

North Carolina Flower Growers' Bulletin

Volume 40, Number 4
August, 1995



Official Publication of the North Carolina Commercial Flower Growers' Association

EFFECTIVE USE OF MARATHON™ ON POINSETTIAS

James R. Baker
Department of Entomology, NCSU

(The following article was taken from a presentation and proceedings submission Dr. Baker made for the 1995 N.C. Bedding Plant Field Day in July.)

Imidacloprid is a systemic chloronicotinyl pesticide manufactured by Bayer and distributed by Olympic Chemical Company as Marathon™. It is currently available in a 1% granular labeled for aphids, mealybugs, thrips and whiteflies in greenhouses and nurseries. It gives more than adequate control of aphids, silverleaf whitefly, greenhouse whitefly, and mealybugs when applied properly. However, Marathon™ does not appear to protect flowers from thrips, though it may give adequate control of foliage feeding thrips.

Marathon™ is applied to the surface of the substrate and is watered into the container for activation and root uptake. Wait until the plants have some roots before applying Marathon™ as poorly rooted plants will be less likely to absorb the material than well-rooted plants. Like other systemic pesticides, Marathon™ is soluble in water. Try not to leach treated plants for several days after applying the granules. Not more than 40 pounds of product per acre should be applied per year.

Marathon™ and Fungus Gnats

It has been noted that poinsettias treated with Marathon™ usually do not have fungus gnat maggots in the substrate (Figure 1). However, Marathon™ is not the answer to fungus gnat problems because fungus gnats infest poinsettias before Marathon™ should be applied. Marathon™ should not be applied before the plants have some roots to absorb it. Fungus gnats often infest unrooted cuttings in the mist chamber. To avoid fungus gnat problems, use sanitation (clean benches and clean under the benches, consider using copper sulfate or hydrated lime

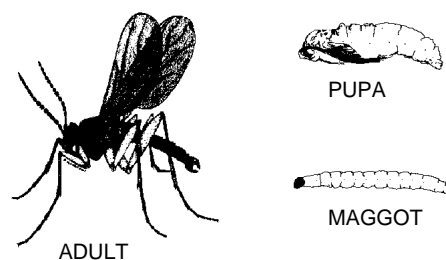


Figure 1. Life stages of fungus gnats.

under the benches to kill weeds and fungus gnat maggots), do not bruise the cuttings when sticking them, and do not overwater the rooted cuttings when they are potted up.

Marathon™ and Resistance

Resistance to imidacloprid is rumored to already have occurred in Europe where imidacloprid has been in use for some years. Because imidacloprid is also labeled for field, fruit, and vegetable crops (as Admire™ and Gaucho™; Premise™ for termites; and Merit™ for outdoor turf and ornamentals), the possibility of resistance is plausible. There are two schools of thought on how to prevent the onset of resistance to Marathon™: the orthodox approach and my approach. The orthodox approach dictates that Marathon™ should be used only once on a poinsettia crop and that the stock plants and autumn crop are all the same crop. By forcing growers to use other means of pest suppression, resistance should be delayed. This sounds good, but it ignores an important difference in how poinsettias are grown by propagators that have a completely different pest situation from finishing crop growers. First the finished crop:

If a grower receives stock plant cuttings in April, it seems unlikely that Marathon™ can completely protect those plants until November or early December. By using Marathon™ only once, the grower would, indeed, have to use other means of suppressing whiteflies. This should delay the onset of resistance. However this means the grower has to use other pesticides toward the end of the crop when the bracts are the most likely to be damaged.

This is my philosophy on managing resistance to Marathon™: Because imidacloprid is applied to millions of insects on various crops every day, the resistance is bound to occur sooner or later. Resistance will probably arise in the Middle

East, Spain, or some other relatively arid country in which only irrigated crops are green. This means that a large percentage of insect populations is treated which really selects for resistance. A resistant whitefly or aphid can make its way onto an ornamental crop and can then be shipped to the United States and bingo! Forty-eight hours later we have resistant pests. Because resistance is coming, we might as well enjoy the short-term benefits of Marathon as there may not be any long-term benefits. I think the best way for most North Carolina growers to use Marathon™ on poinsettias is this. There are actually two poinsettia crops per year in North Carolina, poinsettia stock plants and the fall crop of poinsettias. Marathon™ should not be applied to the stock plants until after the roots have grown out to the edge of the pot. Make sure the plants have plenty of roots before applying the granules. On the fall crop of poinsettias, do not apply Marathon™ until after the pinch, waiting to assure that there are plenty of roots to absorb the Marathon™. By waiting this late, by the time the Marathon™ has begun to dwindle away, frost should have killed whiteflies outside and the chances of whiteflies damaging the crop are greatly reduced. Because the fall crop of poinsettias goes into homes and churches where the plants are inexorably killed and the whiteflies with the plants, even if resistant whiteflies arose on the fall crops, the chances of these whiteflies surviving is very small.

Those few growers in North Carolina (and all out of state poinsettia propagators) who sell poinsettia cuttings to other growers have a moral obligation to supply cuttings that do not have whiteflies whatsoever. Propagators should use IPM, screening, soaps, oils, and synthetic petrochemicals to suppress pests. Certainly propagators should not use Marathon™ more than once or twice a year.

PROPERTIES OF GREENHOUSE SUBSTRATES

William C. Fonteno, Douglas A. Bailey, and Paul V. Nelson
 Department of Horticultural Science, NCSU

Everyone seems to be searching for the ideal greenhouse substrate. The criteria are simple: make a mix with good aeration, that doesn't dry out too quickly, can be used in all cell sizes, contains all the nutrients necessary, and stores indefinitely. All that is needed is a substrate that is not affected by other forces in the greenhouse; a mix that does not change with cultural practices.

Obviously, trying to make the mix totally responsible for air, water and nutrition will be unsuccessful. A better strategy is to integrate the mix into a production system that addresses substrate aeration and water retention as well as plant nutrition.

Aeration and Water Retention

Balancing the air and water contents has been one of the biggest problems facing greenhouse growers, especially plug and bedding plant growers. Just after seeding, plugs are too wet, and many drown. But later in production, plugs dry out too quickly, as plants mature and increase in size. To compensate for changing plant demands, growers must change their watering practices as the plugs mature.

