

Compiled by Ilana Stout

Additional Seedy Resources:

Hawaii Heritage Seed Project Facebook Page

Hawaii Island Seed Stewards Facebook Page

Hawaii Public Seed Initiative

Home: <http://kohalacenter.org/hpsi>

Resources: <http://kohalacenter.org/hpsi/resources>

Seed Variety Selection Tool for the Hawaiian Islands: <http://kohalacenter.org/hpsi/svst>

[A Handful of Seeds: Seed saving and seed study for educators: Lessons by the Occidental Arts and Ecology Center :](http://www.oaec.org/wp-content/uploads/2014/10/A-Handful-of-Seeds.pdf)

<http://www.oaec.org/wp-content/uploads/2014/10/A-Handful-of-Seeds.pdf>

[From Generation to Generation : a Seed Saving Activity guide by Fedco Seeds](http://www.slideshare.net/S7w4X/zwv51)

<http://www.slideshare.net/S7w4X/zwv51>

[Free Seed Saving Guide by Organic Seed Alliance](https://seedalliance.org/index.php?mact=DocumentStore,cntnt01,download_form,0&cntnt01pid=12&cntnt01returnid=139)

https://seedalliance.org/index.php?mact=DocumentStore,cntnt01,download_form,0&cntnt01pid=12&cntnt01returnid=139

[SeedBroadcast “agri-Culture” journalism project : http://seedbroadcast.org/SeedBroadcast/SeedBroadcast.html](http://seedbroadcast.org/SeedBroadcast/SeedBroadcast.html)

Regenerations International Botanical Garden and Kauai Community Seed Bank:

<http://ribg.org/>

Hawaii Island Native Seed Bank:

<http://www.mahaloaina.org/homepage/projects/hawaii-island-native-seed-bank-cooperative/>

Guidelines for Successful Seed Storage & How to Make A Miniature Home Seed Bank

A. Yoshinaga, Center For Conservation Research, June 2005,
Revised by L. Howe & I. Stout, Hawaii Public Seed Initiative, Aug 2016

Although the Royal Botanic Gardens-Kew Mini Seed Bank (for a description see <http://www.kew.org/science-conservation/save-seed-prosper/millennium-seed-bank/support-the-msb/buy-mini-seed-bank/index.htm>) is a fully functional seed storage device, it is currently unavailable and is prohibitively expensive to buy and ship for many prospective users. You can make your own similar home seed storage unit from easily available supplies.

What You Will Need (See Appendix for mail order information)

1. Shallow containers with airtight lid:

To serve as a drying chamber. Rubbermaid 1 gallon or 2.1 gallon rectangular boxes are a convenient size.

2. Drying Agent:

The most popular drying agent is silica gel. Allow 1+ lb. (2 Cups by volume) for each container. Available from craft supply stores, where it is sold for drying flowers. Sometimes available for free in small packets from places that receive electronic equipment. Note: Pure silica gel is white, but silica gel is often mixed with an indicator to show when it needs recharging. There are some health concerns about cobalt chloride, the blue/pink indicator that is widely used. These are most serious for fine grain silica gel, which can be inhaled as dust. An alternative is to use orange indicator silica gel, or plain silica gel with a separate humidity indicator. Another drying agent is calcium chloride, sold at Long's Drug store as "Damp-Rid."

After silica gel has absorbed moisture, it can be re-dried for use again by baking or microwaving. For instructions see <http://www.southernexposure.com./library/drying-seed-silica-gel.html>

Other Drying Agents:

Charcoal, powdered milk, and rice are all effective drying agents when baked. None are as efficient as silica gel, so correspondingly larger quantities are necessary. If you use these, you can get inexpensive humidity indicators from Gaylord as Standard Humidity Card, item #62031
<http://www.gaylord.com>

3. Airtight Storage Containers To Store Seeds:

If small, airtight containers are not available, you can store in a non-airtight container that is then placed inside a larger, glass jar with a rubber-gasket. Snap-lid vials are available from Southern Exposure Seed Exchange or laboratory supply companies (see **Sources** at end of this article).

4. Labels For Airtight Storage Containers:

If you want to store the seeds for more than a few years, consider getting archival grade labels. Adhesive labels from stationary stores may fall off after a few years. You can enclose a piece of paper with information written in pencil and put this inside the storage container.

5. Humidity Indicator Card:

Useful to judge when seeds are adequately dried or drying agent needs Recharging (see **Sources** at end of this article).

