

SEED SAVING BASICS

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The Sex Lives of Plants

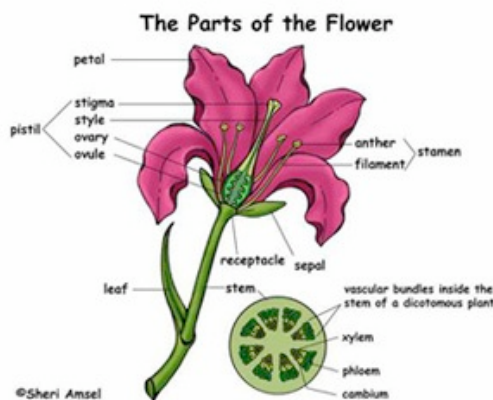
For some of you just hearing the word "botany" brings forth images of dreary classroom sessions and nerdy be-spectacled professors with wild unkempt hair. My experience of botany has been quite the opposite (except for maybe the unkempt hair). Botany is all about the sex lives of plants. Flowers, the sex organs of plants, are quintessentially beautiful and incredibly diverse. Pollination is an intricate dance of plant, insect, wind and chance. If you have never taken a field study course, it is highly recommended. Heading down a mountain path in search of some obscure beauty, you never know what wonders nature will show you along the way. Botany classes for non-academics are available in California at the [Jepson Herbarium](#), [Sierra Nevada Field Campus](#) and [Tilden Botanic Garden](#).

In the garden some knowledge of plant taxonomy is necessary if you want to take sustainability and skills to the next level. Plants in the same family act similarly in how they reproduce and plants of the same species may or may not cross to produce something that resembles the parent. This is important if you want in on the tradition of saving and growing out your own seed. Seed is living gold, the genetic material of the flavors we love. Saving heirloom seed properly is the next step in true sustainability and independence from giants like Monsanto.

How Pollination Happens

The female part of the flower is called the pistil which includes the stigma, style and ovary. The stigma has a sticky surface which will chemically "recognize" only pollen of her potential mate of the same species. The ovary, is what will become the fruit and within it the seeds. The male part of the flower is the stamen, which includes the filament and anther. The anthers produce the pollen. Some plants have male and female parts in the same flower and are self-pollinating within the same flower. Tomatoes are an example of this. In the world of botany we call these flowers **perfect**. Some have male and female parts in the same flower, but have evolved mechanisms to prevent self-pollination and ensure genetic diversity. Some plants have separate male and female flowers on the same plant, such as zucchini and other squash. We call these flowers **imperfect**. Any plant that has male and female on the same plant is called monoecious—which simply means they have everything "in one house". Other plants have male and female flowers on separate plants, thus requiring two plants to reproduce. These flowers are also imperfect and the plants are **dioecious**, having male and female in "two separate houses." Avocado trees are an example of this.

And here's the amazing part. The pollen grain is made up of 2 cells. When a pollen grain of the right type lands on the sticky stigma, there is chemical recognition and bonding starts to occur. The hard outer coat of the pollen grain starts to dissolve. The first cell, called the "tube cell" grows like a tube down the style to the ovary where the second cell fertilizes the ovule to make a seed. The tube cell can grow as much as 12 inches to reach it's goal! In corn, for example, each silk leads to one ovule which will become one kernel of corn. When the pollen from the tassels lands on the silks, the pollen tube grows all the way down the silk to fertilize the one ovule



each plant's pollen has a unique size and chemical marker ~ flower parts ~ pollen tubes

Kingdom, Order, Family, Genus, Species

You may find it surprising, but humans like to make order in their world. The science of classifying and organizing living things is called **taxonomy**. Plants are usually called by their **genus** and **species** name. Thus *Helianthus annuus* and *Helianthus californicus* are two different species in the genus *Helianthus*. Part of the definition of a species is that individuals of the same species can cross and mate. Within a species, there can be lots of variety, especially amongst garden annuals who have been selected and bred by humans for different traits. Just think about humans—we are all one species but no two of

us looks the same! It is important to know when plants that look different are actually the same species. For example, we know that a poodle and a pitbull are both in the same species, *Canis lupus familiaris*. If we want the puppies to look like poodles, we need to cross that pup with another poodle. If we let our female in heat out on a sunny day, we are likely to get something else.

Similarly, broccoli and cauliflower are the same species, so if we want to get offspring that look like one or the other, we need to isolate those plants from each other. Plants in the same family tend to act similarly in their reproductive habits, so while you don't need to learn every family (there are about 400) it is good to know the families that comprise our major food plants. For your fun and edification I have posted a list of the [main plant families that comprise our kitchen gardens](#).

