

Chapter 3 - Avocado Flowering and Pollination

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flowers on a panicle
open and un-opened



Avocado Trees have a Lot of Flowers!

- A mature tree usually has around 1 million flowers
- A “good” fruit set has about 200 of those flowers that set fruit and stay on the tree until harvest (representing 10,000 lbs per acre if each fruit is 8 ounces – size 48)
- Occasionally 500 flowers set (representing 25,000 lbs per acre)

Factors that Affect Flowering

- **Juvenility** most cultivars will not begin to flower until the third year after planting

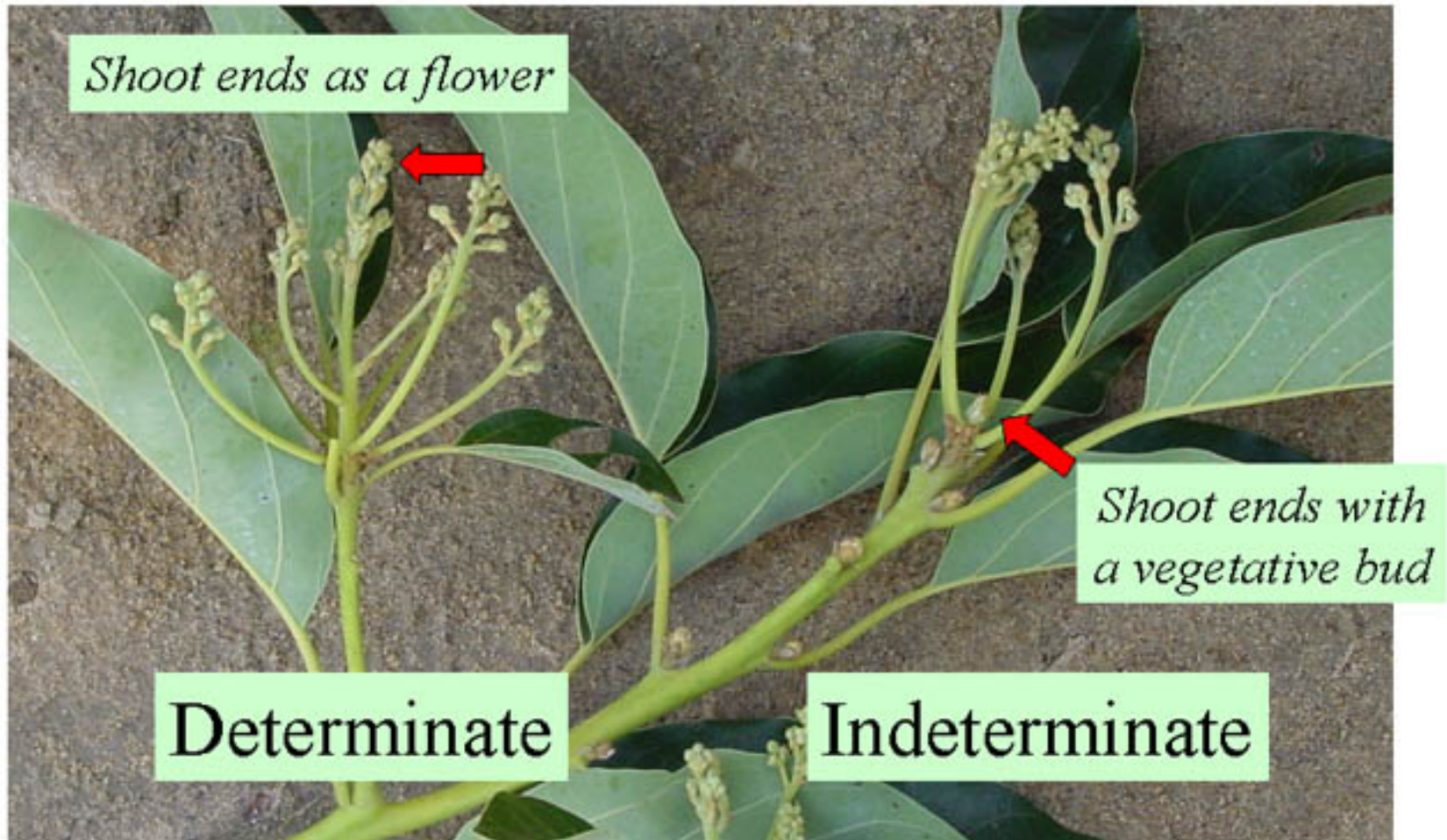
Most ungrafted seedlings have a long juvenile phase and may not produce fruit for 10 yrs

- **Phenology** panicles of flowers are produced mostly on the outside of the tree, in the sunlight (presents a problem in a pruning program)
 - Mexican cultivars flower earliest, West Indians next and Guatemalans last
 - Most fruiting wood grows in the August flush in Calif.

