



Seed Perennials

International Plug & Cutting Conference, 2002

Attention to Detail (ATD) is key

Pay attention to all the little things – they add up to big problems if you don't

Seed storage

General environment: 40-45° F, 25-30% RH

- Some species store well, but it can be variable
- All seed lots will decline in vigor over time
- Hard to predict performance after storage 6 + months

Media & tray filling

Poor filling and watering practices can lead to compaction and poor oxygen supply, especially in small plug cells, regardless of the media used!

Critical media characteristics:

- Consistency from batch to batch
- pH 5.5-6.0 throughout crop (most perennials)
- At proper moisture when trays are filled (moist enough to hold together loosely when squeezed, but not saturated)
- Trays are filled consistently, every time

Consistency in media and tray filling is essential

- Especially challenging for trays with small cell volume (288, 338, etc.)
- Need uniform media from batch to batch, tray to tray, and within a tray
- Use "softer" tray fill (lighter compaction) for items which are covered

Media should be moist enough to just hold a dibble at sowing

- Don't fill trays > 1 day ahead of time (store them in a cool place if you need to fill trays early)

Sowing

No matter how high-tech your seeder, it is no better than the operator. Seed placement is important for good stands and high useable seedling counts. Growers can use multiple seeds per cell (2 to 5) to improve tray fill and useable seedling counts

Covering

We use 50:50 media with fine vermiculite – easier for our growers to read moisture vs. straight vermiculite. Most crops are not covered, and primarily large seeded items are covered. Some crops get a light cover, or are covered after radicle emergence

Watering in

Best to use a watering tunnel for consistency and control. **Goal:** moisten media, but don't saturate or leach (especially if you have a starter charge in the medium).

Water

The single most important factor in germination and plug production.

Goal: provide enough water to allow germination without over saturating media. Remember that temperature reduction slows water loss from trays (shading, fog lines, etc.)

Need to have quality water

- Test over time to monitor changes
- Know how *your water* reacts with *your media* over time

We acidify with phosphoric and sulphuric acid, to control pH and alkalinity

- pH ~ 6.0
- alkalinity ~ 60-70 ppm
- Phosphorous ~ 5-10 ppm (keep P < 10-15 ppm to prevent stretch)
- Test before and after injection, to make sure injector works consistently

Germination

General temperature requirements

- “Cool” (60-65° F): Delphiniums, violas, etc. – cool chamber germination
- “Bench” (70-75° F): bulk of crops – bench germination in greenhouse
- “Warm” (75-80° F): a few warm loving crops – warm chamber germination

Bottom heat is best – media temperature is what matters for germination. Remember the temperature effect on evapotranspiration and on the relative humidity

- The less we have to water, the less likely it is that we will be tempted to over- or under-water
- Shading and/or fog are valuable tools to help control temperature and moisture loss

Problem germinators

Items that typically have germination issues:

- *Astilbe x arendsii*
- *Baptisia* spp. – fresh seed and/or scarification may help
- *Campanula carpatica* –tends to germinate poorly and/or irregularly, especially in summer
- *Coreopsis grandiflora* ‘Early Sunrise’
- *Delphinium x elatum*
- *Gaillardia x grandiflora*
- *Hibiscus moscheutos/x hybrida*
- *Hypericum calycinum* – poor to terrible germination
- *Liatris* spp. – germination and vigor problems
- Ornamental grasses (*Panicum*, *Festuca*, etc.) – frequently germinate poorly
- *Primula* spp. – germination and vigor problems
- *Scabiosa caucasica*
- *Tanacetum (Chrysanthemum) coccineum* – poor and/or irregular germination

Tips for difficult to germinate items

Research the plant’s native habitat for clues, and review the literature for suggestions. Remember that seed dormancy evolved to benefit a species. Consider trying in-house treatments, but **always** test in-house treatments on multiple seed lots, and don’t forget to have a control!

“Frost germinators”: plants which require cold temperature period to germinate

- General strategy: 2-3 weeks at warm temperatures, then then 4-6+ weeks at cold temperatures (38-41° F). May need to repeat the process for perennials with double dormancy
- Fresh seed may germinate better

“Fresh germinators”: species with short storage life, generally < 6 months (see list below)

- For some species, using “frost germinator” strategy will help germinate older seed
- Best bet is to use fresh seed – may want to collect it yourself from mother plants grown for seed production

Stages of plug production

In each Stage, cultural requirements change – with increasing stage, there are higher need for light and feed and plugs are better able to tolerate fluctuations in water (can allow to dry down)

- **Stage 0**: Everything that leads up to germination, including tray filling and seed storage. ATD starts here
- **Stage 1**: Classic Definition - From sowing until radicle emergence. Production Definition - Is broader than the classic definition because we are evaluating a group of seeds
- **Stage 2**: Radicle emergence until the first true leaf develops. The primary goal in this stage is getting the radicle into the medium, to develop a good root system
- **Stage 3**: From the first true leaf until product is shippable size
- **Stage 4**: A toning stage prior to shipping or holding plugs to toughen the plant. Stage 4 is usually 7 days, but can be longer for perennials

Growth regulators

Used as a last resort – primary height control through cultural methods

- DIF, water management, “lean” fertilizer program, etc.
- Not all perennials respond to growth regulators
- Spray application: B-Nine (2,500-5,000 ppm) and Sumagic (5-15 ppm) are effective over a wide range of species of perennials
- Consider early “sprencch” application for crops with initial stretch. Be sure to look at effect on germination when you evaluate early sprencches!