Seeds to save: Easy-Peasy

The easiest seeds to save are those in families with perfect flowers, that are self-pollinating and don't tend to cross easily. These are plants in the bean, sunflower and nightshade families. These plants require little isolation from each other to get offspring "true to type." Anyone can and should save these seeds.

Examples of Bean family plants: all beans, peas, lentils, garbanzos, peanut, fava, sweet pea, clover, alfalfa **How:** Let the pods dry on the plant. Shell and store.

Examples of Sunflower family Plants: sunflower, cosmos, marigold, artichoke, lettuce, endive, chrysanthemum, bachelor's buttons, calendula etc. **How:** Allow plants to flower and collect dried seeds

Examples of Nightshade family plants: Tomato, Pepper, tomatillo, eggplant. **How:** Allow fruits to fully ripen (peppers and eggplant will change color). For tomato & tomatillo squeeze seeds and pulp into a jar add a little water and let ferment for a day. Rinse and let dry on a towel. For pepper, scrape seeds onto a towel and let dry.

Next Hardest, Cucurbits!

Not every plant is self-pollinating. Plants that are wind or insect pollinated will cross with members of their same family. As already mentioned, some plants that look differently are actually the same species and can even more readily cross, such as broccoli and cauliflower. Such plants need some sort of isolation from each other in order to ensure that the next generation resembles the current generation.

One way to separate plants is by distance and different plants need different isolation distances. Another method is by using timing—planting in waves so that only one of that species is flowering at the same time within the recommended isolation distance. If distances and timing cannot insure unwanted crossing (in the city it is almost impossible to ensure no one else is growing corn in a 1 mile radius) then the plants must be mechanically isolated using cages, bags or other means and then be hand pollinated or insect pollinated by introducing those insects to the cage.

Cucurbits are a wonderful and useful family of plants which includes squash, melons, gourds and cucumbers. Isolation distances are not great, but in order to save seed without hand pollination, you must make sure you have only one of each species in your yard. You can have one type of cucumber flowering at a time, one melon, one watermelon, and one each of the following

Cucurbita pepo all summer squashes (zucchini, yellow squashes, etc.), some pumpkins, pattypan, spaghetti, delicata, and acorn

Cucurbita moschata butternut squash

Cucurbita mixta cushaw, some pumpkins

Cucurbita maxima, kabocha squash, some pumpkins

If that is too hard to keep straight, hand pollination of cucurbita is not difficult and is a great place to start! Male and female plants are easily identified. The female flowers have a miniature version of the squash below the flower. Tape flowers shut with masking tape the night before they are to open (they will start to turn yellow and bulge out in the center). Tape 3 males for each female. The next morning, gently open the female, making sure no insect pollinators are around. Then rip off the petals of 3 males and swish the pollen grains onto the sticky center of the female. Tape her shut again and mark the stem so that you know this is the fruit with the pure seed. Full tutorial with pictures [here](#).

Don't Try This At Home: Advanced Seed Saving

I have been encouraging you to save seed and I won't stop. But some plants are a challenge at best especially in an urban environment. It is important to understand how these plants are pollinated and what it would take to ensure seed purity so that we don't attempt it, get it wrong and in doing so pass along seed that won't grow the plant it is supposed to. If you are saving seed for your personal use--it really doesn't matter if the seed is pure--save and experiment away! Indeed many valuable varieties were developed in haphazard out-crossings by home gardeners and small scale farmers. At some point though, they isolated that seed and made it "stable" Here are some crops considered "advanced" in their seed saving requirements.

Corn is wind pollinated. Each silk leads to the embryo of one kernel of corn. The tassels put out copious pollen to ensure that each silk gets a grain. Isolation distances are up to 2 miles for corn. To ensure purity, the ears must be bagged before the silks come out. The bags are quickly removed, hand pollinated with several tassels and then replaced. To ensure diversity a minimum of 100 plants to work with is suggested.

Carrots readily outcross with their wild relatives such as Queen Anne's Lace and can revert to a woody unpalatable root in just a few generations. Carrots go to seed in their second year, so seed saving is a long term commitment. Like corn carrots need bagging and at least 100 individual plants to ensure good genetic diversity.

Brassicas (broccoli, kale, turnip) are insect pollinated and extremely attractive to bees. They love to cross within their species and with less tasty wild relative such as mustards, radishes and wild cress. To ensure purity they require 1/2 mile isolation distance and/or caging with introduced pollinators. They also need a larger group of plants to ensure good genetic diversity.

Chenopods (chard, beets) The chenopods have tiny, unspectacular flowers which produce copious pollen which can travel up to 5 miles on the wind. They readily outcross with less spectacular wild food plants like lambs quarters and pigweed. Commercial production relies on isolation distances for purity, in the home garden the seed stalks must be bagged with additional cotton batting around the stalk to prevent pollen from escaping!