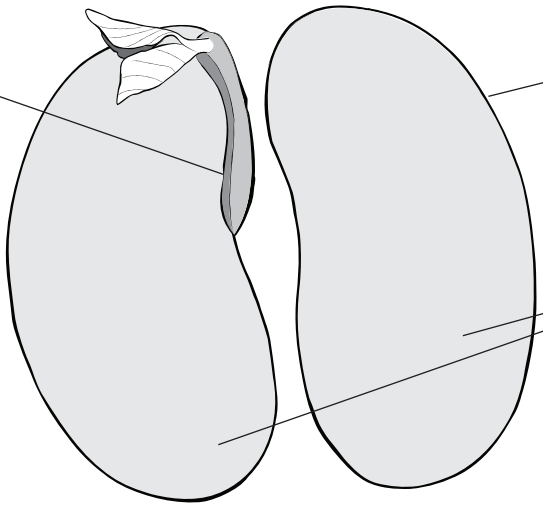
What's in a Seed?

Soak a bean seed in water for several hours until you can peel the skin off. Split it apart and see what's inside.

Baby bean plant
The part on the seed that looks like a grain of rice is the root. The tiny feathery parts on the top are the first "true leaves". Everything else – more roots, the rest of the leaves, the stem, flowers, pods, and seeds – grow from this.



Skin or seed coat
Protects the seed from damage and disease, and prevents rapid changes in moisture.

Cotyledons
Store starch to feed the baby plant until the seed germinates. They are also the "seed leaves" of the bean sprout.

How Seeds Grow

When a seed sprouts, the root grows first. It tunnels downward, no matter which way it is planted, and anchors itself by growing side roots. Then, powered by the food stored in the cotyledons, the growing stem pushes the whole seed up and out of the ground. When the sprout emerges into the sunlight, the cotyledons turn green, and make new food through photosynthesis. They then shrivel and fall off, the "true leaves" expand, and the plant really starts to grow.

To germinate seeds	To store seeds
Moisture triggers seeds to grow	**Dry air** puts seeds to sleep
Warmth triggers seeds to grow	**Cold** makes seeds consume food slowly
Light is needed by some seeds to germinate	**Darkness** helps keep seeds dormant

Family Relations

Why does a bean look so much like a peanut?

Because beans and peanuts are both in the legume family. Other legumes like peas, chick peas, and lentils also look very similar inside.

There are hundreds of plant families and their seeds are all shaped differently, but seeds all contain the same parts. We use beans for this example because they're easy to see and easy to handle.

Why don't old seeds grow?

There's a living plant inside every seed and it needs food. The longer the seed ripens on the vine, the more food it stores. When the food runs out, it dies.

Old seeds sometimes take longer to germinate because their low food reserves make them go dormant (like hibernating) more deeply.

Make your seeds last longer

To keep a seed alive in storage for a long time, you have to slow down the plant's metabolism so it consumes food slower.

Seeds go dormant when they're dry and cold. This is easy to remember because it's the opposite of what they need to germinate.

