

## Special Points of Interest

- Pressure from shrinking profit margins is resulting in growers wanting more crop rotations out of a facility.
- Effect of temperature on the number of days to flower for *Impatiens wallerana* Hook f., *Petunia x hybrida* Hort., and *Viola x wittrockiana* Gams. (pansy) cultivars
- The pros and cons of lowering greenhouse temperatures to save heating costs
- New hardy chrysanthemum

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## How do you schedule bedding plants?

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### The Basics!

The importance of accurate scheduling has increased greatly as more pressure is put on growers to produce a crop at a specific stage of development at a specific time. Much of this pressure is from mass merchandisers.

However, some pressure is from shrinking profit margins resulting in growers wanting more crop rotations out of a facility. This has led to an increase in interest in 'fast cropping'. The term fast cropping is used to describe techniques that hasten crop development and synchronize flowering to enable growers to 1) have more turns or crop rotations through a greenhouse, and 2) exactly schedule flowering of bedding plants to reduce the cost of producing a crop. There are a number of critical rules when scheduling bedding plant crops and fast cropping:

1) Know what the optimal conditions for germination and early seedling development are and deliver them! Seed germination and early seedling development is the most environmental sensitive time in plant development. Non-optimal conditions at this time will 1) result in seedling death, 2) slow germination and early seedling development and 3) increase non-uniformity in a crop. Most species require a 72-74°F media temperature. Remember that media temperature is almost always cooler than air temperature. Also, it is critical to shade young seedlings to reduce excessive heating from the sun.

2) Know what conditions promote flowering! Most bedding plants are photoperiodic, i.e. day length effects when plants flower. We have evaluated over 60 bed-

ding plants species for their responses to photoperiod and were surprised to find bedding plants can be short-day, day neutral or long-day plants. Did you know that short-days hasten flowering of cosmos and zinnia or that *Nierembergia* and *lobelia* must have long days to flower? Information on how day length affects flowering of many crops will be coming out during the next year.

3) Know how supplemental lighting effects when plants flower! Many, but not all, bedding plants will flower earlier if grown with supplemental lighting. We 'coined' the term 'irradiance positive' or 'irradiance neutral' to describe how plants respond to supplemental lighting, or irradiance. For instance, petunias are irradiance positive, i.e. extra lighting hastens flowering. In

**As we develop more and more of this information, you will be able to effectively schedule flowering of any bedding plant crop.**

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contrast, lobelia is irradiance neutral, i.e. extra lighting under long days will not hasten flowering.

4) Know when a seedling will respond to photoperiod or supplemental lighting! Many bedding plant species are not capable of making flowers right after germination. Often they need to reach a certain stage of development before they can be induced to flower. Lighting or giving photoperiod treatments before this time will not affect flowering.

5) You can often induce plants to flower with just a 2-3 week treatment. Most bedding plants do not have to be grown under inductive conditions during their entire life. With most, you can place them under inductive conditions for a period of time and then finish them in another area under non-inductive conditions.

6) Know how temperature effects how quickly plants develop! Generally, bedding plants develop faster as temperature is increased (Table 1). However, excessively cool or hot temperatures will

stunt growth of many bedding plants. Many bedding plants develop at their maximum rate when grown at 76-82°F. Growing them warmer can decrease crop quality and not speed development. In addition, some crops (such as vinca) will be stunted if grown at temperatures less than 65°F.

7) Speeding crop development means that growth retardants may need to be applied more often or at a higher rate! Warmer temperatures will hasten the rate of plant development, or leaf unfolding.

