

Raising a Bulb Collection from Seed

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Every summer I lift and repot about half of the 1300-plus kinds of bulbs I grow plunged in cold frames and sell the surplus bulbs through an informal list. It always surprises me how avid other gardeners are to buy certain kinds, such as species *Narcissus*, that can be grown easily from seed. I acquired around three-quarters of my collection by purchasing seeds or getting them through exchanges or wild collection, beginning around 1990. I was inspired to do this when the late Molly Grothaus, a fine bulb grower, brought a pot of *Fritillaria raddeana* in flower to a NARGS chapter meeting. She mentioned that she had grown the plants from seed, and noticing my enthusiasm, she later gave me some of the seeds they had set. Today I still have half a dozen of the original bulbs grown from those seeds.

Why, then, doesn't everyone who wants bulbs grow them from seed? Some say, "I don't have a place to grow seeds." In most climatic regions in North America, all you need is a flat place that can, perhaps, be covered during inclement weather. Even the worst carpenter in the world (and that would be myself) can knock together a simple cold frame, a box of boards or masonry blocks, and cover it with something translucent. I grew many of my first garden plants, including bulbs, in this way, though I now keep vulnerable seedlings in a solarium fitted with plant benches. Some growers in severe-winter regions grow seedlings in a basement under lights.

Others object, "It takes forever to get a flowering bulb from seed." It can take many years for certain bulbs to flower, notably tulips, but most kinds can be raised to flowering size in four or five years, and some (*Allium* or *Crocus*, for instance) take only three. Some cyclamen, such as *C. hederifolium*, can even be flowered in a year. If you're willing to plant a small tree or shrub and wait years for it to grow into a characterful specimen, you probably have the patience to raise a daffodil too.

The pros of growing bulbs from seed far outweigh the cons. If germination is reasonably good, it saves money, even when you invest \$8 in a packet of 20 seeds and only 10 or 12 germinate. A "population" of seed-grown bulbs contains a number of different clones, genetically varied, so the grower can select the most vigorous or attractive, and the plants are much more likely to produce fertile seed than are purchased bulbs, which may have been vegetatively propagated from a single clone. Many growers feel that bulbs grown from seed to maturity in one garden adapt better than mature bulbs brought in from elsewhere. Finally, home-grown seedlings are far less likely to be infected with the plant viruses and fungal or bacterial diseases rampant in commercial stock.

A "population" grown from seed is likely to display some color variation. You may get appealing hues like those seen in the photos of *Fritillaria pinardii*, *F. stenantha*, and *Cyclamen pseudibericum* (pp. XX–XX). Seed saved from plants in cultivation may produce bee hybrids, such as that between *Fritillaria aurea* and *F. pinardii* (raised by Wim de Goede; p. XX) or several crosses between *F. purdyi* and *F. biflora* that arose in my own collection (p. XX), and these hybrids may have extra vigor as well as aesthetic interest.

Most of all, you can grow species from seed that are rarely if ever available as bulbs: western American *Calochortus* and *Brodiaea* from Ron Ratko's Northwest Native Seeds or Sally Walker's Southwest Seeds, collections from Central Asia and the Caucasus from a range of Czech specialists, or Mediterranean *Crocus*, *Iris* and *Narcissus* and Iranian *Fritillaria* from Jim and Jenny Archibald (now also offering John Watson and Anita Flores's South American collections), along with special discoveries in the NARGS Seed Exchange and similar exchanges. Your own wild collections will be priceless souvenirs of your travels, like the *Alstroemeria umbellata* (p. XX) I grew from seeds I collected on a steep scree above an Andean canyon.

General procedures

Different growers use different seed-sowing mixtures, but most of us stick with just one formula for almost all seeds. Mine consists of one part sieved peat, one part ground horticultural pumice, and two parts coarse, gritty sand, since these are materials readily available in my area. Many growers substitute Perlite for the pumice favored in the Pacific Northwest, and many like to use vermiculite in seed mixes. My mix works well for me but the pots are heavy to lift in the large flats I use; on the other hand, I think it retains moisture more evenly than mixes with artificial ingredients, since the pumice absorbs some water and releases it very slowly. As an alternative, John Lonsdale reports that BioComp BC5 – a composted peanut hull-based compost available to growers in eastern North America – when mixed 50:50 with super-coarse Perlite, makes an excellent light, well-drained, moisture-retentive sowing and growing medium for all bulbs.