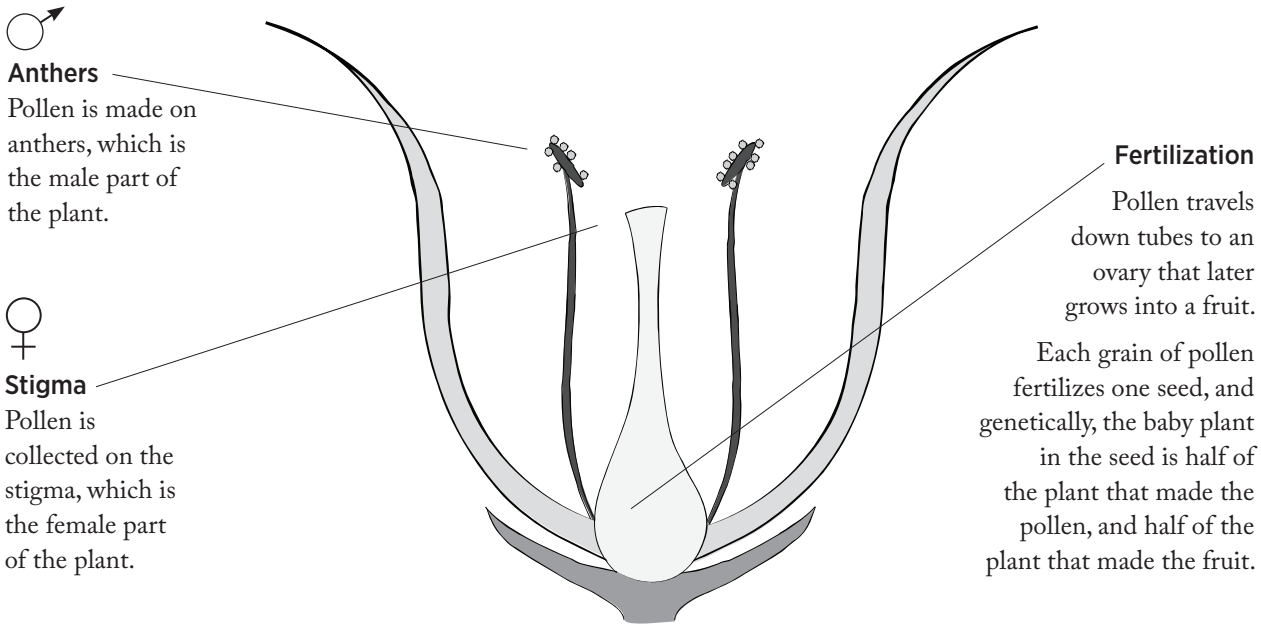
Seed savers - start strong

Harvest your seeds from healthy plants, and leave the seed or fruit on the plant as long as possible.

Seeds harvested before their prime will often grow if you plant them right away, but those that have had time to store lots of food are the healthiest and longest-lasting.

What's in a Flower?

The purpose of every flower is to fertilize each seed with a grain of pollen.



Anthers
Pollen is made on anthers, which is the male part of the plant.

Stigma
Pollen is collected on the stigma, which is the female part of the plant.

Fertilization
Pollen travels down tubes to an ovary that later grows into a fruit.

Each grain of pollen fertilizes one seed, and genetically, the baby plant in the seed is half of the plant that made the pollen, and half of the plant that made the fruit.

Types of Flowers

Complete	Incomplete
Each flower has both male and female parts.	Each flower is either male or female.
Each flower makes pollen, and also makes fruit.	Some only make pollen; some only make fruit.
May be open or closed.	Always open, so that they can be cross-pollinated.

Open	Closed
Flower shape allows insects to reach the pollen andcarry pollen from flower to flower.	Flower shape blocks insects from reaching the pollen.
This kind of flower is cross-pollinating.	Since pollen stays within the flower, this kind of flower is self-pollinating.
Can be complete or incomplete.	Always complete, so they can self-pollinate.

Most plants have a combination of these flower types. Some plants, for example, have complete and closed flowers. Others may have complete and open flowers, or incomplete and open flowers.

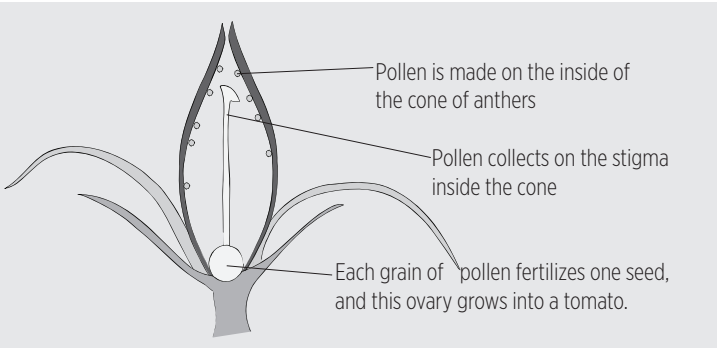
Flip to the other side of this handout to see examples of these combinations, and to learn about how various types of flowers are pollinated.

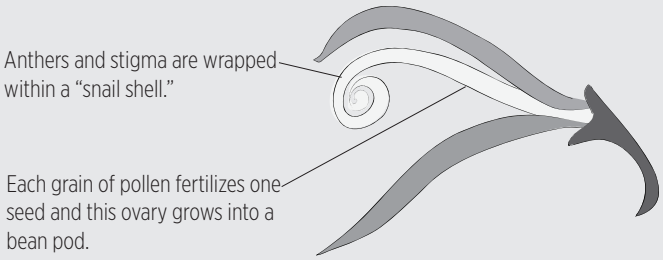
What's in a Flower?

Tomato

Closed, Complete, Self-pollinating

Pollination almost always happens inside each flower. Bees can't enter the closed flowers, so they don't generally cross-pollinate different varieties nearby.





Bean

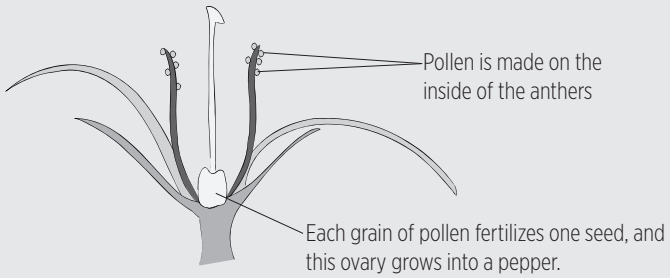
Closed, Complete, Self-Pollinating

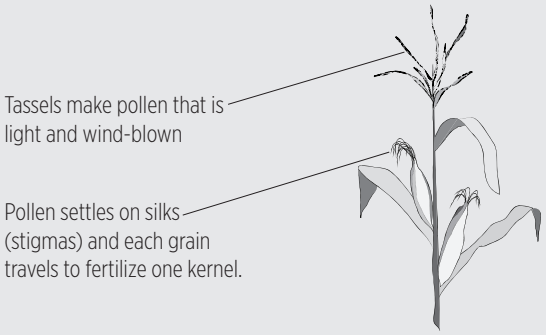
Like the tomato, beans are self-pollinated. The anthers and stigma are both closed within a coil-like structure, so pollination takes place within each flower.

