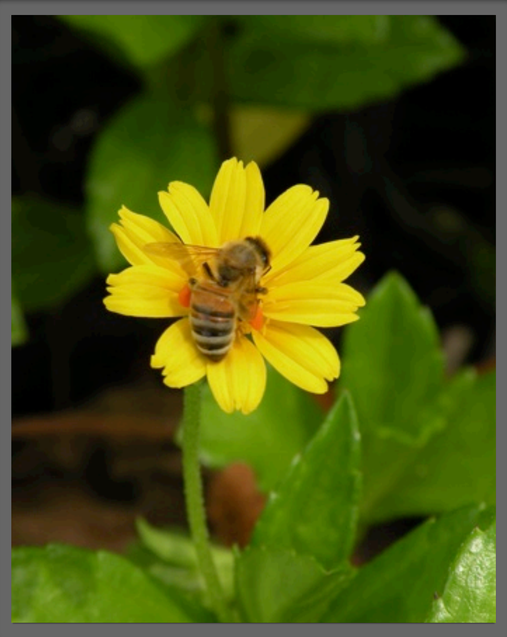
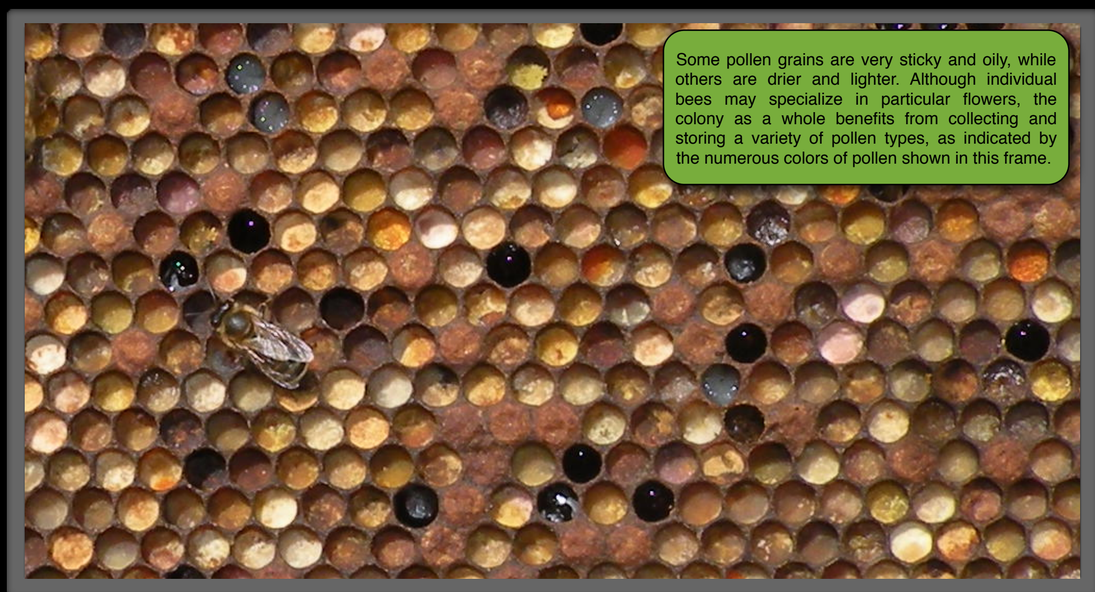
Pollination by honeybees

