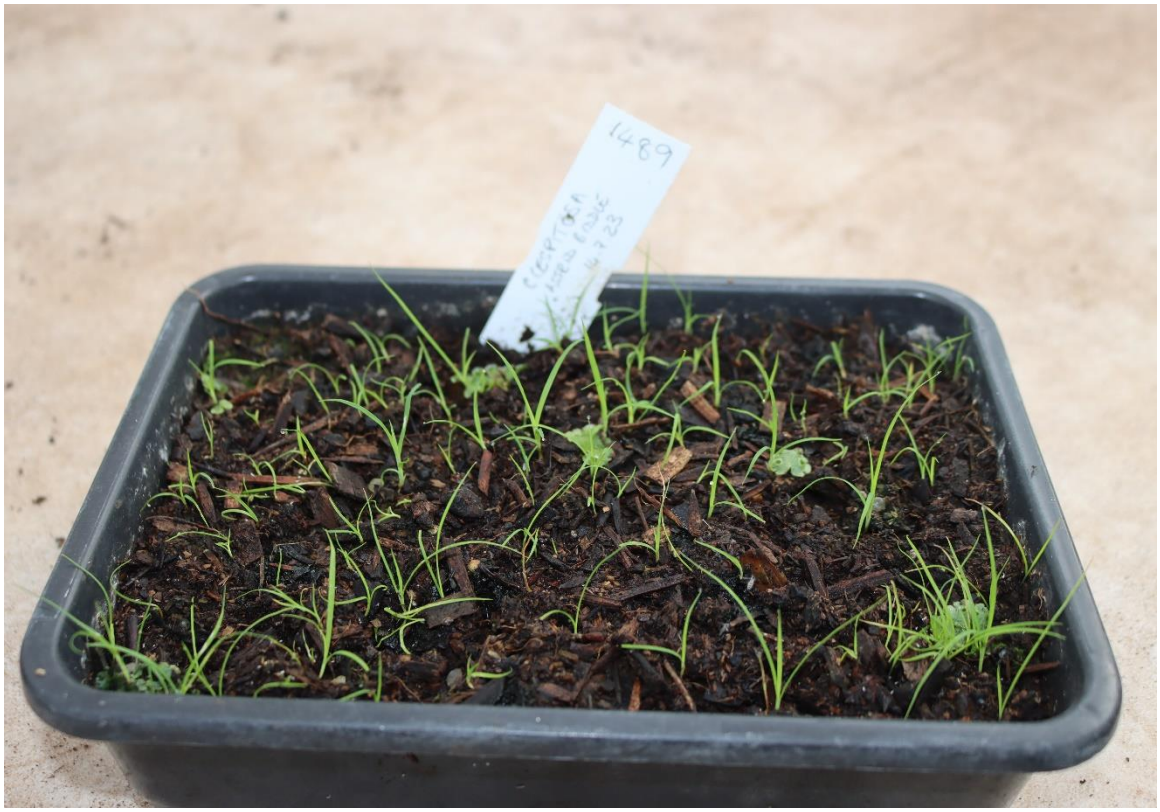
Germinating seed of wild plants: notes from Nosterfield habitat creation nursery



Introduction

Since 2018, the Lower Ure Conservation Trust's nursery at Nosterfield Quarry, North Yorkshire, has been growing local-provenance wild plants for habitat creation projects. Most of our work concentrates on fen and calcareous grassland species. This note summarises our principal technique for germinating seed and some of the results to date.

Seed - collecting, storing, germination

Most plants start to release their seeds when they are mature, and usually this is the best time to collect them, when pods begin to open and capsules and flower heads begin to shed seed. Seed is best collected when conditions are reasonably dry. It can be held in paper bags, envelopes, cotton or similar bags, anything permeable. A few of the plants we grow germinate best when sown as soon as the seeds ripen: examples include Tufted Sedge *Carex elata* and Kingcup *Caltha palustris*. Others have prolonged dormancy and require special treatments to promote germination.

