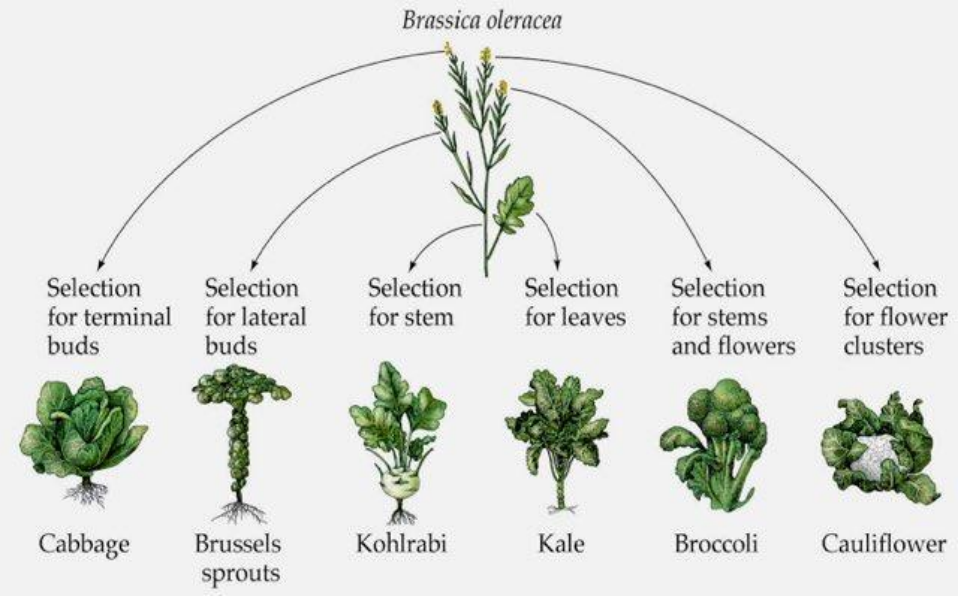
Growing Brassicas for Seed Saving

"Brassica" is the common name of a wide variety of nutritious plants in the cabbage family. The name comes from their scientific name, *Brassica oleracea* (cabbage, kale, broccoli, cauliflower, kohlrabi), *Brassica rapa* (turnip, Chinese cabbage, bok choy, Asian greens), and *Brassica napus* (rutabaga and Siberian kale). Over millennia, these three species have been selected for various characteristics, rather like dog breeds.



Artificial selection of wild* Brassica oleracea *(mustard)

Brassicas are relatively easy to grow. They are cool-season vegetables that can withstand light frost. Some very cold-tolerant varieties (down to -12^{o}C) can be used for winter harvest, which should be planted in late summer.

Saving seeds of brassicas is more challenging than for many other crops, as most are biennial (flower and set seeds the second year after planting). They won't flower until the mature plants are exposed to low temperatures for a sustained period of time. This cold exposure is called *vernalization*.

A few types, like broccoli, some cauliflowers, and Asian greens only need a short period of cold exposure at night. This often occurs in late August here in the Creston valley, so they will flower

the same year they are planted, and are therefore annuals. Broccoli heads are composed of flower buds, which if not harvested, will open to yellow flowers that produce seeds.

Another challenge for seed gardeners is that they require insects for pollination and all members of a species will cross-pollinate with each other. Gardeners need to know the species name of the varieties they plant if they want to save seeds. For example, cabbage and European kale are the same species and will cross pollinate, while head cabbage and Chinese cabbage won't, because they are different species (see footnote[1] at end).

Because insects can fly long distances, varieties of the same species must be separated by at least 200 m (650 ft). But this is only for flowering and seed production. For example, in 2020, you grow a row of cabbage next to a row of broccoli. The broccoli would flower at the end of the growing season and produce seeds, but the cabbage would not. You can then protect the cabbage over winter and it would flower and set seeds in 2021. You couldn't, however, grow cabbage and kale one season, protect them from freezing over winter, and then let both flower for seed saving unless they were separated by 200 m.

If you want to save seeds from Siberian kale or rutabagas, make sure there are no fields of canola nearby. Most varieties of canola will cross-pollinate with rutabaga and Siberian kale - they are all the same species. But canola and Siberian kale won't cross with European kales, like Lacinato.

Lacinato kale.

Preparing the Garden

To do well, brassica crops should be rotated in the garden on a 3-year cycle. Make sure the garden site has good drainage. Remove any weeds and dig or rototill the bed. You should not dig very wet or very dry soil, as this can harm the soil structure. Brassicas need organic matter and

are heavy feeders (meaning that they need high amounts of nutrients). Add manure, compost, or organic fertilizer and dig it in. Rake the bed smooth and allow it to settle for a few days if it is fluffy.