People tend to think of the mix as the overriding factor that determines air and water content in the root zone. Therefore most mixes made over the last 20 years have been characterized according

to their air and water values, as if these were fixed properties of the mix. They are not. There are four major factors which affect the air and water status in containers. These factors are like the four corners of a plug or tray cell; each is necessary in supporting the air and water content in that cell (Figure 1). The four corners are: ❶ the substrate (components and ratios); ❷ the container (height and shape); ❸ substrate handling procedures; and ❹ watering practices. Each of these four factors have a profound effect on air and water content.

The Substrate. Indeed, the substrate can greatly influence the air and water content in the root zone. Most mixes used in greenhouses contain 30 to 60% peat moss or 30 to 60% of a peat moss plus composted pine bark combination. These two mix components can vary in quality,

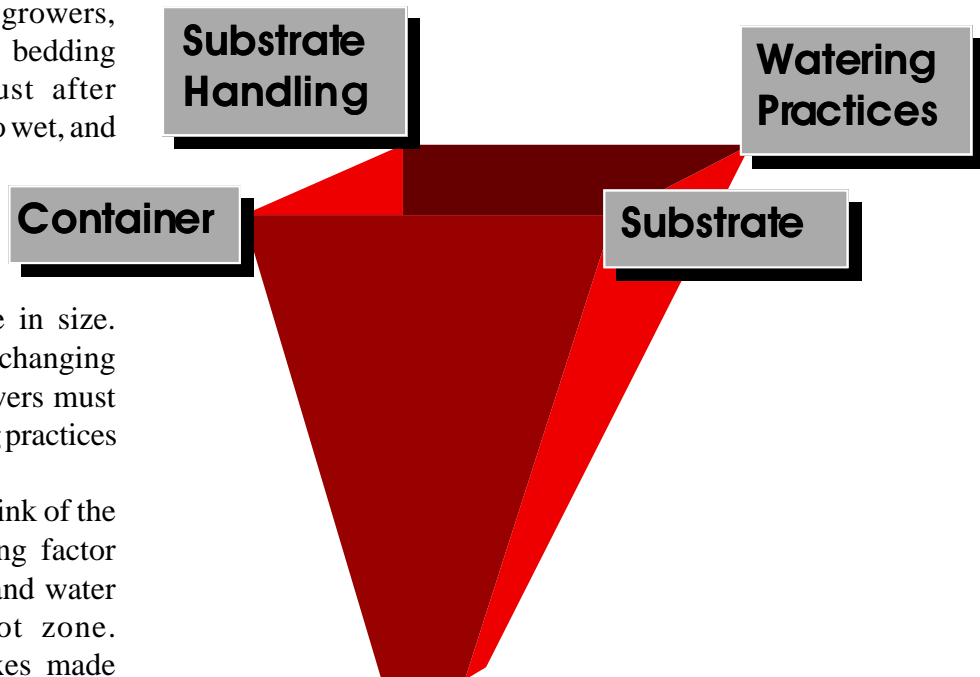


Figure 1. The four major factors which affect the air and water status in containers.

and growers mixing their own substrate should select peatmoss and pine bark based on the following.

Generally, sphagnum peat is preferred because it has an advantageous fiber structure over hypnum or reed-sedge peats, which allows for good aeration and drainage. A word of caution--simply using a sphagnum peat does not assure you of uniformity. If the peat has been milled too much, fibers can be crushed and the quality will be reduced. Mix ingredient quality control is essential for repeatable, consistent production results.

If the mix does contain pine bark, the bark should be composted and not "green." Bark that is aged and not composted will result in nutritional imbalances due to microbes decomposing the bark. The microbes will out compete the plants for available nutrients.

Aggregates are generally added to peat moss / pine bark mixtures to provide more rapid drainage and increase aeration. Most commonly, vermiculite, perlite and polystyrene beads are added; calcined clays are also used. Vermiculite is the aggregate used most often and in the largest ratio, from 20 to 60% by volume. The size of the vermiculite is very important. The size of vermiculite commonly used in general potting mixes and bedding plant flat mixes is #2 (horticultural grade). This does provide large pores (macropores that will provide air space in the substrate), and is recommended for large-celled flat production and large containers. However, plug mixes generally contain grade #3 (which is finer) to allow the mix to flow more evenly into the trays at filling. Ironically, grade #3 is one of the poorest aggregates for adding air space. It holds less water and much less air than #2. It is also more susceptible to compaction and structural collapse.

What does all of this mean? First, peat plays a much more dominant role in plug and bedding plant flat production than in larger containers (bark is rarely used in plug substrates), and the quality of the peat used is very important. Second,

the aggregates used may or may not help improve drainage and add air space, depending on size and shape of particles. Third, smaller particle sizes do not necessarily improve air and water content and can in fact hurt. When selecting a substrate, examine the contents and particle sizes prior to deciding on what is best for the crop (plugs, bedding plant flats, or larger containers) that are being grown.

The Container. The second "corner" of cell air and water content is container height and shape. For large containers and large cell flats, container effects are not as much of a concern, but the effects of containers are greatly accentuated in plug production.

The main reason why it can be harder to grow a good plug than a good pot mum is the plug cell itself. Plug cells have only two basic problems - they are too short and too small. They are so short that at best they drain very little and at worst (like in the 648 waffles) they do not drain at all. For example, a 1 peat: 1 vermiculite mix has an air space of 2.8% by volume in the 288 cell and only 0.5% in the 648 tray. This same mix has an air space value of 13% in a 4 inch pot (3 1/4" tall) and 20% in a 6 inch pot (4 1/2" tall).

The importance of height is illustrated well by Figure 2. A normal 273 plug is approximately 1 inch tall. We "manufactured" a tall 273 cell with the same length and width at the top opening, but made it 2 inches tall with the same general taper. The effect on drainage was dramatic. The four mixes in Figure 2 are commercial plug mixes run through our lab for diagnostic purposes and are simply listed as Mix 1, 2, 3, and 4. Notice the difference in air content between the short and tall plugs. Air content went from a range of 1% to 3% in the short plugs to 5% to 10% in the tall. If we could get 10% air space in all of our plugs we could cut our plug production problems in half. Taller cells equals more air space. Obviously, it is possible to grow good plugs in short plug cells. But the smaller the cells, the greater the chance of the plants being over-watered and under-watered.

