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## PERENNIALS: BASICS OF PROFITABLE PRODUCTION (PART II)

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*(This is the second portion of an article started in the October 1996 issue of the North Carolina Flower Growers' Bulletin. Tables and figures are numbered sequentially starting with the previous article.)*

**A**llan Armitage recommends two forcing periods -- early spring and late spring / early summer (Tables 4 and 5). The species and cultivars listed in Tables 4 and 5 should give any prospective producer a place to begin building a perennials program.

### **Perennial Production Planning**

Still want to produce perennials? The next step after reaffirming your dedication to perennials is planning for production. We have already discussed which species and cultivars to investigate. Now it is time to list the facilities and systems required for successful production.

Propagation Facilities: Unless you intend to purchase plugs or rooted cuttings, you will need propagation facilities that offer light, moisture, and temperature control. Given the various temperature and moisture requirements for different species during the germination / rooting stage, it may be necessary to have temperature and moisture zones in the propagation facilities.

A cooler may be useful for treating some seed for best germination, such as with *Aquilegia* sp., which benefits from 6 weeks of moist storage at 40 °F.

Growing Facilities: Other than the capability of supplying a normal fertilization and insect / disease prevention program, perennials will need temperature and photoperiod control.

In general, perennial production can be completed with two temperature zones, a cold zone set at 35 to 50 °F night temperatures and a warm zone at 50 to 62 °F night temperatures.

The availability of a cold zone is essential for forcing of many perennials. Most perennial species have evolved to include a period of cold temperatures in their life cycle, so producers must be able to fulfill this cold requirement to control growth and development.

Along with a cold requirement, many perennials have evolved to produce flowers as temperatures increase and as daylength increases. Therefore, growers need to have the capability of

**Table 4. Perennials recommended for early spring forcing.\***

Genus and species	Common name	Cultivars	Normal flowering period**	Propagation method(s)
<i>Achillea millefolium</i>	Common Yarrow	Summer Pastels	Summer	Seed
<i>Ajuga reptans</i>	Bugleweed	Bronze Beauty, Burgundy Glow	♣ Late spring	Cuttings, division
<i>Alchemilla mollis</i>	Lady's Mantle		Spring	Seed
<i>Anchusa</i> sp.	Alkanet		Late spring	Root cuttings
<i>Aquilegia x hybrida</i>	Columbine	Musik series, Song Bird series	Spring	Seed
<i>Arabis albida</i>	Rock-cress	Snow Cap, Spring Charm	Early spring	Division, cuttings, seed
<i>Armeria x hybrida</i>	Sea Thrift	Ornament Mix	Summer	Seed
<i>Armeria maritima</i>	Sea Thrift	Splendens, Vindictive	Summer	Division, seed
<i>Armeria pseudoarmeria</i>	Pinkball Thrift		Summer	Seed
<i>Artemisia ludoviciana</i>	White Sage	Silver King	♣ Late summer	Division, cuttings
<i>Artemisia schmidtiana</i>	Wormwood	Silver Mound	♣ Summer	Cuttings
<i>Artemisia</i> x 'Powis Castle'	Wormwood	Powis Castle	♣ Summer	Cuttings
<i>Astilbe x arendsii</i>	Astilbe	Deutschland, Finale, Glow, many more	Late spring	Division
<i>Aubrietia deltoidea</i>	Rock Cress	Novalis Blue, Royal Red	Spring	Seed
<i>Campanula carpatica</i>	Carpathian Harebell	Blue Clips, White Clips	Summer	Seed
<i>Campanula garganica</i>	Gargano Bellflower		Spring	Seed, cuttings
<i>Cerastium tomentosum</i>	Snow-in-summer	Silvery Summer	♣ Late spring	Seed, cuttings
<i>Dianthus deltoides</i>	Maiden Pinks	Arctic Fire, Zing Rose	Summer	Seed
<i>Dianthus gratianopolitanus</i>	Cheddar Pinks	Bath's Pink, Spotty, Tiny Rubies	Spring	Cuttings
<i>Dicentra spectabilis</i>	Bleeding Heart		Spring	Cuttings
<i>Digitalis purpurea</i>	Foxglove	Foxy	Spring	Seed
<i>Geranium sanguineum</i>	Bloody Cranesbill	Alba, Album	Spring	Division, cuttings
<i>Gypsophila paniculata</i>	Baby's Breath	Double Snowflake	Summer	Seed
<i>Gypsophila repens</i>	Creeping Baby's Breath	Alba, Rosea	Summer	Seed
<i>Heuchera micrantha</i>	Small-flowered Alumroot	Purple Palace	♣ Late spring	Seed
<i>Heuchera sanguinea</i>	Coral Bells	Bressingham Hybrids	Late spring	Seed
<i>Hosta</i> sp.	Hosta Lily	many	♣ Summer	Division
<i>Iberis sempervirens</i>	Candytuft	Alexander's White, Snowflake	Spring	Cuttings (Alex.), seed (Snow.)
<i>Linum perenne</i>	Perennial Flax	Saphyr	Spring	Seed
<i>Myosotis scorpioides</i>	Forget-me-not	Indigo Blue, Rosea	Spring	Seed
<i>Papaver nudicaule</i>	Iceland Poppy	Wonderland	Spring	Cuttings
<i>Phlox subulata</i>	Creeping Phlox	Delight series, Emerald series, Scarlet Flame	Early spring	Cuttings
<i>Primula x polyanthus</i>	Primrose	Pacific Giants	Spring	Seed
<i>Salvia superba</i>	Perennial Sage	Blue Queen, Stradford Blue	Summer	Cuttings, seed
<i>Saxifraga arendsii</i>	Arend's Saxifrage	Purple Robe	Spring	Seed

\*From Armitage, 1989; Armitage, 1993; Armitage, 1996a; and Cameron et al., 1996a.

\*\* ♣ = grown for ornamental foliage.

**Table 4, Continued.\***

Genus and species	Common name	Cultivars	Normal flowering period**	Propagation method(s)
<i>Sedum spurium</i>	Stonecrop	Dragon's Blood	Summer	Cuttings
<i>Sempervivum tectorum</i>	Hens and Chicks		♣ Summer	Cuttings, division
<i>Verbena canadensis</i>	Verbena	Homestead Purple, Silver Anne, many more	Summer	Cuttings
<i>Veronica longifolia</i>	Long-leaf Veronica	Sunny Border Blue	Summer	Cuttings
<i>Veronica repens</i>	Creeping Speedwell		Late Summer	Seed
<i>Veronica spicata</i>	Spiked Speedwell	Blue, Red Fox	Summer	Seed (Blue), cuttings (Red F.)
<i>Vinca major</i>	Large Periwinkle	Variegata	♣ Spring	Cuttings

\*From Armitage, 1989; Armitage, 1993; Armitage, 1996a; and Cameron et al., 1996a.

\*\* ♣ = grown for ornamental foliage.

supplying long day (4-hour night break mum lighting of 10 footcandles of light at plant level) conditions for forcing many perennial species. In most cases, long day treatments will be necessary from January through March for the spring forcing season.

### Perennial Production Stages

The most important aspect for greenhouse production of perennials is the presence of flowers or at least flower buds. The goal of the grower is reaching this stage of development as rapidly and efficiently as possible and at the same time, produce a well-developed plant that will survive in the landscape.

To understand perennials and to successfully produce them, we need to look carefully at their life cycle. Just like humans, plants are "borne" (seeds germinate), are juvenile, become reproductive, bear offspring (seeds), and die. If we know which factors (such as photoperiod and temperature) affect growth and flowering in the species we intend to produce, it makes scheduling possible and should reduce total cropping time by more efficient environmental control during production.

Tom Weiler has described the perennial life cycle (and production cycle) very well (Figure 4). Note that not all life cycle stages are conspicuous in all species. Those stages that may

be "missing" from a specie's life cycle are shadowed in Figure 4.

