Lesco Fertilizer Evaluation

Dr. James T. Midcap
Department of Horticulture
The University of Georgia
Athens, GA 30602

Nature of Work:

Lesco=s 18-6-12 Experimental urea formaldehyde fertilizer with minors is a 12 month release controlled release fertilizer. It was evaluated as a container nursery fertilizer at the Center for Applied Nursery Research. The product was incorporated into a pine bark:sand (6:1) potting mix on May 10, 2000. Four rates were used to evaluate its effect on two ornamental crops, Emerald Luster Japanese Holly and Delaware Valley White Azalea in nursery trade gallons. The rates were a low rate of 1.5# Nitrogen per cubic yard, a medium rate of 2.5# Nitrogen per cubic yard, a high rate of 3.5 # Nitrogen yard and an extra high rate of 4.5# Nitrogen per yard. They were incorporated into the potting mix prior to planting.

Uniform 2 1/4" liners of each crop were selected and transplanted into the pine bark:sand potting mix that was amended with 4# of dolomitic limestone per cubic yard. The treatments were completely randomized within each crop with 20 single plant replicates for each treatment. A double border row was placed around the randomized blocks of each crop to eliminate any edge effects. Plants were grown under standard nursery practices and were maintained in good health and pest free.

Plants were monitored for soluble salts and pH every four weeks starting the first week in June. Ten leachate samples from plants in each treatment were collected in June, July, August, September and October using the VTEM pour through method of collecting leachate. The soluble salt levels should show the rates of release of the fertilizer salts and their effect on the potting mix pH. Results were statistically analyzed for treatment effects.

A complete nutrient analysis of the potting mix and leaf tissue samples were done in July and again in October at the end of the trial. A combined sample from three pots in each treatment were collected for both the potting mix and the leaf samples. The sampled plants are discarded from the trial. These analysis should more fully show the nutritional status of the media and the plants at mid season and seasons end.

A visual quality rating by nurserymen and myself were done on sixteen plants of each treatment for each crop. The quality rating helps to determine if the plants in each treatment would be acceptable for sale in the nursery trade. The quality ratings were completed at the end of the growing season on October 31, 2000.

The crops were harvested in October with ten replicates for each treatment. All top growth was removed at the soil line, placed in paper bags and placed in a walk-in dryer for two weeks at 120^{o}F.

The plant stems and leaves were dried completely and weighed to record the plant top growth dry weight. This dry weight accurately reflects the growth of the crops during the production season and is used to statistically compare growth of the treatments.

Results and Discussion:

Soluble salts were collected over five times, four weeks apart starting on June 13, 2000, four week after the plants were initially potted and ending in October. The Holly crop soluble salts had treatment differences between the fertilization rates and the sampling dates based on a two way Analysis of Variance with a completely randomized design.

The Student-Newman-Keuls Test was used to separate mean differences at the 0.05 level. The 4.5# Nitrogen had the highest soluble salt levels, followed by the 3.5# and 2.5# Nitrogen rates. The 1.5# Nitrogen was the lowest, as expected (Table 1). The June date had the highest soluble salts followed by the July date. The August, September and October dates were the lowest and were not significantly different. Controlled release fertilizers typically release at very low rates, often in the range of 0.2 to 0.5 mmhos. The soluble salt levels from July to October are exceptionally low, suggesting lack of fertilizer release.

Table 1. Holly Soluble Salts Statistical Analysis

Treatment	Mean Soluble Salts (mmhos)	Non-Significant Range*
Fertilizer - 4.5# N	0.17	a
Fertilizer - 3.5# N	0.12	b
Fertilizer - 2.5# N	0.11	b
Fertilizer - 1.5# N	0.07	c
June Date	0.30	a
July Date	0.15	b
August Date	0.06	c
September Date	0.04	c
October Date	0.04	c

*Treatments means sharing the same letter are not significantly different using the Student-Newman-Keuls test.

The pH values for the Holly crop had treatment differences between the fertilization rates and the sampling dates based on the ANOV statistical analysis. Separation of the means showed that the 4.5# Nitrogen and 3.5# Nitrogen rates had significantly lower pHs than the 2.5# and 1.5# Nitrogen rate. The 1.5# Nitrogen rate was lower than the 2.5# Nitrogen rate (Table 2). The higher rates of a urea based fertilizer would be expected to reduce the leachate pH more than the lower rates.

Over time these fertilizers would continue to reduce the pH. The initial June media pH ranged from 5.6 to 6.4, well within the desired range. The June date had the highest pH, followed by the July and August dates. The September and October dates were significantly lower.

Table 2. Holly pH Statistical Analysis

Treatment	Mean pH	Non-Significant Range*
Fertilizer - 4.5# N	5.23	a
Fertilizer - 3.5# N	5.24	a
Fertilizer - 2.5# N	5.35	b
Fertilizer - 1.5# N	5.52	c
June Date	6.01	a
July Date	5.34	b
August Date	5.31	b
September Date	5.05	c
October Date	4.98	c

*Treatments means sharing the same letter are not significantly different using the Student-Newman-Keuls test.

The Azalea crop soluble salts had treatment differences between the sampling dates, but no differences between the fertilization rates. The June date had the highest pH followed by July. The June soluble salt means were 0.45 for 1.5# N, 0.75 for 2.5# N, 0.64 for 3.5# N and 0.42 for the 4.5# N treatments. The July soluble salt means were 0.11 for 1.5# N, 0.18 for 2.5# N, 0.28 for 3.5# N and 0.31 for 4.5# N treatments. There was a very significant decrease in the soluble salt levels from June to July. The remaining dates were significantly lower but not different from each other. The soluble salts were gone by August, meaning no fertilizer was being released.

