

## **Seed Saving: the Future of our Nations**

Our seeds are part of the living thread tying us both to our lands and our ancestors. Our ancestors were brilliant plant breeders and seed savers, creating an unparalleled number of food plants adapted to the climates and microclimates of the Americas. Today, farmers and gardeners are under pressure to preserve seeds from potential contamination of local genetic pools by GMOs (genetically modified organisms) carried in wind and insect-borne pollen. As small seed companies are absorbed by the corporate seed industry, the tradition of specialty varieties declines and heirloom crops are lost in a mire of corporate hybrids. Thankfully, there are many Native and non-Native peoples and organizations working to re-implement our traditional farming practices, and revive the use of our old seeds.

White Earth Land Recovery Program	<a href="http://www.welrp.org">www.welrp.org</a>
Oneida Community Integrated Food Systems	<a href="http://www.oneidanation.org/ocifs/">www.oneidanation.org/ocifs/</a>
Msvkoke Food Sovereignty Initiative	<a href="http://www.mvskokefood.org">www.mvskokefood.org</a>
Traditional Native American Farmers Association	<a href="http://www.tnafa.org">www.tnafa.org</a>
Tohono O'odham Community Action	<a href="http://www.tocaonline.org">www.tocaonline.org</a>
Native SeedSEARCH	<a href="http://www.nativeseeds.org">www.nativeseeds.org</a>
New Mexico Acequia Association	<a href="http://www.lasacequias.org">www.lasacequias.org</a>
Indigenous Permaculture Project	<a href="http://www.indigenous-permaculture.com">www.indigenous-permaculture.com</a>

# **Basic Seed Saving How-To**

*adapted from the International Seed Saving Institute*

## **Basic Terms**

The following terms provide a basic understanding of seeds and seed production.

**Seeds** are living, hibernating embryos. They have a life span and survive longest if kept cool, dark and dry.

**Flowers** are the portions of plants where reproduction takes place and seeds are produced.

**Pistils** are the female reproductive organs in flowers made up of the stigma, style and ovary. The stigma is the opening in the pistil through which the pollen passes on its way to the ovary. The style contains the pollen tube between the stigma and the ovary through which the pollen is carried. The ovary contains ovules. When fertilized, ovules develop into mature seeds.

**Stamens** are the male reproductive organs in flowers. They consist of the filament, anther and pollen. A filament is the tube that supports the anther where pollen is produced. Pollen is the equivalent of sperm in plants. Pollen grains fertilize plant ovules.

**Pollination** is the process of sexual fertilization in plants. The different methods a flower uses for pollination will dictate the spacing or isolation necessary for plants to produce dependable seeds.

**Self-pollination** occurs without need for other flowers or plants because it takes place within the flower before it opens. Isolation distance to prevent cross - pollination is not necessary unless insects invade the flowers.

Perfect flowers contain the stamens which produce pollen and the pistil which receives the pollen. Some self-pollinate. Others are self-incompatible, meaning they will not receive their own pollen.

**Cross-pollination** takes place when pollen is exchanged between different flowers on the same or different plants. If not prevented, unwanted characteristics and traits may result in the offspring.

**Isolation distance** to prevent unwanted cross-pollination is the distance between two different flowers necessary to prevent pollen from being exchanged. Wind pollination is pollen exchange caused by wind and insect pollination is pollen exchange caused by insects, primarily bees.

**Hybrids** are varieties resulting from pollination between genetically distinct parents. The "F" in F1 hybrid stands for filial, another name for offspring. F1 means the first generation offspring after pollination. Depending on their genetic complexity, F1 Hybrids can be sterile or produce a majority of offspring unlike themselves.

**Open-pollinated** varieties are stable varieties resulting from the pollination between the same or genetically similar parents. Not hybrid.

**Monecious** plants produce single plants with separate male flowers and female flowers on the same plant.

**Dioecious** plants produce separate male flowers and female flowers on different plants.

**Caging** is a separation technique where insects that might cause cross-pollination are prevented from reaching flowers by a fine net supported by wire or wood. If flowers in the cage are not self-pollinating, several plants must be included in the cage and pollinating insects introduced. Alternate day caging

allows two plants or two groups of plants to be naturally pollinated by insects. Unwanted cross -pollination is prevented because one plant or group of plants is caged one day and the other plant or group is caged the next.

**Root to seed** describes a technique used to produce seed for biennial crops. The roots of the biennials are harvested in the fall, trimmed and stored for the winter. The following spring, the best roots are planted for seed production that season. When roots to biennials are left in the ground in the fall to produce seeds the following summer, the term seed to seed is used.

