

Fertilization of 11 Vegetative Annuals

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We grew a number of vegetative annuals this spring at NC State University to determine their response to fertilization rates. This e-GRO Alert highlights the results of this study in the format of a photographic report.

Alternanthera 'Red Carpet'

Plants grown with 150 ppm N were smaller and also had the appearance of being slightly darker red in color due to less new (lighter) shoot growth (Figure 1). PourThru EC values were 0.95 mS/cm for the 150 ppm plants and 3.53 mS/cm for the 250 ppm plants (Table 1).

Overall Trends

In most cases, growth was greatest with plants fertilized with 250 ppm N and plants grown with 150 ppm were smaller. For growers wanting to maximize growth, 200 to 250 ppm N should be used. For growers wanting to control growth, 150 ppm N can be used, but the substrate EC values should be monitored to ensure that they do not become too low and deficiencies (lower leaf yellowing) occur. The exception is Sanvitalia which flowered more when fertilized with 150 ppm N.

Figure 1. Effect of fertilizer concentration (ppm N) on Alternanthera 'Red Carpet' growth.



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Alternanthera 'Red Carpet' – 3 plants per 6 inch pot

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Artemisia ‘Parfum d’Ethiopia

Growth was greatest with plants fertilized with 250 ppm N (Figure 2) and smaller and thinner with 150 ppm N. PourThru EC values were 1.23 mS/cm for the 150 ppm plants and 3.86 mS/cm for the 250 ppm plants (Table 1).

Figure 2. Effect of fertilizer concentration (ppm N) on Artemisia ‘Parfum d’Ethiopia’ growth.



Artemisia ‘Parfum d’Ethiopia’ – 3 plants per 6 inch pot

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***Calocephalus brownii* 'Compact'**

After four weeks of growth, overall plant size was still small, but plants grown with 250 ppm N were larger (Figure 3). PourThru EC values were 1.31 mS/cm for the 150 ppm plants and 3.28 mS/cm for the 250 ppm plants (Table 1).

Figure 3. Effect of fertilizer concentration (ppm N) on *Calocephalus brownii* 'Compact' growth.



***Helichrysum* 'Silver'**

Plants were more silver and growth was greatest with plants fertilized with 250 ppm N (Figure 4). Plants were pale green in color and smaller when fertilized with 150 ppm N. PourThru EC values were 1.17 mS/cm for the 150 ppm plants and 4.36 mS/cm for the 250 ppm plants (Table 1).

Figure 4. Effect of fertilizer concentration (ppm N) on *Helichrysum* 'Silver' growth.



Heliotropium 'Nagano'

Plants bloomed sooner and were more robust when fertilized with 250 ppm N (Figure 5). Plants were smaller with the 150 ppm N fertilization treatment. PourThru EC values were 0.81 mS/cm for the 150 ppm plants and 2.24 mS/cm for the 250 ppm plants (Table 1).

Figure 5. Effect of fertilizer concentration (ppm N) on Heliotropium 'Nagano' growth.



Heliotropium 'Nagano' – 3 plants per 6 inch pot

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Lamium 'Herman's Pride'

Similar to the other species, Lamium plants were larger when fertilized with 250 ppm N than 150 ppm N (Figure 6). PourThru EC values were 0.98 mS/cm for the 150 ppm plants and 3.86 mS/cm for the 250 ppm plants (Table 1).

Figure 6. Effect of fertilizer concentration (ppm N) on Lamium 'Herman's Pride' growth.



Lamium 'Herman's Pride' – 3 plants per 6 inch pot

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Lysimachia ‘Goldilocks’

Lysimachia ‘Goldilocks’ plant growth increased with N fertilization rate (Figure 7). PourThru EC values were 1.26 mS/cm for the 150 ppm plants and 3.71 mS/cm for the 250 ppm plants (Table 1).

Figure 7. Effect of fertilizer concentration (ppm N) on Lysimachia ‘Goldilocks’ growth.



Lysimachia ‘Goldilocks’ – 3 plants per 6 inch pot



Portulaca ‘Cupcake Grape Jelly’

Portulaca plants were more robust and darker green when fertilized with 250 ppm N (Figure 8). Plants were smaller and had lower leaf red margins with the 150 ppm N fertilization treatment. PourThru EC values were 0.91 mS/cm for the 150 ppm plants and 2.59 mS/cm for the 250 ppm plants (Table 1).

Figure 8. Effect of fertilizer concentration (ppm N) on Portulaca ‘Cupcake Grape Jelly’ growth.