**Seed Dormancy and Germination:** Seed germination of perennials can be more involved than for annuals. For example, some species require scarification (breaking of the seed coat) and / or stratification (a cold moist treatment to remove seed dormancy) prior to sowing to ensure a high percentage of germination. Lupine (*Lupinus polyphyllus*) is an example of a species that benefits from seed scarification prior to sowing. Columbine (*Aquilegia x hybrida*) seed goes dormant as it ages, and germination of older seed can be increased through stratification. A few good references addressing seed dormancy and germination requirements of perennials are Armitage, 1989; Nau, 1993; and Nau, 1996. Perennial producers will find these references essential.

**Juvenility and Reproductive Vegetativeness:** For many perennials, young plants must attain a certain size prior to acquiring the ability to initiate flowers. A recent report in GrowerTalks (Cameron et. al., 1996b) summarized age requirements prior to floral initiation for some perennials (Table 6).

A good example is columbine. Columbine must receive a cold treatment in order to initiate flowers. However, plants must be mature enough to perceive the cold treatment or they will not

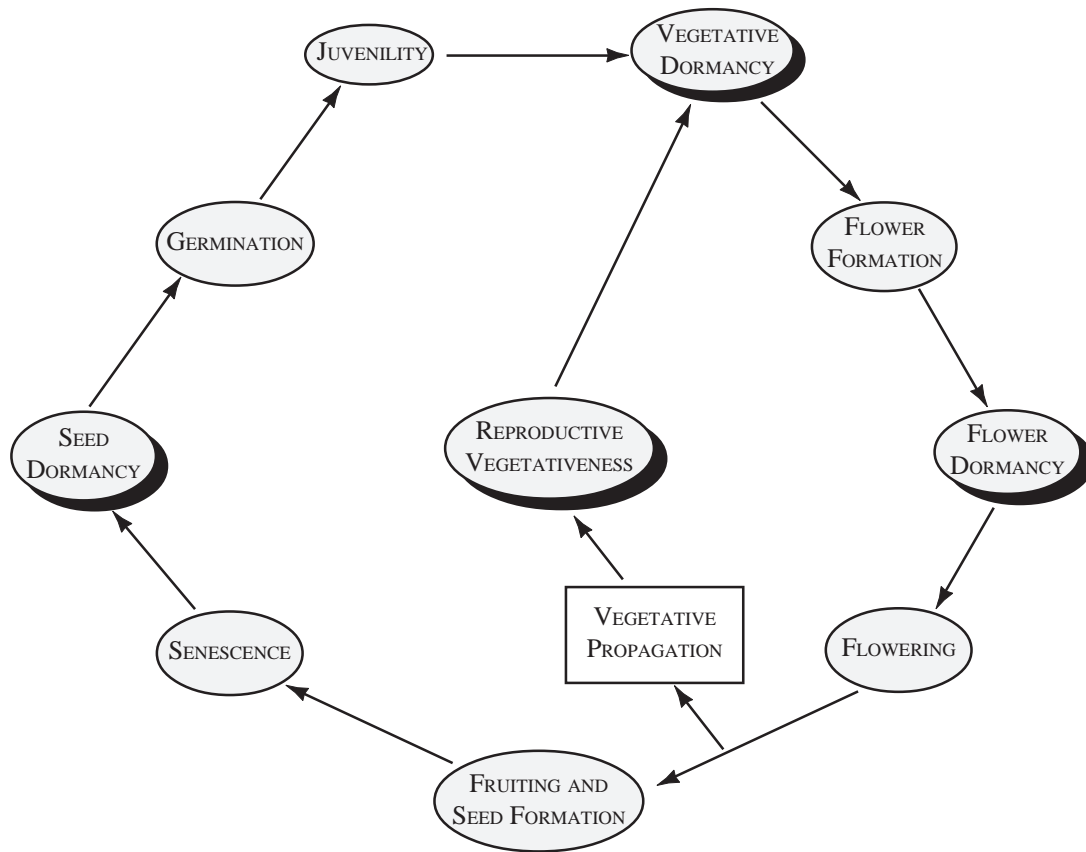


Figure 4. The life cycle of perennials. A shadow around the stage indicates that it is not a required stage for all species and many species will not proceed through or exhibit this stage in their life cycle.

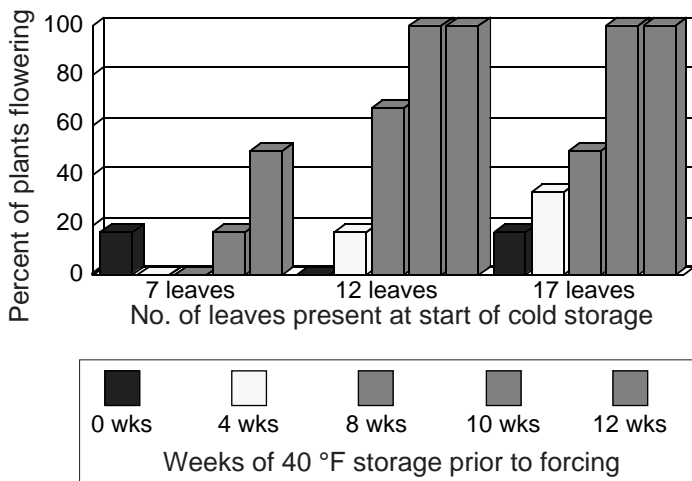


Figure 5. Interaction of plant age and cold storage duration on flowering of 'McKana's Giant' columbine. Figure adapted from Weiler, 1996.

flower. They are “juvenile” and unable to respond to inductive conditions until they reach a certain stage of development (Figure 5). For columbine, plants must have 12 leaves prior to cold treatment.

Other crops also must attain a minimum size prior to giving treatments to initiate flowering. Lavender 'Munstead' (*Lavandula angustifolia*) plants should have at least 40 to 50 leaves (20 to 25 nodes) prior to the beginning of cold treatment (Whitman et al., 1996). Coreopsis 'Sunray' (*Coreopsis grandiflora*) plants should have at least 16 leaves (eight nodes) prior to cold treatment and subsequent long day treatment for flowering (Yuan et al., 1996).

**Table 5. Perennials recommended for late spring / early summer forcing.\***

Genus and species	Common name	Cultivars	Normal flowering period**	Propagation method(s)
<i>Achillea filipendulina</i>	Fern-leaf Yarrow	Cloth of Gold	Summer	Seed
<i>Asclepias tuberosa</i>	Butterfly Weed		Late spring	Root cuttings, seed
<i>Aster alpinus</i>	Alpine Aster	Goliath	Summer	Cuttings
<i>Aster dumosus</i>	Dwarf Asters	Prof Kippenburg	Summer	Seed
<i>Aster x frikartii</i>	Frikart's Aster	Monch	Summer	Cuttings
<i>Ceratostigma plumbaginoides</i>	Leadwort		♣ Late Summer	Cuttings
<i>Chrysanthemum coccineum</i>	Painted Daisy	James Kelway	Early Summer	Seed, cuttings
<i>Coreopsis auriculata</i>	Mouse-ear Coreopsis	Nana	Spring	Cuttings
<i>Coreopsis grandiflora</i>	Tickseed	Early Sunrise, Sunray	Summer	Seed
<i>Coreopsis rosea</i>	Pink Tickseed	Nana	Summer	Cuttings
<i>Coreopsis verticillata</i>	Thread Leaf Coreopsis	Moonbeam, Zagreb	Summer	Cuttings
<i>Delphinium x elatum</i>	Delphinium	Blue Mirror, Magic Fountains series	Summer	Seed
<i>Echinacea purpurea</i>	Purple Coneflower	Bravado	Summer	Seed
<i>Gaillardia x grandiflora</i>	Blanket Flower	Goblin	Summer	Seed
<i>Heliopsis scabra</i>	Heliopsis	Summer Sun	Summer	Seed
<i>Hibiscus moscheutos</i>	Hibiscus	Disco Bell series	Summer	Seed
<i>Lavandula angustifolia</i>	Lavender	Hidcote, Munstead Dwarf	Summer	Seed
<i>Leucanthemum x superbum</i>	Shasta Daisy	Alaska, Snow Lady	Summer	Seed
<i>Lobelia x speciosa</i>	Lobelia	Compliment Scarlet, Fan series	Summer	Seed
<i>Oenothera missouriensis</i>	Ozark Sundrops		Summer	Seed
<i>Physostegia virginiana</i>	Obedient Plant	Alba	Late Summer	Cuttings
<i>Platycodon grandiflorus</i>	Balloonflower	Sentimental Blue	Summer	Seed
<i>Rudbeckia fulgida</i>	Gloriosa Daisy	Goldilocks, Goldsturm, Marmalade	Summer	Seed
<i>Scabiosa caucasica</i>	Pincushion Flower	Butterfly Blue	Summer	Seed
<i>Sedum x 'Autumn Joy'</i>	Autumn Joy Sedum	Autumn Joy	Late Summer, Autumn	Cuttings

\*From Armitage, 1989; Armitage, 1993; Armitage, 1996a; and Cameron et al., 1996a.