**Vigor** is a desirable characteristic that describes strong, vibrant germination and plant growth.

**Inbreeding** can result from self-pollination or pollination between a small number of close relatives. Some vegetables show no signs of inbreeding depression even when self-pollinated for many generations and others show signs of inbreeding depression in first generation offspring.

### **SELECTION TRAITS:**

We make a distinction between selection characteristics and selection traits.

**Characteristics** are general features attributed to unidentified complexes of genes. Complex and hard to define, characteristics are often ignored by commercial breeders and offer the most rewards for home gardeners. Characteristics include but are not limited to freeze tolerance, cold tolerance, regional adaptability, winter hardiness, early maturation, vigor and flavor. Each home gardener can create his or her own list of selection characteristics.

**Traits** are specific features traceable to identifiable genes. For example, pea traits traceable to single genes include vine growth (bush or tall), seed texture (smooth or wrinkled) and disease resistance (fusarium, enation mosaic and powdery mildew resistance).

**Viable** seeds are seeds that germinate and produce vigorous plants. Seeds should not be harvested before they have matured enough to be viable.

**Dehiscent seed capsules** are open and discharging seeds. Seeds must be harvested before this stage takes place and seeds are lost. Seed capsules in some varieties literally explode at the point of maturity. It is not uncommon to have only a few capsules out of hundreds, mature at any one time.

### **Cleaning Seed**

Cleaning and separating seeds from chaff is not difficult or even necessary for small, home garden needs. Often, a little extra time taken during harvest to shake seeds out, one capsule at a time, results in completely clean seeds that need no processing. Thresh is a term used by seed professionals to describe the process of separating seeds from chaff, small, remaining pieces of pods or coverings.

Flail is the process of fracturing or crushing seed pods in order to free the seeds. This can take the form of everything from simply rubbing broccoli pods between hands to walking over bean vines.

Winnow is an ancient technique used to clean seeds. Seeds and chaff are poured through moving air which blows the lighter chaff aside, allowing the heavier seeds to be collected below.

Cleaning Screens with different-sized openings are used to separate seeds from chaff. The screen number denotes the number of openings that will cover a one inch line. A screen is selected with openings just large enough to let seeds drop through without the chaff or as in the case of larger seeds, a screen selected to allow the chaff to drop through without the seeds.

**STORAGE:** The successful storage of seeds demands cool, dark, and dry conditions. Put seeds in plastic bags for separation and labeling before putting the plastic bags into air-tight, glass jars to be stored. Note: plastic bags alone do not protect against moisture, especially in potentially moist locations like refrigerators or freezers. Allow jars that have been stored in refrigerator or

freezer to warm to room temperature before opening to prevent moist air from condensing on the inside walls of the jar.

**Keep Them Cool:**

Storage conditions are best if seeds are kept below 50° F.

**Dark:**

Absolute darkness is best. However, seed storage is adequate if direct sunlight or bright, artificial light is avoided.

**Dry:**

Dryness is the most important factor in the long-term storage of seeds. Optimum levels should be below 9% moisture. Most vegetable and flower seeds will store more than one year without special protection. Silica gel can be purchased for prolonged storage in humid climates.

**MAKE NOTES AND LABEL YOUR SEEDS!**

It's important to keep good records of your seed saving efforts. Note the dates planted, days to maturity, and days of harvest, as well as other observations. This will help you select the traits and characteristics you want to carry on to the next generation.

**Seed Saving Vegetables for Beginners**

These vegetables offer the beginning seed saver the best chance for successful seed saving. They produce seed the same season as planted and are mostly self-pollinating, minimizing the need to be mindful of preventing cross-pollination.

**Beans**

PLANT: Although, ideally, different varieties should be separated by 150 feet or another crop flowering at the same time, we rarely observe cross-pollination even when two varieties are grown next to each other.

FLOWER: Beans produce perfect, self-pollinating flowers. Cross pollination by insects is possible but rare as pollination occurs before the flower opens. Because

the anthers are pushed up against the stigma, automatic pollination is assured when the anthers open.

**SELECTION TRAITS:** Most commercial breeders favor bush varieties which can be mechanically harvested and fibrous bean pods which hold up during harvest and shipment. Pole varieties are more suited to small, home gardens because they produce more beans in a smaller space. Because vines are off the ground beans are easier to pick and away from the settling cold air of unexpected frosts.