Sowing and Planting

You can plant brassica seeds directly into the garden in late April/early May or start them indoors in early April. Annual brassicas like broccoli should be planted as early as possible so they will have time to mature and set seeds. Biennials overwinter better when they are young, so plant these in May or early June. Plants that will be overwintered in the ground should be spaced about 45 cm (18") apart in the row to give the large flowering stalks and seed heads room. Biennials that will be dug up and stored over winter should be spaced as recommended for the variety, but spaced much wider when replanted the following year.

Some brassicas, like sprouting broccoli, are planted in mid to late summer and overwintered so they produce the edible flower heads the following spring. Winter cabbages are also planted in late summer and then harvested for food through much of the winter, or overwintered for seed-saving.

Starting Plants Indoors – early April

- Wash any seeding containers that you have used before in hot water and then dip them in diluted bleach (1 part bleach to 10 parts water) to prevent "damping off," a fungal disease that could kill new seedlings overnight.
- Fill small containers (like 6-cell plastic containers) with commercial seeding mix (not potting soil). You can use a regular seeding mix or one with added fertilizer. Water the mixl in the containers thoroughly.
- Label each cell or container. Popsicle sticks work great if you are doing lots of plants – use a permanent non-fading black marker, and put the variety name on both sides of the stick.
- Put 2 seeds of one variety into each cell or container, about ¼" deep. Gently tamp the soil down over the seeds.
- Cover the containers with plastic wrap or a tray cover to keep them moist.
- Check the seed containers daily to make sure the soil stays moist, but let the surface dry before you water again (to help prevent damping off).
- Sprouts should appear from 3 to 6 days after planting.
- As soon as you see them coming up, remove the cover and put the new seedlings into bright light. They will need 10 to 12 hours of light a day.
- The first leaves are seed leaves (called *cotyledons*). If you used a regular seeding mix without fertilizer: When true leaves (the second set of leaves) start to grow, make up a solution of about one-quarter strength liquid organic vegetable fertilizer. Apply this to the seedlings every other day. *Do not fertilize seedlings that were planted in seeding mix with added fertilizer.*
- When the second set of true leaves appear, increase the amount of the fertilizer added to water so the solution is about half strength.

- Let the seedlings grow for 2 or 3 more days, then start hardening them off by putting them outside during the day and bringing them in at night for a couple of days. Be sure to keep them moist.
- The seedlings can then be transplanted to the garden outside.

Planting Outdoors - May

- For seeds, dig a row 2-3 cm (1 inch) deep and put the seeds in the row 3-5 cm (1-2 inches) apart.
- Cover with about 0.6 - 1 cm (¼ – ½ inch) of soil, tamp down and water thoroughly with a soft spray. The shallow trench will help retain moisture.
- When sprouts appear, let them develop the second set of true leaves, then thin to about 6 cm apart. Eventually they should be thinned to 20 – 50 cm (8 – 20 inches), depending on the type and variety.
- For plants that were started indoors, dig a series of holes spaced 6 cm apart along the row; the holes should be twice the size of the root ball.
- Add 125 mL (1/4 cup) of Gaia Green organic fertilizer to the bottom of the holes and dig it in. Scoop out the soil to re-form the hole.
- Water the holes and the plants in the containers.
- Gently remove the seedlings and root ball from a cell. A teaspoon works well to do this.
- If you have 2 seedlings in the root ball, carefully separate them.
- Put one plant into the hole slightly lower than ground level. Fill in with soil only up to the top of the root ball, then put the other plant in the next hole and fill it in. Tamp down firmly. Continue until the row is planted.
- Put a variety label on the row or near plants. Use a non-fading marker like Sharpie Extreme on large sticks or narrow pieces of yogurt tub. Don't use popsicle sticks – they won't survive the summer. A map of your garden is always a good idea.

Watering

Use a fine spray or drip irrigation to keep the seeds or plants moist, especially while the seeds are germinating and the plants are small. Drip irrigation or soaker hoses work best for larger plants, as overhead watering can promote powdery mildew. Straw mulch will help conserve moisture.

Pests

Brassicas are attacked by a number of pests, but particularly cabbage worms (Cabbage White butterfly caterpillars), flea beetles, and aphids. These annoying pests can destroy brassica crops. The best defense against these is floating row cover (Reemay cloth). Put it very loosely over the plants when seedlings emerge from the soil or as soon as they have been transplanted into the garden. Put rocks, bricks, soil, or lumber along the edges of the row cover to keep it in place when it is windy and to prevent pests from getting under it. When you take the cover off to check your plants or weed, remove only a part of the cover at a time and work quickly. For seed saving, remember to take the cover off when the plants are ready to flower so insects can pollinate them.