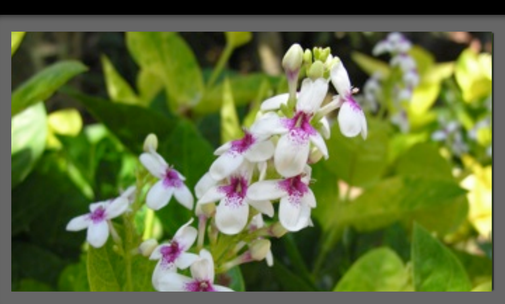




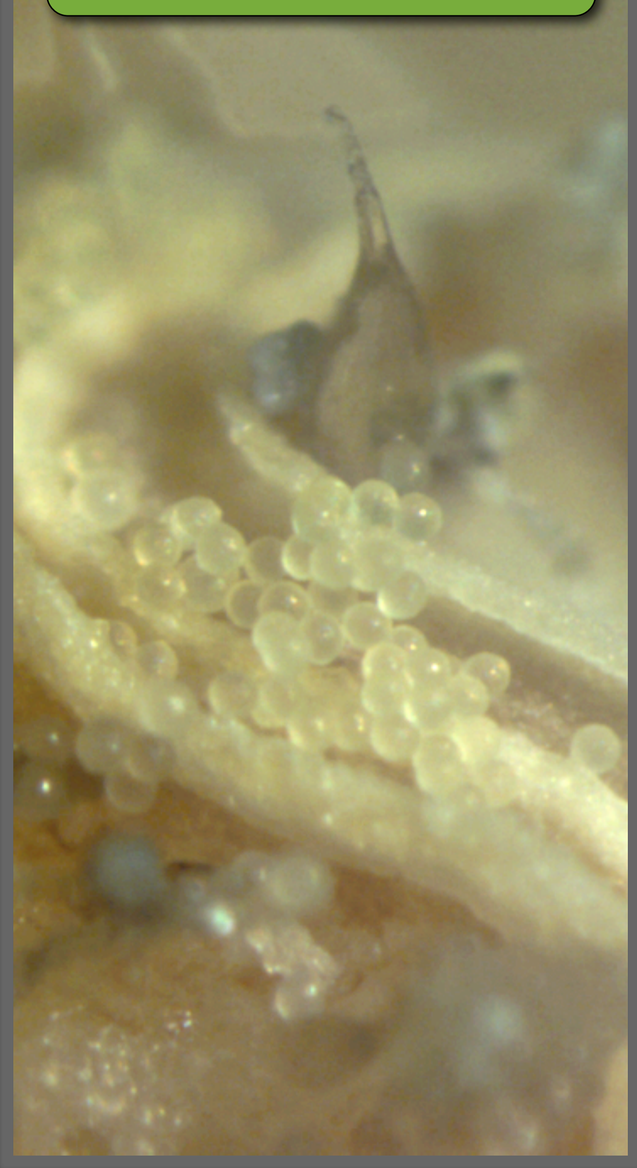
Some pollen grains are very sticky and oily, while others are drier and lighter. Although individual bees may specialize in particular flowers, the colony as a whole benefits from collecting and storing a variety of pollen types, as indicated by the numerous colors of pollen shown in this frame.

Honeybees use a “pollen basket” to carry pollen grains back to the hive. The basket is found on the outer part of the hind legs, and it consists of a slight depression surrounded by a row of long stiff hairs that point inward. The foraging bee brushes the pollen grains into this basket and carries them as a moist pellet, “the pollen load”, back to the hive. Pollen baskets are also used by bumblebees, stingless bees, and orchid bees to bring pollen back to the nest.

Flowers that attract bees are often white, yellow and/or blueish purple. Bees have excellent sense of smell and scent can lure them from far away. The shape of the flower is also important; bee flowers often have landing platforms for the forager to perch on while feeding.



Pollen grains vary in size from 1/100 of an inch to 1/3000 of an inch, and studies have shown that the smaller pollen grains can be more easily compacted into the pollen basket. In fact, the smaller the grain the heavier the pollen load. Larger grains seem to take too much space and can’t be compacted as easily. The amount of pollen transported in each pollen load is an important consideration in studies assessing honeybee pollination efficiency.



Pollen as a resource for the colony: pollen baskets and bee bread

Honeybees live in large colonies and feed exclusively on nectar and pollen. Each colony has many adult bees that search the fields for suitable flowers. In the process of gathering food the bees help spread pollen from one flower to another and in this way they pollinate the crops they visit. Bees do not visit flowers randomly, they seek out flowers that provide high food rewards, either pollen or nectar. Honeybees tend to prefer flowers that are found in great numbers and are relatively close to the hive, thus maximizing energy input, while reducing foraging costs.

