

Stahlman Beekeeping Notes for 2022

Material about Pollen & Honey
from -- Beekeeping 301 Cd now out of print.
Part I - By Dana Stahlman



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An Introduction to Advanced Beekeeping 301 Honey bees are on the search constantly when they can fly from a hive for water, pollen, nectar and resins for use in the hive. Knowing facts about the needs of the hive are important. Often success of the bee hive depends on how close it is located to pollen and nectar sources as well as water.

Honey Plants Introduction

Books have been written on this subject. The two major publications "American Honey Plants" by Frank Pellett and "Honey Plants of North America" by John H. Lovell were first published in the 1920's. Nothing of significance has been published since. A series of articles called The Other Side of Beekeeping by George S. Ayers have been published in the American Bee Journal and honey plant articles by Connie Krochmal have appeared in Bee Culture.

The material here is going to be general. It will describe various honey plants, where they grow, the type of honey produced, what the pollen looks like, and various tid-bits of information I can personally provide. Also included is a chart of honey plants which can be used by you to list the blooming dates around your community. Blooming dates vary with climate conditions. For example, a beekeeper in Pennsylvania living near the top of a mountain will have a late flow of Black Locust while the beekeeper living in the valley not more than twenty miles away will have Black Locust bloom two weeks earlier. Therefore, you as the beekeeper need to complete your own chart of blooming dates. It will be quite useful to you.

Honey production varies from year to year. Good bee yard locations are essential for the commercial beekeeper. A bee yard must be located in an area of potential honey producing plants. The beekeeper must depend upon neighbors and farmers to provide the necessary planting of crops that produce nectar and pollen. Certain plants grow only in specific locations and are not going to be available to all beekeepers. Only beekeepers in these specific regions will be able to place bees to gather the nectar crops from these sources. Tupelo, Citrus and Sourwood are examples of trees that

grow in specific geographic locations. The same is true of sage, fireweed, and cotton. Unless a beekeeper lives near these sources of honey, nectar from those plants will not be gathered by bees. A person might be led to think that they could get a crop of orange honey if they buy a few orange trees and place them on the patio during the summer months, take them in during the winter season, and then return them to the patio the next spring. Unfortunately, this does not work. It takes an orchard of orange trees to produce an orange honey crop.

Honey plants produce both nectar and pollen. Honey bees need both to survive. Before we look at various honey plants, let see what honey and pollen are.

Pollen



A honey bee must forage for food to supply food for its own metabolism, to feed young growing larva, and to provide a surplus of honey and pollen for winter and spring survival. Eva Crane in her fine book, *A Book Of Honey* estimates that it takes three orbits around the earth to produce one pound of honey and during each orbit one ounce of honey is used as fuel.

A colony of bees needs a large work force to gather the necessary nectar and pollen if it is to survive. The beekeepers share of honey produced by a colony of honey bees depends on how the beekeeper managing the bees. Large populations of bees are maintained to gather enough honey and pollen for the bees to survive over winter and get the surplus the beekeeper will harvest.

I am indebted to a number of sources for the material about pollen used in this discussion. By far the most important source I used was: *Agriculture Handbook No. 496 "Insect Pollination of Cultivated Crop Plants"*. This was published in 1976 by U.S.D.A. Some of the other books used were: *Honey Plants of Iowa*, 1930, *Pollen Grains* by R.P. Wodehouse published 1935, *The Pollen Loads of the Honey Bee* by Dorothy Hodges published 1984, *Pollen grains of Canadian honey plants* by Crompton and Wojtas published in 1993 and *Insects and Flowers* by F. G. Barth published in 1985.