The Azalea pH had treatment differences between the fertilization rates and sampling dates. The 4.5# and 3.5# Nitrogen rate had the lowest pH followed by the 2.5# Nitrogen rate. The 1.5# Nitrogen rate

was the lowest. The pH declined significantly with each date from June (5.94) to October (4.93). The initial media pHs ranged from 5.2 to 6.4 in June. The pH in pine bark media with or without fertilizer will decline with time.

The nutritional analysis of the potting mix was done in July and late October. The analysis was done for each treatment within each crop. The pH is with in the acceptable range for all treatments. The soluble salts, nitrogen (NO_3 & NH_4), potassium(K) are all low for all dates and treatments. The phosphorous (P) in July was adequate for all rates above 1.5# N and in October only the 4.5# N rate was adequate. By July there was insufficient nutrients for acceptable plant growth in the Holly potting mix.

For the Azalea crop, the pH was slightly high for most treatments. The soluble salts, nitrogen (NO_3 &NH_4) and potassium (K) were all low for both dates and all fertilizer rates. The phosphorous (P) levels were adequate for all treatments in July and only for the 4.5# N rate in October. Again there was insufficient nutrients for acceptable plant growth in the Azalea potting mix. The fertilizer does appear to have elevated the pH, compared to other products.

The nutritional analysis of the plant leaf tissue was also done in July and late October. The analysis was done for each treatment and each crop. The Holly nitrogen (N) levels in July and October were acceptable with the October 2.5# N and 3.5# N rates being slightly low. The phosphorous (P) and potassium (K) levels were all very low. The remaining minor elements were acceptable except for the copper (Cu) levels, below 6 ppm. The plant tissue is maintaining near acceptable levels of nitrogen, however the phosphorous and potassium were deficient.

The Azalea tissue nitrogen level requirement is slightly higher than the Holly requirement. Therefore, the Azalea nitrogen levels are all low. The phosphorous levels in July were acceptable but dropping off by October. The potassium levels were all acceptable in July and were all low by October. The minor elements were acceptable in July and October, except for copper which was low or slightly low on both dates.

The plant tissue responds gradually to the lack of available nutrients in the potting mix. The early decline in the potting mix nutrients was reflected in both the Holly and the Azalea crop.

The quality ratings range from the high score of 80 for all excellent plants, a medium score of 48 for all average plants and a low score of 16 for all poor plants. The results of evaluating 16 plants from each treatment in October 2000 are presented in Table 3. The quality level increase for both crops as the nitrogen rate treatments increase. However, the rating of all treatments were below average. Most controlled release fertilizers are capable of producing good to excellent quality at the medium rate for Azaleas and at the high rate for Hollies.

Table 3. Holly &Azalea Quality Ratings*

Treatment	1.5# N	2.5# N	3.5# N	4.5# N

Holly	30.7	37.8	43.7	46.0
Azalea	28.3	35.7	37.0	41.7
*Excellent = 80, Good = 64, Average = 48, Questionable = 32 and Poor = 16				

The plant dry weights (grams) were recorded at the end of the production season. The Holly fertilizer treatments showed existing statistical differences. The 4.5#, 3.5# and 2.5# Nitrogen rates were better than the 1.5# Nitrogen rate, but not different from each other (Table 4). The Azalea treatments showed statistical differences as well. The 4.5# Nitrogen rate was better that the other treatments. The 3.5#, 2.5# and 1.5# Nitrogen rates were not different from each other (Table 5). The visual size of both these crops were less than other crops being fertilized with other products under evaluation at the Center. The Holly crop looked small and the dry weights reflect this observation. Hollies are heavier nutrient users and require steady heavy nutrient levels for maximum growth.

Table 4. Holly Dry Weight Statistical Analysis

Treatment	Mean Weight (g)	Non-Significant Range*
Fertilizer - 4.5# N	14.5	a
Fertilizer - 3.5# N	12.8	a
Fertilizer - 2.5# N	12.2	a
Fertilizer - 1.5# N	7.8	b
*Treatments means sharing the same letter are not significantly different using the Student-Newman-Keuls test.		

Table 5. Azalea Dry Weight Statistical Analysis

Treatment	Mean Weight (g)	Non-Significant Range*
Fertilizer - 4.5# N	24.6	a
Fertilizer - 3.5# N	18.3	b
Fertilizer - 2.5# N	16.9	b
Fertilizer - 1.5# N	11.8	b
*Treatments means sharing the same letter are not significantly different using the Student-Newman-Keuls test.		

Summary:

This Lesco 18-6-12 Experimental product did not preform as expected. The soluble salts peaked in

May and June with little to none remaining for the rest of the season. Th pH gradually declined as the season passed. The media and tissue analysis reinforced the indications that the fertilizer released early. The Azalea crop was in a better nutritional state than the Holly crop. The quality ratings put both crops below average for all fertilizer treatments. The higher rates produced better plants. However, at the extra high rate the Azalea plants should have been damaged.

There was some leaf burn on the Azalea liners during the first month after planting. The entire crop was hand watered several times to prevent the stress that was being observed. This was probably caused by high salts from the early release of the nutrients. The higher rates produced larger plants at seasons end as measured by plant dry weight. The plants were small in comparison to other products where the plants were planted at the same time. More work is needed to develop this product.