

Methods of feeding bees

by Dana Stahlman

Feeding bees

It is important for a beekeeper to leave adequate amounts of honey for the bees to survive the winter. Bees will build a nest with honey above the brood nest where the heat from the cluster will be conserved and the bees will eventually use it for winter survival.

Once in awhile a year will come along in which the bees do not get a honey crop or even enough honey to store for the winter. In a situation like that the beekeeper must feed colonies to help them survive.

The concern about hive health is valid. Studies have shown that a bee's diet is instrumental to life longevity. Thus, it is important to make sure the bees are supplied with both honey and pollen. Substitutes such as sugar syrup and pollen patties (often no pollen in them) have become popular as supplemental food.

Feeding bees

A new concern is bee **nutrition.**

In the past, a beekeeper would feed bees to make sure the bees had enough food to survive the winter, help a new colony become established or to stimulate brood production.

The current environmental concerns draw our attention to the lack of forage, balanced bee diets, monoculture and bee survival.

Feeding bees

There are a number of ways to feed bees. We are going to discuss several methods after we talk about formulations of bee feed.

It seems like a simple matter to explain feeding but it gets complicated by the choices a beekeeper needs to make.

Will the beekeeper feed table sugar (sucrose), honey, high fructose corn syrup or something else?

A word of caution: you need to check out the source of the choice you make regardless of what you think it will do. Several years ago, Canadian beekeepers bought cheap corn syrup that gave their bees dysentery. As a result, beekeepers lost a number of colonies of bees.

Feeding bees

A new concern is
bee **nutrition.**

BEEKEEPING IN THE UNITED STATES
AGRICULTURE HANDBOOK NUMBER 335
Revised October 1980
Pages 39 - 45

The material below is taken from the above USDA handbooks concerning the nutrition of honey bees. If you desire to read explicit information on nutrition, this document is available by going to the following link:

<http://www.beesource.com/resources/usda/honey-bee-nutrition-and-supplemental-feeding/>

The next few slides cover in some detail the differences in the types of sugar that honey bees can consume.


Sugar provides the **carbohydrate** part of the honey bee's diet.

Honey bees fed a diet of only sugar did not live as long as honeybees fed a diet of both sugar and pollen (carbohydrate and protein in the diet in scientific experiments.

Some of these slides can be skipped over as they may not be of interest to you. They provide some detailed information on sugars.

Nutrition – Proteins (Pollen)

Honey bees require proteins (amino acids), carbohydrates (sugars), lipids (fatty acids, sterols), vitamins, minerals (salts), and water, and these nutrients must be in the diet in a definite qualitative and quantitative ratio for optimum nutrition.



Since the onset of CCD, many formulas have been created for feeding bees with pollen substitute especially formulated to provide the nutrition honey bees require.

Is it necessary to use them to feed bees? No, but -- Those who have used them indicate they have had good results with the survival of bees over winter.

The best nutrition is a varied diet collected from a variety of plants as pollen and nectar by the bees.

Pollen patties are pre-mixed but you can make the patties yourself. They use various soy flour fillers, with honey bee healthy, powder sugar, and sometimes essential oils.

I found several formulas on an internet search but can not recommend them because I have not used them.

I am familiar with only one of the products sold and it is easy to use with the hive. The cost is small compared to what it would cost to replace the bees if they die. It offers the advantage of being a one package application for all nutritional needs.

Proteins and Amino Acids

Adult worker bees (1 to 14 days old) obtain dietary protein from pollen which workers collect and bring back to the hive; adult drone bees (1 to 8 days old) obtain dietary protein from food supplied by young workers which is a mixture of glandular secretions, pollen, and honey.

Research at Ohio State University in the late 1970's indicated that bees best chance of winter survival was having both honey and pollen in the food bees ate.

Sugars

Feeding Sugar

Before we get to methods of feeding, the type of sugar used to feed bees must be mentioned. A short description of the sugars mentioned here.



Beekeepers often look for cheap sources of sugar. At one time, sugar could be bought as floor sweeping from broken bags. Today it is thrown away. From the grocery outlets I have talked with – it is more costly to clean it up, save it than it is to put it into the trash.

Carbohydrates are abundant in the natural diet of the honey bee and are used mainly for the production of energy, but may be converted to body fats and stored.

Adult bees thrive on glucose, fructose, sucrose, trehalose, maltose, and melezitose.