**WHAT TO NOTE:**

Pole or Bush

Pod edibility: Little or no fiber, Stringless

Seed color

Pod, foliage and flower color

**HARVEST:** Allow pods to dry brown before harvesting, about six weeks after eating stage. If frost threatens, pull entire plant, root first, and hang in cool, dry location until pods are brown.

**PROCESS:** Small amounts of pods can be opened by hand. Flail larger amounts. Remove large chaff by hand or fork. Winnow remaining particles.

## **Lettuce**

**PLANT:** Separate varieties flowering at the same time by at least 20 feet to ensure purity.

**FLOWER:** Lettuce produces perfect, self-pollinating flowers. Each flower produces one seed. Flowers are grouped in little heads of 10-25 flowers all of which open at once for as little as 30 minutes. Anthers are fused together into a little cone that completely surrounds stigma and style. Style is pushed up through anther cone and is coated with its own pollen. Note: Mature head lettuce may need a slit (two or three inches deep) across the top to encourage flowering.

**WHAT TO NOTE:**

Leaf color

Leaf shape

Seed stalk formation

Bolt resistance

Seed color

**HARVEST:** Some outside leaves can be harvested for eating without harming seed production. Allow seed heads to dry 2-3 weeks after flowering. Individual heads will ripen at different times making the harvest of large amounts of seed at one time nearly impossible. Wait until half the flowers on each plant has gone to seed. Cut entire top of plant and allow to dry upside down in an open paper bag.

**PROCESS:** Small amounts of seed can be shaken daily from individual flowering heads. Rub with hands to remove remaining seeds. If necessary, separate seeds from chaff with screens.

## **Peas**

**PLANT:** Ideally, different varieties need to be separated 50 feet or with another crop flowering at the same time. However, in cool regions there is rarely cross-pollination even when two varieties are grown next to each other.

**FLOWER:** Peas produce perfect, self-pollinating flowers. Cross-pollination by insects is possible but rare because pollination occurs before the flower opens. Because the stigma does open before pollen is ready crosses theoretically could occur.

**WHAT TO NOTE:**

Most commercial breeders prefer bush varieties with pods that ripen simultaneously in order to facilitate commercial harvesting. Tall varieties produce more peas in small, home gardens.

**Plant Growth:** Tall or Bush

**Seed Shape:** Round seeds germinate better in cold weather

**Pod Edibility:** lack of fibers on the inside of the pod

**Pod shape**



**HARVEST:** Allow pods to dry brown before harvesting, about four weeks after eating stage. If frost threatens, pull entire plant, root first, and hang in cool, dry location until pods are brown.

**PROCESS:** Small amounts of pods can be opened by hand. Flail larger amounts. Remove large chaff by hand or fork. Winnow remaining particles.

## **Chili Peppers**

**PLANT:** Most home gardeners will get satisfactory results if different varieties are separated by 50 feet and another tall, flowering crop.

**FLOWER:** Peppers produce perfect, mostly self-pollinating flowers. Solitary bees will pollinate if a more desirable pollen is not available in the area.

**WHAT TO NOTE:**

Flavor

Color of Pod

Heat

**HARVEST:** Harvest mature, fully-ripe peppers for seed. (Most bell peppers turn red when fully mature.) If frost threatens before peppers mature, pull entire plant and hang in cool, dry location until peppers mature.

**PROCESS:** There are two methods, dry and wet, to process pepper seeds. The dry method is adequate for small amounts. Cut the bottom off the fruit and carefully reach in to strip the seeds surrounding central cone. In many cases, seeds need no further cleaning. To process the seed from large amounts of peppers, cut off the tops just under the stem, fill a blender with peppers and water and carefully blend until good seeds are separated and sink to bottom. Pepper debris and immature seeds will float to the top where they can be rinsed away. Spread clean seeds on paper towel and dry in cool location until seed is dry enough to break when folded.

## **Tomato**

**PLANT:** Separate varieties with short styles (most modern varieties) by at least 10 feet. Varieties with long styles (heirlooms and older varieties) need at least 100

feet to ensure purity. If solitary bees are prevalent, separate all varieties at least 100 feet and place another flowering crop between.

**FLOWER:** Tomatoes produce perfect, self-pollinating flowers. Anthers are fused together into a little cone that rarely opens until pollen has been shed and the stigma pollinated. (Older varieties with wild tomatoes or *L. pimpinellifolium* in their genetic ancestry may have stigmas that stick out beyond the cone containing the anthers. Varieties with this trait can be identified by looking closely at mature flowers and need to be treated accordingly.)