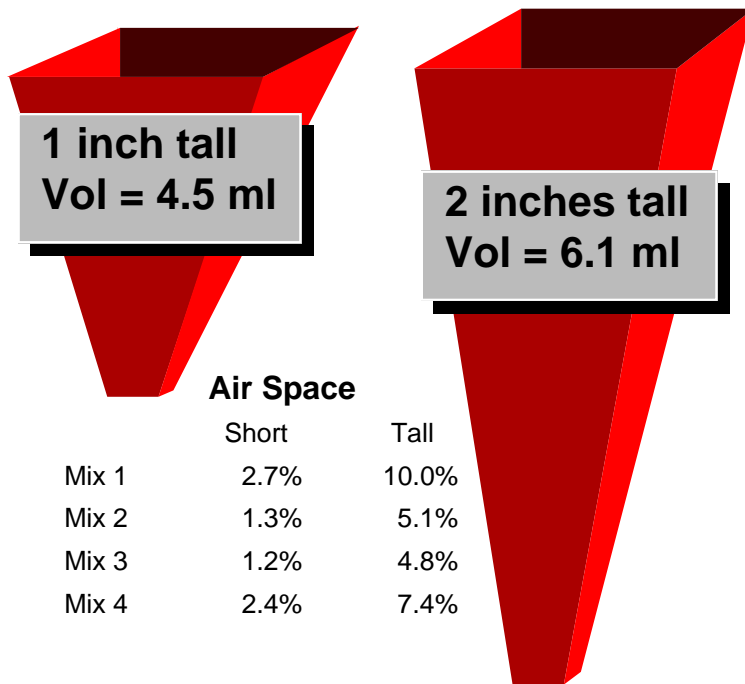


Figure 2. Effect of cell height on air space (reported as percent by volume) in the substrate.

This phenomenon of changing percent air space based on container height is sometimes called a “perched water table” effect. After watering a container, there will always be a portion of the substrate at the bottom of the container that does not drain, and pores remain saturated with water. This saturation zone is a larger percent of the total volume in shorter containers. A good demonstration sometimes used to visualize the effect of container height is a sponge (Figure 3). Imagine that the sponge is the substrate in a container. The example sponge in Figure 3 is 2" x 4.25" x 8.5". This is a total volume of 72.25 cubic inches or 1,184 ml. When fully saturated (squeezing out all the air then soaking in water), the sponge holds 950 ml; the total porosity is 80%. Holding the sponge so it has a 2 inch height resulted in about 50 ml water being drained. The sponge had 4.2% air space when two inches tall. Turning the sponge on its side to create a height of 4.25 inches drained another 125 ml; total air space of 14.8%. Holding the sponge so the height is 8.5 inches drained another 375 ml and resulted in a total air space of

46.5%! Notice the difference in the total volume drained from the sponge, depending on the height. This effect holds true for different height containers filled with the same substrate as well. The height of the container will dictate the total air space of the substrate after drainage of excess water.

Another issue is container shape. Good plugs can be grown in both round or square plug cells. “Round” cells are actually portions of a cone, while “square” cells are sections of pyramids (Figure 4). Of the two designs, the square cells are preferred because they have a larger volume. In Figure 4 we see a round and a square 288 cell. If you calculate the volumes of each you find that the round cells has a volume of 4.66 ml, while the

square cell has a volume of 6.18 ml. Although these numbers are small, the square cell is 33% larger than the round one. This extra volume translates to more water being available to the plant and less chance of drying out. This extra volume does not necessarily increase air space percentage. However, as long as the height remains the same, there is no decrease in drainage, so air space is not adversely affected. There is no advantage to growing in round cells. Even if you can get a better price on round trays, the decrease in container and substrate volume is not worth it.

Substrate Handling. The “third corner” for air and water in bedding plant cells is substrate handling. How a mix is handled can greatly affect the air and water content of the mix. All efforts to select the best material, conscientiously blend them and carefully package them and ship them can be undone on the other end by someone who handles the mix improperly.

What should growers be cognizant of? One factor is *compaction*. Containers, cell paks and plug trays should be lightly filled and the excess brushed away. This can be accomplished by