6. Seed Drying Dishes:

We recommend shallow, flat containers like jar lids.

HOW TO PROCEED

1. Know What Seeds Can Be Stored, Not All Seeds Can Be Stored And Still Retain Germination.

If you are uncertain, try looking in the Royal Botanic Garden Kew Seed Information Data Base (SID). First, find the scientific name of the plant, and then go to: <http://data.kew.org/sid/sidsearch.html>
Find the SID storage classification for the seeds.

1. If the seeds are “**orthodox**” you should be able to store the seeds for years by drying as described below and then storing them frozen in airtight containers. Refrigerated storage also works well.
2. If the seeds are “**intermediate**” then storage can be trickier. You might be able to store them refrigerated.
3. If the seeds are “**recalcitrant**” they are desiccation sensitive and are thus held at ambient temperatures. It is not practical to store them for more than a short time. It is best to germinate them soon after collection.
4. If you cannot find the seeds in SID, you may be able to guess whether the seeds can be stored. Small seeds that dry on the parent plant are usually “orthodox.” Large seeds that are moist when ripe (like mangos) are almost always “recalcitrant.”

2. Collect Ripe, Healthy Seeds

Unripe seeds will not store well. Seeds are usually ripe when fruits are fully ripe or starting to dry. Ripe “orthodox” seeds are typically firm and dry, and are often darker than unripe seeds. (Some seeds may require additional ripening after collection). Remember, viable seeds are alive. After collection, treat them like fresh produce. Keep them in a cool, ventilated place (if you keep them in plastic bags, leave the top unsealed so that the seeds/fruits can breathe). To prevent mold, they should not be wet. Try to process them as soon as practical after collection.

3. Separate and Clean Seeds

If you process the seeds wet then you should air-dry them. Do not use heat to speed drying as this will shorten the storage life - use moving air instead.

4. Dry the Seeds to the Correct Moisture Level for Storage

Under the warm, humid conditions in Hawai‘i, most stored seeds deteriorate rapidly. Air-drying will not dry them enough for good storage life. (See information of Drying Seeds below).

While seeds are drying it is a good idea to germinate some of the seeds to make sure they are really viable. You may need to use special treatments to break dormancy. Seeds of some plants need a period of “after harvest ripening” before they will germinate. Ask other growers for advice.

5. Pack the Seeds for Storage

After you dry the seeds, you need to pack them in airtight containers. Otherwise the seeds will absorb moisture from the air and undo the results of your drying efforts.

Many containers are not as airtight as you might think. For airtight storage, we recommend using containers with rubber gaskets. If you have many small containers of seeds, you can put the small containers into larger gasketed containers - (exception - if you use a self-defrosting refrigerator for both drying and storing the seeds, airtightness does not matter so much. (SEE DRYING SEEDS FOR STORAGE BELOW).

DRYING SEEDS FOR STORAGE

1. Drying in a Self-Defrosting (No-Frost) Home Refrigerator

This is an easy method if you have a self-defrosting refrigerator - if ice does not build up in your refrigerator, you probably do. The self-defrosting unit naturally keeps the air inside the refrigerator dry. You can make use of this to dry seeds by using the following procedure:

- A. Spread the seeds in a thin layer (1 seed deep is ideal if possible) in a container with an airtight lid, but leave the lid off.
- B. Place the container into the refrigerator and leave it there for a month or so for the seeds to dry.
- C. When you are ready to store the seeds, open the door of the refrigerator and immediately put the lid on the container so that moisture does not condense on the seeds (The lid must be at the same temp as the seeds, not room temp). Take the container out of the refrigerator and let it come to room temp before opening it.
- D. Once the container has come to room temp. You can open it and pack the seeds for storage. Alternatively, you can just store the seeds inside the refrigerator in open storage but this will take up more space.

2. Room Temperature Drying in Plastic Containers

If you do not have space inside of the refrigerator, you can dry seeds inside of airtight plastic containers.

A. Spread the seeds into a shallow container in a thin layer (1 seed deep is ideal), and then put the container into an airtight plastic container with drying agent. See below for sources of silica gel. For seeds to be refrigerated or frozen, we recommend calcium chloride, sold at Long's Drugstore and hardware stores under the brand name "Damp-Rid." Mix the calcium chloride with a little water until it is the texture of soggy shaved ice (it will get hot when you add the water). Fill a cup about 1/2 way with the slurry and put the cup into the airtight container. Do not let the slurry touch the seeds.