**WHAT TO NOTE:** Tomato is the most popular vegetable in America and hundreds of the genes have been mapped. Those of immediate importance for home gardeners include:

Plant size Determinate, bush, or dwarf varieties

Leaf Shape

Disease

Ripening

Fruit color

**HARVEST:** If possible, allow tomatoes to completely ripen before harvesting for seed production. Unripe fruits, saved from the first frost, will ripen slowly if kept in a cool, dry location. Seeds from green, unripe fruits will be most viable if extracted after allowing the fruits to turn color.

**PROCESS:** Cut the tomato into halves at its equator, opening the vertical cavities that contain the seeds. Gently squeeze out from the cavities the jelly-like substance that contains the seeds. If done carefully, the tomato itself can still be eaten or saved for canning, sun-drying or dehydrating.

Place the jelly and seeds into a small jar or glass. (Add a little water if you are processing only one or two small tomatoes.) Loosely cover the container and place in a warm location, 60-75° F. for about three days. Stir once a day.

A layer of fungus will begin to appear on the top of the mixture after a couple of days. This fungus not only eats the gelatinous coat that surrounds each seed and prevents germination, it also produces antibiotics that help to control seed-borne diseases like bacterial spot, canker and speck.

After three days fill the seed container with warm water. Let the contents settle and begin pouring out the water along with pieces of tomato pulp and immature seeds floating on top. Note: Viable seeds are heavier and settle to the bottom of the jar. Repeat this process until water being poured out is almost clear and clean seeds line the bottom of the container. Pour these clean seeds into a strainer that has holes smaller than the seeds. Let the excess water drip out and invert the strainer onto paper towel or piece of newspaper. Allow the seeds to dry completely (usually a day or two). Break up the clumps into individual seeds, label and store in a packet or plastic bag.

### **Vegetables for Experienced Seed Savers**

Corn, Cucumber, Muskmelon, Radish, Spinach, Squash/Pumpkin.

The experienced seed saver's vegetables produce seed the season they are planted but require separation to keep unwanted cross-pollination from taking place.

#### **Corn**

**PLANT:** Female corn flowers are pollinated predominately by the wind, rarely by insects. Pollen is light and can be carried great distances. For purity, separate two varieties pollinating at the same time by at least 1 mile. Reasonable results are obtained with separation of 1000 feet.

**FLOWER:** Corn is monecious, producing separate male and female flowers on each plant. Male flowers appear as tassels on the top of corn stalks and female flowers are pollinated via the silk emerging from each ear.

**INBREEDING DEPRESSION:** Corn is susceptible to intense inbreeding depression. If seed is saved from too few plants, subsequent plants may be short, mature late and produce few ears. Grow at least 200 plants and save the seeds from at least 100 of the best.

**WHAT TO NOTE:**

Kernel sweetness

kernel color

kernel starch: flint, dent, or sweet corn

**HARVEST:** Corn seed is usually ready to be harvested 4-6 weeks after eating stage. If growing season is not long enough, pick ears after husks turn brown. Pull back husks and complete drying in cool, dry location.

**PROCESS:** Process all but very large amounts of seed by gripping dried ears by hand and twisting allowing kernels to fall into container. Any remaining silk and chaff can be winnowed.

## **Cucumber**

(All cucumbers except Armenian cucumbers)

**PLANT:** Separate two different cucumber varieties by at least 1/2 mile to ensure purity. Experienced, home, seed savers can grow more than one variety at a time in a single garden by using hand pollinating techniques. (See page 36.)

**FLOWER:** Cucumbers are mostly monoecious with separate male and female flowers on each plant. Female flowers can be identified by locating the ovary (a small looking cucumber) at the base of the flower. Cucumber vines will produce the greatest amount of female flowers when day length shortens to approximately 11 hours per day. Fruits will be aborted during dry spells and very hot weather.

**INBREEDING DEPRESSION:** Although inbreeding depression is not usually noticeable in cucumbers, seeds should be saved from at least 6 cucumbers on 6 different plants.

**HARVEST:** Cucumbers raised for seed cannot be eaten. They should be left to ripen at least 5 weeks after eating stage until they have turned a golden color. First, light frost of the season will blacken vines and make cucumbers easier to find. Undamaged fruits can be stored in cool, dry place for several weeks to finish ripening.

**PROCESS:** Slice fruit lengthwise and scrape seeds out with spoon. Allow seeds and jelly-like liquid to sit in jar at room temperature for 3 or 4 days. Fungus will start to form on top. Stir daily. Jelly will dissolve and good seeds will sink to bottom while remaining debris and immature seeds can be rinsed away. Spread seeds on a paper towel or screen until dry. (See instructions for tomato.)