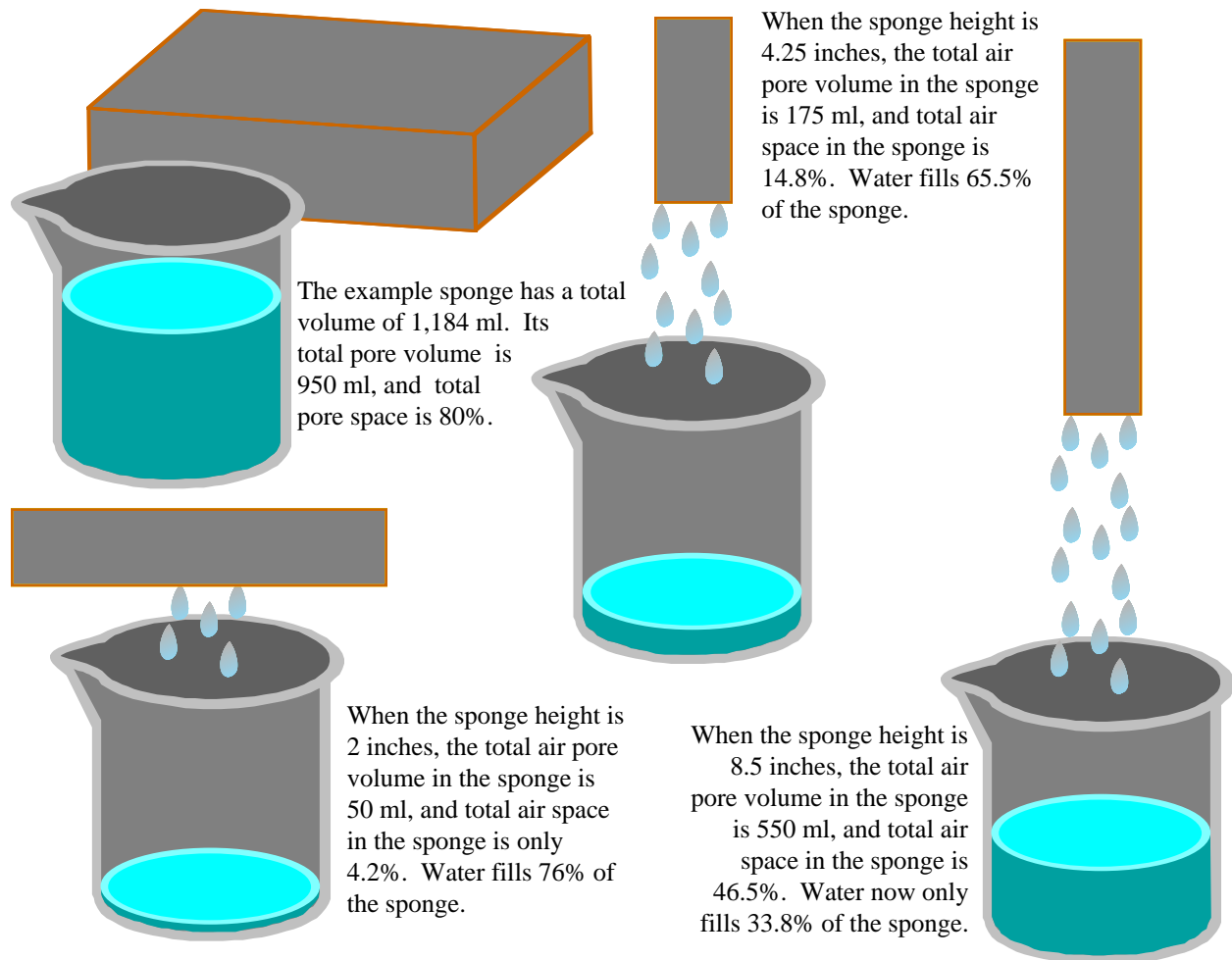


Figure 3. Container height drastically affects air space in a substrate.

hand or machine flat fillers and pot fillers. The substrate should not be packed down, and pots and trays should not be stacked directly over one another. Air space can be cut in half or even completely eliminated by compaction.

The second consideration is the *moisture content* of the mix prior to container filling. When water is added to dry components, such as peat, they hydrate and swell. This swelling helps to create more aeration by reducing the tendency of the particles to nest within one another. This effect is not so dramatic on larger containers, but can be the difference between success and failure of a plug crop. Most plug mixes tend to be inadequately moistened prior to flat filling. Water should be added to the mix before it is placed into the cells.

How much water should be added to the mix? For peat-based substrates used in large containers and bedding plant cell pak production, approximately 100% by weight is sufficient. Plug mixes should have approximately 200% by weight water added to them prior to filling the plug tray. The rule of thumb is, the smaller the cell, the more water to add prior to planting. This level of moisture will seem much wetter than “normal,” but will actually improve aeration. A word of caution for plugs, do not soak down the mix after seeding. Light misting for germinating the seed is fine but the mix does not need more moisture after filling.

Pre-filling pots, cell paks or plug trays and letting them dry out can be detrimental if they are handled much before they are remoistened.

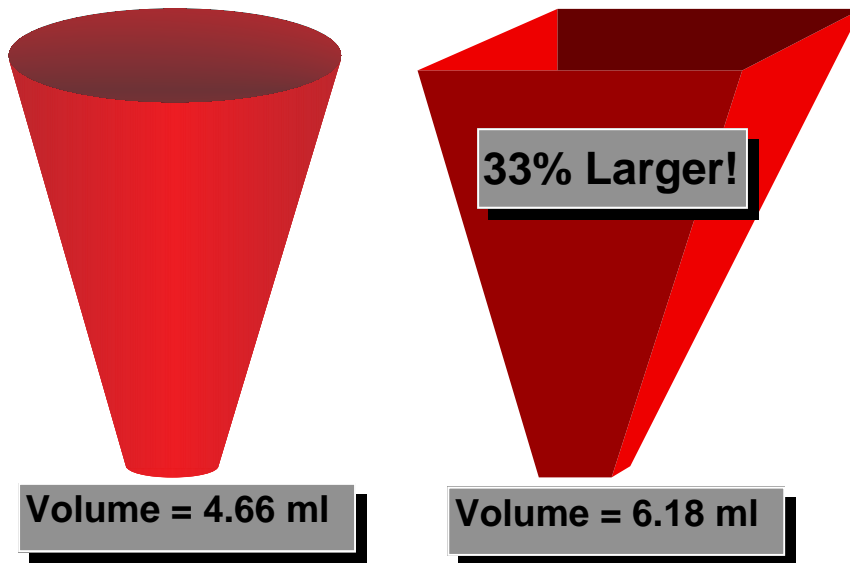


Figure 4. Container shape can affect cell volume, as demonstrated by these two 288 cells.

Continuous flow mixers can also cause problems when portions of the mix sit on the conveyor belts overnight. Slight separation of the mix can occur on the belt which can result in a “different mix” in several containers.

Watering Practices. The fourth “corner” for air and water in cells is watering practices. How you water a mix can influence air and water content in the root zone more than the mix itself, especially for plugs. Because plugs do not drain well they are easily over-watered. There is an old saying in the greenhouse business, “the person at the end of the hose controls your profits.” This is certainly true for plug production. Knowing when to water is perhaps the most important skill for a bedding plant grower. It is also the biggest headache.

Watering is the product of frequency of irrigation \times volume of water applied. For best aeration and water availability, as cell size decreases, decrease water volume and increase irrigation frequency. Also, the smaller the cell size, the smaller the droplet size should be to avoid “blasting out” the cells and plants.

By understanding the four corners outlined in Figure 1, you can begin to use them as management options. They should be considered

together, as a package when trying to optimize the air and water conditions in bedding plant cells. Each of the factors are interrelated, and none can be modified without affecting the rest.

