

Seed Saving

Introduction

With the increasing development and reliance on hybridized crop seed, it is becoming more and more difficult to find varieties of open pollinated varieties. Many of those plants considered as heritage species are in danger of disappearing from the decreasing genetic sources. Organic growers now feel that they can serve an important place in the preservation of plant varieties, by growing and saving the seed.

Seed saving has several definite advantages:

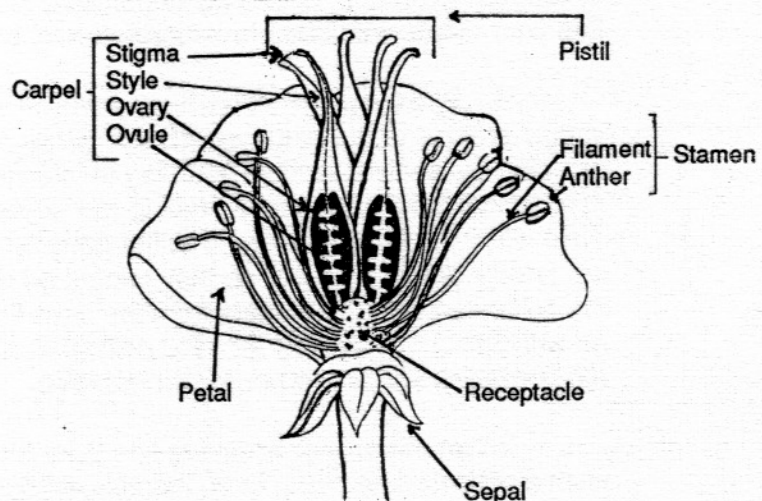
1. saves money.
2. allows the grower to choose the varieties she/he wants.
3. can determine the varieties that grow well in the grower's particular conditions.
4. can help preserve plant varieties for future generations.

Plant Reproduction

When growing seeds it is important to know enough botany to understand the process of seed production. The primary function of all flowers is sexual reproduction. The wide variety of shapes, colors, sizes and scents serves to increase the potential of pollination and successful reproduction by attracting suitable pollinators.

A "perfect" flower has both male and female reproductive organs. See Figure 1. The *stamen*, which is the male organ of the plant consists of the long thin filament topped with the pollen-producing *anther*. Plants usually have more than one stamen and the cluster is called the *androecium*. Pollen is the yellow, brown or red powder that is made up of male cells. Each anther has four *microsporangia* or "pollen sacs". When pollen is released by rupture of the anther it is blown or carried to the female organs.

The female organ of the plant is the *pistil*. This single stem is usually longer than the stamens and is located at the center of the androecium. A flower can have more than one pistil and the group is called the *gynocium*. At the base of the pistil is the *ovary*, which contains female reproductive cells, the *ovules*, which will become seeds when fertilized by pollen. Plants can be pollinated by a variety of vectors including wind, birds, butterflies, beetles, bats, bees, ants and even (as in the case of the paw paw tree) flies. The *stigma* is the moist, hairy part that receives the pollen.



A "Perfect" Flower

Flowers are either complete, "perfect", or incomplete, "imperfect". Imperfect flowers have the male and female organs occurring on different flowers. These individual flowers will be staminate (male) or pistillate (female). The flowers can occur on the same plant (*monoecious*) or different plants (*dioecious*). Each dioecious plant is either male or female. Perfect flowers are usually self-pollinated, sometimes within the flower before the petals open.

Seed Saving Tips

When considering plants for saving seed there are several things you need to know about the plant. These include:

1. *Is the plant a hybrid or stable (open-pollinated)?* Open-pollinated plants consistently reproduce offspring similar to the parent, but first generation hybrids (F_1) are not stable.

2. *Is the plant an annual, perennial, or biennial?* Annual plants will grow, set seed and die all in a year. Biennials will not flower and produce seeds until their second growing season. Common biennials include carrots, beets and kale. Perennials will grow and produce seeds for many years. These long-lived plants, such as rhubarb and asparagus, die back in the winter and come back the following year. Typically, it is easier to save seeds from annual and perennial plants, rather than biennials. With biennials the plant will need to be dug up and taken indoors during the cold months between its growing seasons.

3. *Is the plant self-pollinated, or does it have male and female plants, which requires one of each to set seed?* What is its mode of pollination? If the plant has a perfect flower or both male and female flowers on the same plant, the mother plant will usually fertilize itself. This results in genetic characteristics that remain relatively unchanged.

4. *How susceptible is the plant to cross-pollination -- fertilization by pollen from a different plant of the same species or genus?* In cases of cross-pollination the seeds contain genetic material from both parent plants, so the offspring will not be true. The easiest way to prevent cross-pollination is to plant only one cultivar of each seed crop. Of course this is no guarantee that your plants won't be cross-pollinated by pollen carried from a neighbor's crop.

5. *What are the acceptable isolation distances for each crop?* That is, how far apart should cultivar of the same species or genus be placed to minimize the risk of crossing. Plants can also be isolated by time (planting at intervals so the cultivars bloom at different times), or by mechanical means (cages or floating row covers). The latter requires hand pollination, which is done when the flowers open. Pull the petals of the male flowers off to get to the stamens. Tape the female flowers closed, so they cannot be pollinated until it is removed. The female flowers are pollinated with the anthers from the male flowers. *Q. How effective is a natural barrier (such as woodland) as isolation for wind pollinated crops, such as corn. A. It can be very effective if the prevailing winds are not in that direction.*

When the grower is saving seeds for him/herself occasional cross-pollination may not be such a critical issue. With corn, the affected seeds can be seen on the ear and removed. There may be hidden genes, but in this case, where they can usually be seen, the bad grains can be easily spotted. With other crops, like tomatoes in which the seeds are hidden, affected seeds probably won't be detected until the crop comes in.