## **Muskmelon**

Divided below into seven separate groups because of similar features. All C. melos varieties in all groups will cross with each other. They will not cross with watermelons which are *Citrullus vulgaris*. Indorus: honeydew, crenshaw, casaba Conomon: Asian, pickling melons Dundaim: pocket melon Cantalupensis: true cantelopes (without netted skin) Flexuosus: Armenian cucumbers Reticulatus: Persian melons, muskmelons with netted skin and orange flesh Chito: orange melon, garden lemon melon

PLANT: Separate two different muskmelons by at least 1/2 mile to ensure purity. Experienced, home, seed savers grow more than one variety at a time in a single garden by using hand pollinating techniques. Muskmelon flowers are small and relatively difficult to hand pollinate.

FLOWER: Muskmelons are mostly monoecious with separate male and female flowers on each plant. (Some female flowers have stamens.) Female flowers can be identified by locating the ovary (a small looking melon) at the base of the flower. The early flowers are the most likely to be successfully pollinated and eventually produce seeds.

INBREEDING DEPRESSION: Not usually a problem with muskmelons.

HARVEST: Muskmelon seed is mature and can be harvested from ripe and ready to eat muskmelons.

PROCESS: Simply rinse seeds clean, dry with towel and spread on board or cookie sheet to complete drying.

## **Radish**

PLANT: Separate different varieties being grown for seed at the same time by at least 1/2 mile to ensure purity. Satisfactory results for home gardeners require no more than 250 feet of separation. As radishes cannot self-pollinate, pollen must be carried by insects from plant to plant. Seed to seed: Mulch in the fall to insure winter survival. The following spring, thin to 9" spacing, leaving those roots that showed no sign of bolting. Root to seed: Harvest roots in fall. Select desirable roots and trim tops to within an inch of the roots leaving small, new leaves. Store

at 40° F. in humid location. Replant in early spring at 9" intervals and cover with 1" of soil. Note: Garden varieties of radish will cross with all wild varieties.

**FLOWER:** Radishes produce annual flowers which require pollination by insects, primarily bees.

**HARVEST:** Harvest 3' tall stalks containing seeds pods when pods have dried brown. Pull entire plant and hang in cool, dry place if all pods are not dried at the end of the growing season.

**PROCESS:** Open pods by hand for small amounts of seed. Pods that do not open when rubbed between hands can be pounded with hammer or mallet. Winnow to remove remaining chaff.

## **Spinach**

**PLANT:** It is probably best to grow seeds for only one variety of spinach at a time. Commercial seed crops are separated 5 miles or more. Plant early in the spring to allow enough time for seed production which can take 4-6 weeks more than the time required to reach eating stage. Remove plants which bolt first, and thin remaining plants to 8" for seed production. Leave one male plant for each two females to ensure pollination.

**FLOWER:** Spinach is "dioecious", with male and female flowers on separate plants. Flowers are wind pollinated by spinach's dust-like, powdery pollen which can be carried for miles.

**WHAT TO NOTE:**

Seed shape: prickly or smooth.

Leaf texture: flat, wrinkled.

**HARVEST:** Some outside leaves can be harvested for eating without harming seed production. If possible, wait until all plants have dried brown. Pull entire plant and hang in cool, dry place if necessary at the end of the growing season.

**PROCESS:** Strip seeds in upward motion and let them fall into container. Chaff can be winnowed. Use gloves for prickly-seeded types.

## **Squash/Pumpkin**

Cucurbita maxima varieties with large, hairy leaves, long vines and soft, hairy stems and include: banana squashes, buttercups, hubbards and marrows

Cucurbita mixta varieties with large, hairy leaves, long vines and hard, hairy stems and include the cushaws

Cucurbita moschata varieties similar to C. mixta with flaring stems at the fruit and large, green sepals surrounding the flowers and include: butternuts

Cucurbita pepo varieties with prickly stems and leaves with a hard, five-angled stem and include: acorn squashes, cocozelles, pumpkins, crooknecks, scallops, spaghetti squashes and zucchinis

**PLANT:** Squashes from different species (see above) can be grown next to each other. Separate different squash varieties in the same species by at least 1/2 mile to ensure purity. Experienced home seed savers grow more than one variety in a single garden by using hand pollinating techniques. Squash flowers are large and relatively easy to hand pollinate.

**FLOWER:** Squashes are monoecious with male flowers and female flowers on each plant. Female flowers can be identified by locating the ovary (a small looking squash) at the base of the flower. (Some female flowers have stamens.)

