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RESPONSE OF MAGNOLIA GRANDIFLORA TO SEVENTEEN FERTILIZER REGIMES[1]

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Abstract. Magnolia grandiflora **L. (M. foetida Sarg.) seedlings (15 cm) were grown in 6-liter containers for 9 months with fertilizer regimes commonly used in Hillsborough County, Florida. Plants grown in the 4 cypress sawdust: 1 sand: 1 sedge peat (v/v/v) medium amended with 9 kg/m³ of sewage sludge (5N-2P-0K) and receiving monthly surface applications of fertilizer (26 g per 6-liter container) composed 50% by weight of Shore 8N-3P-7K and sludge were ranked superior to 16 other regimes evaluated during a Cooperative Extension Service result demonstration. Maximum root dry weight was exhibited by plants grown in the medium amended with Scott's 20N-2P-8K.**

Several studies (1, 2, 3, 4, 5) have been conducted to evaluate container-grown tree response to different fertilizer regimes; however, plant response may vary with environmental and cultural practices. Thus, it is difficult to compare results from studies conducted in different areas of the U.S., so the following study was conducted, as a Cooperative Extension Service result demonstration, to evaluate response of *Magnolia grandiflora* to 17 fertilizer regimes commonly used in nursery production in Hillsborough County, Florida.

Materials and Methods

Magnolia grandiflora seedlings (15-cm) were potted January 17, 1983 in 6-liter containers with a 4 cypress sawdust: 1 sand: 1 sedge peat (v/v/v) medium. The potting medium was amended with 2.4 kg/m³ of dolomitic limestone, 0.7 kg/m³ of superphosphate (20% P); $CuSO_4$, $ZnSO_4$ and NaFeEDTA each at 37 g/m³ and 74 g/m³ of $MnSO_4$. The medium contained 19.5% air space (7) and a particle size distribution (by weight) of 28% less than 0.5 mm (U.S. Series sieve #35), 33% between 0.5 and 1.4 mm (U.S. Series sieve #14), 26% between 1.4 and 4.0 mm (U.S. Series sieve #5), 8% between 4.0 and 6.4 mm (U.S. Series sieve #3), and 5% greater than 6.4 mm. Particle size distribution was obtained by shaking 3 replicate samples on a Tyler Portable Sieve Shaker (W. S. Tyler, Inc., 8200 Tyler Blvd., Mentor, OH) for 20 min.

Thirty single plant replicates received each of the treatments listed in Table 1. Containers were placed on black plastic at Gramling Nursery Inc., Plant City, FL and watered as needed by overhead irrigation with approximately 2.5 cm per application. Maximum and minimum air temperatures during the 9 month experimental period averaged 28 and 16°C, respectively, (National Oceanic and Atmospheric Administration) for Plant City, FL (latitude 28°00'N, longitude 82°07'W).

On February 24, June 17, and September 12, 1983, 3 composite samples of growing medium were obtained for each treatment. Each composite sample was comprised of approximately 10 core samples selected randomly from the 30 containers for each treatment. Core samples were obtained from the medium by pushing a 2.5 cm soil probe through the growing medium depth. Nitrate N, P, K, and pH of each sample were determined according to procedures of the University of Florida, Soil Testing Laboratory (6).

On October 12, 59 local production nurserymen rated the plants within each treatment on a scale of 1 (poor) to 7 (outstanding) based on plant quality. Treatments were then ranked (17 = best) based on ratings. Plant heights were measured from growing medium surface to uppermost shoot tip and caliper measured 2.5 cm above uppermost roots. Stems of all plants were severed above uppermost roots, roots were washed and shoot and root dry weights determined.

Results and Discussion

Shore 8N-3P-7K plus sludge fertilization (Treatment 9, Table 1) resulted in maximum shoot dry weight (81.2 g), height (69.6 cm), and caliper (15.3 mm), and was ranked the best treatment (Table 2). Maximum root dry weight (40.7 g) was exhibited by plants grown in the medium amended with Scott's slow-release 20N-2P-8K (Treatment 11, a trademarked fertilizer of 0. M. Scott and Sons Co., Marysville, OH); however, shoot dry weight (40.0 g) for this regime was lighter than 15 other regimes. Yeager and Wright (8) observed a similar response with *Ilex crenata* 'Helleri' in that fertilizer regimes that promote root growth, result in reduced shoot growth.