All species must have at least one method of delaying germination of seed until it has been successfully dispersed and until conditions favour seedling survival. In many plants the seeds contain inhibitors, which must be broken down before germination can occur. Often a period of dry storage is required for this, as in most of the plants selected as the earliest agricultural crops. Some of these breakdown reactions are faster at low temperatures, which naturally occur over winter. With some fruits, the germination inhibitors are in fleshy parts surrounding the seed, which need to be washed off the seeds e.g. tomato. In all these cases, what may appear a 'dormant' stage is actually a period of considerable metabolic activity. Other mechanisms which delay germination can include hard coats which prevent water and oxygen reaching the seed, embryos which are immature and continue to develop, changes in membranes and protein structures. Most seeds require light for germination, and some also need repeated cycles of fluctuating temperatures.

Practical

We attempt to grow around 80 species from seed, and apart from those which germinate readily in Spring, or those where we know individual needs for germination, our approach has been to pick one treatment which should allow seed germination for most species. We carry out a simple cold moist stratification in a domestic fridge over winter, which has the advantage of saving an enormous amount of space in our nursery, and keeping the seed safe from being eaten.

We use:

- Cleaned seed
- Peat-free compost, or fine bark. (Colour contrast makes it easier to see germination than in sand)
- Small re-sealable plastic bags with write-on panels
- Sharpie permanent marker
- Old plastic bowls and spoons for mixing seed and compost.

Method

- For each seed sample, write the lot number (if you use one), plant name and date on a bag.
- Record the same information on paper or on a computer.
- Mix the seed thoroughly with compost or bark.
- Add water to make the mixture moist, but not wet.
- Put the seed & compost mix into the bag, seal it. (A small disposable water cup with the bottom cut out to use as a funnel can make this less messy)
- Rinse bowl, spoon and funnel with water, then wipe with kitchen towel.
- Repeat for each seed lot.
- Put the bags in a domestic fridge (this will normally be at 4 to 5 ^{o}C)
- The bags of seed will need to be inspected for germination after about a month, and more regularly thereafter.
- As soon as the seeds in a sample start to germinate, ignoring obvious weeds (usually grasses), the contents of the bag can be spread over a seed tray or pot of appropriate size, labelled, then watered.
- Do not cover with compost - most seeds require some light for germination.

Our first batches of seed went into the fridge in November.

All remaining seed lots are removed from the fridge in late March and kept at ambient temperature, as some species need exposure to fluctuating temperatures to stimulate germination.

Not all the species we germinate this way require winter chilling but it's a convenient method.

Results

Table 1 below shows the months in which seed began to germinate. Results are from seed sown in Nov/Dec 2021 and 2022.

Species	English name	Jan	Feb	Mar	Apr	May	Jun	Jul
Achillea ptarmica	Sneezewort		●					
Astragallus danicus	Purple Milk-vetch[1]						●	
Briza media	Quaking-grass	●						
Carex canescens	White Sedge						●	
Carex disticha	Brown Sedge[2]						●	
Carex echinata[3]	Star Sedge				●	●		
Carex lepidocarpa	Long-stalked Yellow Sedge				●			
Carex nigra	Common Sedge					●		
Carex paniculata	Greater Tussock-sedge							●
Carex pulicaris	Flea Sedge			●				
Carex rostrata	Bottle Sedge[4]				●	●		●
Carex spicata	Spiked Sedge							●
Carex vesicaria	Bladder Sedge				●	●		
Centaurea nigra	Common Knapweed		●					

[1] Lightly scarified green seeds; a second, untreated batch failed to germinate. Seedlings often die and young plants can perish over winter – a difficult plant to grow.
[2] Four separate batches
[3] Two batches, one gently scarified, the other not – both germinated in April
[4] Low germination rate, not an easy species to grow from seed

Species	English name	Jan	Feb	Mar	Apr	May	Jun	Jul
Cirsium palustre	Marsh Thistle		●					
Comarum palustre	Marsh Cinquefoil						●	
Conopodium majus	Pignut			●				
Crepis paludosa	Marsh Hawk's-beard				●			
Danthonia decumbens	Heath-grass[5]			●				
Dipsacus pilosus	Small Teasel[6]						●	
Eriophorum latifolium	Broad-leaved Cotton-grass						●	
Filipendula ulmaria	Meadowsweet				●			
Galium uliginosum	Fen Bedstraw				●		●	
Genista tinctoria	Dyer's Greenweed			●				
Geranium pratense	Meadow Crane's-bill[7]		●					
Glyceria fluitans	Flote-grass			●				
Helianthemum nummularium	Common Rockrose	●						
Iris pseudacorus	Yellow Flag-iris[8]			●	●			

