

## The Benefits of Pollen to Bees

The bee's basic nutritional requirements are similar to those of humans; they need proteins, carbohydrates, minerals, fats/lipids, vitamins, and water. In order to meet their nutritional requirements, honey bees collect nectar, pollen, and water



Bee Drinking Water

Bees forage for water at almost any source close to their colonies. These sources include ponds, streams, leaky taps, or bird baths. During hot weather, honey bees use water to cool the colony by fanning and evaporating water droplets inside the hive. Water may also provide essential minerals in addition to hydration.

Honey bees consume processed nectar (honey) and pollen (bee bread), both of which are provided by flowers. Nectar, which bees convert to honey, serves as the primary source of carbohydrates for the bees. It provides energy for flight, colony maintenance, and general daily activities. Without a source or surplus of carbohydrates, bees will perish within a few days. Nectar also is a source of various minerals, such as calcium, copper, potassium, magnesium, and sodium, but the

presence and concentration of minerals in nectar varies by floral source.

## Pollen Content

Pollen, in the form of bee bread, is the honey bee's main source of protein and it also provides fats/lipids, minerals, and vitamins. The protein that pollen provides is vital to brood production and the development of young bees. Pollen is the most nutritionally variable food source that honey bees use and typically is composed of the following:

- Water (7%–16%)
- Crude Protein (6%–30%)
- Ether Extract (1%–14%)
- Carbohydrates (19%–41%)
- Sugars (0%–9%)
- Starch (0%–11%)
- Lipids (5%)

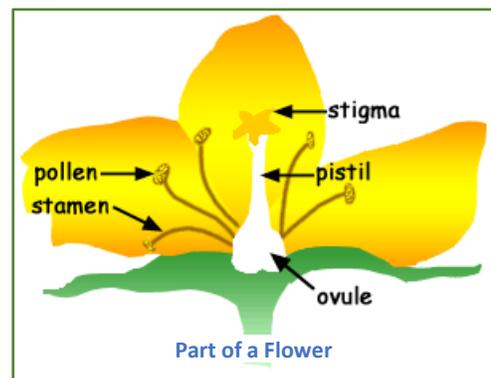
Pollen from different floral sources has different quantities of each component: all pollens are NOT equally nutritious to the bees.

The protein pollen provides is essential for hive growth, but the amount of crude protein available in pollen is highly variable among different pollens, ranging from 6%–30% of the total dry weight of the pollen.

Protein is composed of amino acids, 10 of which have been identified as essential to honey bees. The quantity and type of amino acids present in pollen varies by the floral source from which the pollen was collected.

## Where is pollen produced?

Pollen is produced by the stamen, which is the male reproductive portion of a flower (Figure 2). Honey bees play an important role as pollinators as they transfer pollen from the stamen of a flower to the stigma (female part) of the same or different flowers. Sometimes the pollen only needs to be transferred to a stigma on the same flower or another flower on the same plant, but often the pollen must reach a



different plant altogether. Consequently, a very intricate relationship has developed between plants and their pollinators, as both parties rely on one another for survival.

Plant species differ in the quantity and quality of pollen produced. Some plants may produce an abundance of pollen, but the pollen may be of poor quality, whereas others may produce very little but high quality pollen. Plants that are closely related tend to have similar amounts of crude protein available in their pollens. Plants with relatively high crude protein values include canola and almond while plants with lower crude protein levels include raspberry/blackberry, willow, sunflower, and pine.



Pollen Grains

It has been observed that honey bee workers choose pollen based on the odor and physical configuration of the pollen grains rather than based on nutritive

value. A typical size honey bee colony (approximately 20,000 bees) collects about 125 pounds of pollen per year. On average, 15-30% of a colony's foragers are collecting pollen. A single bee can bring back a pollen load that weighs about 35% of the bee's body weight. Bees carry this pollen on their hind legs, on specialized structures commonly called "pollen baskets" or corbicula.



Once pollen is brought back to the colony, the workers condition it by adding glandular secretions containing enzymes and acids that prevent harmful bacterial activity and prepare the pollen for long-term storage. Stored pollen often is called "bee bread". Bees also add beneficial microbes to the pollen and they produce enzymes that help the pollen release nutrients and amino acids. Bee bread is consumed by a colony relatively

quickly and only stored for a couple of months if there is a surplus. A colony's annual requirement for pollen has been estimated to range from 35 to 125 pounds.

Bees require pollen for growth and development. Immature (larval) bees are fed a mixture of brood food and bee bread. Newly emerged bees consume bee bread so that their bodies can complete development. A diet of high protein pollen increases worker bee longevity, while brood rearing is reduced when supported by pollens low in protein.

Protein content is very important and is the most studied component of pollen, but little is known about the importance of other trace nutrients available in pollen to bees. The chemical analysis of the composition of pollen is complex and only a relatively few pollens have been investigated well.