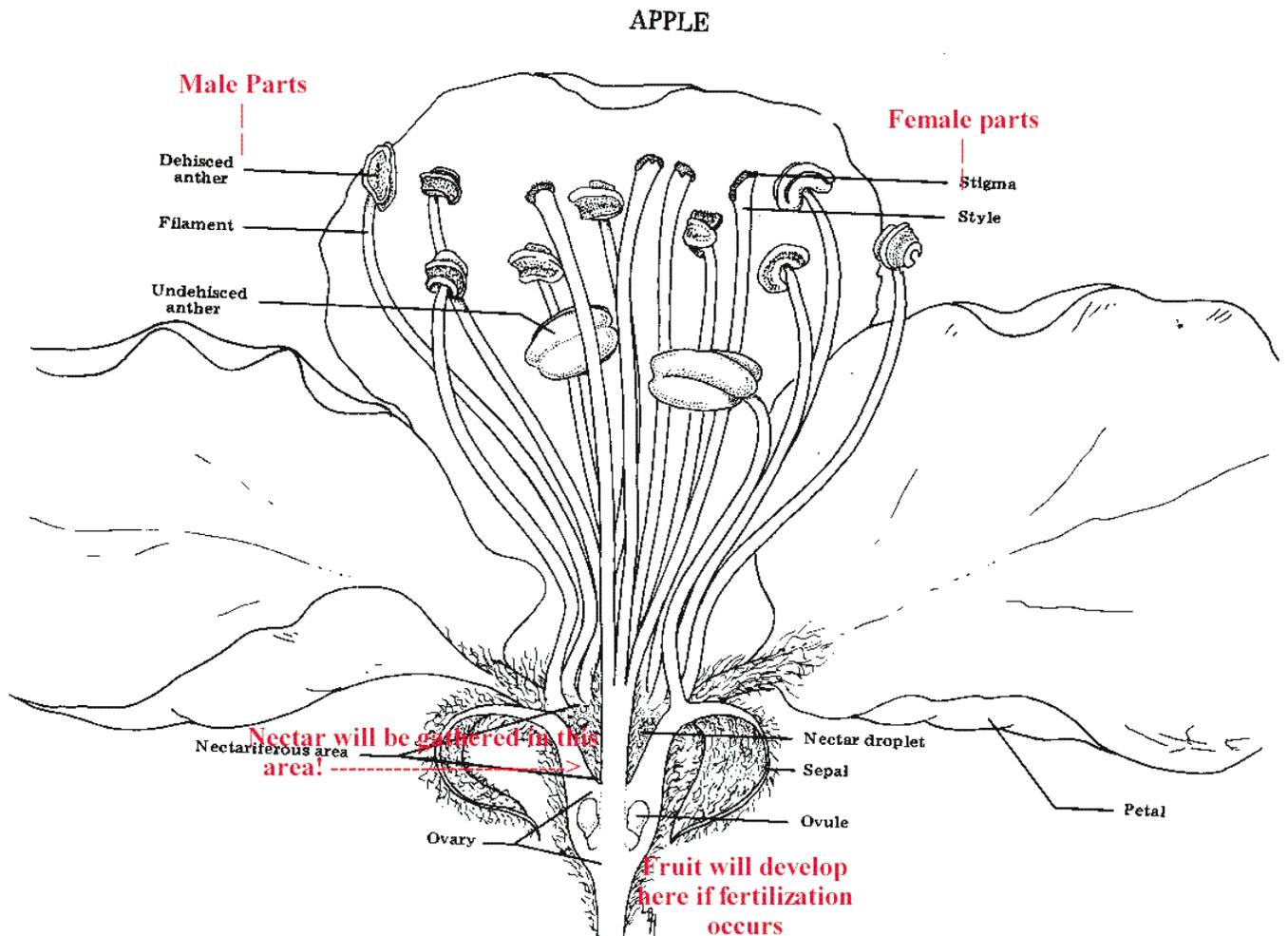
Adequate pollen stores are required by a hive of bees any time brood is being raised. It has been estimated that a hive might use 40 to 70 pounds of pollen a year and those who collect pollen in something called pollen traps can attest to the fact that bees bring in large amounts of pollen. Many bee classes and books recommend the use of pollen substitute in the spring when brood is being raised. When to use a pollen substitute will be discussed in a later section.

Pollen supplies young nurse bees with the ability to produce "royal jelly" sometimes called bee bread which is fed to the young larva.

Royal jelly: This substance is rich in the protein, vitamins, fats and minerals which are converted by the worker bees pharyngeal glands into a creamy substance which is fed to young

larva. Royal jelly is also produced commercially as a product of the bee hive. For those interested in producing royal jelly we suggest you check out queen rearing. Bees feed young queen larva with mass amounts of royal jelly. This can be collected (harvested) from queen cells cups and sold. Most of the commercial production of royal jelly is located in China due to the very low labor cost. Producing and collecting Royal jelly is very labor intensive.

Pollen is produced by plants. Some plants depend on insects to transport pollen from one plant to another for fertilization to take place. The male gametophyte is enclosed within a pollen grain and when it germinates a pollen tube will make its way to the ovary of the plant where the male gametes reach an egg cell and a seed will result.



Pollen Biology

This is a picture of a perfect flower (Apple) taken from *Insect Pollination of Cultivated Crop Plants (Agriculture Handbook No. 496)*.

We should have a basic working knowledge of a flowering plant. In this case, I have chosen an apple blossom to show the various parts. There are four unique features of this apple blossom that are high-lighted in red.

- The style and stigma (female organs)
- The anther and filament (male organs)
- nectar glands
- ovary

For an apple tree to produce apples, pollination must take place. The fruit is adjoining tissue that develops around the seeds in the ovary. If the flower is fully pollinated the seed set will produce an apple fully developed. If the flower is only partly pollinated (some seeds fail to set) then the apple will be distorted -- lopsided. For pollination (fertilization) to take place, pollen grains must be transferred from the anther to the stigma. Honey bees visit apple flowers for the ample supply of nectar and pollen. In reaching for the nectariferous areas at the base of the flower they come into contact with pollen grains which adhere to the many hairs on the bees body. As the bee flies from blossom to blossom it transfers these very small pollen grains on the stigma of the blossoms it visits thus pollinating the plant. The reward for the bees is the nectar gathered and the pollen brushed from its hairs by the special comb on its legs and carried back to the hive in its pollen basket.



