

# GOOD SEED

## Healthy, Disease Free, and Vigorous Seed From Your Own Farm/Garden

*“Seeds are a gift of nature, of past generations, and diverse cultures. As such it is our inherent duty and responsibility to protect them and to pass them on to future generations. Seeds are the first link in the food chain, and the embodiment of biological and cultural diversity, and the repository of life’s future evolution.”*

Vandana Shiva, Manifesto on the Future of Seeds.

*“Seed saving is a natural next step for passionate gardeners. Saving seeds not only allows home gardeners to save money; it provides them with an opportunity to express their creativity! This is because saving seed is a form of selection – the very basis of plant breeding. When choosing which plants to save seed from, a gardener must decide which plants have the most desirable characteristics in terms of meeting their goals for plant size, yield, fruit quality, maturity date, attractiveness, etc., thus helping to improve the offspring. When you save seed from your garden, you can create a cultivar uniquely suited to your location, your aesthetic sensibilities, and culinary tastes. Saving seeds takes time, planning, and attention to detail.”*

Mark Hutton, University of Maine Cooperative Extension Crop Specialist.

Seed saving is an historical act ...and sadly now a political act. The seeds we plant hold the history of human agricultural activity, the stories of families and communities, and very selfishly, our own food. As seed savers we are participating in an age-old tradition, contributing to continued diversity, preserving family history and stories, and perhaps preserving the genetic material we’ll need in the future for our survival.

But improving and continuing a wonderful variety requires maintaining the purity of that seed – and there are a lot of factors to consider.

The desired level of purity

The type of crop: tomato, corn, squash, pepper... etc.

The location and microclimate of the farm or garden plot

The scale of the planting

The exposure or potential exposure to neighboring crops, including GMO plantings

Understanding the diseases we might encounter so as to produce clean seed that will not spread disease ...

...AND...

the resulting juggling act when determining what measures and precautions need to be taken to achieve the goal.

There are a few manuals with directions for seed saving, and most are very general. For example “Seed-to-Seed”, by Suzanne Ashworth, is considered to be one of the most valuable. “Saving Seeds” by Marc Rogers has practical and down-to-earth discussions about potential problems, isolation methods, etc. Good companion for Seed to Seed

Jeff McCormack, in his manual “Organic Seed Production in the Mid-Atlantic and South”, presents more of the factors that need to be considered for achieving varying levels of seed purity. He also recommends plans for smaller non-commercial seed production. I recommend that you download the entire manual at [savingourseeds.com](http://savingourseeds.com), click on Publications.

“Organic Plant Protection”, Edited by Roger B. Yepsen, from Rodale, is a classic and very accessible tome - it addresses a wide array of topics including repellent, companion, and trap cropping, biological control, using naturally occurring predatory insects, physical/cultural control, repellents and poisons, and insect identification. What follows is a crop-by-crop discussion of the many problems a farmer or gardener might encounter, including helpful references to seed borne diseases.

Another impressive reference is "[Diseases and Pests of Vegetable crops in Canada](#)", by Ronald J. Howard. This is a tremendous reference book for professionals, farmers, and gardeners alike. It addresses pest and disease issues from several directions: identification of various types of pests and general means of dealing with them, and reviewing the major pests and diseases of specific crops. Management strategies include IPM (Integrated Pest Management), monitoring, cultural practices, resistant cultivars, biological control, beneficial insects, mites, and pathogens, and chemical control. What follows, in the book, is a crop-by-crop discussion of major pests and diseases, with complete descriptions of the damage caused and the life cycle of the pest/disease. With this type of information it will be possible to step in a prevent further damage or spreading of problems - and of special interest to seed savers, to prevent carrying disease on seed.

## **A REVIEW OF PRINCIPLES**

Jeff McCormack neatly summed up the principles we need to keep in mind when planning to save seed.

### **The desired level of purity**

Small scale non-commercial seed savers need to make a judgment about the level of purity of seed that is acceptable. Saving only for home use leaves some latitude for outcrossing, and in fact can lead to wonderful new discoveries. The long tradition of saving seeds on the family farm undoubtedly led to many mistakes, and many crosses... and led to the great diversity of food plant varieties that we can enjoy and celebrate today.

