Fertilizing Commonly Grown Greenhouse Crops

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What fertilizer program should I use to grow my greenhouse crop? This is a common question and one that has more than one answer. Different approaches to fertilizing can be used to produce a high quality crop of any species. Often, despite major differences in fertilizer programs between two growers, excellent results are achieved when the two crops finish.

In this article, basic fertilizer programs are recommended for the most important crops currently grown in Massachusetts greenhouses. An individual grower may need to "fine-tune" these recommendations to fit his/her conditions, but in doing so the following factors, which ***interact*** to affect the response of containerized plants to fertilizer, should to be kept in mind:

1. **Fertilizer type.** Important considerations are ratio of ammonium to nitrate-N, trace element charge, calcium and magnesium content, and potential acidity or basicity.

2. **Fertilizer rate.** Traditionally fertilizer rate (ppm) has been the main focus of greenhouse fertilizer programs, but rate interacts with the other five factors on this list to determine the success of a fertility program.

3. **Frequency of application.** How many times water-soluble fertilizer is applied is often overlooked as a factor in developing a good fertilizer program. What does the term "constant liquid feed" (CLF) really mean - every watering, once a week, or twice a week? At a given ppm level, more frequent applications will lead to a higher fertility level simply because fertilizer is applied more often.

4. **Volume of fertilizer solution applied.** As the volume of water-soluble fertilizer increases the quantity of nutrients delivered to the plant also increases. Doubling the volume applied also doubles the amount of nutrients potentially available to the plant.

5. **Leaching fraction.** Leaching fraction is the proportion of fertilizer solution or irrigation water applied that is lost from the plant container by leaching. The lower the leaching fraction, the greater the quantity of nutrients and salts retained in the growth medium. Leaching fraction is strongly affected by volume applied (i.e., factor 4).

6. **Plant growth rate and environmental conditions.** In general, nutrient requirements of floriculture crops are greatest during periods of rapid growth. Two major influences on growth rate are the inherent growth pattern followed by the plant and the environment in which it is grown. Too much fertilizer during slow growth periods may lead to excess soluble salts; failure to provide enough fertilizer during periods of rapid growth will lead to deficiency.

Zonal and Ivy Geraniums

pH: Zonals - 5.8-6.5, ivies - 5.3-6.0, "floribundas" 6.2-6.5.

Fertilizer types: 15-15-15 (Geranium Special), 15-16-17 Peat-lite, and 20-10-20 Peat-lite. EXCEL CalMag 15-5-15 could be used as a supplement limestone to add Ca and Mg.

Fertilizer rates and strategy: 200-250 ppm N CLF or 150-200 ppm N with subirrigation or another restricted leaching system. Begin fertilizing at planting. Monitor salts and pH, particularly for ivies. Remove saucers from ivy baskets to allow adequate drainage.

Common nutrient problems:

1. All geranium types are intolerant of high soluble salts.

2. Zonals and "floribundas" are susceptible to iron (Fe)/ manganese (Mn) toxicity. The higher pH range for zonals and floribundas reduces the availability of excess Fe and Mn.

3. Ivies often show interveinal chlorosis due to Fe or magnesium (Mg) deficiency. Mg deficiency occurs on the lower leaves first; Fe deficiency generally occurs on the youngest leaves first.

4. Edema of ivy geraniums is mainly caused by too much water, high humidity, and/or poor drainage. However, low N, P, Mg, and Fe; pH above 6; and/or high EC have been linked to the problem as well.

5. Boron (B) deficiency was a major problem for zonal geraniums in the past, but it seems to be rare today. Upper leaves become chlorotic and show necrotic lesions on the undersides. The leaves easily fall off with slight pressure. Probably the common practice of using water-soluble fertilizers containing trace elements is responsible for the reduced occurrence of this problem.

Bedding Plants

pH: 6.0-6.5 (with some exceptions).

Fertilizer types: 15-0-15 Dark Weather Feed, 15-15-15, 15-16-17, 20-10-20, or EXCEL Cal-Mag 15-5-15.

Fertilizer rates: 200-250 ppm N. Less during plug culture (50 ppm Stages 1 and 2, 100 ppm stages 3 and 4).

Fertilizer strategy: Begin fertilizing vigorous types shortly after transplanting. Small, slow-growing species should receive lower rates or less frequent application until they are well-established. Cut fertilizer rate in half at visible bud or about 2-3 weeks from sale (do a soil test!).

Common nutrient problems:

1. Excess soluble salts in the seedling or early transplant stages.

2. Iron/manganese *toxicity.* Marigolds, seed geranium, and common impatiens are most susceptible of this disorder characterized by bronze speckling to the leaves. This problem is most likely to occur when the growth medium pH is lower than the recommended range.

3. Iron *deficiency.* Pansy, petunias, "superpetunias," snaps, and vinca are prone to Fe deficiency. These plants should be grown at lower than the recommended pH.

4. Boron or calcium (Ca) deficiency in plugs. Abortion of the growing points or distortion of the young leaves may indicate low B or Ca.

5. Ammonium toxicity. Pansy, petunia, tomato, and geranium are especially sensitive. Ammonium will not be a problem if "peat-lite" fertilizers are used.