\*\* ♣ = grown for ornamental foliage.

Not all the perennials grown are propagated from seed. Actually, the majority of named cultivars are vegetatively propagated. These plants do not have a juvenile stage but can exhibit the same lack of responsiveness due to reproductive vegetativeness (Figure 4). An example of when a producer may encounter

reproductive vegetativeness would be with cuttings of *Coreopsis* 'Goldfink', a selection of *Coreopsis grandiflora* that does not come true from seed so vegetative propagation is practiced. Rooted cuttings of 'Goldfink' would require a minimum size, similar to 'Sunray' mentioned above prior to cold treatment and subsequent

**Table 6. Age requirements for receptiveness to floral initiation treatments.\***

Plant name	Common name	Age requirements
<i>Achillea filipendulina</i> Cloth of Gold	Fern-leaf Yarrow	Plants with 8 to 13 leaves flowered inconsistently (must be at least 13 leaves)
<i>Aquilegia</i> -- most species	Columbine	At least 12 leaves; for some, at least 15 leaves for consistent bloom
<i>Aster alpinus</i>	Alpine Aster	Plants require at least 15 leaves to flower consistently
<i>Astilbe arendsii</i>	Astilbe	Plants with 5 to 6 leaves flowered very inconsistently (must be at least 6 leaves)
<i>Chrysanthemum coccineum</i>	Painted Daisy	Plants require at least 15 leaves to flower consistently
<i>Coreopsis grandiflora</i> Sunray	Tickseed	Plants require about 16 leaves to flower consistently
<i>Delphinium x elatum</i>	Delphinium	Plants with 4 to 5 leaves flower
<i>Echinacea purpurea</i>	Purple Coneflower	Plants with 4 leaves flower
<i>Euphorbia epithymoides</i>	Cushion Spurge	Plants with 6 to 8 leaves failed to flower (must be greater than 8 leaves)
<i>Goniolimon tatarica</i>	German Statice	Plants with 10 to 14 leaves failed to flower (must be greater than 14 leaves)
<i>Heuchera sanguinea</i>	Coral Bells	Plants require 16 leaves to flower consistently
<i>Lavandula angustifolia</i>	Lavender	Most consistent flowering with 40 to 50 leaves
<i>Lobelia x speciosa</i> Compliment Scarlet	Lobelia	Plants with 6 to 7 leaves will flower
<i>Papaver orientale</i> Brilliant	Oriental Poppy	Plants with 10 to 14 leaves failed to flower (must be greater than 14 leaves)
<i>Physostegia virginiana</i>	Obedient Plant	Plants require at least 10 leaves to flower consistently
<i>Rudbeckia fulgida</i> Goldsturm	Gloriosa Daisy	Plants require 10 leaves for flowering
<i>Veronica spicata</i> Blue	Speedwell	Plants with 6 to 8 leaves will flower

\*From Cameron et al., 1996b.

long day treatment for flowering. Another example would be varieties of Carpathian harebell (*Campanula carpatica*) grown from cuttings (however, most are grown from seed). Work conducted at Michigan State University (Whitman et al., 1995) indicates that for *C. carpatica*, a minimum of 15 leaves is required prior to start of inductive long day treatment, so rooted *C. carpatica* cuttings would need to attain 15 leaves to be receptive to long day treatment.

**Vegetative Dormancy:** Many perennials have evolved into species that will enter a vegetative dormancy to protect the plant from harsh winter temperatures. For some species of perennials, the short day conditions of autumn trigger this dormancy response. A good example is bleeding

heart (*Dicentra spectabilis*). Bleeding heart plants will continue to grow vegetatively if kept in long daylengths (if temperatures are not too high and plants do not dry out), but become dormant in short daylengths. Once dormant, a cold treatment is required to resume growth and subsequent flowering (Weiler, 1996). Bleeding heart will also go dormant during the summer in the South, mainly due to temperature and water stress (Armitage, 1989). Producers should be aware of potential vegetative dormancy and the environmental factors that control it in species they intend to produce.

**Flower Formation:** Flowering is caused by a cold treatment or specific daylength control (usually long days are required for flowering) in

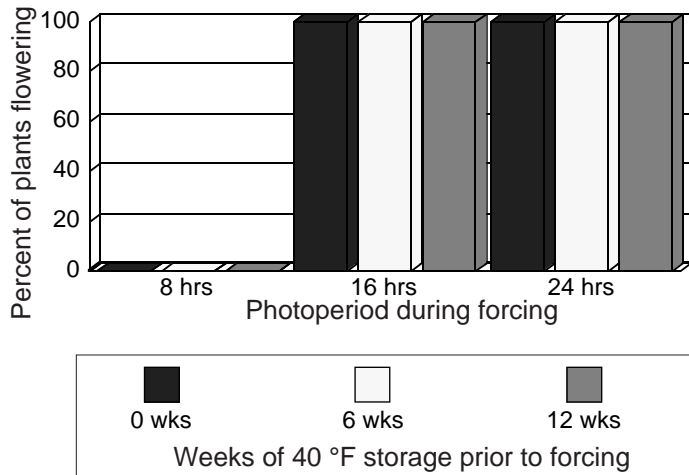


Figure 6. Effect of photoperiod and cold storage duration on flowering of *Sedum spectabile*. Note that cold storage had no effect on flowering. Figure adapted from Weiler, 1996.

many perennials (Table 7). An example species requiring cooling is Columbine, which required 10 weeks or more of 40 °F treatment for 100% flowering (Figure 5). An example species requiring photoperiod control without a cold treatment is Showy Stone Crop (*Sedum spectabile*), which requires long days for flowering (Figure 6). Some species such as Japanese Anemone (*Anemone x hybrida*), require both cold storage and photoperiod control for flowering (Figure 7). Growers should be cognizant of flowering requirements for perennials in order to successfully set flowers and time their crops.

The Integrated Production System: The diversity in perennial species may make them appealing to the customer, but it makes streamlining their production quite difficult. Since different plants have different requirements for growth and development, it is crucial to know the species you intend to produce and know their stages of development and the factors controlling their development. However, we do not have that information for all species produced.

Allan Armitage has summarized how to approach perennial forcing in general

and has outlined four basic rules to follow (Armitage, 1996b). Fortunately, there are very few species that fall outside of his “cookbook” approach to forcing perennials in the greenhouse.

Unless you have more precise information, the steps listed on the following page are perhaps the best place to begin:

**1 Learn about the plant.**

- Research the plant and how it is propagated using general perennial references such as Armitage, 1989; Jelitto and Schacht, 1990; Nau, 1996; and Still, 1988.
- Take note of its growth and development:
  - Is it tall or short?
  - Does it bloom in the spring, summer, or fall?
  - Does it flower with many leaves, a few leaves, or no leaves?
  - Will a single plant fill the container?

**2 All species should be cooled before being forced.**

- Cool as plugs (or in small containers) in a cooler or in the greenhouse; or purchase precooled material.

