Influence of Field-grow Fabric Containers and Various Soil Amendments on the Growth of Green Ash[1]

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Abstract

The influence of field-grow fabric containers (FGFC) and soil amendments (hydrophilic gel, peat and slow release fertilizer) on green ash height and caliper were studied for two years. Green ash seedlings were grown in 30.5 cm (12 in) FGFC or without root restriction throughout the study period. Heights and calipers increased less in plants grown with FGFC than in those without the containers during both growing seasons. Soil amendments had little effect on plant growth throughout the study period.

Index words: hydrophilic gel, slow release fertilizer

Species used in this study: green ash (*Fraxinus pennsylvanica* Marsh.)

Significance to the Nursery Industry

Field-grow fabric containers allow growers to produce plants while restricting the root system in a small volume. This restriction may allow a greater proportion of the root system to remain on the plant at the time of transplanting. Prior to large-scale implementation of FGFC in the production system, growers must be aware of plant responses to the FGFC and practices which may be used to assure maximum plant growth and quality in a minimum time period and with limited financial inputs.

The results of this study indicate that the use of FGFC has limited advantages in the production of green ash trees since both plant height and caliper increases were less in plants grown in the FGFC. Soil amendments of hydrophilic gel, peat and/or slow release fertilizer had little effect on plants grown in the FGFC. Further research on other species, transplant establishment and survival, and growing methods are necessary to determine circumstances in which FGFC may be valuable during production.

Introduction

There has been much interest and publicity on using field-grow fabric containers (FGFC) in the production of woody landscape plants. Proponents of these products note that the roots of trees grown in these containers are confined within the bag, thereby making harvest easier (7). Transplant establishment may be faster in trees produced in FGFC than those which are balled and burlapped since the FGFC retain approximately 80 percent of the root system (10), while up to 98 percent of the root system can be lost during balling and burlapping (8). There has, however, been much disagreement as to whether FGFC are advantageous in the production of woody plants.

Previous experimentation has concerned root growth when FGFC were used. Results have been inconsistent and may be species dependent (3, 4, 6, 9). The root systems of some woody species in FGFC were larger than plants without FGFC (9). Dry weight of roots in the harvest zone for live oak (*Quercus virginiana*), *Ilex opaca* 'East Palatka' and sweet gum (*Liquidambar styraciflua*) were greater when grown in fabric containers than when grown in the field; however, there were no differences between the two methods for four other species (6). Other research has shown that the root systems of other plants have been smaller when FGFC were used (3, 4). There has also been controversy among the industry concerning the small root balls often produced with FGFC compared to standards set by the American Association of Nurserymen (1).

Some proponents of FGFC suggest that better plant growth occurs when fertilizer and water are applied directly to the confined root system. Controlled release fertilizer mixed in the backfill would be expected to provide nutrient release throughout the first growing season.

Other soil amendments such as peat and hydrophilic gels may increase moisture retention within the bag. Hydrophilic gels may increase the water-holding capacity, drainage, and aeration of the growing medium (2). Benefits of hydrophilic gels vary depending upon growing medium and plant species. Past research has shown the most improvement in water relations of tomato in coarse sand amended with starch-base hydrophilic gels, but no difference was apparent when finer textured soils were used (5). Although starch-based gels are no longer used, the current polymer-based gels have also varied in their effect on plant water relations.

The objective of this study was to determine the effect of FGFC and slow release fertilizer, peat, and hydrophilic gel used as soil amendments on top and root growth of green ash during production.

Materials and Methods

Uniform one-year-old seedlings of green ash were planted to the same depth as when they were in the seedling bed in a prepared field of Norge loam (fine-silty, mixed, thermic Udic Paleustolls) soil with or without 30.5 cm (12 in) diameter by 30.5 cm (12 in) deep FGFC (Root Control, Oklahoma City, OK) on May 10, 1989 in Stillwater. Field soil

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used to fill the FGFC was amended with 25 percent (by volume) peat, 4.7 kg/m^3 (8 lb/yd^3) 18N-2.6P-10K (18-6-12) Osmocote slow release fertilizer, 1.2 kg/m^3 (2 lb/yd^3) hydrophilic gel (Hydrosource, Western Polyacrylamide, Castle Rock, CO), peat + hydrophilic gel, peat + slow release fertilizer, or hydrophilic gel + fertilizer. Controls were traditionally planted as bare root plants without soil amendments or FGFC. A randomized complete block design with eight treatments arranged in 20 individual replicates during the first growing season, and 16 replicates during the second season (due to partial harvest) were used.