When to sow. A few kinds of bulbs have seeds with short viability in storage, and they are best sown as soon as possible after ripening, although some germination can be expected in most cases even if sowing is delayed but the seeds have been correctly stored. Examples include most bulbous *Corydalis*, *Fritillaria meleagris*, *F. camschatcensis* and possibly other northeast Asian species, some species of *Colchicum*, subtropical amaryllids such as *Zephyranthes* and *Habranthus*, and many of the ephemeral woodland geophytes. To predict short viability, consider where the plant grows naturally: if seeds are likely to encounter moisture immediately after ripening and being disseminated, they may be short-lived, but if they ripen during a long dry season, they probably can withstand dry storage for months or even years. Art Guppy's discussion of *Erythronium* in this issue is a perfect example of a genus in which species native to summer-rainfall areas have short-lived seeds while those from dry-summer regions have long-lived seeds.

The majority of geophytes (plants that spend part of their annual cycle as underground storage organs, such as bulbs, corms, and tubers) come from regions with moist winters and dry summers. Their seeds can be stored dry at room temperature until early fall and sown in cool, moist conditions at that time. The seeds should not be frozen, although some species tolerate freezing at this stage, but they should be kept cool – under 60° F/15° C – through the winter. I keep my ungerminated seed pots outdoors on a roofed deck, but when intermittent subfreezing temperatures are likely, I examine them frequently and place the seedlings that appear in a frost-free, cool solarium. A few kinds of bulbs can stand freezing when very young, but most cannot.

If you don't get your seeds until after the New Year, I recommend sowing them right away. Some will experience a long enough chill to germinate in the current year, and others will remain dormant through an entire year and then germinate the following year. I have sown seeds received until April with success, but John Lonsdale writes, "If I get anything after the middle-end of February I refrigerate them until the fall. Here on the east coast anything that germinates in late spring doesn't get enough time to build up a decent bulb before going dormant, and the seedlings are all too easily lost in the summer." The difference in our experiences is probably due to the cooler temperatures, especially at night, during spring and summer in the Pacific Northwest where I live.

How to sow. I sow most bulb seeds on the surface of the seed soil mix, cover them with about 1 cm of fine granite grit, and press the surface down gently but firmly with a flat-bottomed pot. Large seeds, such as those of *Iris* species, can be covered with extra soil mix. Some small seeds, particularly *Crocus*, also benefit from deeper planting. Some growers plant flat seeds like those of *Lilium* and *Fritillaria* on their edges, but others think this is unnecessary.

Care before germination. Keep the pots slightly moist and unfrozen, in full light. Protect them from rodents; I find cheap "bird netting" adequate for this. Examine them frequently and move young seedlings into a well-protected place with strong light. Seeds of many bulbs, especially *Cyclamen*, fall-flowering *Crocus*, and western North Americans (notably *Brodiaea* and related genera) germinate in the fall. Pots containing ungerminated seed of dry-summer species can be allowed to dry out in summer, with watering resumed in fall. Gardening in Pennsylvania, John Lonsdale finds this very important on the east coast, where keeping bulb seeds moist in summer heat causes many to rot, especially crocuses and erythroniums.

Care after germination. This is a tricky period for the young bulbs. Provide as much sunlight as possible during winter, but shade them lightly in summer (in nature, they would probably be shaded by larger plants). Watch carefully for aphids, which are especially attracted to *Iris*, *Crocus*, and other *Iris* family members. You can remove a few aphids by hand, but I use a systemic granular insecticide applied to the soil. I don't recommend spraying any product (even "organic" ones) on new seedlings. Another problem is damping off, especially in *Calochortus*; I don't know of any effective treatment, and the best way to avoid it is to grow your *Calochortus* seedlings as cold as possible without freezing them, and maintain as much air movement as possible. Naturally, protect the seedlings from slugs, snails, and other plant predators.