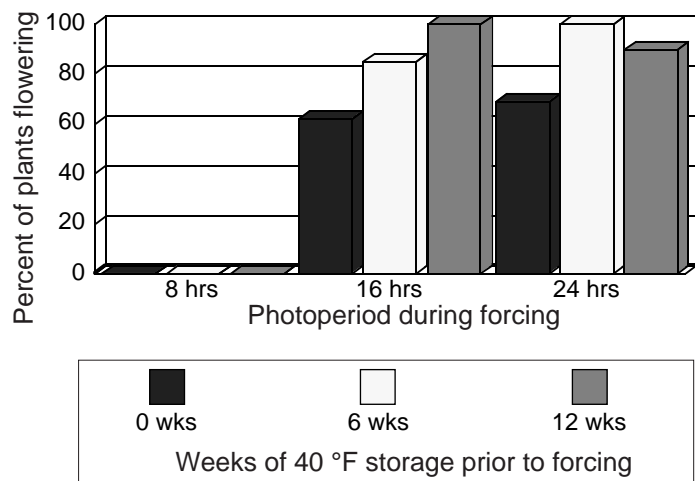


Figure 7. Effect of photoperiod and cold storage duration on flowering of *Anemone x hybrida*. Note that both cold storage and long days were needed for best flowering. Figure adapted from Weiler, 1996.

- Cooling is beneficial for most species and will not harm those plants that have no response to cooling, so cool as insurance.
- Cooled plants spend less time on the forcing bench resulting in lower forcing costs.
- Most species require about 6 weeks of cooling at 40 °F in a cooler. From 8 to 10 weeks may be required in a greenhouse, as temperatures will rise above effective cooling temperatures during the day. Use these durations as a starting point and adjust as needed or as information for

**Table 7. The influence of long days (4-hour night break) and cold temperatures (40 °F storage for 6 to 16 weeks [species dependent]) on flowering of selected perennials.\***

	No Response to Long Days	Long Days Beneficial	Long Days Required
No Response to Cold	<i>Aquilegia x hybrida</i> - cultivars that do not require cold (e.g. Songbird series) <i>Cerastium tomentosum</i> (NO LD and no cold for foliage only) <i>Perovskia atriplicifolia</i> <i>Primula x hybrida</i> 'Pacific Giants'	<i>Leucanthemum x superbum</i> 'Snow Lady'	<i>Asclepias tuberosa</i> (if no SD**) <i>Campanula carpatica</i> 'Blue Clips' (if no SD) <i>Catananche caerulea</i> <i>Coreopsis grandiflora</i> 'Early Sunrise' <i>Coreopsis verticillata</i> 'Moonbeam' <i>Hibiscus moscheutos</i> 'Disco Bell Mixed' (if no SD)
Cold Beneficial	<i>Arabis albida</i> 'Snow Cap', 'Spring Charm', 'Compinkie' <i>Armeria maritima</i> <i>Armeria pseudoarmeria</i> <i>Armeria x hybrida</i> 'Ornament Mix' <i>Aubrietia deltoidea</i> 'Royal Red', 'Whitewall Gem' <i>Delphinium elatum</i> 'Blue Mirror' <i>Dianthus deltoides</i> 'Zing Rose' <i>Erodium reichardii</i> 'Roseum' <i>Myosotis sylvatica</i> 'Victoria Rose', 'Victoria Blue' <i>Platycodon grandiflorus</i> 'Astra' <i>Veronica spicata</i> 'Blue'	<i>Anchusa capensis</i> 'Blue Bedder' <i>Anemone sylvestris</i> <i>Echinacea purpurea</i> 'Bravado' <i>Lobelia x speciosa</i> 'Compliment Scarlet' <i>Oenothera tetragona</i> <i>Phlox subulata</i> <i>Platycodon grandiflorus</i> 'Sentimental Blue' <i>Scabiosa caucasica</i> 'Butterfly Blue'	<i>Gypsophila paniculata</i> 'Double Snowflake' <i>Oenothera missouriensis</i> <i>Rudbeckia fulgida</i> 'Goldsturm'
Cold Required	<i>Arabis sturii</i> <i>Aster alpinus</i> 'Goliath' <i>Aquilegia x hybrida</i> - hybrids that require cold <i>Heuchera sanguinea</i> 'Bressingham Hybrids' <i>Iberis sempervirens</i> 'Snowflake' <i>Linum perenne</i> 'Saphyr' <i>Veronica longifolia</i> 'Sunny Border Blue'	<i>Astilbe x arendsii</i> <i>Cerastium tomentosum</i> (for flowers) <i>Coreopsis grandiflora</i> 'Sunray' <i>Gaillardia x grandiflora</i> 'Goblin' <i>Gypsophila repens</i> <i>Lavandula angustifolia</i> 'Munstead Dwarf' <i>Salvia superba</i> 'Blue Queen'	<i>Achillea filipendulina</i> 'Cloth of Gold' <i>Anemone x hybrida</i> <i>Asclepias tuberosa</i> (after SD) <i>Chrysanthemum coccineum</i> 'James Kelway' <i>Lavandula angustifolia</i> 'Hidcote' <i>Physostegia virginiana</i> 'Alba'

\*From Armitage, 1996a; Armitage, 1996b; and Cameron et al., 1996a. No response to a treatment means there is no need to apply that treatment; plant quality will be about the same either way. A beneficial treatment means flowering will either occur more rapidly or more uniformly; or plant quality will somehow be enhanced by applying the treatment. A required treatment means that flowering will not occur in a reasonable length of time unless the treatment is applied.

\*\*SD = short days.

specific plants becomes available (e.g., see Hamaker et al., 1996a; Whitman et al., 1996; and Yuan et al., 1996).

- Some plants may not be receptive to cold treatment until they reach a certain size (effect of juvenility or reproductive vegetativeness). Make sure plants are of adequate size prior to cold treatment.

- Do not allow plants to dry out or to remain too moist during the cooling stage.

③ **The greenhouse must be outfitted with lights for long days (LD).**

- Use incandescent lights (or metal halide HID lights) for lighting during natural short day conditions.

- Although many perennials are day neutral (see Table 7), some greatly benefit from LD treatment.

- Light intensity should be between 10 and 20 footcandles to effectively create LD conditions.

- Day neutral plants will not be adversely affected if LD are provided.

- Apply lights as a 4 hour night break (10:00 PM to 2:00 AM). This technique appears to be as effective as extending the natural daylength and in many cases, is less expensive.

- Lighting can be stopped when daylength is greater than 13 hours.

④ **After completion of the cold treatment, plants may be grown warm or cool.**

- Growing plants at low (40 to 50 °F nights) makes sturdier plants, but more time is needed for forcing.

- Warmer (60 to 68 °F nights) temperatures can be used without sacrificing much plant quality, and less time will be required during forcing. Warmer temperatures can increase stretching, especially under low light.

Growth Regulators: Most spring flowering perennials will not require height control unless day temperatures are too high and/or light intensity

is too low. The most commonly used chemical growth regulator for perennials is B-Nine applied at 3,000 to 5,000 ppm as a spray. Example species that respond to this treatment are columbine, candytuft, forget-me-not, phlox, and salvia (Armitage, 1996a; Latimer, 1994). Cycocel at 750 to 1,500 is effective on balloon flower, pinks, and English daisy as a drench or a spray (Armitage, 1996a). A-Rest, Bonzi and Sumagic are also useful on some crops (Table 8). Check labels prior to use to assure chemicals are registered for use on the crop needing height control.

Nutrition: Nutrient requirements are temperature dependent. Armitage (1996a) offers the following suggestions for fertilizing perennials: When growing plants at cooler temperatures, 50 to 100 ppm nitrogen at each watering should be sufficient for most species. As temperatures increase, increase the concentration to 100 to 200 ppm nitrogen. Use a mixture of calcium nitrate and potassium nitrate to feed perennials. Avoid high ammonium-N fertilizers such as 20-20-20, especially when temperatures are cool. Once flowering occurs, reduce the concentration to about 100 ppm nitrogen supplied with potassium nitrate.

### **Parting Perennial Shots**

We have concentrated on forcing flowering perennials, but you should also consider producing "foliage" perennials, grown for their attractive leaves. Hostas, ferns, and ornamental grasses are tremendously popular right now. Producing them in warm greenhouse conditions will put you ahead of growers utilizing field or hoop-house (overwintering house) production schedules. Shade tolerant hostas and ferns can be forced under existing benches and in shady corners of the greenhouse.