Pepper

Open, Complete, Cross-pollinating/Self-pollinating

Since they are in the same family, the pepper and tomato flowers look similar. The pepper flower is complete, but the anthers don't make a cone, so insects can enter. As they move, they brush pollen onto the stigma, so some seeds are self-pollinated. They also carry pollen from flower to flower, so some seeds are cross-pollinated.





Corn

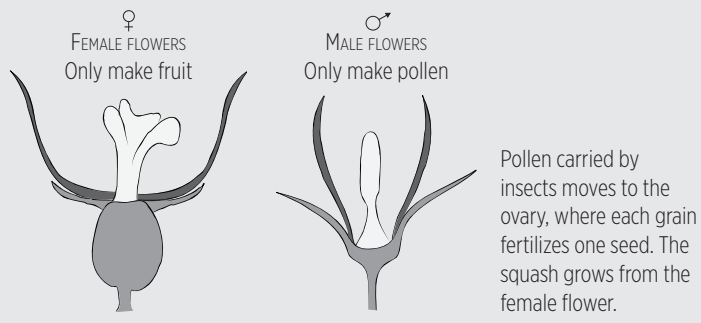
Open, Incomplete, Cross-pollinating (by wind)

Flowers are either male or female, so they cannot self-pollinate. Corn pollen is small and dusty enough to be carried for great distances by wind, so different varieties must be far enough to prevent crossing.

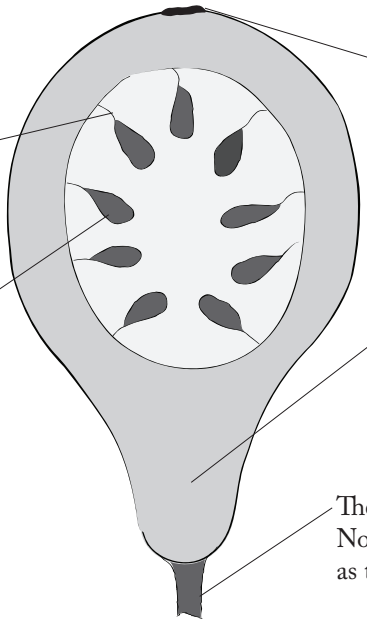
Squash

Open, Incomplete, Cross-pollinating

Flowers are either male or female, so they rely on insects to carry pollen. Since the flowers can't self-pollinate, they must be separated by a large distance from other varieties to prevent cross-pollination.



What's in a Fruit?



Each seed is attached by an "umbilical cord" that feeds it. (Think of the strings in a halloween pumpkin.)

The blossom end is where the stigma was attached. Pollen entered here and each grain travelled to a different seed to make the baby plants.

Food stored in the fruit continues to feed the seeds even after it'-s picked from the plant.

The seed coat is part of the fruit. Genetically, the baby plant inside is half of the fruit's plant (♀), and half of the plant where the pollen came from (♂).

The stem end is where the base of the flower grew. Nourishment from the plant comes in here, as long as the stem is moist.

After a flower is pollinated, the ovary grows up and feeds the seeds. The more food that's stored in the seeds, the longer they will last, and the stronger they will sprout.

What is a fruit?

We call this "seed nursery" a fruit, but what do you call it?

Is a cucumber a fruit?

Is a pepper a fruit?

Is a green bean pod a fruit?

Is rhubarb a fruit?

Is a maple key a fruit?

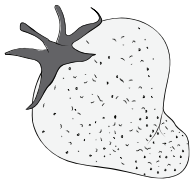
Is watermelon a fruit?

Pure or Crossed?

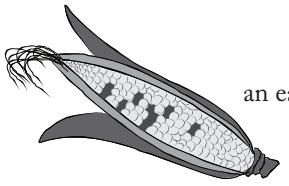
Every seed is fertilized by a different grain of pollen, so if they're cross-pollinated, you can't tell by testing one seed. The seed coat is part of the female, not the baby, so you can't tell crosses by looking at the seed colour.

If the fruit isn't fully pollinated, it won't fully grow.

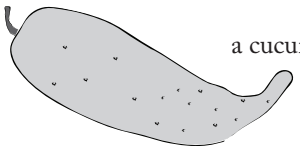
Have you ever seen:



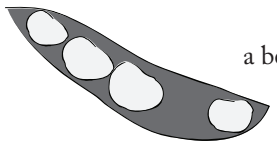
a strawberry that looks like this?



an ear of corn that looks like this?



a cucumber that looks like this?



a bean or pea pod that looks like this?

The seeds that didn't get any pollen failed to grow, and the fruit didn't grow around them because it wasn't needed.