective and stop feeding when that goal is reached!

Nectar Variability

Minerals:

- Variable mineral content – depends on floral source and mineral composition of soil the plants are growing in
- Darker honey tends to have a higher mineral content, but higher mineral contents have been linked to causing dysentery in bees.

Proteins:

- Total protein intake of a colony is very important and can increase worker bee longevity when the colony has a diet of high protein pollen.
- Brood rearing is reduced when colonies are consuming a lower protein diet.

How can YOU tell what pollen is best?

- Understanding how much pollen/protein your bees are getting is difficult and depends on climatic conditions, nectar availability, brood area, and the quality of pollen collected.
- If the crude protein is low, then the colony needs MORE of it collected.
- Look for a wider variety of different colors of pollen coming in and being stored. The wider the variety, the more likely the average protein levels are good and that the 10 amino acids essential to honey bee nutritional health are there, too.

Fats, Minerals, and Vitamins

- **Fats** – lipids with fatty acids, sterols and phospholipids. They help with structural integrity and function of cellular membranes.
- **Minerals** – potassium, phosphate, sodium chloride, and calcium are all needed. Excessive levels of sodium, sodium chloride, and calcium have bee show to be toxic.
- Increased concentrations of minerals in pollens have been shown to limit brood rearing.

> 2% ash show brood rearing decline

>= 8% ash will cease brood rearing

- **Vitamins** – Vitamin B complex is essential for most insects, but vitamins are not very stable and will deteriorate quickly in stored pollen

How to assess colony stores when you can't open the hive.

- Inspection can be done by simply lifting a Langstroth hive by the hand grips to ascertain the weight of its contents or in a top bar hive by inspecting only the honey storage bars. There is no need to disrupt a brood nest in most instances.
- We prefer to inspect AFTER a cold spell and at the beginning of a period of "warm" weather. If a colony is deemed to be short on stored honey then frames of honey kept by the beekeeper or sugar can be provided to the colony to avoid starvation. When night time temperatures are above 50 degrees heavy (2:1) syrup can be fed.

Winter Stores

- Make sure your bees have enough stores to overwinter BEFORE winter arrives (Halloween?)
- We overwinter in our Lang hives with 3 mediums or 1 deep & 1 medium (which has proven insufficient for larger colonies) and our top bar hives overwinter on 12-14 bars of brood and stores.
- Colonies overwintered in any location should be checked several times after the beginning of winter. When you are confident they have adequate stores, they can probably be left alone until mid-January.
- Exposing a colony to the elements will often be extremely detrimental to a cluster of bees or a colony which has started rearing brood after a period of winter shut down.
- Bees frequently starve out in March, brood nests have expanded and our alternating warm spells and freezes can leave a big population quickly eating through all available stores.

Lack of Nectar or Pollen

- Without nectar, the bee's principle source of carbohydrates, the colony can die within days
- Lack of nectar will cause colonies to be more aggressive in defending their hives
- Lack of nectar will cause a decline in foraging/field bees
- Lack of nectar will reduce the hygienic behaviors in a colony
- Loss of nectar stores will equate to a reduction in the area of brood being cared for by the colony

Solution:

- Artificial stimulus can be created by feeding 1:1 sugar to water by weight
- In Winter, if night-time temps are > 50 degrees feed 2:1 (sugar/water)
- Candy can be easier for bees to digest and you need 25lbs of sugar per hive

Emergency Feeding

When you find the need to feed a weak colony in the midst of winter, temps <45 degrees, there are may things you must be careful of.

- The bees need to be able to access the food when clustered. It only takes a short cold spell for the bees to starve if the cluster cannot get to food.
- You need to be careful not to chill the bees while giving them feed.
- You don't want to feed syrup as the excess moisture can easily cause dysentery/nosema in weak colonies.

Recipe for Candy

- 25 lb bag of sugar
- 2 quarts of water
- 6 Tbls vinegar

- Place water and vinegar into a large cooking kettle and bring to a boil.
- Slowly add sugar and continue stirring. (about 1/3 at a time)
- Keep stirring and heating until it thickens (~270 F) to the consistency of cooked oatmeal. It takes time, be patient. (use a candy thermometer)
- Remove from heat, wait till boiling stops and then pour into the molds.
- Let cool overnight.
- **Use extreme caution, the sugar will burn you badly if you spill it on you**
  (An old turkey fryer works great for making the sugar candy)

Dearth - a scarcity or lack of something.

