Fertilizer Applications for Container-Grown Ornamental Tree Production

Growth of containerized ornamental shade trees is predicated on nutrients and varies with tree species and production conditions. Fertilizer practices such as topdressing, incorporating and liquid feeding methods can cause substantial economic loss creating a need to better manage nutrient applications during a growing season. The specific objective of this study was to compare the effects of various fertilizer practices and nutrient application methods in above or below ground containers that were irrigated with buffered pond or city water on the growth response of *Acer rubrum* 'Red Sunset'.

Different fertilizer practices were used to test the growth in two commercial nursery fields. Two slow-release granular fertilizers (18-5-12 and 12-0-42) were applied separately or together by incorporation, topdress or both to a potting mix for trees grown in 26 liter (7 gal) containers. In each field, the same 16 treatments were replicated (Table 1).

Tree growth was assessed by stem diameter (caliper), height, canopy size, leaf color and root measurements. Significant higher caliper increases occurred in trees treated with 18-5-12 fertilizer and irrigated with either pond or city water than trees treated with the 12-0-42 fertilizer (Table 2). Significantly higher percent increases in caliper also occurred for trees irrigated with pond water and top-dressed with 18-5-12 fertilizer than trees with incorporated 18-5-12 fertilizer. With the same slow-release fertilizer applications, trees irrigated with pond water and supplemental nutrients had greater percent increases of caliper, larger canopy areas and better root systems than trees irrigated with city water. The differences in tree height increase were not as great as the caliper increases. However, trees irrigated with pond water required additional inputs with extra nutrients and labor costs throughout the growing season.

Shortening tree production time and saving labor costs could be achieved by maximizing the one-year growth of container-grown trees through the optimal fertilizer practices.

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Table 1. Incorporation (I) or top-dressed (T) slow-release 18-5-12 and 12-0-42 granular fertilizers in the potting substrate for red maple trees grown in above (A) or below (B) ground containers.

Treatment no.	Slow-release fertilizer applied	Application[z]	Container location[y]	Treatment label[x]
1	18-5-12	I	A	F1(I,A)
2	18-5-12	T	A	F1(T,A)
3	No fertilizer	None	A	None(A)
4	18-5-12	I and T	A	F1(IT,A)
5	18-5-12	I	B	F1(I,B)
6	18-5-12	T	B	F1(T,B)
7	No fertilizer	None	B	None(B)
8	18-5-12	I and T	B	F1(IT,B)
9	12-0-42	T	A	F2(T,A)
10	12-0-42	I	B	F2(I,B)
11	12-0-42 (I) and 18-5-12 (T)	I and T	B	F1(T)F2(I)(B)
12	12-0-42 (I) and 18-5-12 (I)	I	B	F1(I)F2(I)(B)
13	12-0-42 (I) and 18-5-12 (T)	I and T	A	F1(T)F2(I)(A)
14	12-0-42 (I) and 18-5-12 (I)	I	A	F1(I)F2(I)(A)
15	12-0-42	T	B	F2(T,B)
16	12-0-42	I	A	F2(I,A)

Table 2. Percent increase in calipers and heights of *Acer rubrum* 'Red Sunset' red maple trees irrigated with pond or city water for different fertilizer treatments. Treatment No. was ranged based on caliper increase from greatest to smallest in the pond water field.

Treatments		Mean caliper increase (%)[y]		Mean height increase (%)[y]	
No.	Label[z]	Pond	City	Pond	City
2	F1(T,A)	172 (27)a	113 (22)b	33 (14)A	33 (20)A
4	F1(IT,A)	169 (28)a	133 (24)b	53 (22)A	39 (21)A
6	F1(T,B)	161 (39)a	103 (16)b	43 (9)A	31 (9)B
8	F1(IT,B)	150 (31)a	78 (22)b	60 (22)A	58 (35)A
5	F1(I,B)	140 (30)a	99 (21)b	41 (7)A	32 (18)A
1	F1(I,A)	138 (26)a	90 (25)b	30 (12)A	19 (8)B
13	F1(T)F2(I)(A)	133 (46)a	86 (28)a	50 (25)A	50 (25)A
12	F1(I)F2(I)(B)	130 (32)a	75 (19)b	39 (24)A	48 (22)A
16	F2(I,A)	129 (31)a	44 (7)b	28 (12)A	39 (18)A
7	None(B)	126 (38)a	38 (9)b	40 (17)A	13 (6)B
15	F2(T,B)	120 (33)a	64 (19)b	36 (11)A	12 (6)B
11	F1(T)F2(I)(B)	116 (45)a	110 (22)a	61 (29)A	41 (16)B
3	None(A)	116 (18)a	42 (10)b	38 (22)A	14 (7)B
14	F1(I)F2(I)(A)	112 (35)a	97 (31a)	37 (22)A	22 (15)A
10	F2(I,B)	101 (32)a	36 (11)b	54 (21)A	27 (21)B
9	F2(T,A)	99 (25)a	58 (10)b	43 (22)A	18 (9)B

[z]Treatment labels are defined in Table 1.
[y]Means across rows followed by different lower-case or upper-case letters are significantly different. Standard deviations are in parenthesis.

Zhu, H., Zondag, R., Merrick, J., Demaline, T., Jeon, H.Y., Krause, C.R., Locke, J.C. 2013. Fertilizer applications for container-grown ornamental tree production. Journal of Environmental Horticulture. 31(2):68-76.