Supplemental N was added to the entire study area annually at the rate of 227 kg/ha (200 lb/a) as urea (43-0-0). Plants received overhead sprinkler irrigation during summer dry periods. Weed control was accomplished through a yearly application of (2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methyl-ethyl) acetamide (metolachlor) and periodic cultivation as needed.

Plants remained in the field for two growing seasons. Plant height and calipers at 2.5 and 30.5 cm (1 and 12 in) above the soil surface were measured three times during the first growing season and monthly during the second season, beginning in mid-April (budbreak) and ending in October (leaf abscission). In late October of the first growing season, four plants from each treatment were harvested by hand. Trees in the FGFC treatments were displanted in the bag with no extra soil and control trees were harvested as if balled and burlapped within a ball diameter of approximately 40 cm (16 in) (1). Roots were washed then dried in an oven at 45C for seven days before weighing. Analysis of variance procedures and Duncan's Multiple Range tests were used to determine differences among the treatments.

Results and Discussion

During 1989, control plants increased in height more than those with FGFC except when the soil inside the FGFC was amended with peat along (Table 1). Most of this increase occurred during the early season growth period (before July). There was no difference in height change among plants in FGFC regardless of the presence or absence of any soil amendment. During 1990, the total height increase of plants without FGFC and those with FGFC and nonamended soil was similar. Plants in FGFC and soil amended with peat or gel and fertilizer were also similar to plants without FGFC. Amending soil in FGFC with gel and peat resulted in the least height increase of any treatment. Total height increases for the two years was greatest in the control plants.

Caliper increases were also dependent on time of year, and presence or absence of FGFC and soil amendments (Tables 2 and 3). The caliper at 2.5 cm (1 in) above the soil increased more for trees without FGFC than in any FGFC treatment except those with peat and slow release fertilizer between April and July, 1989 (Table 2). Six of the seven FGFC treatments resulted in total caliper increases similar to those of the control in 1989. The gel-only-amended-FGFC treatment produced less of an increase in caliper than the control.

During 1990, the caliper at 2.5 cm (1 in) increased the most in control plants before July (Table 2). This led to a greater total increase in control plants than those with no FGFC in 1990, and there was no difference in plants in FGFC regardless of soil amendment. The more rapid growth of control plants was especially evident in the evaluation of total caliper increase for the two-year study.

Total caliper increase at 30.5 cm (12 in) for 1989 were similar among the treatments except that those plants in FGFC with soil amended with gel only or gel and peat had smaller caliper increases than plants without FGFC (Table 3). Overall, in 1990, the plants grown without FGFC had a greater caliper increase than any of the FGFC treatments. The greatest growth of plants in all treatments occurred during early summer.

Differences in root dry weights among the treatments occurred in plants harvested in 1989 (Table 4). Plants with no FGFC and those with FGFC and amended with hydrophilic gel only had lower dry weights than those in FGFC with peat and fertilizer. At this time, no large roots had extended outside of the bags, but small roots had penetrated the bag making bag removal difficult. By the end of 1990, large roots, up to 2.5 cm (1 in) in diameter had extended through the bag in all treatments. Removal of bags for subsequent planting was difficult and time consuming.

Results of this study contrast with those of Chong, et al (3), in which top growth of popular (*Populus deltoides x nigra*) was not affected by containment, but root dry weight was reduced. The green ash in the present study had less top growth with FGFC. Root dry weight in the present study did not differ between control plants and those in FGFC except when soil within the FGFC was amended with peat and fertilizer. Roots had undoubtedly grown outside of the

Table 1. Increase in height (cm) of green ash during 1989 and 1990.