Melezitose, also spelled melicitose, is a nonreducing trisaccharide sugar that is produced by many plant sap eating insects, including aphids. Most beekeepers have no access to use this for feeding bees unless it is in honey to be fed to bees.

Sugars: **maltose**

High fructose corn syrup, a sugar made from corn, comes in two compositions—HFCS-42 and HFCS-55. A simple comparison of the percentage of glucose and fructose reveals its striking similarities to table sugar.

Use it with caution! GMO concerns but the corn industry say it is just as safe as honey when used in food processing.

Sugar fed to bees

Corn syrup has a close resemblance to honey. It has been used by commercial beekeepers to feed bees for many years.

In recent years, some concern has been expressed about the GMO corn used to make corn syrup.

Corn syrup heated to high temperatures changes the nature of the sugar which might cause a problem. A word of caution for those using it occurred when Canadian beekeepers bought cheap corn syrup that gave their bees dysentery. Many hives of bee died as a result of the quality of the food.

Trehalose is a white crystalline dihydrate powder produced from tapioca / starch. It is a non-reducing disaccharide consisting of two glucose molecules bonded by an $\alpha, \alpha - 1, 1$ glycosidic link which is stable at low pH (high acid) conditions and is non-hygroscopic (moisture attraction), which results in a free-flowing dry crystal that is stable to 94% humidity.

Sugar -- Trehalose

Too expensive for the beekeeper to use as bee feed.

This sugar is used primarily as a sweetener for medical applications.

It is non hygroscopic unlike most sugars and honey. Most sugars and honey will absorb water.

Not used in feeding bees but could be if a supply was available.

Sucrose
or **table**
sugar is
obtained
from sugar
cane or
sugar
beets.

sucrose

Sugar Processing:

Sugar or more specifically sucrose is a carbohydrate that occurs naturally in every fruit and vegetable. It is the major product of photosynthesis, the process by which plants transform the sun's energy into food. Sugar occurs in greatest quantities in sugar cane and sugar beets from which it is separated for commercial use.

In the first stage of processing the natural sugar stored in the cane stalk or beet root is separated from the rest of the plant material by physical methods. For sugar cane, this is accomplished by:

- a) pressing the cane to extract the juice containing the sugar
- b) boiling the juice until it begins to thicken and sugar begins to crystallize
- c) spinning the sugar crystals in a centrifuge to remove the syrup, producing raw sugar; the raw sugar still contains many impurities
- d) shipping the raw sugar to a refinery where it is washed and filtered to remove remaining non-sugar ingredients and color
- e) crystallizing, drying and packaging the refined sugar.

Beet sugar processing is similar, but it is done in one continuous process without the raw sugar stage. The sugar beets are washed, sliced and soaked in hot water to separate the sugar-containing juice from the beet fiber. The sugar-laden juice is purified, filtered, concentrated and dried in a series of steps similar to cane sugar processing

Glucose and Fructose is found in honey!

When you feed with honey you are feeding Glucose and Fructose.

Honey gets its sweetness from the monosaccharides fructose and glucose.

These sugars are used to determine if a honey like product is real honey or not.

Fructose & glucose

Fructose, or fruit sugar

It is one of the three dietary monosaccharides, along with glucose and galactose that are absorbed directly into the bloodstream during digestion.

Glucose

Glucose is a carbohydrate and is a simple sugar important for energy sources for both plants and animals.

Glucose is called a simple sugar or a monosaccharide because it is one of the smallest units which has the characteristics of this class of carbohydrates.

Most beekeepers will use sugar (Sucrose) from either cane sugar or sugar beets to feed bees.

1st -- it is easy to find in all grocery stores.

2nd – it is cheaper than honey to use.

Also available are bakery sugars which include numoline. [Inverted or invert sugar syrup is a mixture of glucose and fructose; it is obtained by splitting sucrose into these two components].

Do not use: Brown sugar, molasses, maple syrup, etc. These may cause dysentery.

Know what you are putting into your bee hive

I have been asked which is better [sugar from sugar cane or sugar beet?]

The literature indicates the process to make the table sugar found on grocery shelves is very similar. Most plants will have some sugar content.

Thus, if the bees need to be fed and you have a choice to make -- it should make no difference if you use pure cane sugar or pure beet sugar.