- Dearth can be another set of circumstances that may require supplementary feeding to prevent starvation.
- Feed sugar syrup as a stimulus to the colony. Our typical dearth is in July and August (sometimes Sept) and followed by the fall nectar flow. During the summer dearth colonies will shut down most of the brood rearing. Mid-August reassess to see how well the colony is prepared for the fall flow.
- Non-stop spring rains which literally washed the nectar out of the spring flowers can create an odd nectar dearth. Many beekeepers are tricked by the abundant flowers and incoming pollen. Large colonies that could have been making honey need to be fed and some colonies will have issues with becoming pollen bound.
- When it's not too hot, the colony will obtain most of its water requirements through the nectar. It is mainly when colonies rely on stored honey or the climate is hot and dry, that the ratio of field bees in a colony significantly changes to favor water gathering.

I'm Starving!

The principal cause of the loss of honey bee colonies over winter is not the cold temperatures, but **starvation**.

Central Texas –25 lbs – 40 lbs honey to over-winter 1 colony.

Check the eggs and larva for amount of brood food.

Why the need to feed sugar?

- Does the colony need stores for winter or drought?
- Does the colony need stimulating to maintain an active open brood nest for population maintenance or build up?
- Does pollen foraging need to be encouraged by syrup feeding in order to improve pollination efficiency or maintain drone rearing?

When to feed?

- Feed too late or too early and the response will not produce the desired outcome, also it may prove to be an absolute waste of money and time by the beekeeper.

What to feed?

- Dry sugar is the best form of providing sugar without stimulating the colony to any significant extent.
- Thick syrup (67%) is less stimulative than thinner syrup (50%), thus the beekeeper must decide what the aim is, as this will influence the preparation of the sugar.

How to feed sugar?

- A large amount of syrup fed all at once may have a reducing stimulus effect, compared to slow release of the same amount of syrup over many days. Thus the type of feeder, i.e., open or slow release, of the same volume of syrup will impact on the colony's response.

Preparation

- Only mix the required amount of syrup for immediate needs.
- Buy plain white granulated sugar from cane or beet.
- Syrup can either be mixed thick or thin. Thin syrup for stimulating a colony, thick syrup may be a better choice to provide stores to a colony prior to winter.
- Dry sugar requires no preparation.
- Sugar Syrup: Hot water will dissolve the sugar into solution with less effort than cold water. You can boil water first for 10–15 minutes to eliminate yeast cells.

Frequency of Feeding Sugar

- Depends on desired goal: Small amounts (1 or 2 quarts) provided once or twice per week will act as a stimulus, whereas a gallon or more provided all at once to a single colony will produce a much reduced stimulating effect. When a stimulus effect is desired a very slow release feeder should be provided so a colony can obtain a continuous low volume supply of syrup (a quart every 2-4 days). About 4 thumb tack sized holes can accomplish this (the typical lids that come with board man feeders feed a high volume).
- If a colony is being prepared for winter and the idea is to get the bees to store as much as possible, then providing colonies several gallons of heavy sugar syrup will provide the desired outcome. Dry sugar can sustain a colony but it is not immediately available for feed.

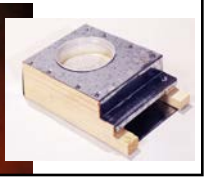
Types of feeders

Frame Feeders

- The major positive impact of frame feeders is that the syrup is close to the warmth of the brood or cluster area and the syrup is readily consumed.
- The negative, other than drowning bees, is that the syrup is taken up by the bees relatively quickly and thus any stimulation benefit quickly passes.
- Also, there is a need to remove one or two frames each time the feeders are placed in a hive.

Bottle or tin feeders

- Bottle or tin feeders were common in past decades, but their use has lost momentum. Their placement in the hive varies, they can be put inside or outside of the hive body with bees accessing the syrup via a series of small holes.
- The number of holes dictates the rate at which the syrup can be consumed by the bees. Thus, by reducing the number of holes, the amount of syrup consumed is slowed down. This method provides a stimulation effect over a longer time span.
- The feeders can be as big as the available container which usually restricts the size of the feeder, as large tins/bottles in excess of 1 or 2 liters are uncommon.
- The disadvantage of these feeders is the small amount of syrup available to the colony and the mold that often grows on the inside of the feeder. They require cleaning and sterilizing, otherwise any syrup will quickly ferment when the feeder is reused and bee deaths will result.



Bucket Feeders

- Bucket feeders are essentially the same concept as a bottle or tin feeder. They are normally inverted over a hole in the lid of the hive. The bucket lid is designed with 10 to 20 small holes or a small piece of very fine screen, 5 cm diameter in the middle.
- Large amounts of syrup can be fed to a colony, restricted only by the size of the bucket.
- One disadvantage besides the fact they need to be thoroughly cleaned after each time they have been used, is that they are often blown off the hive when they are empty. Some beekeepers have overcome this by placing a brick either in or on the bucket.