**INBREEDING DEPRESSION:** Not usually noticed in squash and pumpkins.

**HARVEST:** Squash must be fully mature before harvested for seed production. This means that summer squashes must be left on the vine until outer shell hardens. Allow to cure 3-4 additional weeks after harvest to encourage further seed ripening.

**PROCESS:** Chop open hard-shelled fruits and scoop out seeds. Rinse clean in wire strainer with warm, running water. Dry with towel and spread on board or cookie sheet to complete drying.

### **Beet/Swiss Chard**

**PLANT:** Grow seed for only one variety of beet or Swiss chard at any one time.

**Seed to seed:** Mulch first year crop in the fall to ensure winter survival. The following spring, thin to 18" spacing. **Root to seed :** Harvest roots in fall. Select

desirable roots and trim tops 1-2" above root. Store at 40° F. in humid location.

Replant in early spring at 18" intervals with tops just showing above the soil.

**FLOWER:** Beets and Swiss chard produce perfect flowers. Pollen is light and can be carried for miles by the wind.

**INBREEDING DEPRESSION:** Save seed from at least 6 different beets to ensure genetic diversity and vigor.

**WHAT TO NOTE:**

Root color

Root shape

**HARVEST:** Cut 4' tall tops just above the root when majority flowering clusters have turned brown. Tops can be stored in cool, dry locations for 2-3 weeks to encourage further seed ripening.

**PROCESS:** Small quantities of seed can be stripped by hand as seed matures.

Large numbers of tops can be put into a cloth bag and stomped or pounded. Chaff can be winnowed.

## **Cabbage Family**

Includes broccoli, brussels sprout, cauliflower, cabbage and kale.

**PLANT:** All vegetables and varieties in this large species will cross with each other. Separate different varieties at least 1000 feet for satisfactory results or at least 1 mile for purity. Caging with introduced pollinators or alternate day caging is also recommended in small gardens. Plants to be left for seed production should be mulched in the fall or carefully dug, trimmed and stored for the winter in humid area with temperatures between 35-40° F. Flowering plants can reach 4' in height and need at least 2' spacing for good seed production.

**FLOWER:** Members of the *B. oleracea* species, with the exception of a few early - season broccolis and cauliflowers, require vernalization (cold, winter-like temperatures for several weeks) before flowering occurs. Flowers are perfect, most of which cannot be self-pollinated. Necessary cross-pollination is performed by bees. The stigma becomes receptive before the flower opens, and pollen is shed hours after the flower opens.



**INBREEDING DEPRESSION:** Plant at least 6 different plants to protect vigor and ensure a reasonable amount of genetic diversity.

**WHAT TO NOTE:**

Plant characteristics

Plant color: purple, green, magenta.

Leaf shape: wide, entire, smooth, hairy.

**HARVEST:** Broccoli, cauliflower, cabbage and kohlrabi heads grown for seed should not be trimmed for consumption. Brussels sprouts, collards and kale can be lightly trimmed for eating without affecting quality seed production. If small amounts of seeds are wanted, allow individual pods to dry to a light brown color before picking and opening by hand. Lower pods dry first followed by those progressively higher on the plant. For larger amounts of seeds pull entire plant after a majority of pods have dried. Green pods rarely produce viable seeds even if allowed to dry after the plant is pulled.

**PROCESS:** Smash unopened pods in cloth bag with mallet or by walking on them. Chaff can be winnowed.

## **Carrot**

**PLANT:** Separate different varieties at least 1/2 mile to ensure purity. (Queen Anne's Lace or wild carrot will cross with garden carrot.) Alternate day caging or caging with introduced pollinators allows two or more varieties to be grown for seed in small gardens. Seed to seed: Plant seeds in mid-summer. Finger-sized carrots are more winter hardy than full-grown carrots. Mulch in late-fall to ensure winter survival. Thin to 30" spacing in the spring. Root to seed: Harvest eating-sized roots in fall for replanting in fall or early spring. Mulch if planted in fall. Clip tops to 1 -2" and store at 35-40° F. in humid location or layered in sawdust or sand. Replant roots with desirable characteristics 30" apart with soil just covering shoulders.

**FLOWER:** Carrots produce perfect flowers that are cross-pollinated by a number of insects. Flowers are arranged in round, flat groups called umbels. Carrots

require vernalization (cold, winter-like temperatures for several weeks) before flowering occurs

**INBREEDING DEPRESSION:** Carrots can exhibit severe inbreeding depression. Save and mix seed from as many different carrots as possible.