Harvesting Seeds

Always save the seeds from the healthiest plants, as well as from those with desirable characteristics -- i.e. earliness, color, vigor, etc. Harvesting methods vary according to the type of seeds. Those seeds which grow in clusters are fairly simple to collect. Watch the plants carefully and when the first few seeds drop collect the entire head of seeds. If the seeds ripen at different rates you can place a plastic bag over the plants to collect those falling early.

Seed pods (as in peas and beans) should be allowed to overripen in the field. Pull up the vines before the pods open. After the vines are dry, the seeds can be picked and shelled or threshed. A simple method of threshing small amounts of seeds is to place the pods in a pillowcase, which is then beaten with a stick. Threshed seeds can be separated from chaff by pouring them from one container to another in a breeze. Corn should be allowed to dry on the ears. Seeds can be removed from crops with a high water content by a wet method, which is very simple and works for tomatoes, squash, etc. Tomatoes can be run through a strainer to remove the skin and much of the pulp. Water is added to make a slurry and this is allowed to ferment for 2-3 days in buckets. As the mixture ferments, the heavy seeds (usually the most viable) will drop to the bottom and a foamy liquid, which contains the light unacceptable seeds forms on the top. After the 3 days the liquid is poured off and the seeds rinsed 4-5 times and placed in a warm place to dry. Vegetables, like squash are prepared in the same way, except that only the pulp and seeds is removed. Water is added and the mixture left to ferment for about two days. Fruit should be allowed to overripen and the seeds then removed.

Seeds should be air-dried on stainless steel mesh or newspaper. Testing for dryness can be done by breaking the seeds between the fingers. If a seed is dry it will break with a snap. If they can be dried to less than 8 percent moisture the seeds will keep a very long time. Placing them in the freezer can increase the period of viability tenfold.

Plant Breeding

There are advantages in a grower breeding his/her own plant varieties. This allows the grower to select for whatever characteristics seem important: earliness, vigor, color, disease resistance, insect resistance, drought. With fruits a grower may want to select for early/lateness depending on the season, as well as color, flavor, resistance to bolting. If the seeds are saved from the specific plants that best meet the needs and/or wants of the grower the subsequent generations will gradually be improved. Regardless of the variety, always select from the most vigorous plants. When selecting the varieties to save, try to grow those that are compatible with the climate and conditions of the area.

Business Considerations

There is a growing number of seed companies willing to contract with local growers for open-pollinated seeds. They are relatively easy to produce and offer a good return for the investment of time and the land that isn't being used for other crops. If the seeds are being sold commercially, it is wise to do germination testing before they are sent to the contracting company. Most seed buyers will pay the grower only for the viable seeds. If their own tests detect differences they will clean the seeds again, removing the bad seeds.

Isolation Distances for Some Common Cultivars

Vegetable	Home Use	Pure Seed	Comments
Beans	25 feet	100 - 150 feet	Watch disease Biennial Crosses with broccoli, cauliflower, kale, cabbage, kohlrabi, collards.
Beets	1/4 mile	1/2 - 1 mile	
Brussel Sprouts	1/8 mile	1/4 - 1/2 mile	
Broccoli	see above		
Cabbage	see above		
Cauliflower	see above		
Collards	see above		
Kale	see above		
Carrots	330 feet	1/8 - 1/4 mile	Crosses with Queen Anne's Lace
Corn	300 feet	1/2 - 1 mile	Save at least 500 seeds from at least 10% of planting
Cucumber	1/8 mile	1/4 - 1 mile	
Eggplant	150 feet	1/8 mile	
Kohlrabi	See Brussel Sprouts		
Lettuce	12 feet	25 - 50 feet	
Mustard	600 feet - 1/8 mile	1/4 - 1/3 mile	Isolate from Chinese Cabbage
Muskmelon	1/8 mile	1/2 - 1 mile	
Okra	1/8 mile	1/4 - 1/2 mile	
Onions	150 feet	1/4 - 1/2 mile	or cage plants
Peas	50 feet	150 feet	
Southern Peas	50 feet	150 feet	Keep from asparagus beans too
Peppers	150 feet	300 feet	hot and sweet
Radish	1/8 mile	1/4 - 1/2 mile	including wild plants
Spinach	1/4 mile	1/2 - 1 mile	
Squash			Crossing happens within but rarely between species
Summer (pepo)	1/8 mile	1/4 - 1/2 mile	or hand pollinate
Acorn (pepo)			
Cushaw (mixta)			
Spaghetti (pepo)			
Butternut (moschata)			
Pumpkins (maxima, pepo, or moschata)			
Swiss Chard	1/4 mile	1/2 - 1 mile	Same species as beets
Turnips	600 feet	1/4 - 1 mile	from mustard and Chinese cabbage too
Tomatoes	35 feet	75 feet	Size of planting counts
Watermelons	1/8 mile	1/2 - 1 mile	

References and Resources

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Nick, Jean M.A. and Fern Marshall Bradley, Editors 1994, Growing Fruits & Vegetables Organically, Rodale Press, Emmaus, PA.

Flower and Herb Exchange

Rt. 3 Box 239
Decorah, IA 52101

Seeds of Change

P.O. Box 15700
Sante Fe, NM 87506-5700

Natives Seeds/SEARCH

2509 N. Campbell #325
Tucson, AZ 85719.

Southern Exposure Seed Exchange

P.O. Box 170
Earlsville, VA 22936

Seed Savers Exchange

Rt. 3 box 239
Decorah, IA 52101

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