Special Research Report: #522: Production Technology

Optimal Nutrient Levels for *Curcuma alismatifolia* 'Pink' and *Globba* 'Prestige Pink'

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American Floral Endowment

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BACKGROUND

Cooperative research between Louisiana State University and the University of Hawaii has provided valuable information on the effect of photoperiod, light levels, plant growth regulators, rhizome storage time and temperatures, forcing temperatures and postproduction longevity of several genera of ginger (see Special Reports 509 – 514). However, no studies have been published on the nutritional aspects of production. Thus, growers have fertilized with no guidance either in rhizome production and during forcing. The objective of this study was to develop optimum nutritional levels for production of *Curcuma* and *Globba*.

MATERIALS & METHODS

One rhizome per pot of *Curcuma alismatifolia* 'Pink' and *Globba* 'Pristine Pink' were planted on April 2005 using one per one-gallon container in 100% perlite. Treatments consisted of a complete fertilization with 100, 200 or 300 ppm N; 15, 31 or 62 ppm P; 80, 160 or 320 ppm Ca; 12, 24 or 48 ppm Mg. The middle concentrations of each element were considered as standards. Treatments were applied by using an automated fertigation system so each container was leached by 20% during each irrigation. This prevented a build up of nutrients in the containers and treatment concentrations could be maintained. Temperature set points were 86° F day/76° F night (latitude 30.43N). Growth measurements were taken and plants were harvested when the first flower had fully opened. Elemental analysis was conducted on shoots of each plant.

RESULTS

For *C. alismatifolia*, there were very few differences in days to flower, inflorescence length, pedicle length, plant height, bract number, number of tuberous roots, rhizome number, rhizome dry weight, leaf number, leaf area, leaf dry weight or flower dry weight when ½ times and 2 times treatments were compared to the standard treatment. The primary effect on plant growth was with the 300 ppm N treatment, which increased days to flower by 16 days and reduced the length and size of the flower. The elemental concentrations in shoot tissue were very similar. Elemental concentrations in tissue increased with the concentration of that element in the fertilizer treatment but this did not enhance growth. Thus, nutrient sufficiency levels as summarized from this research for *C. alismatifolia* are listed in Table 1.

For *Globba* 'Pristine Pink', the 300 ppm N treatment significantly reduced leaf area, leaf number and rhizome growth. Thus, concentrations of N above 200 ppm N are deleterious to growth and flowering. The 80 ppm Ca treatment reduced leaf area and leaf number

significantly. The most significant effects of the remaining treatments were the 320 ppm Ca and 48 ppm Mg, which increased the number of tuberous roots produced. The shoots of the plants in the high Ca and Mg treatments also had increased concentrations of Ca and Mg (Table 2). The Mg concentrations in shoots of the high N and low Mg treatments were lower than the complete treatment. The remaining nutrient concentrations by treatment were not significantly different from the complete.

CONCLUSIONS

The complete fertilization treatment provided the best growth and flowering for both ginger species. Tissue nutrient sufficiency levels for *C. alismatifolia* are 2.3% N, 0.43 % P, 5.6 % K, 0.88 ppm Ca and 0.32 ppm Mg. Tissue nutrient sufficiency levels for *Globba* 'Pristine Pink' are 2.6% N, 0.26 % P, 4.8 % K, 1.05 ppm Ca and 0.37 ppm Mg. These values should be used as a reference for tissue analysis. The high treatment fertilization rates were often deleterious to plant growth and thus should be avoided. The only exceptions were the high treatment rates of 320 ppm Ca and 48 ppm Mg which increased the tuberous roots for *Globba*. This would be beneficial to those growing for rhizome production.

IMPACT TO THE INDUSTRY

1) Optimum nutrient sufficiency levels were established for *Curcuma* and *Globba*.
2) Tissue nutrient sufficiency levels for *C. alismatifolia* are 2.3% N, 0.43 % P, 5.6 % K, 0.88 ppm Ca and 0.32 ppm Mg.
3) Tissue nutrient sufficiency levels for *Globba* 'Pristine Pink' are 2.6% N, 0.26 % P, 4.8 % K, 1.05 ppm Ca and 0.37 ppm Mg.

Table 1. Elemental shoot tissue concentrations for *Curcuma alismatifolia* 'Pink' when grown at various nutrient concentrations.

Treatment	N (%)	P (%)	K (%)	Ca (ppm)	Mg (ppm)
Complete	2.3	0.43	5.6	0.88	0.32
100 ppm N	2.3	0.40	5.3	1.12**	0.32
300 ppm N	2.5	0.41	5.2*	0.82	0.24**
15 ppm P	2.4	0.40	5.5	0.90	0.37**
62 ppm P	2.4	0.41	5.3	1.00	0.32
80 ppm Ca	2.4	0.42	5.3	0.83	0.42***
320 ppm Ca	2.3	0.43	5.3	1.25***	0.23***
12 ppm Mg	2.3	0.42	5.4	1.04*	0.27
48 ppm Mg	2.4	0.41	5.3	0.75	0.44***

*Significant at P<0.05
**Significant at P<0.01
***Significant at P<0.001

Table 2. Elemental shoot tissue concentrations for *Globba* 'Pristine Pink' when grown at various nutrient concentrations.

Treatment	N (%)	P (%)	K (%)	Ca (ppm)	Mg (ppm)
Complete	2.6	0.26	4.8	1.05	0.37
100 ppm N	2.5	0.31	5.6	1.37	0.35
300 ppm N	2.7	0.24	4.3	0.93	0.18***
15 ppm P	2.7	0.22	5.1	1.02	0.28
62 ppm P	2.5	0.31	5.3	1.17	0.28
80 ppm Ca	2.6	0.26	5.1	1.00	0.34
320 ppm Ca	2.4	0.25	4.3	2.13***	0.29
12 ppm Mg	2.7	0.26	5.4	1.24	0.22**
48 ppm Mg	2.5	0.21	4.7	1.26	0.52**

*Significant at P<0.05
**Significant at P<0.01
***Significant at P<0.001

For additional information contact Jeff S. Kuehny at jkuehny@lsu.edu.