This information deals in generalities and draws upon details when available. Propagation techniques, cold storage durations, and photoperiod responses still need defining for many perennials produced today. Hopefully the

**Table 8. Response of 35 species of herbaceous perennials to repeated spray applications (every 10 days from established transplants to flowering) of 100 ppm A-Rest, 5,000 ppm B-Nine, 30 ppm Bonzi, 1,500 ppm Cycocel, or 15 ppm Sumagic.\***

Species		Response to chemical growth retardant				
Plant name	Common name	A-Rest	B-Nine	Bonzi	Cycocel	Sumagic
<i>Achillea millefolium</i> Summer Pastels	Common Yarrow					
<i>Alcea rosea</i> Chater's Double Mix	Hollyhock					
<i>Asclepias tuberosa</i>	Butterfly Weed					
<i>Aster alpinus</i> Alpine Mix	Alpine Aster					
<i>Astilbe arendsii</i> Bressingham Beauty	Astilbe					
<i>Campanula carpatica</i> Blue Clips	Carpathian Harebell					
<i>Campanula persicifolia</i> Blue	Bellflower					
<i>Centaurea montana</i> Violet	Mountain Bluet					
<i>Chelone glabra</i>	Turtlehead					
<i>Chrysanthemum coccineum</i> J. Kelway	Painted Daisy					
<i>Coreopsis grandiflora</i> Sunray	Tickseed					
<i>Coreopsis verticillata</i> Moonbeam	Threadleaf Coreopsis					
<i>Delphinium x elatum</i> Mix	Delphinium					
<i>Echinacea purpurea</i> Bravado	Purple Coneflower					
<i>Gaillardia x grandiflora</i> Burgundy	Blanket Flower					
<i>Gaura lindheimeri</i> Whirling Butterflies	Gaura					
<i>Gypsophila paniculata</i> Double Snowflake	Baby's-breath					
<i>Helenium autumnale</i>	Sneezeweed					
<i>Hemerocallis</i> Hall's Pink	Daylily					
<i>Heuchera sanguinea</i> Bressingham	Coral Bells					
<i>Hibiscus x hybrida</i> Disco Belle Mix	Mallow					
<i>Lavandula angustifolia</i> Munstead Dwarf	Lavender					
<i>Leucanthemum x superbum</i> Marconii	Shasta daisy					
<i>Linum perenne</i> Sapphire	Flax					
<i>Lobelia x hybrida</i> Queen Victoria	Cardinal Flower					
<i>Lobelia x speciosa</i> Compliment Scarlet	Lobelia					
<i>Perovskia atriplicifolia</i>	Russian Sage					
<i>Phlox paniculata</i> Eva Cullum	Summer Phlox					
<i>Physostegia virginiana</i> Summer Snow	Obedient Plant					
<i>Rudbeckia fulgida</i> Goldsturm	Gloriosa Daisy					
<i>Salvia x superba</i> Blue Queen	Sage					
<i>Sedum spurium</i> Dragon's Blood	Sedum					
<i>Veronica longifolia</i> Red Fox	Speedwell					
<i>Veronica longifolia</i> Sunny Border Blue	Speedwell					
<i>Veronica spicata</i> Blue	Speedwell					

\*From Hamaker et al., 1996b. Note that these are reported responses to the chemical growth retardants and NOT commercial recommendations.

□ = no response      □ = slight response      □ = moderate response      □ = strong response

tools offered here will make your exploration into perennial production more profitable.

### Literature Cited

- Armitage, A.M. 1989. Herbaceous perennial plants: a treatise on their identification, culture, and garden attributes. Varsity Press, Inc. Athens, Ga.
- Armitage, A.M. 1993. Forcing perennials for early spring sales. Professional Plant Growers Assn. Nwsl. 24(6):2-3.
- Armitage, A.M. 1996a. Forcing perennials in the greenhouse. GrowerTalks. 60(3):86, 88, 93-94, 96-97.
- Armitage, A.M. 1996b. User-friendly forcing for perennials. Greenhouse Grower. 14(3):96-97.
- Cameron, A., R. Heins, and W. Carlson. 1996a. Forcing herbaceous perennials. Professional Plant Growers Assn. Nwsl. 27(7):3.
- Cameron, A., M. Yuan, R. Heins, and W. Carlson. 1996b. Juvenility: your perennial crop's age affects flowering. GrowerTalks 60(8):30-32, 34.
- Groff, D. 1991. Producing perennial starter plants. Presentation at the International Floriculture Industry Short Course, Cincinnati, Ohio, on 17 July 1991.
- Hamaker, C.K., R. Heins, A. Cameron, and W. Carlson. 1996a. Forcing perennials crop by crop: threadleaf coreopsis. Greenhouse Grower 14(8):43-46.
- Hamaker, C.K., B.E. Engle, R.D. Heins, W.H. Carlson, and A.C. Cameron. 1996b. Using growth regulators to control height of herbaceous perennials. GrowerTalks 60(6):46-47, 50, 53.
- Jelitto, L. and W. Schacht. 1990. Hardy herbaceous perennials. 3rd ed. Timber Press. Portland, Ore.
- Karlovich, P.T. 1995. The pros and cons of producing perennials from seeds. Greenhouse Management and Production. 14(7):37, 41-42.
- Latimer, J.G. 1994. Growth regulators on perennials. Presentation at the Southeast Greenhouse Conference and Trade Show on 17 June 1994 in Greenville, S.C.
- Nau, J. 1993. Ball culture guide: the encyclopedia of seed germination. 2nd ed. Ball Publishing. Batavia, Ill.
- Nau, J. 1996. Ball perennial manual: propagation and production. Ball Publishing. Batavia, Ill.
- Rhodus, T. 1995. Top 20 perennials. Greenhouse Grower. 13(1):80, 82, 84.
- Still, S. 1988. Manual of herbaceous ornamental plants. 3rd ed. Stipes Publishing Co. Champaign, Ill.
- Weiler, T.C. 1996. Forcing perennials. Presentation at the Southeast Greenhouse Conference and Trade Show on 14 June 1996 in Greenville, S.C.
- Whitman, C., R. Heins, A. Cameron, and W. Carlson. 1995. Production guide for *Campanula carpatica* as a flowering potted plant. Professional Plant Growers Assn. Nwsl. 26(4):2-4.
- Whitman, C., R. Heins, A. Cameron, and W. Carlson. 1996. Forcing perennials crop by crop: lavender. Greenhouse Grower 14(5):37-40.
- Yuan, M., R. D. Heins, A. Cameron, and W.H. Carlson. 1996. Forcing perennials crop by crop: tickseed. Greenhouse Grower 14(6):57-60.



# 1996 SUMMER BEDDING PLANT TRIAL SUMMARY

Douglas A. Bailey

Department of Horticultural Science, NCSU

*(Readers interested in the full report should contact Doug Bailey at 919-515-1195 [FAX 919-5157747] and request Horticulture Research Series Number 122)*

Over 470 entries of annual and perennial plants were evaluated during the 1996 bedding plant season at test gardens in Raleigh, North Carolina. The trial gardens are used each year to evaluate bedding plants for landscaper and home owner use.

The trial gardens are located at the Horticulture Field Lab, 4301 Beryl Road, in Raleigh. The site is located on latitude 35°47'N, longitude 78°42'W with an elevation of 400 feet. Transplants were grown in 2.5 inch x 2.2 inch containers, and most were planted in the trial garden on 7 May 1996. A few slower selections were planted when ready. Plant spacing in the trials was 18 inches x 24 inches (in-row x between-row spacing). Seven plants of each entry were used to evaluate the performance of the cultivars with the exception of All America Selections judged entries, which had 14 plants each.

All plants were grown in full sun except for begonias, hypoestes, impatiens, mimulus, New Guinea impatiens, and tuberous begonias; these were grown under 55% shade. When needed, water was applied using overhead irrigation.

Temperatures were very close -- slightly above in June and slightly below in July, August, and September -- to average for the summer season (Table 1, Figure 1). Looking at the entire 5-month season, temperatures were moderate and averaged about 1% below normal (74 °F average daily temperature).