Nutrition

The chemistry of nutrition in greenhouse crops can be very complex and varies from crop to crop and even from season to season. However, the basics are generally the same.

Incorporated fertilizers.

A minimum base charge is placed in the mix (Table 1)

and additional nutrition is applied as liquid feed. This gives the grower added flexibility in speeding up or holding back plants.

The incorporated charge should supply ample calcium (Ca) and magnesium (Mg) for short term crops such as bedding plants from the dolomitic lime added for pH control. It will also supply sufficient micronutrients for short term crops as long as the substrate pH is managed correctly. For more long-term crops such as pot mums and poinsettias, additional Ca, Mg and micronutrients may be needed during the cropping cycle.

Phosphorus additions are also made during greenhouse production, even though phosphorus is included in most substrates during blending. Sulfur is also included in most substrates. The addition of nitrogen and potassium charges is optional. If liquid feed can be started soon after planting then they are not necessary additions to the mix. However, fast growing crops such as chrysanthemums and poinsettias may benefit from a preplant charge of both N and K.

Substrate pH. The pH of the substrate, as estimated by measuring the pH of a substrate extract, is very important to plant nutrition. The pH directly affects the availability of many plant nutrients, especially micronutrients.

Table 1. Nutrient sources commonly added into greenhouse substrates during formulation.

Nutrient source	Rate per cubic yard	
	Soil-based substrates	Soilless substrates
To provide calcium and magnesium		
Dolomitic limestone	0 to 10 lb	10 to 15 lb
To provide phosphorus and sulfur		
Superphosphate (0-20-0)	3.0 lb	4.5 lb
<i>OR</i>		
Treble superphosphate (0-45-0)	1.5 lb	2.25 lb
+ gypsum (calcium sulfate)	1.5 lb	1.5 lb
To provide micronutrients: iron, manganese, zinc, copper, boron, and molybdenum		
F-555HF	3 oz	3 oz
<i>OR</i>		
F-111HF	1 lb	1 lb
<i>OR</i>		
Esmigram [®]	5 lb	5 lb
<i>OR</i>		
Micromax [®]	1 to 1.5 lb	1 to 1.5 lb
To provide nitrogen and potassium (optional)		
Calcium nitrate	1 lb	1 lb
Potassium nitrate	1 lb	1 lb

Too low of a pH can result in increased micronutrient availability that can lead to phytotoxic responses in some plant species. For example, a low pH in conjunction with excessive levels of iron and manganese can result in iron and / or manganese toxicity in geraniums and marigolds.

At the other end of the spectrum, pH above 6.2 can lead to micronutrient deficiency problems such as iron deficiency chlorosis in petunias and azaleas; and boron deficiency in salvia, petunias, and pansies. Both excessively low and high pH's should be avoided in greenhouse production.

Most greenhouse crops grow best at pH 5.4 to 6.0, but some crops such as azaleas prefer a more acidic substrate (4.5 to 5.8) while others such as

Easter lilies are grown at a higher pH (6.5 to 6.8). Although most mix pH recommendations call for a range of 5.4 to 6.0, it may take from 24 hours to 7 days for the pH to adjust up to this level after the mix has been moistened. This will depend on the ratio of components, particle size and grade of lime used, the salts used to make the base charge, and the pH and alkalinity of your irrigation water. Prior to using a mix, fill a few pots with it, water them in with distilled water, and set them in the greenhouse for a few days, keeping them moist. After this "equilibration period", measure the pH of the substrate; it should be within the range given above for best results. Monitoring and controlling substrate pH is essential in a greenhouse fertility program.

PRODUCTION OF ERYNGIUM

John Njenga

Department of Horticultural Science, NCSU

(John Njenga is currently a graduate student in our department working with Dr. Roy Larson on his Master's degree. John is researching cut flower production of eryngium with an emphasis in propagation.)

Alpine Sea Holly belongs to the family Umbelliferae (Apiaceae) in the genus *Eryngium* (Atwater, 1980). The common name is Alpine Sea Holly but it is also referred to as *Eryngium*. The name *Eryngium* is from *eringion*, an old Greek name for a thistle which some of the species' appearance seems to suggest. The plant is a herb with spiny leaves on the margins. The leaves are simple cut or lobed (Taylor, 1983). *Eryngium* is an excellent cut flower. There are several species which are suitable for use as cut flowers (Sansone, 1994).

Eryngium is a hardy perennial plant of great decorative value which grows from 2 to 3 feet high during the summer months (Everett, 1960). Aside from their use as a cut flower, sea hollies are also widely cultivated for the border or rock gardens (Everett, 1960).

Inflorescence Description

Eryngium has small flowers arranged in a tight globose head and each inflorescence is subtended by showy bracts (Armitage, 1993). The bloom head is somewhat thistle like. Leaves are also ornamental (Everett, 1960). Flowers are mainly blue in the cultivated varieties, but also can be white or green. The bloom calyx is showy and spiny toothed. The petals which are usually not conspicuous, are erect and stiff. Most cultivars are summer blooming (Taylor, 1983).

Popular Species and Their Characteristics

Eryngium is found wild chiefly in Southern Europe but some are native to North America. *Eryngium aquaticum* is a native of northeastern United States. The genus has over 200 species but the seven listed in the next column are the most popular (Taylor, 1983):

E. alpinum -- This species is about 2 feet high, has a bushy growth habit, and has 10 to 20 bracts per inflorescence. The leaves are triangular, heart shaped and bluish in color. The upper leaves may be trilobed. The flower heads are bluish purple. There is also a white variety. Hardy at -20 to -10 °F.

E. amethystinum--Grows to about 2 feet. Leaves are compound and deeply lobed. Flower heads are bluish purple in color and are usually 1/2 inch long. Bracts are lance or pinnatifid in shape. Hardy at -20 to -10 °F.

E. aquaticum -- A stout, bushy herb, growing 4 to 6 feet high. The leaves are stiff and very narrow. The flower heads are pale blue or whitish. Hardy at -20 to -10 °F.