**WHAT TO NOTE:**

Root color

Root shape

**HARVEST:** For small amounts, hand pick each umbel as it dries brown. Large amounts of seed can be harvested by cutting entire flowering top as umbels begin to dry. Allow to mature in cool, dry location for an additional 2-3 weeks.

**PROCESS:** Clean small amounts by rubbing between hands. Larger amounts can be beaten from stalks and umbels. Screen and winnow to clean. Carrot seed is naturally hairy or "bearded". Debearding in the cleaning process does not affect germination.

## **Onion**

Varieties within each onion species will cross with each other. Crosses between species although not common, are possible. *Allium schoenoprasum*: Common chives *Allium tuberosum*: Garlic chives *Allium fistulosum*: Japanese bunching onions (Occasional crossing between *A. fistulosum* and *A. cepa* has been observed.) *Allium cepa* comprised of three groups: *Aggregatum* includes shallots, multiplier onions and potato onions; *Cepa* our biennial, common storage and slicing onions; *Proliferum* includes the Egyptian or walking onions.

**PLANT:** Separate from other flowering *Alliums* of the same species at least 1000 feet for satisfactory results or at least 1 mile for purity. Caging with introduced pollinators or alternate day caging is also recommended in small gardens. Seed to seed: Plant seeds in late-spring or early-summer. Immature onions are more winter hardy than larger, full-grown bulbs. Mulch in late-fall to ensure winter survival. Thin to 12" spacing in the spring. Root to seed : Harvest in the fall and select the largest bulbs which produce more seed. Clip tops to 6" and store at 35-

40° F. in dry, airy location. Replant in early spring with 12" spacing. Cover bulbs with 1/2" soil.

**FLOWER:** The Alliums produce perfect flowers, most of which are cross-pollinated because stigmas in each flower become receptive only after pollen in that flower is shed. Flowers in an individual umbel open and shed pollen at different times so crosses can and do occur on the same plant. Cross-pollination is performed mostly by bees. Many onions require vernalization (cold, winter-like temperatures for several weeks) before flowering occurs. Store for at least two weeks in a refrigerator.

**INBREEDING DEPRESSION:** Onions display a fair amount of inbreeding depression after two or three generations of self-pollination. Save and mix the seeds from at least two different plants.

**WHAT TO NOTE:**

Bulb color

Heat/Sweetness

**HARVEST:** Clip umbels as soon as majority of flowers have dried. Seeds will start dropping from some flowers at this time so check often. Allow to dry in cool, dry location for up to 2-3 weeks.

**PROCESS:** Fully dried flowers will drop clean seeds naturally. For small amounts, rub remaining flowers to free seeds. For larger amounts, rub heads over screens. Winnow to remove remaining debris.

## **Resource List for Open-Pollinated and Heirloom Seed**

### **Baker Creek Heirloom Seeds**

2278 Baker Creek Road

Mansfield, MO 65704

(417) 924-8917

<http://rareseeds.com>

Catalog: Free online.

Baker Creek has been issuing catalogs for ten years now, and the current one builds on their already impressive offerings. They feature hundreds of non-hybrid vegetables, flowers, and herbs, this catalog is especially strong on hot-weather crops. It lists 44 different eggplants, 175 tomatoes, plus ample numbers of old-time corn, squash, and melons. The other garden vegies are here, too, just in smaller numbers.

### **Bountiful Gardens**

18001 Shafer Ranch Road  
Willits, CA 95490  
fax: (707) 459-6410  
email: [bountiful@sonic.net](mailto:bountiful@sonic.net)  
<http://www.bountifulgardens.org>  
Catalog: Free online.

Offers only open-pollinated varieties, including some newer varieties as well as a fair number of old-timers. Of these, only a few are identified as heirlooms, even though many others, including some fairly rare ones, are also heirlooms.

### **Heritage Harvest Seed**

Box 40, RR3  
Carman, MB, RoG oJo  
CANADA  
(204) 745-6489  
<http://heritageharvestseed.com/>  
email: [seed@heritageharvestseed.com](mailto:seed@heritageharvestseed.com)  
Print Catalog: \$2.00 in U.S. Free in Canada.

Specializing in rare and endangered varieties, this young company's catalog is chock-full of intriguing heirlooms. If those weren't quite enough, HHS offers Canadian originals, Native American vegetables, and short-season varieties. For many of them, HHS is the only commercial seed source. A laudable effort, especially since without niche seed companies like this one, many rare and choice heirlooms would simply cease to be.