Some pests overwinter in soil or debris near the garden, so it is important to grow brassicas only where no brassica crops have grown for the previous 3 years. Good garden sanitation, including tilling in the fall or spring, will help.

Cabbage White butterflies will lay eggs on unprotected brassicas beginning in mid-summer. The eggs are yellow, tiny, and laid individually, usually on the under sides of leaves. The eggs hatch into caterpillars, which feed on the leaves.

Cabbage White butterfly and leaves damaged by caterpillars.

Seedlings are especially vulnerable to flea beetles. These insects are tiny and black, and will jump away quickly if they are disturbed. They chew shot-holes in leaves, and will kill young plants very quickly. Established plants aren't harmed as much. Diatomaceous earth, yellow sticky traps, and other organic control methods could be tried, although these also kill beneficial insects.

Flea beetles.

Aphids are a common problem on brassicas. Check your plants regularly. Look under leaves and along stems. New leaves will curl up when infested by these insects. If you catch them early, try spraying them off with a strong jet of water. Insecticidal soap will kill them on contact, but any that escape will continue to reproduce. Floating row cover will help protect the plants. Aphids are very capable of finding their way under it, however.

Aphids on broccoli leaf.

Harvesting for Food

Many brassicas require a long growing season. Leafy brassicas like kale and Asian greens can be harvested by taking off leaves and allowing the plant to keep growing. The main heads of broccoli and cauliflower can be harvested when ready in early fall, and then side shoots will grow for further harvests. Cabbage is harvested in fall or early winter. Sprouting broccoli is harvested in the spring of the year after planting, while the root vegetables turnip and rutabaga, as well as kohlrabi (actually the swollen stem of the plant) are harvested at the end of the growing season.

Seed Saving

Saving seeds from annual brassicas is relatively easy. Some varieties of Asian greens, like mizuna and tatsoi, will bolt (produce flowering stalks) if they are exposed to temperatures below 10^{o}C for a few weeks when first planted in spring. This is not a desirable trait and seeds should not be saved from these plants.

- Grow only one variety within a species.
- Grow at least 6 plants per variety.
- Make sure they correspond to the characteristics of the variety and are strong and healthy.

Saving seeds from biennial brassicas is more complicated. Some varieties are very cold tolerant and can be left in the ground over winter if mulched heavily. Other varieties won't withstand freezing. These plants would need to be dug up and stored in an area that remains above freezing.

- Save seeds from only one variety within a species.
- Keep at least 8 plants per variety.
- Make sure they correspond to the characteristics of the variety and are strong and healthy.
- Plants must reach a certain maturity and then be exposed to a sustained cold period of 6 to 12 weeks.

Recommendations for Saving Brassica Seeds.

SPECIES AND TYPE	CYCLE	OVERWINTER	VERNALIZATION		SEASON
	annual (A) or biennial (B)	In ground (G) or remove for storage (S)	below temp ^{o}C	Weeks needed	Best planted in:
Brassica oleracea					
Broccoli	A	n.a.	10	1 - 4	early spring
Cabbage	B	S	10	10 -12	late spring
Brussels sprouts	B	G	10	10 -12	late spring
Cauliflower	B*	G, S	10	10 -12	late spring
Kohlrabi	B	G, S	10	10 -12	late spring
Kale, curly kale	B	G	10	10 -12	late spring
Sprouting broccoli	B	S	10	6 - 8	summer
Brassica rapa					
Turnip	B	G, S	7	6 - 8	early summer
Chinese cabbage	B	S	7	6 - 8	early summer
Bok choy	A	n.a.	7	1 - 4	late spring
Broccoli raab	A	n.a.	7	1 - 4	early spring
Asian greens	A	n.a.	7	1 - 4	early spring
Brassica napus					
Rutabaga (swede)	B	G	4	10 -12	early summer
Siberian kale	B	G	4	10 -12	late spring

*a few varieties are annual

Information derived from Buttala and Siegel 2015.

Overwintering

Although the minimum number of plants that should be retained for seed-saving is 6, there will be some loss over winter, so try to keep 8 to 10. Trim off loose or damaged leaves. Take off the large outer leaves of head cabbage. Label the plants if you are overwintering more than one species.

Most brassicas will not withstand freezing because ice crystals form inside plant tissues, which could rupture when the plant thaws. Some varieties, such as kohlrabi, can freeze solid as long as both freezing and thawing are gradual. A heavy layer of mulch allows for this gradual change in temperature.