Treatment				Height increase (cm)				
				1989		1990		
Bag	Gel	Peat	Fertilizer	July	Total	July	Total	Total[z]
No	No	No	No	43.2 a[y]	46.7 a	77.3 a	77.2 a	123.0 a
Yes	No	No	No	27.2 b	31.0 b	70.2 ab	71.0 ab	99.5 b
Yes	No	No	Yes	26.3 b	30.6 b	60.4 b	60.5 bc	89.8 bc
Yes	No	Yes	No	33.6 ab	37.6 ab	65.7 ab	65.9 abc	99.7 b
Yes	No	Yes	Yes	33.4 ab	33.2 b	59.6 b	59.8 bc	92.0 bc
Yes	Yes	No	No	27.6 b	27.7 b	60.5 b	60.9 bc	92.3 bc
Yes	Yes	No	Yes	27.5 b	28.7 b	66.0 ab	66.1 abc	95.0 bc
Yes	Yes	Yes	No	25.8 b	26.2 b	56.5 b	56.4 c	81.1 c

[z]1989 + 1990 total was determined by subtracting initial plant height at planting from final plant height at transplanting; therefore, discrepancies between adding the 1989 total to the 1990 total come from growth between the final measurement in October of 1989 and the initial measurement in April of 1990.

[y]Mean separation within columns by Duncan's Multiple Range Test. Means followed by the same letter are not significantly different (P = 0.05).

Table 2. Caliper increase (mm) of green ash at 2.5 cm (1 in) above the soil surface during 1989 and 1990.

Treatment				Caliper increase (mm)				
				1989		1990		
Bag	Gel	Peat	Fertilizer	July	Total	July	Total	Total[z]
No	No	No	No	7.6 a[y]	13.3 a	16.6 a	18.3 a	34.1 a
Yes	No	No	No	4.6 cd	12.6 a	11.2 bc	13.2 b	26.6 b
Yes	No	No	Yes	6.0 bc	12.6 a	9.6 bc	10.3 b	23.7 b
Yes	No	Yes	No	5.6 bc	12.5 a	10.7 bc	11.9 b	26.2 b
Yes	No	Yes	Yes	6.6 ab	10.9 ab	11.7 bc	12.4 b	26.6 b
Yes	Yes	No	No	3.6 d	9.3 b	11.9 b	12.9 b	22.7 b
Yes	Yes	No	Yes	5.5 bc	11.7 ab	9.1 c	10.5 b	23.7 b
Yes	Yes	Yes	No	5.7 bc	12.3 a	12.1 b	13.4 b	26.0 b

[z] 1989 + 1990 total was determined by subtracting the initial plant caliper at planting from the final plant caliper at transplanting; therefore, discrepancies between adding the 1989 total to the 1990 total come from growth between the final measurement in October of 1989 and the initial measurement in April of 1990.

[y] Mean separation within columns by Duncan's Multiple Range Test. Means followed by the same letter are not significantly different (P = 0.05).

Table 3. Caliper increase (mm) of green ash at 30.5 cm (12 in) above the soil surface during 1989 and 1990.

Treatment				Caliper increase (mm)				
				1989		1990		
Bag	Gel	Peat	Fertilizer	July	Total	July	Total	Total[z]
No	No	No	No	5.4[y]	10.7 a	14.3 a	15.6 a	26.8 a
Yes	No	No	No	3.3 c	9.0 ab	10.5 b	11.7 b	20.9 b
Yes	No	No	Yes	5.1 a	9.4 ab	9.2 b	10.5 b	18.8 b
Yes	No	Yes	No	4.4 abc	10.0 ab	9.7 b	10.0 b	20.0 b
Yes	No	Yes	Yes	5.1 a	9.5 ab	10.5 b	10.9 b	20.7 b
Yes	Yes	No	No	3.3 c	8.0 b	10.9 b	11.0 b	18.5 b
Yes	Yes	No	Yes	4.6 ab	9.7 ab	8.8 b	9.6 b	18.8 b
Yes	Yes	Yes	No	3.6 bc	8.2 b	9.8 b	11.0 b	19.2 b

[z] 1989 + 1990 total was determined by subtracting initial plant caliper at planting from the final plant caliper at transplanting; therefore, discrepancies between adding the 1989 total to the 1990 total come from growth between the final measurement in October of 1989 and the initial measurement in April of 1990.

[y] Mean separation within columns by Duncan's Multiple Range Test. Means followed by the same letter are not significantly different (P = 0.05).

Table 4. Dry weight (g) of green ash with or without field growbags and various soil amendments after one growing season.