New Guinea Impatiens pH: 5.8-6.5.

Fertilizer types: 15-15-15, 15-16-17, 20-10-20.

Rates and fertilizer strategy: New Guineas cannot tolerate high soluble salts during the first 3-4 weeks after potting. High salts can be avoided by using the following strategy:

Weeks 0-3 - no fertilizer.

Weeks 4-8 - 100-200 ppm N.

Weeks 8 to finish - 200-250 ppm N.

Rate (ppm) and frequency of application interact markedly to affect final size and quality. In general, it is best to use low fertilizer rates and make no more than two applications per week.

Common nutrient problems:

1. Overfertilization (high EC) right after planting will slow the growth of the plants and inhibit branching. Also, too much fertilizer may reduce flower number.

2. Fe and/or Mn toxicity. The best way to prevent this problem is to keep the pH above 5.8. This disorder may be aggravated by overfertilizing.

3. General nutrient deficiency (N deficiency). New Guineas show some chlorosis, reduction in leaf size, and leaf twisting or curling when N is deficient. This problem could develop if low nutrition is carried on too long.

Fall Garden Mums

pH: 5.7-6.2 (soilless) 6.3-6.7 (with 25% soil).

Fertilizer types and rates:

a. Water-soluble (15-16-17, 20-10-20) - 250 ppm NCLF or 350 ppm one application/week.

b. CRF (incorporated) Osmocote 14-14-14 (12 lb./yd^3) or 19-6-12 (9 lb./yd^3).

c. CRF (topdress) 18 grams/gal. pot (#3 Scott's spoon) Osmocote 14-14-14 or 12 grams/gal. pot (#2 Scott's spoon) Osmocote 19-6-12.

Fertilizer strategy: Begin fertilizing at planting and monitor EC to avoid excess salts. Reduce fertilizer when buds show color. Stop fertilizing three weeks before sale, but do a soil test first! Sometimes, late in the crop, a water-soluble fertilizer may be needed to supplement CRF to prevent N deficiency.

Common nutrient problems:

1. Excess soluble salts early. This problem is commonly the result of large applications of CRF. Try to distribute CRF evenly around the plants and don't allow the pellets to come in contact with the tender cuttings.

2. Late season nutrient deficiency (mainly N). This occurs during very warm summers with high rainfall or irrigation. The deficiency probably reflects the fact that the CRF pellets are depleted and/or the nutrients have leached.

Herbaceous Perennials

Here is a crop group we have much to learn about. The problem is the diversity of plant species grown as "herbaceous perennials." Very little is known about the specific nutrient requirements and nutrient problems of many species during commercial production.

In the greenhouse:

Plugs or seedling transplants can be grown-on using water-soluble fertilizer using the same rates and strategy recommended for bedding plants. Lower rates (100-150 ppm N) may be best for slow-growing species or types prone to "rank" growth.

Outdoor containers (with overwintering):

Use the same water-soluble fertilizer program as in the greenhouse or the CRF program used with fall mums.

1. Fertilize according to growth rate to avoid excess soluble salts, nutrient deficiency, or too much growth.

2. Do not fertilize late in the season as the plants approach dormancy. Curtailing fertilization encourages root growth and helps harden the plant to resist low temperatures.

3. Do not begin fertilizing in the spring until the new growth begins and the danger of frost has past. Applying fertilizer too soon may make the plants susceptible to injury from spring frosts or cold spells.

Poinsettia

pH: 5.8-6.2.

Fertilizer types: 15-0-15, 15-16-17, 20-10-20, or EXCEL Cal-Mag 15-5-15.

Fertilizer rate: 200-300 ppm N with 250 ppm average. If subirrigation or another a restricted leaching system is used, no more than 200 ppm should be applied. 100-150 ppm N is possible with no leaching and frequent application.

Fertilizer strategy: Begin at planting and continue to 2-3 weeks before sale and stop. Calcium is most critical during bract expansion to avoid bract necrosis. Magnesium and molybdenum deficiencies are most likely in November.

Common nutrient problems:

1. Calcium deficiency. Bract edge burn and leaf edge necrosis (stock plants) are disorders linked to Ca deficiency. Ca deficiency can be prevented by using EXCEL Cal-Mag or 15-0-15. (Do not use 15-0-15 for long periods with soilless growth media containing no phosphorus fertilizer).

2. Magnesium deficiency. Interveinal chlorosis of the lower leaves *on the breaks* is the main symptom. Mg deficiency can be prevented by EXCEL CalMag or monthly application of magnesium sulfate at a rate of 1-3 lbs./100 gal.

3. Molybdenum deficiency. Interveinal chlorosis and marginal necrosis occurs on the recently-mature leaves and middle-aged leaves. This problem seems to be rare nowadays, but remember that 'Heggs' and 'Lilo' are quite susceptible. The best way to prevent this problem is by maintaining the recommended pH and the regular use of "peat-lite" fertilizers.

4. Ammonium toxicity. This is another cause of interveinal chlorosis. This problem has all but disappeared since the widespread adoption of "peat-lite" fertilizers which are about 50% nitrate-N.

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