E. bourgati -- The plant is hardly over 18 inches high. The leaves are almost round, stiff, spiny toothed and divided into 3 to 5 segments. The flower heads are 1/2 inch long and bluish purple. Hardy at -20 to -10 °F.

E. giganteum -- This species grows 5 to 7 feet high. The leaves are much branched or heart shaped. The upper leaves are trilobed. Flower heads are almost 4 inches wide and their color is blue or pale green. Bracts are long and green. Hardy at -10 to 0 °F.

E. oliverianum -- Usually 2 to 3 feet high. Leaves are undivided and upper ones are in 4 to 5 parts. The flower heads are 1 1/2 inches wide, blue or bluish purple in color. This species is of unknown hybrid origin. Hardy at -20 to -10 °F.

E. planum -- Usually less than 3 feet high. The leaves are undivided and the upper are 3 to 5 parts. The flower heads are blue and are about 1/2 inch wide. The bracts are rigid and very narrow. Hardy at -30 to -20 °F.

Propagation

Eryngium is commonly propagated by seed. It can also be multiplied by division where the plantlets growing at the base of the plant are carefully transplanted and also by cuttings. Mature root cuttings of 2 to 4 inches long sections will root when placed in a moist porous substrate at warm temperatures of 68 to 75 °F (Armitage, 1993). The weakness of Sea Hollies is that they are slow to recover from the shock of division, dislike being disturbed and are rather slow to establish after transplant. This is the reason why it may be better to set them out where they are likely to remain (Everett, 1960).

When propagating eryngium from seed, the seed should be ripe before it is collected. Freshly harvested seed should be sown immediately. Seeds of Eryngium become dormant soon after harvest. The main block to germination of seeds in this genus is the delay in embryo maturation which is enhanced by the presence of inhibitors until they are leached or neutralized (Atwater, 1980). Research conducted at the University of Georgia emphasizes the need to use fresh seed. Seeds of *Eryngium planum* germinate readily when fresh, however, it may take several months for seedlings to emerge, and many seed will not germinate at all if they are not fresh (Pinnel et al., 1985). The germination of Eryngium alpinum is less uniform and much slower than that of Eryngium planum.

Cultural Requirements

Sea Hollies thrive best in well drained, light and sandy soils (Everett, 1960). However, heavy clays can be made suitable by digging and mixing in gravel, sand and compost (Everett, 1960). The substrate should be kept reasonably moist during production (Taylor, 1983). Sea Hollies can tolerate saline soil conditions and they are fairly cold hardy. For flowering they require chilling temperatures of 40 °F or below. These environmental conditions can be met by field production, cold frames protection (in colder climates), or production in minimally heated

greenhouses. The crop can also tolerate hot summers (Armitage, 1993). Shading experiments have shown that field performance is reduced by shade although flower color is improved (Armitage, 1991). (Table 1).

Plants grown South of Zone 5 are of poor quality than those grown in more northern zones

Table 1. The effect of shade on yield and stem length of *Eryngium planum* in the third year of production.*

Percent shade	Yield (stems/plant)	Scape length (cm)
0	8.6	84.0
55	4.2	86.7
67	0.4	109.5

*From Armitage, 1989b.

which are of high quality but have shorter stems (Armitage, 1993).

Since Eryngium is a perennial crop it can last for several years in the field, however, for commercial production, 3 to 5 years is the average life span employed because the yield starts to decline thereafter. Although yield declines with plant age, the stem length and diameter are not affected. A closer spacing of 18 inches is used for plants rotated every 3 years, and a wider spacing of 3 feet is used for plants that will be grown more than 3 years in the field. Crop production under shade cloth is good for preventing rain damage but as already stated there is yield reduction following the provision of shade. Field foliar analyses done by Armitage (1993) have resulted in the following suggested optimum foliar nutrient levels: 4.05% N, 0.63% P, 3.36% K, 1.19% Ca, 0.47% Mg, 257 ppm Fe, 84 ppm Mn, 28 ppm B, and 61 ppm Zn.

Post Harvest

Cut Eryngium flower stems can be used either fresh or dried. Eryngium was listed among the top 30 flowers for drying (Armitage, 1991). Harvesting should be done when the entire flower

head including the bracts turn blue (Armitage, 1993), as soon as the whole bloom is open (Armitage, 1989b). *Eryngium planum* can produce flower stems of 3 feet long easily, and flower heads of about 3/4 inch long. Cut stems of *E. planum* and *E. amethystinum* are easy to ship, keep long in the vase and dry well (Armitage, 1989a). Placing flowers in 40 °F coolers intensifies the color. Flowers persist for months in a water vase though the foliage lasts only 7 to 10 days (Whyman, 1993). The stems may be stored at 38 to 40 °F for 7 to 10 days. Though drying in the air is quite successful, more color is preserved by use of a desiccant such as silica gel (Armitage, 1993).

Marketing

In 1993 dried Eryngium were selling at \$2.75 per bunch wholesale, while the retail price was \$2 to \$4 a bunch of 10 stems. A field bunch was \$ 3.30 wholesale price (Whyman, 1993).

Literature Cited

Armitage, A. 1989a. Notes on eryngium. The Cut Flower Quarterly. 1(2):10.
 Armitage, A. 1989b. The influence of shade on field grown crops. The Cut Flower Quarterly. 1(3):4.

Armitage, A. 1991. Stage of flower development at harvest. The Cut Flower Quarterly 3(1):13.
 Armitage, A.M. 1993. Specialty cut flowers. Varsity Press, Timber Press. Portland, Oregon.
 Atwater, B.R. 1980. Germination, dormancy and morphology of the seeds of herbaceous ornamental plants. Seed Sci. & Technol. 8: 523-573.
 Everett, T.H. 1960. New illustrated encyclopedia of gardening unabridged. Vol. 2 Greystone Press. New York.
 Pinnel, M.M, A.M, Armitage, and D. Seaborn. 1985. Germination needs of common perennial seed. Univ. of Georgia, College of Agriculture, Experiment Stations. Research Bulletin 331.
 Sansone, P. 1994. Field trials: lemons and lemonade. The Cut Flower Quarterly. 6(1):6.
 Taylor, N. 1983. The garden dictionary. An Encyclopedia of Practical Horticulture. Garden Management and Landscape Design. Boston and New York. Houton Mifflin Company. The Riverside Press Cambridge.
 Whyman, A. 1993. Pricing profile. The Cut Flower Quarterly. 5(3):6.