Other varieties will not overwinter in the ground even under mulch. These plants must be carefully dug up after the first frost, including the roots.

For root vegetables like turnip and rutabaga, dig them on a warm, dry day. Shake off as much soil as possible (don't wash them) and spread them out on the garden bed. Leave them there for several hours to harden the skin. Turn them once so the part that was touching the ground gets exposed to air. For vegetables like kale and cabbage, dig them up, shake off the soil from the roots (don't wash them), and they are ready to store. Discard plants with damaged roots or ones that don't look healthy.

Put the plants in a container such as a plastic bin. Separate them so they don't touch. Put shredded newspaper or straw over the roots to retain moisture. Put the bin in an area that is as cold as possible without going below freezing. A root cellar is ideal, or an unheated garage. Keep the roots barely moist. The plants should be checked every week or two to make sure they haven't dried out or rotted. If the tops start to shrivel, they are too dry; if moldy, they are too wet. Don't put the lid on the bin unless the plants are drying out, then put it on loosely.

In early spring, prepare the garden and plant the overwintered brassicas as described on p. 2. Most biennial brassicas should be planted about 50 cm apart. Cabbages have dense heads that can prevent the flower stalks from emerging. Cut a 2 cm deep "x" in the top of the head after planting. Put row cover over the plants until they start to flower.

Seed Production and Harvesting

The flowering stalks of most brassicas will grow up to 1.5 m tall, so staking these is recommended. *Remember to take the row cover off of the plants so pollinators can reach the flowers.* The yellow flowers will produce seed pods over an extended period of time. The pods must mature on the plant to have viable seeds. The pods are mature when they are dry and brown. The seeds inside the pod should be reddish brown to dark brown.

Harvesting the pods can be a challenge because the pods shatter easily, resulting in seed loss. Branches can be cut into a large bag or cloth on the ground. Or, the whole plant can be cut and put onto a tarp or other cloth. The plants should then be moved to a protected area and allowed to dry for a few days. The pods are ready for threshing when they can't be dented with a fingernail.

Brassica seed pods.

Seed Cleaning

Several methods can be used to thresh brassica seed pods. Small quantities of pods can be rubbed between one's hands. Branches and whole plants can be put on a tarp, the tarp folded over, and then walked on. Or branches and plants can be beaten against the inside of a garbage can.

The larger material can be picked out manually, and then the remaining chaff removed by winnowing and screening with 1-3 mm mesh. If further cleaning is needed, a piece of felt can be put over a board and one end raised; the seeds and chaff are slowly poured down this ramp. The chaff will stick to the felt and the round seeds will collect at the bottom.

Record Keeping

Fill out an evaluation form for each variety. This information will help seed bank staff decide which varieties should continue to be grown for the seed bank. It will also help determine whether the seeds you planted were "true", not a hybrid. For example, if you planted a type of head cabbage and the plants remained leafy, your seeds may have come from plants that were cross-pollinated. Include photographs if possible.

If you keep a journal with notes on gardening activities, you won't have to try to remember when you planted which variety and how it grew. Then it is easy to fill out the evaluation form.

Storage

Store seed bank seeds and your own in a paper envelope in a cool, dry place. Your own seeds will last for years in the refrigerator if they are very dry. Put seed envelopes in a jar with a tight

lid. Just make sure the type, variety name, and the year is on each envelope. For seeds you will donate back to the seed bank, also put your initials on the envelope.

References

Buttala, L. and S. Siegel, eds. 2015. The seed garden: the art and practice of seed saving. Seed Savers Exchange, Inc. Decorah, Iowa. 390 p.

Seeds of Diversity Canada. 2013. How to save your own seeds. A handbook for small-scale seed production. Toronto, Ontario. 68 p.

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November 2021
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Thank you Laura, for your review and edits. P.H.

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[1] Species: the scientific name of plants or animals that share common characteristics and are capable of breeding and producing viable offspring. Species have two names that always go together, called *Genus* and *species.* The first part of the name, *Genus*, may include a number of species. Genus is capitalized and species is not.

For example, the genus name of kale is *Brassica. Brassica oleracea* is the species name of kale, cabbage, and broccoli. *Brassica rapa* is the species name of turnip and bok choy. These 2 brassica species will not cross-pollinate (interbreed and produce brassica seeds that grow).

Variety: Within species are varieties. For example, Houston Evergreen Cabbage, Lacinato Kale, and Calabrese Broccoli are all varieties of the species *Brassica oleracea.* Varieties of the same species can cross-pollinate, resulting in viable seeds that would produce hybrid plants the following season.