e-GRO Alert

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Uneven Seed Germination in Plug Trays

With spring production underway, seedling plug production is in full swing. As with any greenhouse crop, uniformity is key to produce high-quality plants efficiently and economically. For seed-propagated crops, this starts in the plug tray.

The first step in producing seed-propagated annuals and perennials is growing seedling plugs for transplanting into containers for finishing. Seed germination is the first step in seedling development, and it consists of two stages. In Stage 1, the seedling root or radicle emerges from the seed. In Stage 2, cotyledons emerge and develop while the radicle penetrated the growing substrate. Once these two stages are over, germination is complete and the seedling moves into the growth stages (Stages 3 and 4, true leaf development and toning, respectively).

While each stage of plant growth is important, germination (and the stages that comprise it) is the most crucial for growing seedling plugs. There are several factors that you should keep in mind as you prepare to and proceed with growing plugs.

Uniform flat filling. Filling flats uniformly before seeding will help improve uniformity in germination of plugs. Cells with less substrate will dry out quicker than those with more substrate, and will generally take longer to germinate due to the lower moisture around the seed. In addition to uniformly

filling flats with growing substrate, you will also want to make sure that flats are uniformly sown or filled with seed, whether you are sowing by hand or using a drum seeder. While human error is often the cause of non-uniform seeding when performing the task by hand, automated vacuum seeders can have their orifices clogged by substrate, clay seed coating, and other debris.

Moisture management. Availability of substrate moisture is critical to uniform seed germination. Access to water is critical for the chemical and physiological processes of seed germination to occur. However, the degree of moisture to promote optimal germination varies with species. Plugs like begonia, impatiens, pansy, and vinca germinate better under "wet" conditions, whereas cosmos, dahlia, verbena, and zinnia germinate well under drier conditions; other crops such as ageratum, celosia, geranium, and petunia germinate well under moderate moisture levels. If the substrate is too dry, seeds will not germinate uniformly (Figs. 1 and 2). The moisture during germination can be maintained in a variety of ways, including careful irrigation, humidity management, and using a covering (Figs. 2 and 3); you should use whichever approach you are comfortable and successful with. While growing too dry during germination is problematic, so it growing too wet. If the substrate is waterlogged and oxygen is unavailable to the germinating seed, radicle emergence can be inhibited and germination delayed.

Figure 1. Note the uneven germination of seed in this plug tray. If you look closely, you can see that the amount of substrate in the cells vary.

Figure 2. These two plug strays were sown on the same day, but grown by two different growers. The grower who was in charge of the tray on the left carefully managed moisture during Stage 1 (radicle emergence), while the grower of the tray on the right grew too dry, delaying germination.

Figure 3. Covering seeds, whether with germination substrate or with coarse vermiculite, can help manage moisture during germination. However, it is also possible to have excellent germination with careful moisture management. Here are two plug trays of marigold, one with covering (left) and one without (right); each has good uniformity in germination.

Figure 4. With the right preparation before sowing seed and a diligent approach to managing your environment and culture, you can make sure that you maximize germination to give your plugs the best start possible.

Light. While a covering can be used as a tool for managing moisture, some seeds need to be covered to promote germination while others cannot be and require light. Crops like begonia, impatiens, and petunia should not be covered so they are exposed to light during germination, while crops including phlox and vinca should be covered to exclude light for better germination. Many other species can be germinated with or without light, so any covering with vermiculite or coarse perlite is more to improve moisture management for these crops.

Temperature. During germination, the temperature should be warmer than it would be as seedling development progresses into true leaf development and toning. What that temperature is varies among species from those that should be germinated at warmer (~77°F; ageratum, begonia, impatiens, vinca), moderate (72°F; cosmos, dianthus, geranium, marigold), and cooler (67°F; pansy, phlox) temperatures. If temperatures are too warm or too cool, germination can be delayed and uniformity can diminish, contributing to less-than-uniform results.

By taking into account all of these different factors, you should be able to improve the uniformity of you seed germination (Fig. 4) and get a great start on your spring crop production!

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