CALENDAR OF EVENTS

Event	Date	Time	Location and contacts
PPGA International Bedding Plant Conference	Saturday–Thursday 30 Sept.–5 Oct.		San Jose Convention Center, San Jose, California. Contact PPGA at 800-647-7742 for further information.
Association of Specialty Cut Flower Growers 1995 National Conference	Wednesday–Sunday 25–29 October		Omni Inner Harbor Hotel, Baltimore, Maryland. Contact ASCFG at 216-774-2887 for more details.
NCSU Poinsettia Open House	Wednesday 29 November	10:00 am to 3:00 pm	Horticulture Field Laboratory, Raleigh, N.C. Contact Roy Larson at 919-515-3133.

1995 WINTER TRIAL SUMMARY

Douglas A. Bailey, Department of Horticultural Science, NCSU

(The following summary was distilled from the 1995 NCSU Winter Annuals Evaluation. If you would like to receive a copy of the entire report that includes performance ratings for each cultivar, contact Doug Bailey at 919-515-1195 and request a copy of Horticulture Research Series No. 116.)

During November 1994 through mid-May 1995, we evaluated 100 pansy selections plus 8 viola entries and recorded how well they performed in the North Carolina landscape. We also evaluated 15 dianthus cultivars planted in November and compared them to 12 cultivars planted last May.

Leaders of the Pack

The following were selected in 1995 on their ability to display attractive landscape color throughout the majority of the winter and spring season. At any one time, other 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.

Dianthus: 'Floral Lace Picotee' (BALL), 'Ideal Crimson' (ELI), 'Ideal Deep Violet' (ELI), 'Color Magician' (AAS)

Pansies:

White--Clear: 'Accord' (GOLD)

White--Blotch: 'Fama Dark-Eyed White' (BEN), 'Universal Plus White Blotch' (GOLD), 'Vernale White w/ Blotch' (ELI)

Yellow--Clear: 'Clear Sky Primrose' (S&G), 'Delta Pure Yellow' (S&G), 'Accord Clear Yellow' (GOLD), 'Universal Plus Yellow' (GOLD), 'Fama Golden Yellow' (BEN)

Yellow--Blotch: 'Universal Plus Yellow Blotch' (GOLD), 'Skyline Yellow' (S&G), 'Rally Yellow w/ Blotch' (PA)

Orange--Clear: 'Clear Sky Orange' (S&G), 'Fama Orange' (BEN)

Orange--Blotch: 'Rally Orange w/ Blotch' (PA)

Rose--Clear: 'Bingo Light Rose' (PA)

Rose--Blotch: 'Universal Plus Rose Blotch' (GOLD)

Red--Clear: 'Universal Plus Red' (GOLD)

Red--Blotch: 'Skyline Red' (S&G)

Red/Yellow--Blotch: 'Skyline Yellow Red Wing' (S&G)

Blue--Clear: 'Experimental Denim Blue' (PA), 'Rally True Blue' (PA), 'Fama True Blue' (BEN), 'Accord Clear Blue' (GOLD), 'Universal Plus True Blue' (GOLD)

Blue--Blotch: 'Rally Light Blue w/ Blotch' (PA), 'Delta Blue w/ Blotch' (S&G), 'Skyline Blue' (S&G), 'Fama Dark-Eyed Blue' (BEN)

Purple--Clear: 'Rally Lilac Cap' (PA)

Purple--Blotch: 'Fama See-Me' (BEN)

Purple/White--Blotch: 'Experimental Beaconsfield' (PA), 'Universal Plus Beaconsfield' (GOLD), 'Skyline White/Purple Wing' (S&G)

Mix: 'Accord Mix' (GOLD), 'Skyline Mix' (S&G), 'Delta Pure Colours Formula Mix' (S&G)

Violas: 'Alpine Summer' (AAS), 'Jewel Purple w/ Face' (AAS), 'Velour Blue' (CSP)

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 winter and spring color needs. Only four cultivars were selected from 141 entries in the

1995 winter trial:

1. *Viola*, 'Alpine Summer' (AAS)
2. *Pansy*, 'Experimental Beaconsfield' (PA)
3. *Viola*, 'Jewel Purple w/ Face' (AAS)
4. *Pansy*, 'Rally Lilac Cap' (PA)

The ratings for the dianthus and pansy series that had at least three entries are listed in Table 1 in descending order of average performance. We planted three series of dianthus (but two were planted twice; once in May and then in November) and 10 series of pansies.

The dianthus with a † were planted in May of 1994 and were compared to dianthus planted in November. In every case, the November planted cultivars outperformed May-planted cultivars.

Skyline was the top performing pansy series in the 1994/1995 winter trials. Rally and Fama ranked close behind. Although the Bingo series was the lowest rated, individual flowers on Bingo were very large. The main reason for the low rating of Bingo was fewer flowers (less overall color show) than the other series trialed.

The number of pansies continues to increase each year, and the quality appears to improve as well. However, there is still a need for contrasting

Table 1. Series ratings for the winter trials.

Series	Number trialed	Source	Avg. rating
Dianthus			
Ideal	3	ELI	3.5
Floral Lace	3	BALL	3.4
Princess	6	GOLD	3.0
Floral Lace†	3	BALL	2.3
Princess†	6	GOLD	2.1
Pansy			
Skyline	7	S&G	3.5
Rally	10	PA	3.4
Fama	10	BEN	3.4
Accord	9	GOLD	3.3
Universal Plus	21	GOLD	3.3
Clear Sky	4	S&G	3.3
Delta	12	S&G	3.2
Scala	3	ELI	3.2
Vernale	6	ELI	3.1
Bingo	9	PA	3.1

†Series planted in May 1994 rather than Nov.

plant materials during our cool season in the Southeast, and dianthus is a refreshing addition to the winter landscape.