White powder sugar has 5% corn starch added to keep the sugar fine and avoids clumping.

Methods

Sugar can be fed as a solid, or as a liquid.

Feeders are generally used for liquid applications of sugar syrup.

Sugar can also be used as a dry food, a candy or as a patty mixed with other ingredients.

Reasons for feeding bees

Feeding bees

- **To stimulate brood production especially in the spring.**
- **To Provide: Nutrition to establish bee health when natural sources are lacking.**
- **To help a hive survive because of a shortage of food especially in the fall.**

One way to spot a hive being robbed is to notice how the bees are flying around it. Most normal hives will have a steady stream of bees going into and out of the hive. Some bees will be carrying nectar and pollen into the hive.

When a hive is being robbed, you will notice a large number of bees trying to get into the hive -- flying in circles around the hive. Some will be flying to the back of the hive around the top cover and places with no entrance into the hive. This is not normal behavior. Bee behavior during robbing is very erratic and somewhat desperate.

Problems that might be encountered

Robbing is common during the late summer when bees need to be fed.

Feeding a hive late in the evening may help.

Reducing entrances to hives being fed will help.

Hives being fed should not be left open for any length of time. Working bees and feeding at the same time may encourage robbing.

Liquid feeding

Feeders are varied in use and design.

Top feeders:

The top feeder will hold a large amount of food. Some can hold a gallon or more easily.

It is easily filled. Does not require opening the hive under the feeder – thus less disturbance to the bees.

Bees may not move up to get food in cold weather.



Liquid feeding

Feeders are varied in use and design.

Inside feeders:

Inside feeders usually discourage robbing. They are placed in the hive by removing frames and placing the feeder into the space formerly held by the frames. When feeding is done, the frames need to be returned to the hive.

One of the disadvantages is the feeder must have a float placed in it to prevent bees from drowning in the sugar syrup.

If you look closely, you will see this feeder is filled with dead bees floating above the food in the feeder.



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This feeder is similar to the previous slide except the design of this feeder has two holes with plastic tubes leading down into the feeder. Bees can climb down and out of the feeder as the syrup level falls. It saves bees from drowning.

Liquid feeding:

This beekeeper has two 50 gallon drums of sugar syrup on the bed of his truck which are pumped by a 24 volt electrical pump. A rolling hose line serves as a pipe line to each hive as each jar is filled and replaced on each hive.



Some beekeeper prefer to use jars. This is a commercial bee yard with migratory covers. Each cover has a hole with the cap of the feeder in it.

5 pound honey jars are filled with syrup. Commercial beekeepers develop unique ways to speed up the feeding process. In this operation the bees are not disturbed much by changing jars.

Another adaptation of this sort of feeding is one gallon buckets used in place of jars. A box can be placed around the bucket to protect it from pest.

Hobby beekeepers use the boardman feeder much in the same way. The only difference is the commercial beekeeper will be feeding over 600 colonies or more. I have seen tanks on trucks that are 500 gal. filled with sugar syrup to feed and stimulate bees for package production.

Jar feeders

All liquid feeding should be done when bees are flying (spring thru fall). Liquid feeding would add moisture to a hive in winter and moisture is one of the worst conditions a hive of honey bees can endure during cold weather.

Jars also present another problem. Glass jars can break and certain pest will be attracted to them because they are easy to pull off the hive. Raccoons are especially adapt to finding them.

If used by a beekeeper in early spring when snow might still be possible such as when installing package bees, the bees may starve because they can not break the cluster to go get the sugar syrup.



Patty, fondant, and dry feeding

Dry feeding is done during cold periods and often as emergency feeding during very cold winter.

Candy boards are used during the winter in place of liquid feeders.

Fondant is used as well. Fondant is much like cake frosting. It can be made into patties using dry powder sugar or you can grind granular sugar into a powder. Powder sugar contains 5% of corn starch and some beekeepers would rather use 100% sugar. In my own experience it really doesn't make much difference. You can use corn syrup or honey to hold the powder sugar together. Adding some pollen would add to the nutrition value.



Most inner covers have a lip that allows bees access to the top of the inner cover. Dry granular sugar can be spread around this hole.

Patty, fondant, and dry feeding

The following can be used with dry sugar, fondant, or patties.