Apply a liquid fertilizer, diluted to about half the strength recommended by the manufacturer, to the seedlings two or three times during their growing season. Some growers add a small amount of superphosphate to the seed soil mix.

Keep the seedlings moist but not soaking wet as long as they are growing strongly. Eventually they will approach their natural dormancy and begin to wither. Unless they're plants of constantly moist habitats (e.g., *Fritillaria meleagris*), reduce watering at this time and put the pots in a dry, shady position; I cover them with mesh-bottom flats and leave them on the covered deck, out of the sunlight. You can also cover trays of seedling pots with sheets of Styrofoam used as building insulation, which helps greatly to protect young bulbs from desiccation.

Moving on. Growers differ in when they transplant seedling bulbs into a new growing medium. I like to replot many kinds after their first year, but I leave *Crocus* and

most *Calochortus* species in their seed pots for two years to develop corms large enough to handle easily. John Lonsdale prefers to leave all bulbs in seed pots for at least two or often three years. Let the seed pot's soil dry out so you can spot the young bulbs. Some will be obvious, others not. If you can't see any bulbs, don't despair; just put the soil back into the pot and set it with your ungerminated seed pots, and perhaps another cohort of seeds will sprout next year. When I find only a few bulbs in a seed pot, I top up their new pot with the soil from the seed pot, and often there are more seedlings to follow. I also fill in between the pots in my bulb frames with soil from harvested or completely failed seed pots, and sometimes this "last chance" produces plants.

To pot on the bulbs, fill your growing pot (because I plunge the pots in sand, I prefer clay but also use plastic mesh "aquatic" pots; John Lonsdale uses ordinary plastic pots) almost up to the intended surface level and distribute the little bulbs on it. They don't need to be very deep at this time – one inch (2.5 cm) below the surface is fine for most kinds, unless you find them at the bottom of the seed pot. Cover them with more of the soil mix you've chosen, and mulch with grit if you wish. I use a soil mix of 2 parts coarse, sharp sand, one part ground pumice, and one part forest topsoil. I don't mulch the tops of most pots because I have so many and replace the soil every other year, but it's probably better to do so.

John Lonsdale comments: "I use the BioComp:Perlite mix for everything, and always mulch with granite grit. I know we differ here – I always underpot to protect against overwatering, and find that bulbs like to be in a fairly confined space. Others use Styrofoam packing pellets with single or a few bulbs to bulk out the pot." I've tried the packing pellet strategy but found that it interferes with proper drainage and results in a disgusting mess during repotting, so don't recommend it either.

It can be difficult to tell which end is up when dealing with seedling bulbs, but the good news is that in most cases it doesn't matter; they'll figure it out for themselves. Some, such as *Narcissus* and *Erythronium*, are vertically elongated and should be oriented properly. Others, such as *Allium* and Old World *Fritillaria*, make little round bulblets that seem to cope well with being sown at random. Crocus cormlets can also be "sown." The roots will plunge downward and the stem upward, and in another year the bulb will be positioned normally.

Keep the young bulbs in pots until you feel they're mature enough to go into the garden. If you're putting them in troughs, they can go directly from seed pot to trough as long as they won't be overwhelmed by other plants while tiny. I believe that bulbs grown in pots are best plunged in some well-draining medium, preferably sand. If, however, you're growing them in solid plastic pots, plunging is not necessarily beneficial; most growers just stand them on a bench, perhaps on a layer of sand or gravel. For more information on managing bulbs at this stage, see my chapter on frames in the NARGS/Timber Press book *Rock Garden Design and Construction*.

Notes on genera

Following are some observations on seed growing of individual genera of geophytes, including some dicots often included in bulb collections.

Allium. Almost all are easy from seed, which is available in great quantity and variety through exchanges. Most germinate within 3 months from fall to winter planting. The tiniest species, many from the American West, should be left in seed pots 2 years, but most can be identified and replanted during their first dormancy. Some species are summer-growers (e.g. *A. cernuum*, *A. cyaneum*) and should be grown like herbaceous perennials rather than summer-dormant bulbs. Many species flower in 3 years from sowing.