However, if you plan to share those seeds at a swap or exchange, seed purity takes on new importance. The seed you share will carry and/or spread impurities and will not fairly represent the variety.

And a step further, seed grown for seed companies MUST be pure.

### **The type of crop: tomato, corn, squash, pepper... etc.** and any special considerations

Obviously different crops have different characteristics. It is important to understand the biology of the variety you would like to save, and understand what it will TAKE, literally, to provide the right environment for saving that variety.

A good example is the blossom structure of tomatoes. Tomatoes are commonly considered to be self pollinated, usually called selfers, but there is a significant difference in blossom structure that makes many varieties vulnerable to outcrossing. Older varieties and specifically the potato leaved varieties (the Brandywines, for example), have a longer stigma – which results in a more open and vulnerable blossom – and are more likely to cross. More modern varieties have a shorter stigma and are less vulnerable.

Another important example is cucurbits. There are discreet species, and all varieties within each species will cross with each other. The simplest method of isolation is to simply plant only one variety within each species, thus eliminating crossing. When this is not possible, hand pollination is the only alternative.

### **Location and microclimate where the crop will be grown**

The local climate, length of season, and any special microclimate factors in the area need to be taken into consideration. It might seem like it would be ideal to carve many small plots into a forested area – after all there would be complete isolation - but wind is needed for some pollination. Access to pollinators is needed, so this is not an optimum solution. Isolation does not mean opting out, but rather working with Mother Nature.

Consider your local climate, the prevailing wind and land contours where you plan to farm/garden and save seeds. Using that information you can determine if some barrier plantings, caging, or season extending needs to happen.

### **The scale of the planting**

Large commercial plantings are simpler in many ways, but are not necessary for good seed saving on a small scale. Respecting a minimum number of plants for good diversity within the variety is necessary, as is understanding the botany and the best method of pollination.

### **The exposure or potential exposure to neighboring crops, including GMO plantings**

It's this simple: you have to know what your neighbors are growing. It's very easy to isolate or effectively manage many small-scale plantings even if your neighbors are farming or gardening. But GMO crops are not acceptable, and wind borne pollen is a reality. Refer to the Jeff McCormack chapter on isolation for excellent guidance.

### **Juggling the factors and deciding that isolation alone will not be enough**

Sometimes simple isolation will NOT be enough. Other methods can be used very effectively.

One choice is **timing**, particularly with crops like corn, where isolation distances are HUGE due to wind pollination. Timing corn crops to "flower" (tassel) at different times is very effective method.

Another factor is using **barrier** crops. With tomatoes, for example, barriers that are tall and dense, like peas, are very effective. In my own experience trellised cucumbers and gourds are also very effective.

Then there is the choice of **caging**. Simple cages, covered with insect proof cloth, can be built to enclose a smaller crop. The cages of two or more varieties can be opened on alternate days to admit pollinators, or pollinators like flies – especially with umbellifer crops like carrots - can be introduced to do the job.

**Hand pollinating** is the method of choice for some crops. Corn, because it is wind pollinated and very difficult to isolate, is frequently hand pollinated. And with cucurbits, which are promiscuous within species, hand pollinating can be the way to go.

### **Understanding the diseases that might be transmitted by your saved seed.**

It is entirely possible to spread many vegetable diseases on seed, and it is important to know which of our common diseases are actually seed borne.

The following are excerpts from articles that I located about *Anthracnose* on beans and cucumbers, and mosaic in lettuce. There is a lot of information available – if your seed saving plans are interrupted by disease your first priority is to have the disease identified. You will then be able to make an informed decision whether or not to save seed.

#### **Anthracnose in beans**

Anthracnose, caused by the fungus *Colletotrichum lindemuthianum*, primarily infects snap beans and dry beans such as pinto, kidney, and navy beans. Anthracnose survives winter in infected plant debris and produces spores in the spring that are rain splashed or wind blown to healthy plants. Anthracnose may also be introduced into the garden on infected seed.