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**Table 1. Effect of temperature on the number of days to flower for *Impatiens wallerana* Hook f., *Petunia x hybrida* Hort., and *Viola x wittrockiana* Gams. (pansy) cultivars. Plants were grown in the reported temperatures from when the cotyledons expanded to when the first flower opened with a 16 hour daylength and 1500 footcandles of total light (Erwin and Mattson, unpublished data).**

Cultivar	54° F	61° F	68° F	75° F	Delay in Flowering
					if 24-h Temperature is Reduced 1 °F (days)*
<i>I. wallerana</i>					
‘Super Elfin Lipstick	-	72	54	47	1.8
<i>P. x hybrida</i> ‘Avalanche Pink’	88	74	47	39	2.5
<i>P. x hybrida</i> ‘Dreams Rose’	84	67	46	37	2.3
<i>P. x hybrida</i> ‘Purple Wave’	112	88	57	45	3.3
<i>V. x wittrockiana</i>					
‘Colossus Yellow Blotch’	95	82	63	58	1.9
<i>V. x wittrockiana</i> ‘Crystal Bowl Supreme Yellow’	72	63	51	46	1.3
<i>V. x wittrockiana</i>					
‘Delta Pure White’	88	71	61	53	1.6
<i>V. x wittrockiana</i> ‘Sorbet Blackberry Cream’	68	60	50	45	1.1

\*for temperatures between 54 and 75 °F  
-plants died in this treatment

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Therefore, the same amount of growth retardant may need to be applied in a shorter period of time.

8) Growing plants warmer means that plants will need to be watered and/or fertilized more often. Since leaves may unfold faster, plants can have an increased need for both nutrients and water when fast cropping.

## Temperature Affects Crops Differently!

We conducted research at the University of Minnesota on the effects of temperature on time to flower of a few major bedding plant crops (Table 1). The impact of increasing temperature on days to flower differed across species. That is, growing plants warmer decreased production time of some crops more than others. For instance, increasing temperature from 61 °F to 68 °F decreased days to flower for Impatiens 'Super Elfin Lipstick' from 72 to 54 days, a decrease of 18 days. In contrast, increasing temperature from 61 °F to 68°F under long days decreased days to flower for Petunia 'Purple Wave' from 88 to 57 days, a decrease of 33 days!

## The Bottom Line.

Scheduling bedding plants is a lot like scheduling a potted plant crop. Many bedding plants are photoperiodic, i.e. day length affects flowering just like chrysanthemums and poinsettias! Remember, temperature

affects different plants differently! Therefore, you will need different schedules for each crop. As we develop more and more of this information, you will be able to effectively schedule flowering of any bedding plant crop. Also, as we provide this infor-

mation to plug crops, you may eventually be able to buy pre-induced plugs with specified finishing times under certain temperatures. Look for more updates and talks from us on this topic in the future!



## South Africa Visit

**John Erwin, Department of Horticultural Science, University of Minnesota**

Some of you may know that I went on a trip to South Africa this fall to 1) look at what plant materials may have potential for development as floriculture crops here in the US, and 2) start developing relationships with some of the universities in South Africa.

South Africa is the most beautiful and dangerous country I have ever visited. Once you get beyond the venomous snakes, including cobras and mambas, you have to deal with the crime. Having said this, once you figure out how to get around safely, my experience was wonderful! The people are kind, helpful, and friendly. In addition, the exchange rate was 8.5 Rand to the dollar which made the trip very cheap!

The trip was a success! Not only did I identify a number of crops that could be new floriculture crops, but I also started collaborative relationships with the University of Stellenbosch (Western Cape) and the University of Natal (Natal).

South Africa is a tremendous botanical resource! For instance, we currently base our geranium industry on four geraniums species. Two of those species are South African in origin (ivy geranium, Regal geranium)! There are over 200 other indigenous geranium species in South Africa! There are more plant species on the Western Cape region alone than in all of North America! There are many new potential potted, bedding and cut flower crops.

My program at the University of Minnesota along with Neil Anderson's will be co-supporting South Africa graduate students to work on collection and commercialization of some of these species. Students will spend time here and in South Africa. It is our intention that this collaboration will occur over the next 5 years. Many of you will have the opportunity to meet these students during the upcoming years.

Please feel free to give me a call if you are interested in participating in this exciting collaboration! You will be seeing and/or hearing more about the results of this work over the next five years as well through the bulletin and FAX.