Rainfall received during the 5-month period (35.3 inches!) was well above our average of 21.2 inches (Table 1 and Figure 2). May was dryer than average; June rainfall was average. July was wetter than average; August was slightly dryer than average. September was much wetter than average, due in part to the 10 inches received on 5 September contributed by Hurricane Fran.

Beds were pretreated with Basamid® for weed control prior to planting. Fertilizer was applied as a preplant incorporation and as dry applications during the bedding plant season. No insecticide applications were made during the evaluation in order to document major

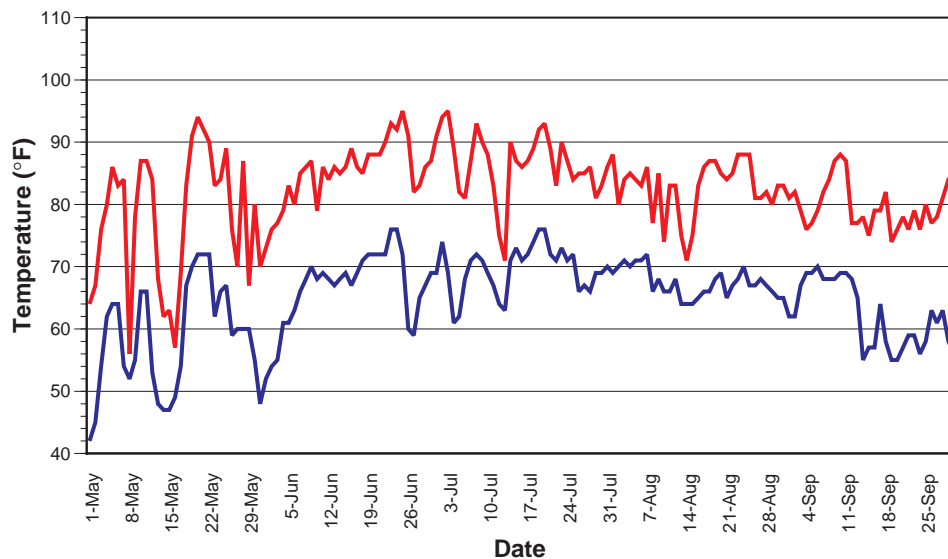


Figure 1. Daily minimum and maximum temperatures for Raleigh, North Carolina from May 1 through September 30, 1996.

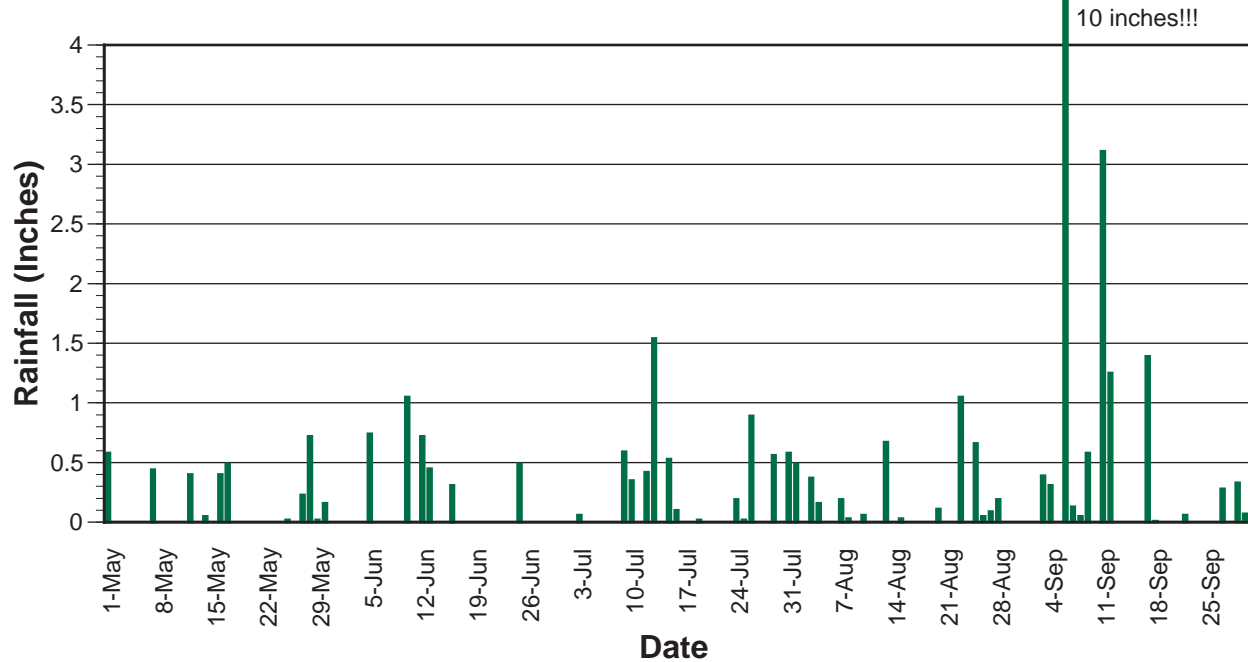


Figure 2. Rainfall received from May 1 through September 30, 1996.

pest problems. No major pests were noted during the 1996 season. Plant diseases were less prevalent in 1996 than in 1995. The major disease problems included Botrytis blight and bacterial leaf spot on geraniums.

Plants were given a visual rating by the same individual once a week beginning 29 May 1996,

three weeks after planting through 20 weeks after planting; the final evaluation date was 25 September 1996. The rating was based on plant performance and appearance, including floriferousness, plant size and shape, and freedom from insect and disease problems. The rating scale used ranged from 1 (very poor) to 5

(excellent), with 0.5 unit increments; a 0 rating indicates all seven plants of the cultivar died. Weekly ratings were averaged to provide an overall rating for the entire season. We used the seasonal average ratings to select the N.C. State Leaders of the Pack and the NCSU Exceptional Performance Winners.

Table 1. Temperature and rainfall from May to September 1996 and 30-year temperature and rainfall averages for Raleigh, N.C.

Month	1996 average daily temp. (°F) and % change from 30-year avg.	30-year average daily temp. (°F)	1996 monthly rainfall (inches) and % change from 30-year avg.	30-year average monthly rainfall (inches)
May	68.1 (0%)	68.1	3.51 (-17%)	4.22
June	75.9 (+1%)	74.9	3.76 (+1%)	3.73
July	78.1 (-1%)	78.8	5.85 (+21%)	4.84
August	75.1 (-3%)	78.0	4.15 (-8%)	4.52
September	71.0 (-2%)	72.1	17.99 (+367%)	3.85



### Sources of Seeds and Plants

The following companies graciously sponsored the 1996 trial gardens. The companies are acknowledged by the abbreviation that appears to the left of the company name. Appreciation is also given to Fafard, Inc. and to the North Carolina Commercial Flower Growers' Association for their contributions towards the trials.