Alstroemeria. Not a bulb, but often grown in collections of geophytes. The seeds appear to benefit from a period of warm dry storage before sowing. Germination occurs in cool, moist conditions, usually within one year. Seedlings can be transplanted carefully when they have 4 leaves. Don't leave multiple seedlings in a single pot for too long, since the brittle roots will be difficult to disentangle.

Anemone. Species with "cottony" seeds coated in fluff tend to remain viable in storage, but those with smooth seeds usually do not. Germination of stored seed can be erratic, with seedlings appearing sometimes after 3 years, so keep the pots. Do not dry out the young seedlings completely after they go dormant. They can be potted on while in new growth the second year after germination, or, if the seed pot contains only one or two plants (as often happens), simply remove the entire soil mass into a larger pot of growing mix, or a rock garden site, while the plant is dormant, setting it at about the same level in the soil.

Arum. Plant the large seeds well down in the pot. Germination can be erratic over several years. The young tubers are easily identified and should be potted on after one year, because they will enlarge rapidly. The top of the tuber has a little, folded-over "topknot."

Bellevalia. Easy from seed, flowering in 3 years. The lovely turquoise *B. forniculata* should not be dried out completely at any time of year. The young bulbs are usually glossy white and should be planted with the narrow end upward.

Biarum. See *Arum*. Germination in this genus seems better than in *Arum*, and flowering can occur in 4 years from sowing.

Brodiaea. Germinates at a high rate within 3 to 5 months of fall planting, often within weeks if the seeds have been stored for any time. Seeds remain viable for many years in dry storage, whether or not temperature-controlled. Small brown bulblets are readily identifiable. Flowering takes 3 to 4 years from sowing. Give large species plenty of depth for growing.

Calochortus. Seeds remain viable a long time in dry storage. Most species germinate well within 3–5 months. Sow thinly to help prevent damping off, a common problem in this genus, and keep the seedlings as cool as possible without freezing them. Most species, other than the largest and most vigorous, are best left in the seed pot for 2–3 years. The bulblets are brown, fibrous-appearing, and much elongated, and should be planted about three times their length deep in the soil. Flowering typically takes 4 to 5 years, sometimes less in *C. venustus* and its close relatives.

Chionodoxa. Germination is fairly high, with most bulbs flowering in 3 years.

Colchicum. Plant seed fresh if possible. Stored seed germinates very erratically, if at all; keep seed pots up to 5 years. Germination appears to be environmentally triggered, as typically several species from several years' sowing will germinate within days of one another, often in a midwinter warm spell. The seeds tend to rise to the surface, so plant

them rather deep with plenty of grit top-dressing. Small species can flower in 4 years from germination, larger ones perhaps taking longer. Growing colchicums from seed is only for the patient and expense-tolerant.

Corydalis. Fresh seed germinates far better than stored seed in most species, and seeds can be damaged by rough handling in the mail, so this is another gamble. Nevertheless, a small number of seeds, even from stored stock, may germinate. The seed pots should not be dried out severely, even in the case of dry-summer dwellers, and plants should be left in the seed pots for 2 years.

Crocus. Germinates fairly well, usually at the time of year the species would normally begin foliage growth. Plant the seeds deeper than you would normally place such small seeds, because a radicle (first root) emerges first and can push up above the surface if the seed (which is on the tip of the radicle) is placed too shallowly. The leaf emerges a little later, but in the same season. The seedling corms are mostly very small. Flowering takes 3 to 4 years.

Cyclamen. Fresh seed germinates much better than stored seed, but enough germination can be obtained from stored seed to make it worth a try. Germination is somewhat erratic. Tubers are identifiable after one year but can be left in the seed pot two or three years to advantage, unless very crowded. Do not let the dormant tubers dry out severely, but don't keep them too moist either when it is hot, and keep them in the shade. John Lonsdale, who has an extensive collection of this genus, covers dormant pots of all *Cyclamen* species except *graecum*, *persicum* and *rohlfsonianum* with Styrofoam sheets.

Dichelostemma. See *Brodiaea*.