Early growth regulator “sprencch” crops

A-Rest (10 ppm)	Bonzi (5 ppm)
<i>Alcea</i>	<i>Anthemis</i>
<i>Hibiscus</i>	<i>Arabis</i>
<i>Lathyrus</i>	<i>Arenaria</i>
<i>Lavandula</i> ‘Lady’	<i>Aubrieta</i>
<i>Penstemon</i>	<i>Aurinia</i>
<i>Lupinus</i>	<i>Cerastium</i>
<i>Monarda</i>	<i>Cheiranthus</i>
<i>Nepeta</i>	<i>Dianthus</i>
<i>Saponaria</i>	<i>Erysimum</i>
<i>Thymus serpyllum</i>	<i>Euphorbia</i>
	<i>Gypsophila</i>
	<i>Iberis</i>
	<i>Linaria</i>
	<i>Linum</i>
	<i>Lunaria</i>
	<i>Oenothera speciosa</i>
	<i>Sanvitalia</i>
	<i>Sedum</i>
	<i>Stachys</i>
	<i>Teucrium</i>

Fertilizer

Our media has a small starter charge. Most perennials are not heavy feeders, use 100-200 ppm N as needed. Consider total levels of nutrients being applied, including what is in irrigation water. Limiting phosphorous in irrigation water (10-15 ppm maximum) helps control stretch.

Tray patching

To meet counts, trays are patched from “oversow” trays – extras sown for use in patching. We use a 10 to 100% oversow for perennials (average 25%). Hand patching is done 2-3 weeks before shipping

Oversow vs. seeds per cell

For crops which don't germinate well, there are two options: increase oversow and do more patching, or increase the number of seeds per cell. In deciding which tactic to use, consider:

- Cost of the seed
- How easy it is to patch the item
- Typical germination percentage of the item
- Whether having multiple seedlings per plug is desirable

Pest control

Remember: IPM is not “count the bugs on the card, then spray”

Thrips

- Number 1 pest for us
- Primary problem is vectoring viral diseases like TSWV/INSV – many perennials are hosts
- Strongly consider screening as a preventative measure
- Weed control is critical

Disease-prone crops

Crops which are prone to disease problems in plug production.

<i>Achillea</i>	<i>Echinacea purpurea</i>
<i>Alyssum (Aurinia) saxatile</i>	<i>Gypsophila</i>
<i>Arabis</i>	<i>Iberis sempervirens</i>
<i>Arenaria montana</i>	<i>Leucanthemum</i>
<i>Aubrieta</i>	<i>Linum perenne</i>
<i>Campanula glomerata</i>	<i>Lupinus x hybrida</i>
<i>Campanula medium</i>	<i>Papaver orientale</i>
<i>Centaurea</i>	<i>Platycodon</i>
<i>Cerastium tomentosum</i>	<i>Tanacetum</i>
<i>Delphinium</i>	

Summer Shade

Crops which may benefit from 30-50% shade during production in summer, under high light.

<i>Alchemilla</i>	<i>Hypericum</i>
<i>Aquilegia</i>	<i>Lobelia</i>
<i>Astilbe</i>	<i>Papaver</i>
<i>Bergenia</i>	<i>Primula</i>
<i>Campanula</i>	<i>Pulsatilla</i>
<i>Doronicum</i>	<i>Saxifraga</i>
<i>Heuchera</i>	<i>Sidalcea</i>

Perennial "Fresh Germinators"

The following perennials germinate best when fresh seed (stored less than 6 months) is used. Some, noted with a *, do not tolerate storage, and are best sown immediately after harvest. For some species, cold stratification may be helpful in germinating seed which has been stored.

*Aconitum**

*Adonis vernalis**

Anemone biflora, blanda, caucasica, nemorosa, obtusiloba, polyanthes, ranunculoides, tetonensis

Anemonella

*Anemonopsis**

Asarum canadensis

*Astrantia**

Aureolaria virginica

Bulbocodium vernum

Callianthemum

Caltha palustris

Campanula alliarifolia, altaica

Cardiocrinum giganteum

Caryopteris incana

Chelidonium majus

Chionodoxa lucilia

Claytonia virginica

Clematis

Corydalis lutea

Corydalis nobilis

Dicentra spectabilis

Eryngium alpinum

*Helleborus**

Isopyrum thalictroides

Paeonia

Primula rosea

Thalictrum

Tiarella

Viola odorata

Grasses

Helictotrichon sempervirens