Like many fungal diseases, anthracnose develops quickly during cool, wet conditions. Symptoms are often visible shortly after emergence, but are usually first noticed as small, reddish brown spots on the pods. These spots later enlarge, becoming brown to black and sunken. Occasionally, spots contain a pink jelly-like material which consists of spores. The leaves, petioles, stems, and seeds may all be infected. Leaf lesions are typically observed along the veins as brown lesions, while yellow to brown sunken lesions develop on infected seedpods.

These leaf spots on cucumber are the symptoms of anthracnose, caused by the plant pathogenic fungus *Colletotrichum orbiculare*. The round, tan lesions are 2-10 mm in diameter, and often develop holes or cracks in the center. Lesions can form on leaf blades, petioles, stems and fruit. The spore-bearing structures (acervuli) of the causal fungus are found in the necrotic lesions. They are tan or light orange in

color and contain numerous spores in a slimy matrix. A diagnostic feature of this disease is the presence of dark brown hairs, or setae, in the acervuli. The setae are visible with a hand lens or dissecting microscope.

#### Anthracnose in cucumbers

The fungus can infect muskmelon and watermelon in addition to cucumber. The pathogen survives the winter in infected plant residues. The fungus can also be associated with seed. As with most fungal diseases, long periods of leaf wetness favor disease development. Spores are splashed from leaf to leaf, and plant to plant, during irrigation or rain events. Several disease cycles can occur in a single growing season, resulting in defoliation of severely infected plants.

Management of anthracnose in cucurbits involves both cultural and chemical measures. There are several cucumber cultivars that are resistant to anthracnose –this information is usually listed in the descriptions found in seed catalogues. Remove infected plant debris from the vegetable garden to reduce the amount of spores available for causing infection the following season. Purchase new seed each year, since the fungus can overwinter on seed from infected fruit. Avoid overhead irrigation, which promotes long leaf wetness periods and aids in the spread of the fungus from plant to plant. If anthracnose has been a problem in the past, consider using a protectant fungicide to protect uninfected leaves. Remember, fungicides will not cure leaves with lesions. Always follow label directions when using any pesticide.

#### Mosaic on lettuce

Symptoms of lettuce mosaic vary greatly. Leaves of plants that are infected at a young stage are stunted, deformed, and (in some varieties) show a mosaic or mottling pattern. Such plants rarely grow to full size; head lettuce varieties infected early fail to form heads. Plants that are infected later in the growth cycle will show a different set of symptoms. These plants may reach full size, but the older outer leaves will be yellow, twisted, and otherwise deformed. On head lettuce the wrapper leaves often will curve back away from the head. Developing heads may be deformed. In some cases brown, necrotic flecks occur on the wrapper leaf.

There are several sources of the Lettuce mosaic virus. Since the virus is seedborne in lettuce, infected seed is a primary way of introducing lettuce mosaic to fields. The virus can infect numerous crops and weeds, thereby creating reservoirs of the virus. Lettuce mosaic virus can also be vectored by aphids, which spread the virus within a lettuce field and introduce it into lettuce fields from infected weeds and crops outside the field.

#### **Cucurbits: Extremely Useful Information**

I can't say enough about the potential frustration with saving squash, melon, or cucumber seed. We all know about the amazing and totally inedible surprises from the compost bin. Understanding which species is which will make a huge difference in the initial planning for saving cucurbit seeds. The most common squash varieties fall into four groups – varieties **within** each group varieties will cross – outside the groups there is no crossing. Please see the chart from Jeff McCormack's chapter on cucurbits at the back of the handout. It will be an invaluable guide to help determine the species of the different cucurbits. Take note of *Cucurbita maxima*, *argyrosperma* (mixta), *moschata*, and *pepo*. Cucumbers, *Cucumis sativus*, are in a different group, as are melons, *Cucumis melo*.

In an area where many folks are gardening it may be impossible to isolate a cucurbit crop – so resorting to hand pollinating may be the best idea.

#### **Biennials: A Different Challenge in New England**

Most biennial vegetables are too tricky to overwinter in the ground. The simplest way is to store them well in a root cellar, and then replant healthy roots in the spring. Then the techniques appropriate for each type of vegetable kick in. Isolation is crucial for carrots, parsnips and beets, so plans need to be in place.