Usually a shallow super is placed above the top box. It allows bees plenty of room to crawl onto the sugar, fondant, or patties placed on a newspaper to prevent sugar from dripping or dropping down into the hive. One can also use a plastic bag to hold the sugar and it might even be used with a liquid filled bag with pin holes punched into the underside of the plastic bag. I have also seen screen wire used in place of a newspaper.

Beekeepers are creative people and some build a rim that replaces the shallow box. All serve the same purpose.

The advantage of this type of feeding is the food is placed directly above the cluster of bees where it is available for their use.

Feeding honey

This is the best bee food available. Often granulated honey is a problem for beekeepers. Feed it back to the bees during winter.

As long as it is free of disease [especially American foulbrood] frames of honey offer an advantage of being placed next to the winter cluster where it is then available to the cluster of bees.



Honey in a hive is a valuable resource. Sometimes a beekeeper can save frames of honey from hives because they die.

Before using honey from a dead out hive, make sure it did not have a disease such as nosema or American foulbrood.

Open feeding: I most likely should not include this method but a situation occurred which brought it to the attention of many beekeepers who's bees gathered red honey. Open feeding – a sugar product is put into a barrel or as shown here a plastic container commonly used in commercial kitchens. Open feeding is simple and easy. Just pour in 5 pounds of dry granulated sugar and add a little water. If you have bees in the neighborhood, you will know it. Yellow jacket and hornets will find it as well.



Open feeding



Honey bees are attracted in large numbers to any sugar they can find, anywhere!

These bees found a hummingbird feeder. It contains a sugar mixed with a red dye formulated for hummingbirds.

Many candy companies have rejected candy they sell for scrap. This source of sugar is cheap and available in large quantities. Large beekeeping operations have contracts to buy this sugar supply for bee feed.

Candy canes are often used in feeding – they have colored dyes which bees gather with the sugar. Red sugar mixed with nectar = Red contaminated honey.

Advantage: cheap and easy – little management or equipment. Can be used for fall feeding

Disadvantage:

- 1. Encourages robbing**
- 2. Feeds neighbors bees**
- 3. Contaminates hives producing honey – nectar from plants and sugar syrup do not = honey!**
- 4. Tip off --The sugar syrup from candy canes is colored red, green, blue and white. The white is often not seen.**

UTAH'S Red Honey

It isn't Red Honey after all

In late June of 2013, beekeepers started noticing bright red candy-colored nectar in their hives. State and county officials collaborated to determine if any natural vegetation could be causing this widespread red-colored nectar. State apiculturists from other states were also consulted regarding the condition. The general consensus was that no natural nectar sources were available to produce the red nectar. Throughout the Summer, numerous beekeepers continued to contact officials about this apparent contamination. By early September, the red contamination in honey had been observed in four counties in the state: Davis, Salt Lake, Utah, and Washington Counties. In addition to managed honey bee colonies, red honey was found in a feral honeybee colony that was extracted from a tree.



Unopened red honey in a frame.

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Identifying the Source

Starting in early July, the red honey came under much speculation by the beekeeping community of Utah. Unfortunately, none of the speculation helped to quickly identify the source or resolve the issue. Comments on beekeepers' discussion boards expressed feelings of worry and anger. Some beekeepers even dismissed the problem. Early speculation about the source of the red contamination ranged from burning/grilled feeders to snow cone shacks to red fire retardant used to quench regional fires.

In late August, a commercial beekeeper contacted a county honey bee inspector to reveal that crushed red candy byproduct had been fed to bees across the state of Utah. The candy was dispensed in hives using open feeding techniques and appeared to be the epicenter of regions within the state where beekeepers were observing red contamination in hives.

The Fears

Beekeepers gave various descriptions of the flavor of the red contaminated honey. Reports of flavors included cherry, peppermint, and coconut. Some beekeepers de-



Full frame of red nectar.

This article appeared in the November 2013 issue of Bee Culture Magazine.

I mention this because as beekeepers we often do not know where our bees gather nectar or sugar.

In Utah a number of beekeepers were finding red honey in their hives and could not think of any plant producing red nectar growing in the area.

Open feeding leads to many issues: If other people's hives bring back red sugar and mix it with nectar thus making it impossible to sell the honey as honey – can you be held responsible for it.

The other major issue is: Using frames with granulated honey that may contains American foulbrood spores – This would not only spread the disease to your own bees but every hive of bees in the area.