### **Johnny's Selected Seeds**

955 Benton Avenue  
Winslow, ME 04910  
1-877-Johnnys (1-877-564-6697)  
<http://www.johnnyseeds.com/>  
Catalog: Free online.

While Johnny's specializes in short-season crops, it also offers a nice selection of heirlooms identified as such.

### **Native Seeds/SEARCH**

526 N. 4th Ave.  
Tucson, AZ 85705-8450  
(520) 622-5561, Fax: (520) 622-5591  
<http://www.nativeseeds.org>  
Catalog: Free online.

Specializing in the traditional foods from the American Southwest and northern Mexico, this non-profit organization offers a wide variety of crops developed by the Hopi, Apache, Navajo, and other farmers throughout the region. This catalog is strong in the "Three Sisters" of American agriculture: beans, corn, and squash, but it also has chile peppers, tomatoes, melons, and lots of other goodies

including tomatillos, teosinte, gourds, and traditional cotton. The descriptions here are short, but these plants tell the real story about biodiversity and the people who care enough to preserve them.

### **Nichols Garden Nursery**

1190 Old Salem Road NE  
Albany, OR 97321-4580  
(800) 422-3985, Fax: (800) 231-5306  
<http://www.gardennursery.com/>

Catalog: Free online.

Offering an intriguing assortment of new and old plants, Nichols' catalog is always a treasure-trove. It has a good selection of heirloom vegetables, including some old-timers that have become popular again, and some odd-balls nobody else seems to have.

### **Ronniger's Potato Farm**

12101 2135 Rd  
Austin, CO 81410  
(877) 204-8704  
[info@ronnigers.com](mailto:info@ronnigers.com)  
<http://www.ronnigers.com/>

Catalog: Free online. Ronniger's Potato Farm has long been known for its amazing collection of interesting potato varieties, including a number of rare spuds. Many are new or relatively so, but they've also got a fine selection of heirlooms. Many of the old-timers here had faded to obscurity, but Ronnigers brought them back and now offers them virus-free thanks to the high-tech world of meristem tissue culture. Certified organic.

### **Seed Savers Exchange**

3076 North Winn Road  
Decorah, IA 52101  
(563) 382-5990  
<http://www.seedsavers.org/>

Catalog: Free online.

Associated with the Seed Savers Exchange, Heritage Farm maintains an astounding 20,000 endangered vegetable varieties. To help finance that worthwhile effort, Heritage Farm sells seeds of heirloom vegetables, herbs, and flowers plus books and posters. Their collection of vegetables, which numbers more than 500 popular varieties, is particularly strong on heirloom tomatoes, beans, and peppers, but also has a nice selection of others.

Seeds of Change  
P.O. Box 15700  
Santa Fe, NM 87592  
(888) 762-7333  
<http://www.seedsofchange.com/>

Catalog: Free online.

Lots and lots of heirlooms, grown organically.

### **Skyfire Garden Seeds**

1313 23rd Road  
Kanopolis, KS 67454  
no phone

Catalog: Free online.

Operated by a long-time member of the Seed Savers Exchange and organic grower, Skyfire specializes in heirloom and open-pollinated vegetables and easy flowers. The catalog offers a wide assortment of all the different vegetables, plus several intriguing in-depth collections. For example, the catalog lists more than 100 different tomatoes, more than two dozen different carrots, about that same number of peppers, and more than a dozen different summer squash. There are some real treasures here, including some hot-weather varieties and others that are rarely sold in the seed trade. What's more, the seeds are priced at only \$1.75 per packet. New to this list, and a worthy addition.

### **South Carolina Foundation Seed Association**

1162 Cherry Road  
Box 349952  
Clemson, SC 29634  
(864)656-2520

<http://virtual.clemson.edu/groups/seed/heirloom.htm>

Perhaps the most interesting source of pass-along and handed-down heirlooms from Georgia and the old South, this foundation offers beans, butterbeans, corn, peanuts, squash, pumpkins, and others adapted to hot summers. Each of these varieties has a rich history, including some traditional Native American and African-American varieties.

### **Vermont Bean Seed Company**

334 West Stroud Street  
Randolph, WI 53956  
(800) 349-1071

In addition to a huge assortment of vintage beans, this seed company offers a good selection of other vegetables. Some are heirlooms, but not all of them are labeled as such.

### **The Victory Seed Company**

P.O. Box 192  
Molalla, Oregon 97038  
(503) 829-3126 (voicemail and fax)  
<http://victoryseeds.com/>

Catalog: free online or \$2.00 (refundable with order) for print version

email: [info@victoryseeds.com](mailto:info@victoryseeds.com)