- **AAS** All-America Selections, 1311 Butterfield Road, Suite 310, Downers Grove, IL 60515
- **BALL** Ball Seed Co., P.O. Box 335, West Chicago, IL 60185
- **BEN** Ernst Benary of America, Inc., 1444 Larson Street, Sycamore, IL 60178
- **BG** Bodger Seeds Ltd., 1800 North Tyler Avenue, Lompoc, CA 91733 3618
- **DHN** Dæhnfeldt Inc., P.O. Box 947, Albany, OR 97321
- **DMN** Dümme USA, 7000 Topeka Lane, Vancouver, WA 98664
- **ECKE** Paul Ecke Ranch, P.O. Box 230488, Encinitas, CA 92023-0488
- **GLC** Fred C. Gloeckner Company, Inc. 600 Mamaroneck Avenue, Harrison, NY 10528
- **GOLD** Goldsmith Seeds, Inc., P.O. Box 1349, Gilroy, CA 95020
- **GRS** G.S. Grimes Seeds, P.O. Box 640, Concord, OH 44077 0640
- **HN** Homewood Nursery, 10809 Honeycutt Rd., Raleigh, NC 27614
- **IF** Icenhower Farms, 179 Icenhower Road, Leicester, NC 28748
- **NCSU** Department of Horticultural Science, Box 7609, North Carolina State University
- **PA** Pan American Seed, P.O. Box 438, West Chicago, IL 60185
- **PDN** Plant Delights Nursery, 9241 Sauls Road, Raleigh, NC 27603
- **SAK** Sakata Seed America Inc., 105 Boronda Road, Salinas, CA 93907
- **S&G** S&G, 3010 Woodcreek Drive, Suite B, Downers Grove, IL 60515
- **T&M** Thompson & Morgan, Inc. P.O. Box 1308, Jackson, NJ 08527-0308
- **VN** Vaughan's Seed Co., 5300 Katrine Avenue, Downers Grove, IL 60515
- **WIWA** Willow Wood Arboretum, P.O. Box 1295, Morristown, NJ 07962-1295

### N.C. State Leaders of the Pack

The following were selected in 1996 on their ability to display attractive landscape color throughout the majority of the bedding plant season. At any one time, other species or entries may have made a better short-term showing, but the "Leaders of the Pack" were selected for consistent, dependable full-season performance as a source of color and beauty in the landscape. The cultivar source is shown in parenthesis.

#### Begonia

Bicolor: 'Varsity Bicolor' (S&G)  
 Mix: 'Cocktail Mix' (BEN), 'Olympia Mix' (BEN), 'Espresso Mix' (DHN)  
 Pink: 'Senator Pink' (DHN)  
 Red: 'Inferno Red' (DHN), 'Baron Red Green Leaf' (VN)  
 Rose: 'Baron Rose Bronze Leaf' (VN), 'Varsity Bronze Leaf Rose' (S&G), 'Victory Rose' (GOLD), 'Senator Deep Rose' (DHN)

#### Begonia, continued

White: 'Baron White Green Leaf' (VN), 'Varsity Bronze White' (S&G), 'Senator White' (DHN)

#### Celosia

'New Look' (BEN)

#### Coleus

'Rose Trailer' (WIWA), 'Solar Shade' (HN), 'Inky Fingers' (WIWA), 'Camellia' (WIWA), 'Black Trailer' (WIWA), 'Red Mars' (WIWA), 'Yellow in Sun' (WIWA),

**Coleus, continued**

'Touchelay' (WIWA), 'Black Magic' (WIWA), 'Burgundy Flame' (HN)

**Dianthus**

'Floral Lace Violet Picotee' (BALL), 'Floral Lace Crimson' (BALL)

**Dusty Miller**

'Silver Lace' (GLC), 'Silver Cloud' (GLC)

**Evolvulus**

'Blue Daze' (HN)

**Geranium**

'Pinto Coral' (S&G)

**Globe Amaranth**

'Gnome White' (SAK)

**Hypoestes**

'Red Splash Select' (PA)

**Impatiens**

Bicolor: 'Blitz 2000 Rose Star' (S&G), 'Accent Salmon Picotee' (GOLD)

Blue/Violet: 'Dazzler Burgundy' (BALL), 'Accent Lilac' (GOLD), 'Mosaic Lilac' (GOLD), 'Dazzler Lilac Splash' (BALL)

Coral: 'Super Elfin Melon' (PA)

Mix: 'Deco Tri-Color Mix' (PA)

Orange: 'Tempo Orange' (BG), 'Accent Orange' (GOLD)

Pink: 'Impulse Deep Pink' (S&G), 'Dazzler Deep Pink' (BALL), 'Cajun Deep Pink' (S&G)

Red: 'Accent Red' (GOLD), 'Blitz 2000 Red' (S&G)

Rose: 'Impulse Rose' (S&G)

Salmon: 'Tempo Peach Frost' (BG)

White: 'Super Elfin White Improved' (PA), 'Tempo White' (BG)

**Lobelia**

'Fan Cinnabar Rose' (BEN)

**Marigold**

'96BP03' (AAS), 'Bonanza Flame' (AAS)

**Melampodium**

'Medaillon' (S&G)

**Mexican Heather**

Mexican Heather (HN)

**Narrow-Leaf Zinnia**

'95F21' (AAS), 'Crystal White' (AAS), 'Gold Star' (GLC)

**New Guinea Impatiens**

Bicolor: 'Liberty Lilac & Red' (DMN)

Blue: 'Aruba' (ECKE), 'Acapella' (DMN)

Orange: 'Antiqua' (ECKE)

Pink: 'Patriot Soft Pink' (DMN), 'Tonga' (ECKE)

Red: 'Patriot Dark Red' (DMN)

**Petunia**

Blue/Purple: 'PrimeTime Lavender' (GOLD), 'Purple Wave' (PA)

Pink: 'Pink Wave' (PA), 'Fantasy Pink' (GOLD), 'Fantasy Pink Morn' (GOLD)

Red: 'Carpet Bright Red' (PA)

Rose: 'PrimeTime Rose' (GOLD)

Salmon: 'Dreams Salmon' (PA), 'Fantasy Salmon' (GOLD)

Yellow: 'Celebrity Chiffon Morn' (BG)

**Salvia**

Blue: 'Mina' (GLC), 'Signum' (BG), 'Strata' (AAS)

Blue/White: 'Reference' (BEN)

Red: 'Grenadier' (VN), 'Red Vista' (PA), 'Hot Stuff Red' (VN)

White: 'Argent' (GLC)

**Sanvitalia**

'Orange Sprite' (PA)

**Setcreasea**

'Purple Heart' (IF)

**Snapdragon**

'Princess White<sup>w</sup>/Purple' (GLC), 'Tahiti Pink' (S&G)

**Sparkler Daisy**

'Cape Daisy Lusaka' (ECKE), 'Cape Daisy Nairobi' (ECKE), 'Cape Daisy Zimba' (ECKE)

**Spur Flower**

*Plectranthus coleoides* 'variegata' (HN)

**Strawflower**

'Chico Mix' (PA)

**Sweet Potato**

'Sulfur' (NCSU), 'Blackie' (NCSU)

**Verbena**

- Blue/Purple: 'Homestead Purple' (PDN),  
'Imagination' (AAS)  
Pink: 'Texas Appleblossom' (PDN)  
Red: 'Summer Blaze' (PDN)  
Rose: 'Fiesta' (PDN), 'Batesville Rose' (PDN)  
White: 'Snowflurry' (PDN)

**Vinca**

- Blue/Purple: 'Grape Cooler' (GLC)  
Mix: 'Prairie Pastels Mix' (S&G)  
Pink: 'Icy Pink Cooler' (PA), 'Pink Cooler'  
(PA), 'Heat Wave Orchid' (BG), 'Orchid  
Cooler' (PA), 'Heat Wave Pink' (BG)  
White: 'Peppermint Cooler' (PA), 'Heat Wave  
White' (BG)

**NCSU Exceptional Performance Winners**

Each year, the best of the best, those cultivars that exemplify outstanding performance during the trials, will be recognized as Exceptional Performance award winners. The winners are judged on full-season performance and are recommended as outstanding selections for our region. Growers, retailers and landscapers are encouraged to consider these cultivars first for their color needs. Only eight cultivars were selected from over 470 entries in the 1996 trial garden:

**1996 Winners**

- |   |   |
|---|---|
| 1. <i>Evolvulus</i> , 'Blue Daze' (HN)    | 5. <i>Impatiens</i> , 'Super Elfin White Improved' (PA) |
| 2. <i>Spur Flower</i> , (HN)              | 6. <i>Impatiens</i> , 'Super Elfin Melon' (PA)          |
| 3. <i>Mexican Heather</i> , (HN)          | 7. <i>Vinca</i> , 'Peppermint Cooler' (PA)              |
| 4. <i>Impatiens</i> , 'Accent Red' (GOLD) | 8. <i>Vinca</i> , 'Icy Pink Cooler' (PA)                |

**1995 Winners**

1. *Petunia*, 'Purple Wave' (HN) -- from cuttings
2. *Petunia*, 'Purple Wave' (AAS) -- from seed
3. *Verbena*, 'Homestead Purple' (PDN)
4. *Evolvulus*, 'Blue Daze' (HN)