Factors that Affect Flowering

- **Temperature.** Flowering is induced by a period of low temperature (59F day, 50F night) (but hopefully not too low!)
- **Day length.** Does not seem to be an important factor
- **Water stress.** May reduce flowering, probably due to salt accumulation and leaf drop
- **On-year, Off-year.** Not well understood
 - **On/off** for each tree, and **on/off** for the whole grove

Figure 1. Example of determinate and indeterminate inflorescences in avocado



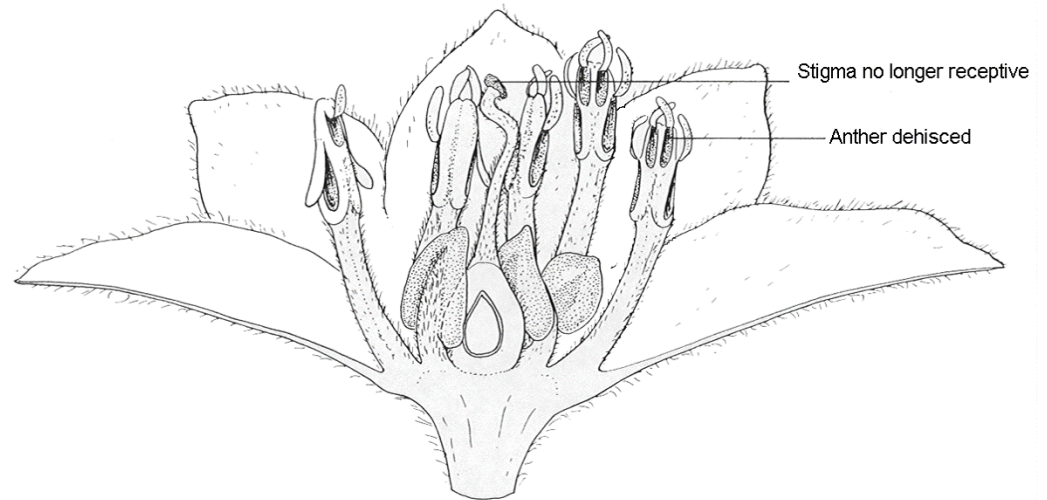
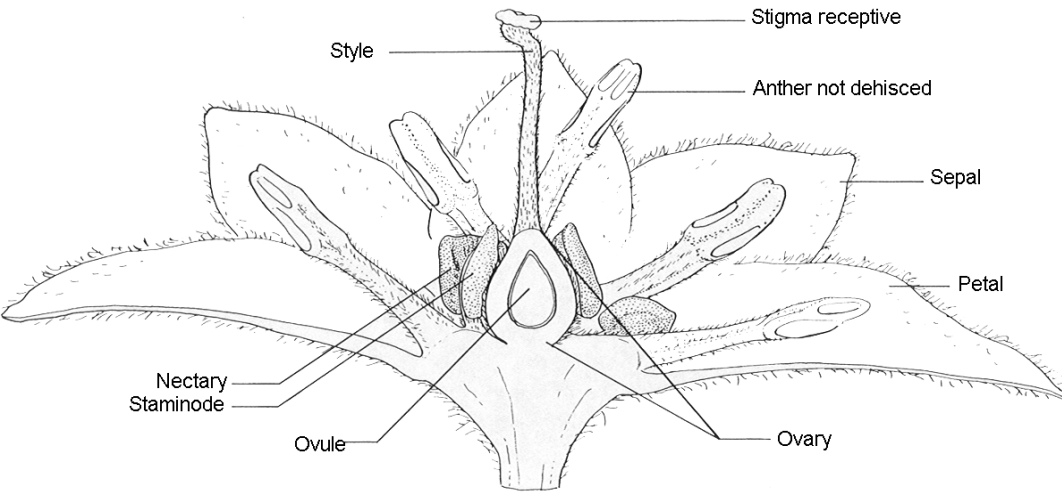
Flower Structure

- Refer to page 36 in chapter 3
- The avocado flower opens twice, first as a female, then closes and opens as a male the next day
- Read “The Remarkable Avocado Flower, p. 37 in chapter 3
- Note difference between A and B type flowers
- The flowering sequence works as long as average temp is above 70 F, colder delays female opening, and may push male opening into night. Below avg. 60F there may be no fruit set

A and B Flower Types

	First Day		Second Day	
	Morning	Afternoon	Morning	Afternoon
A type	Female (stigmata receptive)		Male (sheds pollen)	
B type	Female		Male	

Female stage, Male stage



Female Stage, Male Stage



Types of Pollination

- Cross-pollination. When pollen is transferred from male flowers of type A to female flowers of type B, and vice versa. This has been shown to have a substantial increase in yield when trees are 1 or 2 rows away. There is a moderate increase in yield up to 15 rows away.

Types of Pollination

- Close pollination. When pollen from male flowers pollinate female flowers in the same tree, probably occurring during the overlap of female/male flowers at noon.
- Self pollination. When pollen from the anthers either blow into or fall into the stigma of the same flower. We assume this is not very important because caged trees (without bees) have very poor fruit set. Also, stigmas in the same flower are usually dry when pollen is released.

Bees

- Bees are important for pollination, but they prefer other flowers (avocado is low on their list of favorites)
- Bees stick with one to three trees at a time, this reduces the effect of cross-pollination

Bee with a Pollen Load



(c) Kathy Kestley Garvey

Bees vs. No Bees

Number of fruit per tree from caged tree trials

Type of Tree	Beeless	Bees
Zutano	4	120
Hass	5	284

Improving Pollination

- Bring bees into the grove (don't rely on natural bee populations). Use at least 1-2 hives per acre (better to use 3-4)
- Add pollinizer trees to the grove (B flower)
- Keep grove open, have a wall of flowers all the way down to the ground
- Have water available for bees

Development through the year