Pollen grains are very small. They vary in color and shape. Pollen can be detected in honey and is used as a way of identifying nectar sources. Since honey is produced from a number of nectar sources, it will also have a number of pollen indicators as well. Generally speaking, if a honey sample contains 45% pollen grains from an individual plant source it is considered predominant. Secondary dominating rating is 16 to 45% of a plant source in a honey sample. Vary rarely will a honey sample be 100% of one source.

For example, if in early spring one would sample some honey from a hive, one would find pollen in the honey from maple, apple, willow, dandelion, and others.

What is in bee pollen?

A number of Chemical analysis of the composition of bee pollen have been done. These studies have found: amino acids, minerals such as potassium, magnesium, calcium, copper, iron, silicon, phosphorus, sulfur, chlorine, and manganese, vitamins and hormones, water, reducing sugars, starches, fatty acids and others. It has been referred to as the "perfect food" by some.

Facts about pollen

Pollen is an integral part of a honey bee colonies nutrition. Pollen is a complex material providing food (proteins etc.) for young brood. A shortage of pollen will cause a hive to decrease in bee population and eventually cause the death of the colony.

- *The pollen grain is the male part of the fertilizing unit.*
- *When pollen is gathered from the flower the collecting bee gets much of the pollen all over the body hairs. This is scrapped off using a comb and rake on the legs. At the same time the pollen is mixed with a small amount of nectar used by the bee to pack the pollen in the pollen baskets.*
- *The pollen grain has a strong coating to protect the nucleus and its nutritive matter inside from all sorts of extreme environments thus the existence of fossilized pollen grains which allow the identification of plant species that grew many millennia ago.*
- *Pollen is a source of protein and varies in two ways:*

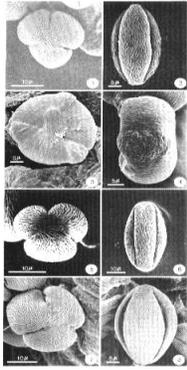
First -- Total protein content is calculated by measuring the amounts of nitrogen in the sample. This is referred to as "crude protein."

Second -- The amino acid content of pollen varies from one plant species to another. Some pollens provide a balance of amino acids ideally suited to the bee's requirements while other pollens are missing one or more of the amino acids and thus are of limited value to the honey bee.

- *Pollen supplies minerals, vitamins and some fats for the bee's diet.*
- *Pollen has only a small amount of carbohydrate and thus is not a source of energy for adult bees. Honey is a carbohydrate and thus it provides adult honey bees with the energy to fly and exist.*
- *Fresh pollen has the highest level of nutritive value. Once stored it begins to deteriorate. If you are collecting pollen and want it to be viable for the longest period of time, you should freeze dry it.*
- *Air dried pollen must be kept in air-tight containers and not exposed to moisture. Otherwise, pollen will develop a musty smell and mold will grow in it.*
- *Bees will compact pollen in cells with their heads. This pollen is often covered with honey and capped over. It is then used by the bees when needed.*
- *Pollen grains of the same species and of closely related species tend to be alike and the degree of their similarity is a measure of the closeness of relationship.*

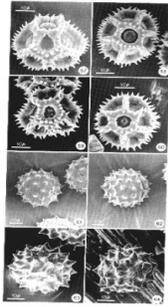
Some Scanning electron microscope images of pollen. These images were taken from [Pollen Grains of Canadian Honey Plants](#) published by the Canadian Department of Agriculture and Agri-Food which has one of the best guides to pollen identification that I have seen.

Two views are shown in each set of photographs. The left side photos show the end view of a grain of pollen and the right are side views. Pollen grains vary in shape, size, and various features.



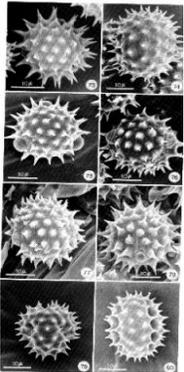
These are examples from the family

Acer Better known as *Maple*



These are examples from the family

Cichorium Better known as *chicory*



These are examples from the family

Helianthus Better known as *sunflower*

The price of this book when purchased was \$57.00 U.S. when purchased in 1995. I do not know if the book is still in print. One might try:

Canada Communications Group -- Publishing Ottawa, Canada K1A 0S9

If you are serious about this topic and want to identify pollen grains with a microscope, this book is invaluable.

Pollen grains in honey

Have any of you watched Forensic Files on TV? There is a science of identifying pollen grains found in almost any sample that might be examined. The pollen helps the scientist understand where the pollen grains originated. This can get very exact -- Almost down to the exact geographic location.



This is a sample of pollen in honey.

This honey sample has three different identifiable pollen grains in it plus some additional particles which can be found in honey. It is 1/3 sunflower (*Helianthus*), 1/3 basswood (*Tilia*), and 1/3 rape (*Brassica*)

What are some other things found in honey?

- Soot from smoker fuel, yeast, algae, fungal spores, bacterial spores, & bee legs.
- In fact, anything the honey bee can come into contact with including chemicals.