Store the remaining calcium chloride in an airtight container - if you expose it to air, it will pick up water and dissolve. You can dispose of the used calcium chloride solution by pouring it down the drain. Calcium chloride is not poisonous (it is an ingredient of canned tomatoes), but will corrode metals.

B. Whether you use silica gel or calcium chloride, place the drying container in a cool place away from the sun. Check the container from time to time to see whether the silica gel or calcium chloride needs replenishing. If the silica gel becomes saturated, replace it with fresh silica gel. If the calcium chloride dissolves completely, add some more crystals.

C. Allow the seeds to dry for about a month, and then pack them for storage.

STORING THE SEEDS

Seeds of most garden and crop plants store best when dried and kept at low temperatures. In most national seed banks, the preferred method for long-term storage is freezing to near zero degrees F, which is the temperature in a home freezer or in the freezing compartment of a home refrigerator. For year-to-year storage, many people store the seeds near 39 degrees F, around the temperature of a home refrigerator. In developing countries, dried seeds are often stored at room temperature inside airtight containers, but cold storage is better, if available.

If the refrigerator or freezer fails, it is not a disaster. Changing temperatures during storage will not harm the seeds, but when they are warm they will age much faster than when they are cold. When the temperature drops, they will go back to aging slowly.

Our recommendations for storage conditions, once the seeds have been dried:

1. **First choice:** Freezing
2. **Second choice:** Refrigeration (seeds of wild plants store better refrigerated than frozen but this is rare for cultivated plants).
3. **Third choice:** Room temperature after proper drying, in airtight containers.

GERMINATE A SAMPLE FROM TIME TO TIME

If you store the seeds for more than a few years, you may want to take out some of the seed to test from time to time. Even under good storage conditions, seeds will eventually deteriorate. When the first signs of reduced germination appear, it is time to replenish the seed supply. Southern Exposure Seed Exchange has a good guideline at <http://www.southernexposure.com/how-to-test-germination-ezp-162.html>

PREPARE THE SEEDS FOR SOWING

Seeds that have been dried for storage may become damaged if they absorb water too fast. This will lead to poor germination or unhealthy seedlings. To prevent this, allow the stored seeds to pick up moisture from the air slowly before sowing them. You can do this by putting them in a sealed plastic container with a damp paper towel for a day. (Do not let the damp towel contact the seeds). In Hawai'i we can just expose them to open air for a couple of days.

NOTE: If you have stored seeds in the freezer or refrigerator, allow them to come to room temperature before opening the storage container. Otherwise, moisture will condense on the seeds. If you do not use all the seeds, reseal the container immediately. You do not have to re-dry the remaining seeds unless the volume of air in the container is much greater (100 times) than the volume of seeds

NOW YOU CAN SOW THE SEEDS!

SOURCES OF SUPPLIES

Southern Exposure Seed Exchange carries supplies for small-scale seed storage operations, including airtight vials, heat-sealed envelopes, and indicator silica gel. Note that indicator silica gel is more expensive than plain silica gel. Their website has detailed information on handling of silica gel.

Southern Exposure Seed Exchange
P.O. Box 460
Mineral, VA 23117
(540) 894-9480
<http://www.southernexposure.com>

Gaylord carries archival storage supplies, including silica gel, humidity indicator cards (item #62031) and archival labels in many sizes.

Gaylord Bros.
P.O. Box 4901
Syracuse, NY 13221-490
(800) 634-6307
<http://www.gaylord.com>

The Hawai'i Conservation Alliance Seed Storage Manual lists other sources of supplies
http://www.ctahr.hawaii.edu/ougc/downloads/Internet_Resources_for_Seed_Storage.pdf

Hawai'i Public Seed Initiative, a project of The Kohala Center, has seed growing and storing information and downloads online on the resource page. This organization also sometimes has mini-seed bank kits available for purchase, if you are interested in purchasing a kit contact seedproject@kohalacenter.org/hpsi

hawaiiseedgrowersnetwork.com will be opening their online marketplace with seeds they have been growing and evaluating for local adaptation for Hawaii's farmers and gardeners. Visit their website and the Meet the Farmers pages to get to know the farmers that have been developing this high quality, locally adapted seed statewide. Local Seeds For Local Needs will be available in 2017.