Growing medium NO_3-N, P, and K levels for Treatment 9 ranged from 50, 8.6, and 51 ppm, respectively, in February to 164, 76.3, and 200 ppm, respectively, in September. Growing medium levels for Treatment 11 ranged from 226 ppm NO_3-N in June, 26 ppm P, and 197 ppm K in February to 107, 4.4, and 30 ppm NO_3-N, P, and K, respectively, in September. Growing medium pH ranged from 6.8 for Treatment 12 in June to 3.4 for Treatment 1 in September.

In summary, *M. grandiflora* grown in a 4 cypress sawdust: 1 sand: 1 sedge peat (v/v/v) medium amended with 9 kg/m³ of sludge (5N-2P-0K) and receiving monthly surface applications of Shore 8N-3P-7K (13 g) and sludge (13 g) were ranked superior to 16 other fertilizer regimes evaluated during a Cooperative Extension Service result demonstration in Hillsborough County.

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Table 1. Fertilizer treatments for container-grown *Magnolia grandiflora*.

Treatment no.	Product	Method of application[z]	Amount g/container	No. of surface applications	Application rate (kg/m^3)
1	Lesco 20-3-10	TDR	17	3	—
2	Miller 21-3-12	TDR	17	3	—
3	Estech 14-1-2	INC	—	—	5 16-g tablets/ container
4	Estech 12-3-1	INC	—	—	5 17-g tablets/ container
5	Peoples 18-3-10	TDR	76	3	—
6	Peoples 20-2-7	TDR	41	4	—
7	IMC V-J Special 15-2-7	TDR	32	6	—
8	Shore 24-3-13	TDR	16	3	—
9	Shore 8-3-7	TDR	13	9	—
9	Sludge[y] 5-2-0	TDR	13	9	—
9	Sludge 5-2-0	INC	—	—	9
10	FEC 15-3-7	TDR	27	3	—
11	Scott 20-2-8	INC	—	—	7
12	Sunniland 12-1-8	INC	—	—	12
12	Sunniland 17-2-9	TDR	28	2	—
13	Sierra 18-3-10	INC	—	—	7
14	Sierra 17-3-10	INC	—	—	9.5
15	Atlanticote 18-3-10	TDR	12	6	—
15	Atlanticote 18-3-10	INC	—	—	4
16	Scott 20-1-7	INC	—	—	7
16	Chicken Manure[x] 3-1-2	INC	—	—	9
17	Sierra 24-2-7	INC	—	—	7

[z]Top-dress (TDR), Incorporated (INC).
[y]Activated sewage sludge from Houston, TX, is a product of Shore Fertilizer Company, Plant City, FL.
[x]The use of dried chicken manure is not a recommendation of O. M. Scott Co. Chicken manure is a product of West Coast Wholesale Growers, Brandon, FL.

Table 2. Treatment means for *Magnolia grandiflora* height, caliper, shoot and root dry weights, and numerical ranking after 9 months growth.

Treatment[y] no.	Height (cm)	Caliper (mm)	Shoot dry weight (g)	Root dry weight (g)	Numerical[z] ranking
1	54.2	15.0	58.2	34.5	16
2	52.1	14.0	54.6	29.5	10
3	47.3	14.1	45.5	40.3	8
4	47.2	13.1	45.1	24.8	8
5	45.2	13.0	46.6	18.5	1
6	49.8	14.0	50.0	17.2	13
7	45.0	12.4	43.0	15.8	6
8	55.7	13.3	50.8	24.3	14
9	69.6	15.3	81.2	33.6	17
10	47.2	13.2	46.4	29.8	5
11	43.5	12.1	40.0	40.7	2
12	44.8	12.6	41.1	18.7	7
13	45.9	12.4	43.5	19.0	4
14	54.5	14.0	57.5	32.4	15
15	55.5	13.8	61.0	27.6	11
16	40.8	12.6	37.7	28.8	3
17	46.5	13.1	46.4	25.4	12

[z]Each treatment was rated on a scale 1 (poor) to 7 (outstanding) based on plant quality. The number of occurrences for each of the 7 rating choices was multiplied by the respective numerical value for the choices to obtain the numerical ranking.
[y]See Table 1.

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