We are indebted to the following companies for supporting our 1994–95 winter trials. The companies are acknowledged in the ratings tables by the abbreviation that appears to the left of the company name:

- **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 Seed Growers Ltd., P.O. Box 1127, D-3510 Hann. Münden 1, Germany
- **CSP** Clause Semences Professionnelles, 100 Breen Road, San Juan Bautista, CA 95045
- **ELI** Elidia Seed, Z.I. La Motte, BP 83, 26800 Portes lès Valence, France
- **FLS** Fleuroselect, Parallel Boulevard 214D, 2202 HT Noordwijk, The Netherlands
- **GOLD** Goldsmith Seeds, Inc., P.O. Box 1349, Gilroy, CA 95020
- **PA** Pan American Seed, P.O. Box 438, West Chicago, IL 60185
- **SG** S&G Seeds, 5300 Katrine Avenue, Downers Grove, IL 60515

Appreciation is also expressed to **Fafard, Inc.**; **North Carolina Commercial Flower Growers' Association**; and **Wetsel Seed Company, Inc.**, for their donations to and support of the 1995 winter annual trial garden.

NCCFGA NEWS

Rob Lassiter, President

(Before moving into Rob's message below, I wanted to take a few moments and acknowledge some wonderful efforts. Think of this as the business portion of the service just before the sermon. First, all of us at NCCFGA extend our greatest appreciation and true thanks to Betty Woodhouse for serving as our first executive secretary. Betty has been a wonderful asset to our association, and we will miss her as she moves on to new challenges ahead. We are pleased to announce that we have found someone to pick up where Betty left off; more on that on the next page. Finally, I wanted to thank all of you who attended the Bedding Plant Field Day. It was an excellent event, with over 250 in attendance. If you missed it, please plan now to attend next year. Also mark your calendars for the NCSU poinsettia open house to be held on Wednesday, 29 November. Roy Larson has over 60 cultivars in his trials this year! In the mean time, let us enjoy Rob's comments on poinsettias and other crops below. (Ed.))

Summers in North Carolina are hot and humid. What time its not humid, its raining. We Carolinians know rain forests!

Garden mums are sitting ready to make their presence felt on the market. There should be a good demand for mums and pansies this year considering the fate of many bedding plants I have seen in the landscape. Already there are mums in full bloom in roadside stands in the eastern part of the state. So much for the generation that named them "October Roses." When mums are brought into bloom by black clothing, they should demand an additional price over field grown mums. Vegetable growers charge their highest price for early vegetables! Why not an additional charge for short-day treatment of our products? Do vegetable growers know something we don't? The same thing should hold true for poinsettias. Early poinsettias that have been black clothed should be sold at a higher price than normal blooming plants.

More than 10 years ago, learned men warned us not to devalue poinsettias year after year. I remember these pleas for sanity in pricing. Do not turn poinsettias into a commodity they said.

The public has a love affair with this plant. They will pay you for well-grown poinsettias--heck, they will pay you for not so well grown ones. Do not overproduce this symbol of Christmas was their refrain. I heard and I watched as prices have tried to reach new lows each year. Our fate with this crop is predictable. Demand is high, prices are below production costs! To use poinsettias as a lost leader at most nurseries to keep employees busy until Spring seems to me like a shame. The government had to create a welfare system to stop farmers from overproducing their crops. Can we avoid this fate? It doesn't seem to me that we can. After all, before allotments were set by the government, my grandfather planted so much tobacco in his fields that there were not any middles to take the mules into. Tobacco was 5 cent a pound and headed down. Thanks for the lesson Grandpa: I ain't learned a thing.

I bet you can't wait for the next bulletin, can you?



MEET YOUR NEW NCCFGA EXECUTIVE SECRETARY

Please join us in welcoming our new Executive Secretary, Bonnie Holloman. Bonnie has been working with the Southeastern Grain & Feed Association for fifteen years as their secretary and treasurer. This work involves running the daily affairs of the association, recruiting new members and providing services to all members. In addition, she plans all annual and board meetings and publishes their 234 page directory each year. Prior to working for SGFA, she was employed by NCDA for six years.

Betty lives in Raleigh and works out of her home. Please note that our address and phone number has changed to: NCCFGA, 8600 Crowder Road, Raleigh, NC 27603 Ph. (919) 779-4618, FAX (919) 779-1685.

We are pleased to have attracted Bonnie to work with NCCFGA. With her background and association experiences, we are confident she

will continue the efficient pace set by Betty Woodhouse.



NCCFGA AND ROY LARSON HIT CYBERSPACE

Longtime researcher, teacher, and columnist Roy Larson has once again pushed floriculture forward to take advantage of the latest internet and world wide web technology. Roy has the first floriculture editorial column in cyberspace.

Along side Roy's column, "The Tangled Web," you will also find information about Your association. NCCFGA has association membership information, association activities, a statement of purpose, and the latest listing of officers and board of directors on the world wide

web. There are also back issues of the NCCFG Bulletin that can be downloaded from anywhere in the world.

To access Roy's columns, NCCFGA information as well as NCSU Floriculture research and extension publications, access the NCSU Floriculture home page at: http://www2.ncsu.edu/ncsu/cals/hort_sci/floriculture/. You can also send electronic mail (e-mail) to NCSU floriculture faculty members by contacting Doug Bailey (Doug's e-mail address is given in the return address of each NCCFG Bulletin).



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

**DOUGLAS A. BAILEY, EDITOR
DEPARTMENT OF HORTICULTURAL SCIENCE
NORTH CAROLINA STATE UNIVERSITY
BOX 7609
RALEIGH, NC 27695-7609
(919) 515-1195 FAX (919) 515-7747
INTERNET: doug_bailey@ncsu.edu**

**BULK RATE
U.S. POSTAGE
PAID
RALEIGH, NC
27695-7609
PERMIT #2283**

TO:



In This Issue:

Effective Use of Marathon™.	1
Properties of Greenhouse Substrates	3
Production of Eryngium	9
Calendar of Events	11
1995 Winter Trial Summary	12
NCCFGA News	14
Meet Your New NCCFGA Executive Secretary	15
NCCFGA and Roy Larson Hit Cyberspace	15