Honeybees collect pollen because of its nutritional value. Nurse bees, which are in charge of the developing larvae inside the hive, eat large quantities of pollen and subsequently feed the bee larvae protein rich nutrients derived from the pollen they consumed. This is why abundant pollen supplies are often associated with an increase in brood production and colony growth.

The factors that influence the pollen foraging intensity are not only interesting from a scientific point of view, but also potentially very important for the successful pollination of agricultural species and the production of honey. Colony growth is related to nectar and pollen availability and honeybees respond quickly to seasonal flowering peaks.

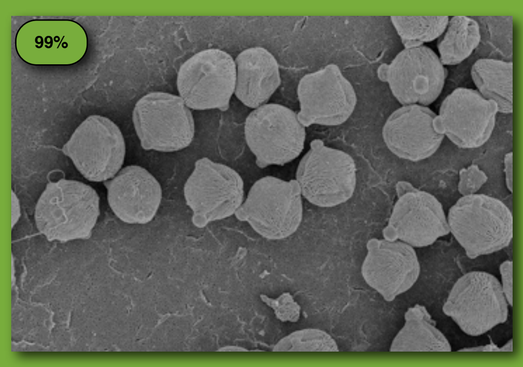
Individual bees tend to specialize on certain flowers and collect pollen from the same floral sources over a period of several days. The flower constancy exhibited by bees, allows them to become “experts” at handling the flowers they visit, and presumably, the familiarity with the flower structures reduces the time spent at each flower, and increases their efficiency at pollen collecting.

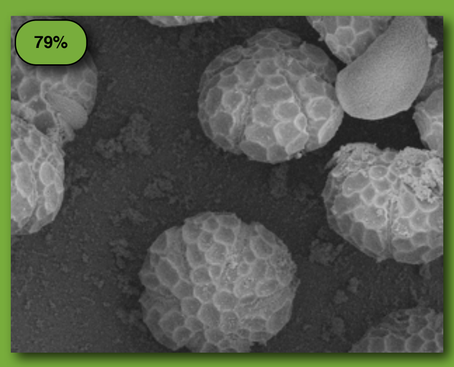
The phenomenon of flower constancy in bees can be illustrated by examining the pollen grains brought back to the hive by individual workers. Foraging bees differed greatly from each other in their floral choices, as it is obvious from the SEM pictures below. Foragers however, were very consistent in the type of pollen stored in their pollen baskets, suggesting they were specializing on a flower type.

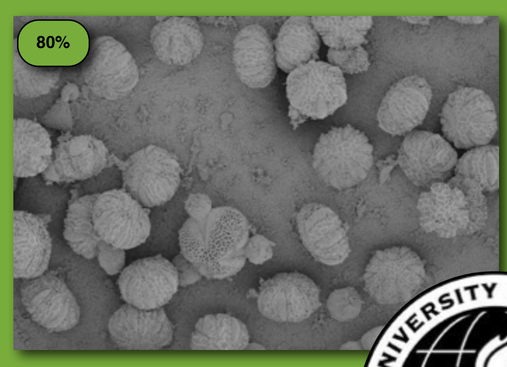
A high degree of constancy suggests that the bees have learned to use, and prefer to visit, a particular flower species. If the selected flower is an agricultural species, then the bees will likely be performing a good job at pollinating that crop.

Foraging bees bring back pollen to the hive where it is fed to developing bees or stored for later use. Stored pollen, called “bee bread” is modified by the bees, often mixed with honey and with helpful microbes that improve the dietary value of pure pollen. Young bees need to consume bee bread to be able to feed the queen and the young larvae. Without adequate pollen sources a colony will not be able to produce new bees and its population will decline over time.

Fig 2.
Flower constancy means the foraging bees preferentially visit a flower species over others. Each SEM picture is from an individual forager bee, and the percent (top left corner) corresponds to the frequency of the most abundant pollen type found in each of these samples. Flower fidelity benefits both the bees and the plants. The bees improve their pollen collecting efficiency through experience, and the plants benefit because their pollen does not get “diluted” among other flowering species.







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