[5] Very few seeds
[6] Few germinated
[7] Seeds were lightly scarified with sandpaper before refrigeration
[8] Yellow Flag seeds germinate better if placed in water for a few weeks before refrigerating

Juncus subnodulosus	Blunt-flowered Rush[9]			●	●			
Lotus pedunculatus	Greater Bird's-foot Trefoil[10]		●					
Species	**English name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**
Malus sylvestris	Crab Apple[11]		●	●				
Molinia caerulea	Purple Moor-grass				●			
Rumex hydrolapathum	Great Water Dock				●			
Sanguisorba officinalis	Great Burnet			●				
Sialum silaus	Pepper Saxifrage						●	
Trifolium fragiferum	Strawberry Clover	●						
Triglochin palustris	Marsh Arrow-grass	●						
Valeriana dioica	Marsh Valerian[12]			●				
Valeriana officinalis	Common Valerian			●				

[9] Germination of Blunt-flowered Rush is erratic so most of our propagation is vegetative.
[10] Same result for three collections. Germination of this species without chilling can be stimulated by abrading fresh seed with sandpaper
[11] Seedlings eaten by voles
[12] Two collections, both germinated during March; same for Common Valerian

The following species were not included in our 2021/2022 trials but we've known them to germinate in spring, after autumn sowing then exposure to winter cold:

Angelica sylvestris	**Wild Angelica** (erratic germination, often poor)
Brompsis erecta	**Upright Brome**
Clinopodium vulgare	**Wild Basil**
Eupatorium cannabinum	**Hemp Agrimony**
Galium verum	**Lady's Bedstraw**
Geum rivale	**Water Avens**
Lycopus europaeus	**Gypsywort**
Oenanthe lachenalii	**Parsley Water-dropwort**
Plantago media	**Hoary Plantain**
Primula veris	**Cowslip**
Silene vulgaris	**Bladder Campion**
Typha angustifolia	**Lesser Reedmace**
Verbascum thapsus	**Great Mullein**

The following germinate readily when seed is sown directly into seed trays without overwinter chilling or other treatment:

Achillea ptarmica	**Sneezewort**
Betonica officinalis	**Betony**
Briza media	**Quaking-grass**
Caltha palustris	**Kingcup**[13]
Campanula glomerata	**Clustered Bellflower**
Campanula rotundifolia	**Harebell**
Filipendula vulgaris	**Dropwort**
Glyceria fluitans	**Flote-grass**
Helianthemum nummularium	**Common Rock-rose**
Lathyrus palustris	**Marsh Pea**[14]
Leontondon hispidus	**Rough Hawkbit**
Lotus corniculatus	**Common Bird's-foot Trefoil**[15]

[13] Must be sown very fresh
[14] Sown as fresh seed before seed coat had hardened
[15] Germination of most legumes is increased by sandpapering the hard seed coat

Lythrum salicaria	**Purple Loosestrife**
Oenanthe fistulosa	**Tubular Water-dropwort**[16]
Ranunculus bulbosus	**Bulbous Buttercup**
Scabiosa columbaria	**Small Scabious**
Silene flos-cucculi	**Ragged Robin**
Trifolium fragiferum	**Strawberry Clover**

Other species

Purple Small-reed *Calamgrostis canescens* has germinated well when we've chopped up fresh panicles and pressed them into damp compost. Chilling not necessary.

Fruits of **Tufted Sedge** *Carex elata* need to be sown as fresh as possible: see https://www.luct.org.uk/plant-propagation

However, several collections of Tufted Sedge also germinated in April (and one in March) after overwinter refrigeration.

Fruits of **Great Fen-sedge** *Cladium mariscus* need a long period of after-ripening followed by abrasion to stimulate germination: see https://www.luct.org.uk/plant-propagation

Produced by Pandora Thoresby, Laurie Reed and Martin Hammond for the Lower Ure Conservation Trust, December 2023.

[16] Unusual in that seed of many umbellifers requires over-winter chilling

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