Portulaca ‘Cupcake Grape Jelly’ – 3 plants per 6 inch pot



Sanvitalia ‘Sunvy Super Gold’

Sanvitalia plants fertilized with 150 ppm N were more compact and flowered more profusely than those fertilized with 250 ppm N (Figure 9). The lower fertilization rate appears to be encouraging earlier flowering. PourThru EC values were 0.58 mS/cm for the 150 ppm plants and 4.42 mS/cm for the 250 ppm plants (Table 1). With the accumulation of soluble salts, it appears that fertilization rates lower than 250 ppm N would be recommended.

Figure 9. Effect of fertilizer concentration (ppm N) on Sanvitalia ‘Sunvy Super Gold’ growth.



Scaevola ‘Scala Blue’

Scaevola ‘Scala Blue’ plant growth increased with N fertilization rate (Figure 10). PourThru EC values were 0.65 mS/cm for the 150 ppm plants and 3.66 mS/cm for the 250 ppm plants (Table 1).

Figure 10. Effect of fertilizer concentration (ppm N) on Scaevola ‘Scala Blue’ growth.



Torenia 'Purple Moon'

Torenia 'Purple Moon' plants were darker green and larger in size when fertilized with 250 ppm N (Figure 11). Plants fertilized with 150 ppm N had an overall thin, spindly appearance with less leaves and the stems developed a red coloration. PourThru EC values were 0.67 mS/cm for the 150 ppm plants and 4.54 mS/cm for the 250 ppm plants (Table 1).

Figure 11. Effect of fertilizer concentration (ppm N) on Torenia 'Purple Moon' growth.



These growth trends will help you determine the fertilization rate to use, depending on the amount of plant growth desired. Remember to monitor the substrate EC over time to determine if the fertilizer rate is adequate. Downward trends in EC indicate that plant requires a higher rate of fertility. Level trends indicate that the plant is utilizing what is being provided. Increasing levels of EC over time indicates that the fertilizer rate is greater than the plants needs.

We could like to thank Fafard for the donation of the substrate, Dümmen USA for the donation of the cuttings, NCDA Agronomic Division for nutrient analysis, and the USDA Specialty Crops grant for funding the supplies.

How We Conducted the Experiment

Three rooted cuttings were transplanted into 6-inch pots containing Fafard 1P. The plants were fertilized with drip emitters with a 20% leaching fraction from either 150 ppm N or 250 ppm N. The fertilizer solution was formulated with 50% of the N being contributed from 20-10-20 and 50% from 13-2-13 Cal-Mag. The photographs were taken after 4 weeks of growth. As a general rule based on published research, growers utilizing sub-irrigation or 0% leaching fractions can use 25% less N and achieve the same EC values.



Table 1. pH and EC Substrate Sample Values

| Species | 150 ppm N pH | 150 ppm N PourThru EC (mS/cm) | 150 ppm N SME EC (mS/cm) | 250 ppm N pH | 250 ppm N PourThru EC (mS/cm) | 250 ppm N SME EC (mS/cm) |
|--|-----------------|-------------------------------------|--------------------------------|-----------------|-------------------------------------|--------------------------------|
| <i>Alternanthera</i> 'Red Carpet' | 6.0 | 0.95 | 0.63 | 5.5 | 3.53 | 2.35 |
| <i>Artemisia</i> 'Parfum d'Ethiopia' | 6.6 | 1.23 | 0.82 | 5.9 | 3.86 | 2.57 |
| <i>Calocephalus brownii</i> 'Compact' | 6.0 | 1.31 | 0.87 | 5.7 | 3.28 | 2.19 |
| <i>Helichrysum</i> 'Silver' | 6.0 | 1.17 | 0.78 | 5.4 | 4.36 | 2.91 |
| <i>Heliotropium</i> 'Nagano' | 5.9 | 0.81 | 0.54 | 5.4 | 3.36 | 2.24 |
| <i>Lamium</i> 'Herman's Pride' | 7.2 | 0.98 | 0.65 | 5.3 | 3.86 | 2.57 |
| <i>Lysimachia</i> 'Goldilocks' | 5.7 | 1.26 | 0.84 | 5.0 | 3.71 | 2.47 |
| <i>Portulaca</i> 'Cupcake Grape Jelly' | 5.7 | 0.91 | 0.61 | 5.9 | 2.59 | 1.73 |
| <i>Sanvitalia</i> 'Sunvy Super Gold' | 6.1 | 0.58 | 0.39 | 5.3 | 4.42 | 2.95 |
| <i>Scaevola</i> 'Scala Blue' | 5.6 | 0.65 | 0.43 | 5.3 | 3.66 | 2.44 |
| <i>Torenia</i> 'Purple Moon' | 6.7 | 0.67 | 0.45 | 5.6 | 4.54 | 3.03 |

EC and pH values are based on the PourThru extraction method after 4 weeks of growth. PourThru EC values divided by 1.5 = SME EC values. Fertilizers derived with equal N contributions from 20-10-20 and 13-2-13 Cal-Mag. Substrate was Fafard 1P.