## **TAKING UP THE CHALLENGE PERSONALLY!**

I encourage folks to take on new challenges – a small planting of carefully tended and hand pollinated squash plants is one of my goals for this coming season. In order to do that I need to take stock of OUR situation as you will have to in order to save these seeds.

For example, here's my line of thinking:

I would like to save tomato and pepper seeds that are pure enough to share and offer through Seed Savers Exchange.

I need to save seed from several tomato and pepper varieties every year. It would be a great challenge to add 2-3 squash varieties to the seed saving list.

Our gardens are raised beds nestled on a southeasterly facing slope. There is an extreme temperature difference between the topmost and lowest beds. We also have the option of planting in unheated poly-tunnels. Observation: it is not practical to plant many cucurbit seed crops in the lowest gardens. I need to craft my rotation to allow cucurbit seed crops to be in the unheated houses and the upper gardens.

I will continue to be a small-scale seed producer, but need to respect the minimum plant population recommendations, especially for tomatoes. I DO have neighbors who grow cucurbit crops, so I will have to plan for hand pollinating. And in addition our beds are very closely spaced.

Conclusions:

Because of the tight quarters, I'll need barrier crops, at least row covers, and probably some insect proof cages. AND I'll have to plant most of the cucurbits in the upper gardens to ensure that they will mature. Because I'm planting more peppers each year I need to build some cages for that crop and try using alternate day opening for good pollination.

And so on to another season! Our tomato and pepper seeds are available through the Seed Savers Exchange Annual, due out soon. It is a wonderful challenge to save seeds well – and very satisfying. And of course the bonus is that you will be able to enjoy those favorites on the dinner table. Good gardening and farming to all!

**SEED SAVING ORGANIZATIONS AND SEED COMPANIES  
THAT OFFER NON-GMO, ORGANIC, AND OPEN POLLINATED SEED**

Seed Savers Exchange  
[www.seedsavers.org](http://www.seedsavers.org)

Baker Creek Heirloom Seed Co.  
[www.rareseeds.com](http://www.rareseeds.com)

Bountiful Gardens  
[www.bountifulgardens.org](http://www.bountifulgardens.org)

Eastern Native Seed Conservancy  
P.O. Box 451  
Great Barrington, MA 01230

FEDCO Seeds  
[www.fedcoseeds.com](http://www.fedcoseeds.com)

Kokopelli Seed Foundation  
[www.kokopelli-seed-foundation.com](http://www.kokopelli-seed-foundation.com)

Native/Seeds SEARCH  
[www.nativeseeds.org](http://www.nativeseeds.org)

Peaceful Valley Farm Supply, Inc.  
[www.groworganic.com](http://www.groworganic.com)

Sand Hill Preservation  
[www.sandhillpreservation.com](http://www.sandhillpreservation.com)

The Scatterseed Project  
Will Bonsall  
39 Bailey Rd.  
Farmington, Maine 04938

Southern Exposure Seeds Exchange  
[www.southernexposure.com](http://www.southernexposure.com)

Territorial Seeds  
[www.territorialseeds.com](http://www.territorialseeds.com)

Turtle Tree Seed  
[www.turtletreeseed.com](http://www.turtletreeseed.com)

Wild Garden Seeds  
[www.wildgardenseeds.com](http://www.wildgardenseeds.com)

High Mowing Seeds  
<http://www.highmowingseeds.com/>

## BIBLIOGRAPHY

**Seed to Seed**, Seed Saving and Growing Techniques for Vegetable Gardeners (2nd Edition)  
Suzanne Ashworth, Seed Savers Exchange, 2002.

This book has been considered the standard reference, for vegetable seed saving, for many years, and is in its second edition. If you have or can get the first edition, all the basics are unchanged, and for most seed savers it has all you'll need. There is some additional material in the second edition.

**Saving Seeds**, The Gardener's Guide to Growing and Storing Vegetable and Flower Seeds  
Marc Rogers, Storey Publishing, 1990

This is a very inspiring little book. It's filled with specifics about each plant family including very practical and down-to-earth discussions about problem solving, isolation methods, etc. Good companion for Seed to Seed.

