

Tips Of The Trade

by ALLAN ARMITAGE
Contributing Editor



Q&A ON COOLING PERENNIAL PLUGS

THE use of perennials as a greenhouse crop needs no further justification. Selecting, germinating, and producing the plugs are all part of a successful program. However, plugs are only as good as the finisher, and decisions on how to treat plugs need to be made before they are transplanted into the final containers. The ability to put a flower on the finished plant has become, to some, as important as putting a flower on an annual. Some of the many questions that often come up concerning perennial finishing have to do with the need to cool perennial plugs.

Q Do all perennials need cooling?

Armitage: In fact, very few cultivars or species need to be cooled in order to flower. Some species of achillea, arabis, cerastium, sedum, and alpine plants need cooling in order to flower well.

However, like with all simple questions, there is no simple yes or no. I hope you ask the right questions to get me out of this jam.

Q Does the size of the plug make a difference as far as cooling is concerned?

Armitage: Great question, the answer being yes. Research on columbines by Dr. Tom Weiler and graduate student Karen Shedron in 1982 at Purdue University showed plugs had to have a certain number of leaves before they were receptive to cooling. They found young plants did not flower regardless of how much cold they received, but more mature plants (about 12 leaves) flowered with 8-10 weeks of cooling. They also saw that even older plants (about 15 leaves) flowered with even shorter periods of cooling. Other work has shown similar correlations.

In general, the larger the plug, the

more effective the cold treatment will be. Plants in size 50 plug trays would do well. Very densely planted trays (sizes 300-800) contain plants which have fewer nodes and some may not benefit from cold at all. 128 plugs seem to be a good size for most perennials we have tried.

Q Can the plugs be cooled in a greenhouse or is it best to cool them in a cooler?

Armitage: Plugs can be or often are cooled in a greenhouse. Freezing the plugs in an unheated greenhouse is occasionally done but not recommended. Light freezes (28°F) do little damage, but hard freezes (less than 25°F) can damage the root system, particularly if little or no cold weather preceded the freeze. A temperature close to freezing (32°-34°F) is best because this will do all the things a hard freeze does but reduces the potential damage and the recovery time.

As usual, there are exceptions to any blanket statement. The larger the plug, the more soil surrounds the roots, therefore, the colder the temperature that can be applied. Secondly, the soil should be moist prior to cooling the plugs and watered occasionally to retain moisture. Cooling is more effective when the soil is damp.

Noncooled plugs can be transplanted immediately to final containers and simply grown-on in the greenhouse. In this case, it is best to maintain cool temperatures, around 35°-40°F, for the entire winter and allow temperatures to rise, or heat, as the market approaches. This requires more time on the bench than by using cooled plugs, but if bench space is available, an excellent crop can be produced.

In the cooler, a 33°-35°F temperature is most often used, although plugs may be cooled as high as 40°F. If good disease control is used, cool-

ing can be accomplished in the dark, however, a small amount of light (10-15 footcandles) to keep the tissue green is often used. The light may be on continuously, but 12 hours of light (with a timer) is also effective. Using a fungicidal foliar spray is recommended prior to cooling. As with the greenhouse cooling, moisture must be present to ensure good response.

The temperature in the cooler has been looked at recently. Beth Engle, a researcher at Michigan State University, tried to determine if plugs could be frozen, then grown-on later. She pre-cooled a number of species at 32°F or 40°F prior to placing them at 28°F. She had limited success with yarrow, blanket flower, and candytuft when they were pre-cooled prior to freezing. In hers and others' research, *Campanula carpatica* has been found to tolerate freezing without damage. I expect that as alpine species are tested, they will also be shown to be tolerant of freezing.

Q How long must plugs be cooled?

Armitage: In most cases, a maximum of 12 weeks would satisfy almost any species I can think of. In the greenhouse, 12 weeks may be necessary because of the fluctuating temperatures caused by incoming light. A thermograph is absolutely necessary to determine the number of cold weeks below 40°F. It is also easier to provide 12 weeks in a greenhouse than in a cooler because air movement is better in a greenhouse.

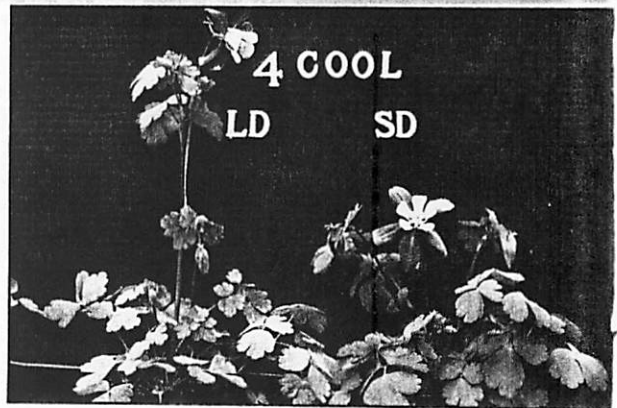
While 12 weeks is the maximum, plugs generally respond to a lot less cooling. If the greenhouse stays below 40°F for 8 weeks, that is likely sufficient. In the cooler, our work shows that for nearly every species we have tested (128 plug), 8 weeks at 33°-36°F provides significant benefits. Longer than 8 weeks may be

even better for some plants, however, the incidence of storage diseases and difficulty of maintenance in a cooler makes getting them out of there as soon as possible a good idea.

Q So if cooling is not necessary, why cool?

Armitage: Cooling may not be necessary, because most plants (see question 1) will flower with or without cooling. However, cooling can provide two rather large benefits:

- Most importantly, cooling reduces the time on the bench (see graph). The total time may not be reduced if you cool them yourself, but once under production, benchtime declines as cooling time goes up. In some species, it seems that 2 weeks cooling is approximately equal to 7-10 days reduction in bench time. This is a significant benefit if one buys in cooled plugs.



Four weeks of cooling helped produce taller flower stems on columbine, which tends to bloom inside the foliage.

- With some plants, cooling tends to make the flower stalk a little taller. In our love affair with "short and compact," this may not seem to be a benefit. However, it helps with plants like columbine, where the flowers want to bloom inside the foliage regardless of photoperiod if no cooling is provided. With as little as 4 weeks cooling, the flower stalk rises like the Phoenix (see photo).

Q Should I buy in precooled plugs or cool them myself?

Armitage: Obviously that depends on the facilities available for cooling. If empty greenhouse space is available or cooler space is already available, then growing the transplanted crop cool or cooling the plugs is certainly possible. Another reason to cool your own is if the cultivars you want are not available as precooled plugs.

If you have decided that cooled plugs makes sense for your program, the decision is yours entirely. This is similar to that great original argument that has raged for decades: "Should I buy in plugs or grow my own?" My opinion: save yourself significant headaches and deal with someone who is precooling the plugs or a broker who is handling their product. We are fortunate to have a number of plug specialists doing a good job of producing and cooling. It makes sense to me to use them.

There are as many ways to handle perennials as there are growers who wish to grow them. This is a relatively new class for the greenhouse, and without doubt, we will discover many ways of being successful. Try using plugs as your system allows, be flexible, make changes where needed, and success will come. **GG**

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