

## How Bees Make Honey

Honey bees collect nectar and pollen from flowers but only nectar is used to make honey. Nectar is an incentive given by the plant to attract a pollinator. Pollen is transported back to the hive in the pollen baskets on the hind legs whereas the nectar is transported in the stomach. Nectar is mostly water with dissolved sugar. The amount of sugar varies greatly but is usually 25-50%. Back in the hive the nectar is placed into wax cells. The excess water evaporates until the honey is approximately 83% sugar and 17% water. This takes a few days. The cell is then capped with wax, which is later removed when the bees need to eat the honey. When large amounts of nectar are being collected the bees speed up evaporation by using their wings to ventilate the hive.



- A worker honey bee inserts her tongue into the nectary of a borage flower.
- On returning to the hive a nectar forager (right) transfers her nectar to a receiver worker (left) who has her tongue extended; the receiver places the nectar in a cell.
- Honey comb part filled with honey; when full the cells are capped with a wax lid.
- Beekeepers remove full honey combs from their hives; the honey is extracted using a centrifuge, strained and bottled; honey is traded internationally.

In making honey from nectar, the sugar is changed. Most sugar in nectar is sucrose (table sugar). Sucrose has large molecules. The bees make an enzyme that breaks each sucrose molecule into two smaller sugar molecules, one glucose and one fructose. By evaporating the excess water and converting the sucrose into smaller sugars the bees make the honey too concentrated for yeasts and other microorganisms to grow. Preventing fermentation is important to the bees because the honey made in the summer is used as winter food. Without at least 10-20kg of honey a colony cannot survive the winter, when there are no flowers.

In addition to sugar, nectar contains other chemicals. Although these are only present in small amounts they are important because they give different honeys their distinctive colours and flavours. Although the bees from

one colony collect nectar from many species of plants, at certain times they collect most of their nectar from one or a few plant species that are very abundant. These nectar flows are responsible for most of the honey that actually gets stored. Beekeepers often harvest honey after a nectar flow, thereby producing honey predominantly of a single flower species and with a characteristic flavour and colour. However, at certain times of the year a wide variety of flowers are producing nectar. The honey produced at this time is multifloral. Which is the best honey? That is a matter of personal preference.

### Did You Know?

- \* Beekeepers often move their hives to places where there are lots of flowers. The hives are moved by vehicle at night when the bees are all inside.
- \* A full-time beekeeper may keep 1000 or more hives. With an average of 30,000 bees per hive that makes 30 million bees to look after.
- \* The bees in a hive help each other to forage more effectively by telling each other the direction and distance of flower patches using the waggle dance.
- \* The Quran says this about bees and honey "From its belly comes forth a fluid of many hues, a medicinal drink for men". In other words, honey is good for you!
- \* Comb honey is the name given to honey sold in honeycomb, just as the bees made it. To make comb honey a hive full of bees and a strong nectar flow are needed.
- \* Until a few hundred years ago, and the production of sugar from sugar cane and sugar beet, honey was the only pure sugar available in most parts of the world.

### How Amazing!

- \* When full, a forager worker bee's honey stomach can weigh more than half the bee's unladen weight and the forager's abdomen is visibly longer.
- \* It takes approximately 50,000 bee loads of nectar to make one pound of honey.
- \* Honey bees will fly as far as 12km from their hive to profitable flower patches. Long distance foraging mostly occurs in summer when high quality patches are scarce.
- \* When flowers are scarce, honey bees try to steal honey from other colonies.
- \* The ancient Egyptians used honey to help wound healing. Modern science has shown that honey kills bacteria and honey is again being used as an antiseptic.
- \* In North Carolina, special conditions there can result in blue honey.
- \* Long before beekeeping humans practiced honey hunting, raiding wild colonies. We know this because it is shown in prehistoric cave and rock paintings.