**The Wisdom of Plant Heritage: Organic Seed Production and Saving**  
Bryan Connolly, NOFA, 2004

The book is part of the NOFA (Northeast Organic Farming Association) series about Organic Principles and Practices. It has valuable additional information about seed cleaning, hot water treatment to eliminate seed borne diseases, and a major list of seed companies that offer heirloom and open pollinated seed.

### **Seed Sowing and Saving**

Carole B. Turner  
Storey Books, 1997

The information here is fabulous! The book is intended to take you through the growing process as well as the final seed saving. It is arranged by plant family, has fabulous illustrations, and summary information for each plant including: temps for germination, time to germinate, planting instructions, seed storage, and in most cases, average seed viability.

### **Growing Garden Seeds, A Manual For Gardeners and Small Farmers**

Robert Johnston, Jr. Originally published in 1976, second edition 1983

Very specifically a manual designed for northern growers. Lots of practical and well presented advice. It would be wise to consult Seed-to-Seed or Jeff McCormack's publications for isolation distances.

### **Saving Our Seeds**

Jeff McCormack, USDA-CREES and SARE 2004, [www.savingourseeds.org](http://www.savingourseeds.org)

With the support of SARE Jeff McCormack has created a set of invaluable manuals for the serious seed saver. Most important is his material on isolation, and in addition there are manuals for tomato, pepper, bean, cucurbit and brassica seed saving.

### **Vegetable Seed Production, 2<sup>nd</sup> Edition**

Raymond A.T. George, CABI Publications

A comprehensive review of the diseases that afflict vegetable crops and those that can be carried on seed. Heady and out-of-print. Check with Extension folks to read a copy as buying a copy is \$\$\$\$\$.

### **Organic Plant Protection**

Edited by Roger B. Yepsen, Jr, Rodale Press Inc. 1976, available in used book stores and on Amazon

From A to Z – Acerola to zucchini! Discusses the pests and diseases that present challenges to successfully growing fruit and vegetable crops, trees, flowers, and herbs. A good basic reference loaded with information presented for the layman.

## Bibliography, continued

### Diseases and Pests of Vegetable Crops in Canada

Edited by Ronald J. Howard, J. Allan Garland, and W. Lloyd Seaman, the Canadian Phytopathological Society

Invaluable photos! This is a great reference book that is completely relevant to New England. In a crop-by-crop listing, diseases are discussed including symptoms, the disease cycle, and management suggestions. The photo gallery is incredibly comprehensive and helpful.

### Excellent web Resources

<https://www.gardenmedicinals.com/>

This is Jeff McCormack's current seed company.

<http://howtosaveseeds.com/index.php>

huge

<http://www.seedsave.org/issi/issi.html>

general, but very comprehensive re INBREEDING DEPRESSION

[http://eap.mcgill.ca/MagRack/COG/COG\\_P\\_97\\_05.htm](http://eap.mcgill.ca/MagRack/COG/COG_P_97_05.htm)

written by director of Seeds of Diversity, Canada

Excellent discussion of saving OP corn seed

<http://umaine.edu/publications/2750e/>

Basic seed saving article by Extension Vegetable Specialist Mark Hutton

<http://www.highmowingseeds.com/SB-Seedborne-Disease-and-Its-Control.html>

Good article by Jodi Lew-Smith, PhD, Director of Research and Production at High Mowing Seeds

<http://www.highmowingseeds.com/pdfs/vegetable%20planting%20guide.pdf>

Informative chart including LOTS of planting information.

Look this up on google. The book is there electronically!

[Pests, Diseases, and Disorders of Peas and Beans: A Color Handbook](#)

By Anthony J. Biddle, Nigel D. Cattlin, John M. Kraft

<http://www.highmowingseeds.com/blog/seed-viability-chart/>

<http://vegetablemdonline.ppath.cornell.edu/>

<http://www.savingourseeds.org/> - for specific cucurbit information, see pages 3 and 4

<https://dl.dropbox.com/u/1953132/amy/SEED-BORNE-DISEASE-REFERENCE-LIST.pdf>

<https://dl.dropbox.com/u/1953132/amy/SEED-VIABILITY-2013-NOFA.pdf>