Tray or Top Feeders

- They sit on top of the frames of the hive and are housed in a shallow hive body, often an ideal or half depth super. The lid is placed over the top of the super ensuring robbing bees can't get access. The trays can be whatever is available.
- These feeders are usually filled by removing the lid of a hive, pouring in the required quantity of syrup, and replacing the lid. As many are open to bees within the hive, drowning can be a major problem. Floating racks or devices are essential to reduce the loss of adult bees, which can be substantial.
- Most tray feeders can hold 1-2 gallons, but this depends on the evenness of the ground on which the hives are placed. Bees will do a reasonable job at cleaning all the syrup out of the tray, although it is necessary to manually clean the tray after each feed of syrup. As with all feeders that are designed for single hive use, the volume of syrup provided to each colony can be varied according to each colony's requirements.

Plastic Bag Feeders

- Plastic bags are handy for small quantities of syrup in an emergency.
- A plastic bag can be filled with syrup, sealed and placed on the top of the frames under the lid cavity.
- If the lid cavity is too small, then a frame can be removed and the bag placed in this space.
- Some plastics are very thick and may require punching with a few pin holes. Mostly bees will chew a small hole and start the process themselves.
- If the plastic bag is left in the hive, bees will continue to chew at the plastic, shredding it and attempting pull it out of the hive.

Open Feeders

- Drowning bees are a major problem and floating materials are essential. Fresh straw has been used quite successfully, but must be replaced after one use.
- The advantage of this system of feeding is the speed at which syrup can be fed to an apiary and the lack of the need for an investment in individual feeders.
- The disadvantages are that strong colonies will collect more syrup than weaker colonies.
- Protection from livestock and moisture is important.
- Large numbers of drowning bees are common and thus floating materials are vital.
- There is nothing to stop bees within a few kilometers radius, either feral or managed honey bee colonies, helping themselves to the syrup.
- Though not proven, there have been suggestions that it may spread bee diseases.

Pollen Supplement vs. Pollen Substitute

- Supplement – is when you are helping the bees get more REAL pollen by feeding them pollen that you previously harvested or purchased.
- Substitute is giving them an alternative protein that is not natural pollen, such as pollen sub you buy or make.
- When to feed pollen –
  - Pollen is available naturally, but either not enough or it's of poor quality or
  - When there is no pollen naturally available to a colony and the colony needs pollen to rear brood.
  - The more hives you have in one area, the less pollen you have to go around. (from nature)
- How much and how long you feed depends on
  - colony strength,
  - the desired population levels,
  - the attractiveness of the supplement, and
  - the effectiveness of the supplement in achieving the desired goal.
- A smaller apiary (1– 20 hives) located in a town or close to an urban area is unlikely to ever suffer any major pollen shortfall except in extremely exceptional circumstances.

Buying Pollen Subs

Easier and safer than making your own.

- Ultra Bee or Bee Pro – Mann Lake
- Mega Bee – Dadant

Ratio to make your own pollen sub:

- Pollen 10–25%
- Soy flour 20–100%
- Yeast 20–25%
- Sugar/honey/water 20–50%
- Warning: Frequently bees may consume the mixtures presented to them, not for the nutrients as normally obtained from pollen, but rather for the honey/sugar stimulus. If there is no fresh nectar available to foraging bees or sugar syrup is not being provided to the colony, then it is a dubious exercise to feed pollen supplements. Otherwise a pollen supplement may be an expensive method of feeding sugar.
- Any prepared pollen supplement is best kept in the freezer or fridge until required. Only enough ingredients should be purchased to satisfy the immediate needs of the colonies. Most of the ingredients, except dry sugar, have a limited shelf life of between 6–12 months.

Crabby Patty – Dr. Hill

Simple, easy, and disposable winter feeding system

4 lbs sugar

.5 lbs protein supplement

.5 lbs of water

(mix just enough water to get sticky consistency that will not fall of a bag)

Mix well, package it in 1 gallon Ziplock bags, place 2 small wood pieces in the the Ziplock bags to prevent collapse on bees, and place directly over the frames after cutting a hole between the 2 wood pieces in the bag for bee access.

Place above brood cluster with a 2-3” eke or spacer over the top. (upper brood box if you have 2)

Recipe for Healthy Colonies:

- **Keep colonies “young”**
- **Provide good nutrition**
- **Minimize toxin load**
- **Maintain low mite levels**