Erythronium. See the feature article in this issue for detailed information on seed viability. Eurasian and eastern American species' seed should be planted fresh; western American species' seed remains viable in dry storage for at least one year. Germination of the latter from fall planting is high, and bulblets can be moved on during their first dormancy. They are elongated, and the larger end, usually lighter in color, is the bottom. No species should be "baked." Some flower in 3 years, most in 4 to 5.

Fritillaria. A few species (*F. meleagris*, *F. camschatcensis*, and possibly other East Asian natives) have short seed viability and must be planted fresh and not allowed to dry out completely at any time. Other species remain viable in dry storage for one year, with germination rates diminishing greatly thereafter. Some growers plant the seeds "on edge," but I don't find this necessary. Germination of Old World species usually occurs 3–5 months after sowing, but North American species planted in fall often germinate almost immediately. Bulblets can be left in the seed pots for 2 years, but they are easily identified unless you use perlite in the mix (they look like slightly irregular pearls). Fertilizing is especially beneficial in this genus, but use a dilute strength.

Galanthus. Snowdrop seeds apparently do not remain viable in storage and should be planted immediately after ripening. After germination, do not allow the pots to dry out completely, and keep them in a cool site even while dormant. Keep in seed pots for 2 years.

Gladiolus. I grow mostly the hardy Eurasian species, very easy from seed, germinating copiously and flowering in 3–4 years. The small, elongated, brown first-year bulblets are hard to identify, so leave them in the seed pots 2 years, providing ample fertilizer.

Gymnospermium. This tuberous member of the Podophyllaceae is popular with bulb collectors and can be increased only via seeds. Plant the large seeds at a good depth in a well-drained soil mix. The young tubers are light brown and easily identified. This is a fairly large plant, so move them on to a pot with plenty of depth after one year. The seeds have elaiosomes eaten by ants, and volunteers often appear some distance from the parent plants.

Iris. Growing irises of the Reticulata section from seed is a good choice, because they germinate readily, reach flowering size relatively quickly, and can thus be freed of the prevalent Ink Spot disease (as long as you keep them away from commercial Reticulata bulbs). First-year bulblets are quite small. Also popular with bulb enthusiasts are members of the Scorpiris (Juno) section. The large seeds should be sown deeply and germinate erratically over several years. Handle the young dormant plants very carefully so as not to damage the developing storage roots.

Leucojum. Many former members of this genus have been moved to *Acis*, and it is in the latter genus that we find those most likely to have storage-tolerant seeds; *L. vernum* and *L. aestivale* should be sown fresh. The *Acis* species (including the much-grown former *L. autumnale*) tolerate dry dormancy and germinate readily. Seedlings are small.

Lilium. The growing requirements of this huge genus are too varied to condense here. For details see Edward McRae's book *Lilies: A Guide for Growers and Collectors* (Timber Press, 1998). Because viruses are such a severe problem in lilies, growing species from seed is strongly recommended.

Muscari. Most are very easy from seed, forming good-sized first-year bulblets, usually glossy white with an obvious enlarged base.

Narcissus. A top choice for seed growers. Seed germinates readily and produces easily identified brown, elongated bulblets the first year. (John Lonsdale comments, "Elongated bulbs are often a sign of too-shallow planting – plant them deeper and they'll become round.") Don't dry them out completely. Smaller species can flower the third year. Garden-collected seed is likely to produce hybrids unless the stock is carefully hand-pollinated.

Ornithogalum. Another easy genus that can be moved on during its first dormancy.

Scilla. Most germinate readily the first year and can be moved after one season.

Sternbergia. Import restrictions make this a genus needing seed propagation. Germination can be erratic, suggesting that seeds be planted fresh even though sternbergias come from dry-summer regions. The brown bulblets develop quickly.

Triteleia. See *Brodiaea*.

Tulipa. Germination is usually moderately successful, but you may wait many years for flowers. A few species (e.g., *T. cretica*, *T. sylvestris*) flower when fairly young. Move the bulblets on to pots with plenty of depth. Another genus where widespread virus disease in commercial stocks makes seed growing desirable.

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