

1. Cold-germinators are still referred to as frost-germinators, although this isn't quite correct. The sowing must be kept warm (about +18 to +22°C) [about 64 to 72°F] and moist for the first 2–4 weeks. After this period the sowing must be kept at a cold temperature (between –4 and +4°C) [between 25 and 39°F] for another 4–6 weeks. Colder temperatures of –5°C [23°F] are only advantageous for most species of the Ranunculus family. It is not so important if the temperature is higher or lower during the cooling period, but the cooling period has to be prolonged because the synthesis of the germination inducer, hormon-like acid, slows down or comes to a standstill.  
  
It is beneficial to cover the sowing with snow during the cooling-period. The temperature below it usually keeps in the optimum range of –4 to 0°C [25 to 32°F]. The sowing is kept moist, and the melting snow helps to destroy the shell, which is advantageous for the germinating seedling. After this cooling-period the sowing may not be immediately exposed to high temperatures. The most effective temperatures are between +5 to +12°C [41 to 54°F], even if germination has started. The best location for this sowing, even in March, April and May, is the open field, the cold frame or a cold greenhouse.
2. Most species of the Ranunculus-family need lower temperatures during the cooling-period – about –5°C [23°F]. In other respects follow the directions in 1. above. The reason is probably the freezing point of these seeds, which is at –7°C [19°F], while most other seeds freeze at –5°C [23°F].
3. These species usually show excellent results if sown soon after the harvest, although most of them only germinate in spring after the effect of winter. For best results please order seeds in time.
4. These are very tiny seeds which should be mixed with finest sand or talcum for an even sowing. Do not cover with compost, only press them in gently. Irrigate from the bottom or with a hand-sprayer, so that the seeds will not be washed away.
5. The directions of 1. do not always show the best results. After the cooling-period some species need a longer time until germination starts. As some seeds do not germinate until the next year, it is important not to throw away the seed boxes too early.
6. These seeds germinate extremely late, sometimes it takes one year or longer before germination starts. To best utilize space and avoid drying out, this seed must be "stratified" (placed in layers of wet sand – alternately a thin layer of seeds and a layer of well-moistened sand, etc.). The stratification boxes have to be kept in the shade to benefit from weather effects – especially winter. A fine wire mesh will protect them from mice and birds. Nurseries have found that concrete boxes are useful for large amounts of seed. In spring frequently check to see if germination has begun. When germination has started, the seeds must be sown immediately in the prepared bed with the moist sand.
7. These seeds must be covered with a layer seed kernel diameter. Keep daytime temperatures at approximately +20°C [68°F], and keep the moisture constant, for Cyclamen, however, +18°C [64°F] is recommended. The seeds must be kept in the light and moderately warm after germination.
8. These perennial seeds germinate very irregularly over a long period. Lower temperatures of less than +5°C [41°F] are very effective. Seed trays should not be discarded prematurely. Constant moisture must be maintained. Do not leave in direct sunlight. For Alstroemeria we recommend to keep sowing for 3 weeks at approximately +30°C [86°F], then 3 weeks at +5°C [41°F], then at +21°C [70°F].
9. These seeds germinate rapidly depending on species and origin. If germination does not occur after 3–4 weeks a cooling period of 2–4 weeks is recommended.
10. For these bigger hard-shelled seeds, mechanical damaging of the shell is helpful for quicker swelling. One method is to grind the seed in dry sharp sand. They can also be treated for several hours in a "softener" (Polyethylenglycol 6000), which is used for the production of plastic material.
11. Opuntias germinate more effectively the second year after harvest. Fresh seed often lies in the ground for about a year before germination.
12. No cooling-period is necessary, but these seeds usually need several months until complete germination.
13. Allow these large seeds to swell up in water for 2–3 days. If a "softener" is used only soak for a maximum of one day. After that cut off a thin slice of the seed close to the germcone so that the embryo is almost bare. Place seed with the cut facing up in a moist seed compost e. g. Vermiculite. This must be covered tightly with glass, a good interval from the seeds. The rising air pressure, at temperatures of about +22°C [72°F], accelerates the germination.
14. A warm period of +25 to +30°C [77 to 86°F] and moist conditions after sowing for about 4–5 weeks neutralizes the germination inhibition. The phytohormones which inhibit germination will then break down. At this point the sowing needs very cool conditions, approximately +2°C [36°F]. Initial germination lasts for about 80 days under these conditions. During this period keep in dark cold storage chamber. Then temperature and lighting must be increased gradually.
15. Rapidly germinating, keep seed in constant moisture (not wet) with temperatures of about +20°C [68°F]. Seeds must be covered thinly. Do not cover very small seeds, but tightly press into the earth. Keep in cooler conditions after germination occurs.
16. See 15 with the exception of germination being slower and more irregular. This poses no problems.
17. Waterplants must be sown in waterproof plastic trays or similar containers containing a nutritious muddy compost. Fill water up to 1 cm over the top of the compost. Keep the trays at warm temperatures of approximately +22°C [72°F].
18. See 17. Allow the seed trays to be left for only 2–4 weeks at warm temperatures, then keep at 0°C [32°F] for another 4–6 weeks. It does not matter if the water freezes. After this treatment allow temperature to rise gradually.
19. To stop the germination inhibition give seeds a warm compost (about +22°C) [about 72°F] with constant humidity for at least 6 weeks. Then keep cold (–4 to +4°C) [25 to 39°F] for 6–8 weeks. Usually, the germination starts at +4°C [39°F]. Raise temperatures gradually up to +10°C [50°F] until germination is completed. If the warm or cold period was not long enough the seeds will not germinate until the following year. They will then need another warm period (summer) and a cold period (winter). Well-known examples: Cimicifuga and Helleborus.
20. To obtain best germination results, seeds need temperatures of +22°C [72°F] or more. Moderate, but constant humidity is very important. Gunnera, however, prefers very moist (not wet) and warm (+24 to +30°C) [75 to 86°F] conditions.

### General remarks:

Never put the sowing into a freezer with temperatures below –5°C [23°F]! The expansion of the freezing water in the seed cells is too rapid. The cell membrane can not tolerate the pressure compensation. The cell wall would be destroyed and the seed would die. Rapid drops in temperature below the freezing point do not occur naturally. A normal, slow rise in pressure can be tolerated by the cell membrane, its permeability taking care of an osmotic equalization of pressure.

It is possible to use a refrigerator with a temperature of about 0°C [32°F] to create an artificial cooling period. Since it is usually not possible to put the seed trays into a refrigerator, you can mix the seed with moist sand. It should be put into a plastic bag and placed into the refrigerator after the required warm period. The sand must be kept constantly moist. After the required cooling period sow the sand with the seed into seed trays and leave at required temperatures.

**Copying or reprinting these sowing directions, even in excerpts, is not permitted. These directions should only be used for the sowing of seeds supplied by us. Other uses, e. g. for teaching, are only authorized by our permission in writing.**