**1994 Winners**

1. *Salvia*, 'Cover Girl' (BEN)
2. *Vinca*, 'Pretty In Rose' (AAS)
3. *Salvia*, 'Lady In Red' (FLS)
4. *Hypoestes*, 'Pink Splash' (PK)
5. *Salvia*, 'Sizzler Lavender' (CSP)
6. *Salvia*, 'Rhea' (CSP)

**1993 Winners**

1. *Vinca*, 'Hot Streak Salmon' (GRS)
2. *Impatiens*, 'Accent Lilac' (GOLD)
3. *Begonia*, 'Stara Clear Rose' (CSP)

**1992 Winners**

1. *Globe Amaranth*, 'Lavender Lady' (PK)
2. *Evolvulus*, 'Blue Daze' (HN)
3. *Mexican Heather* (HN)
4. *Begonia*, 'All Round Greenleaved Pink' (DHN)

**1991 Winners**

1. *Evolvulus*, 'Blue Daze' (HN)
2. *Mexican Heather* (HN)
3. *Begonia*, 'All Round Greenleaved White' (DHN)
4. *Begonia*, 'Rio Pink' (S&G)

**1990 Winners**

1. *Globe Amaranth*, 'Dwarf Buddy'
2. *Vinca*, 'Grape Cooler'
3. *Impatiens*, 'Impulse Bright Eye'
4. *Celosia*, 'New Look'

## NCCFGA NEWS

**T**here is no sight more pleasing than looking down the main corridor of an empty greenhouse and seeing the tail end of the last delivery truck leaving the loading dock. I hope this holiday sales season has been good for each of you.

We had an excellent Poinsettia Open House earlier this month at NC State. I was very impressed with the trials as well as the turn out; over 90 attended. We had visitors from Florida, South Carolina, Michigan, Pennsylvania, Virginia, California, and France; as well as North Carolinians. I would like to thank Roy Larson and Ingram McCall for their dedication and commitment to this project. The time they put in was evident in the high quality of the plants (and the quality of the refreshments, too! Thanks to Darlyne Larson and Ingram for their efforts in that project as well.).

By now you should have received your NCCFGA Directory. We are proud of this publication and hope to build on it in the future both in number of members as well as offering the opportunity to members to advertise their company (and to support the Association). Enclosed in this month's Bulletin is a list of additional members who joined NCCFGA after the September deadline for the directory. Welcome to our new members.

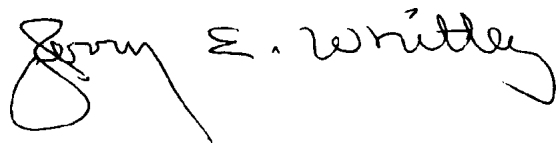
The 1997 directory will include all members who join prior to 1 April 1997. If you are interested in supporting NCCFGA through an ad in the directory, the costs are: \$350 for outside back cover, inside back cover or inside front cover; \$ 250 for a full page ad; \$150 for a half page; and \$100 for quarter page ad. Contact Bonnie Holloman at 919-779-4618 for more information. Directory sponsors need to have their ads and payment to Bonnie by 1 April 1997.

Speaking of membership, you will receive an invoice this month from Bonnie as dues need to be paid by January 1997. Please make every effort to be expedient in remitting payment; we want you included in the membership directory and I am sure you don't want to miss an issue of the Bulletin or let your membership lapse. There is a membership application on page 19 of this issue if you would like to pay in advance. If you know of someone who should be a member, cut out the application and sign them up. Our Association needs your help in attracting new members so we can continue to grow and increase our efforts to assist the industry.

Our next effort is coming up quickly. The Green and Growin' Show is Thursday-Sunday, 9-12 January 1997. We will be cosponsoring this event and have a grower's session scheduled for Friday afternoon, January 10. Make plans now to attend and also to exhibit at this event. It is an excellent opportunity to promote your product to retailers and landscapers. You should have received a packet from the N.C. Association of Nurserymen. If you have not, call Bonnie and she can send you that information.

Soon we will all be busy with preparations for the upcoming spring season. However, I hope that each of you will be able to take some time to relax and recharge before embarking onward towards spring.

Happy holidays to all,



Jerry E. Whitley, NCCFGA President

# GIBBGRO® 4LS LABELED FOR GREENHOUSE USE IN NORTH CAROLINA

Agtrol Chemical Products received EPA approval for 24(c) registration of GibbGro® 4LS, 4% w/w gibberellic acid in North Carolina earlier this year. GibbGro is now labeled for use in greenhouses in North Carolina as per the 24(c) labeling. The labeling allows for use as a foliar spray on spathiphyllum to induce flowering and azalea to induce flowering as well as partial or total substitution of cold treatment to break dormancy. Prior to using GibbGro, make sure you have the 24(c) labeling in your possession. Contact your agricultural chemicals supplier for product and labeling information. This label only allows for greenhouse use in North Carolina and not other states. Florida has a 24(c) label that allows use on azaleas and spathiphyllum, but not in a greenhouse.

## CALENDAR OF EVENTS

Event	Date	Time	Location and contacts
Green & Growin' Show and Floral Expo	Thursday–Sunday 9–12 January 1997		Benton Convention Center, Winston-Salem, N.C. Contact Bonnie Holloman at 919-779-4618 for further details.
NCCFGA Board Meeting	Saturday 11 January 1997		Benton Convention Center, Winston-Salem, N.C. Contact Bonnie Holloman for further details.
GrowerExpo '97	Thursday–Sunday 9–12 January 1997		Pheasant Run Resort, St. Charles, Illinois. Call 1-800-456-5380 for more information.

*Happy  
Holidays!!!*





# DUES NOTICE



**NORTH CAROLINA COMMERCIAL FLOWERS GROWERS' ASSOCIATION**  
**8600 Crowder Road**  
**Raleigh, NC 27603**

Company: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Additional Employees: \_\_\_\_\_ FAX: \_\_\_\_\_

(\$20.00 each) \_\_\_\_\_ E-mail: \_\_\_\_\_

\_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

**Dues Categories (please check appropriate categories):**

- \_\_\_ 0 to 10,000 ft<sup>2</sup> of greenhouse . . . . . \$ 40.00
- \_\_\_ >10,000 ft<sup>2</sup> to 1 acre of greenhouse . . . \$ 60.00
- \_\_\_ >1 acre to 5 acres of greenhouse . . . . \$ 100.00
- \_\_\_ >5 acres of greenhouse. . . . . \$ 125.00
- \_\_\_ Allied Trades . . . . . \$ 60.00
- \_\_\_ Additional Employees (each). . . . . \$ 20.00
- \_\_\_ Educator . . . . . \$ 20.00
- \_\_\_ Student . . . . . \$ 1.00

Please Mail This Form  
 and Your Check To: **NCCFGA**  
**8600 Crowder Road**  
**Raleigh, NC 27603**

*Contributions to NCCFGA are not deductible as a charitable contribution for federal income tax purposes. Dues may be deductible to members for federal income tax purposes as ordinary and necessary business expenses.*

**For Our Next Directory, Please Indicate Your Categories:**

- Wholesale Grower
- Retail Grower
- Allied Trades
- Research
- Extension
- Municipal
- Landscaping
- Garden Center
- Educator
- Student
- Other: \_\_\_\_\_

**If a Grower, Please Indicate:**

**Total Heated ft<sup>2</sup>** \_\_\_\_\_  
**Total Field Production ft<sup>2</sup>** \_\_\_\_\_

**Please Check Crops Grown:**

- Bedding Plants
- Cut Flowers
- Potted Flowering Plants
- Hanging Baskets
- Foliage Plants
- Hardy Chrysanthemums
- Perennials
- Herbs
- Other: \_\_\_\_\_

Total Dues Enclosed:  
 \$ \_\_\_\_\_

**Upon receipt of your dues you will receive a membership confirmation and certificate.**



**NORTH CAROLINA  
COMMERCIAL FLOWER GROWERS' ASSOC.**

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