Treatment				Dry weight (g)
Bag	Gel	Peat	Fertilizer	
No	No	No	No	95.8 b[z]
Yes	No	No	No	134.0 ab
Yes	No	No	Yes	135.9 ab
Yes	No	Yes	No	132.7 ab
Yes	No	Yes	Yes	176.8 a
Yes	Yes	No	No	82.8 b
Yes	Yes	No	Yes	138.1 ab
Yes	Yes	Yes	No	126.4 ab

[z] Mean separation within columns by Duncan's Multiple Range Test. Means followed by the same letter are not significantly different (P = 0.05).

harvested root ball when no FGFC was present. Trees grown with the gel alone or with gel and peat or fertilizer had sparse, coarse root systems compared to those of plants in other treatments. This may have resulted from reduced soil air:water relations as a result of the presence of the gel; however, this was not measured.

Growth of green ash using bags and amendments in a nursery setting with occasional overhead irrigation limited caliper and height growth. Harvest was somewhat simplified but post-production planting was more time consuming as bags were cut from around the root systems prior to planting. It would appear from the results of this study that the use of field-grow fabric containers was not justified in terms of plant response for green ash. This does not mean, however, that grow bags may not prove beneficial and profitable for some species or in some production situations.

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Response of Selected Old Garden Roses to Seven Isolates of *Marssonina rosae* in Mississippi[1]

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Abstract

Seven isolates of *Marssonina rosae* (imperfect stage of *Diplocarpon rosae*) elicited different blackspot disease expression among 39 Old Garden Roses in laboratory tests. 'Felicite Parmentier' (Alba), 'Mme. Hardy' (Damask), 'The Bishop' (Centifolia) and 'Rosa Mundi' (Gallica) showed no symptoms. 'Cardinal de Richelieu' (Gallica), 'Hermosa' (China) and 'Leda' (Damask) were the most susceptible showing a cultivar ratings mean of 2.86 or more. The Wayne variant was the least virulent, causing susceptible reactions on only 46.1% of the roses. The Hinds variant was the most virulent and caused symptoms of 89.7% of the rose plants tested. The remaining five variants caused disease on 69.1% to 79.5% of the plants.

Index words: Blackspot, *Marssonina rosae*, old garden roses

Significance to the Nursery Industry

Old Garden Roses (Heritage Roses) have gained popularity among rose fanciers in recent years, resulting in more producers of a greater number of varieties. This research on the reactions of 39 heritage roses to seven isolates of rose blackspot [*Marssonina rosae* (Lib.) Lind], in a state with high rainfall and humidity, may assist producers in the cultivars offered to states with similar weather conditions. It may also help rose fanciers to more efficiently select those varieties that have an apparent higher resistance to blackspot.

Introduction

Blackspot, caused by *Marssonina rosae* (Lib.) Lind (imperfect stage of *Diplocarpon rosae* Wolf), is generally regarded as the most important fungus disease of roses worldwide. Differential pathogenicity of isolates and susceptibility of rose selections has been firmly established (2, 3, 8, 10).

Blackspot is particularly destructive in Mississippi because of the large number of fungus variants (Spencer, data not shown) and highly favorable weather during the growing season. A modern rose cultivar may show resistance to blackspot in one location in the state (Personal observation) but be highly susceptible at another due to fungus variant and local weather conditions.

Old Garden Roses received a great deal of interest and recognition in the garden or landscape during the 1980's (1, 4, 5, 6, 11, 13) with Old Garden Rose Seminars held at several locations in the United States. Some Alba roses were reported to show blackspot resistance whereas Gallica was reportedly susceptible (4).

There is limited commercial production of Old Garden Roses in Mississippi and a planting of Old Roses was made in an Arboretum within the state by Rosarians. Because of the widespread interest in this group of roses, research was initiated with the encouragement of University patrons. Objectives of this research were to: 1) determine the response of selected Old Garden Roses to seven variants of *M. rosae* occurring in Mississippi, and 2) provide such information to rose fanciers for possible use in selecting for landscape plantings, and 3) assist producers in selecting cultivars with blackspot spot resistance.

Materials and Methods

Isolation and growth. Fungal isolates were obtained from infected leaflets from seven Mississippi counties (Marion, Oktibbeha, Chickasaw, Hinds, Wayne, Sharkey and Quitman) that represented spatially dispersed geographical rose growing areas. Diseased leaflets were washed in running water for 5 min, submerged in 75% ethyl alcohol (ETOH) for 3 min and then in 1% sodium hypochlorite for 3 min. Pieces of diseased leaflets were placed on yeast-malt extract agar (YMEA). The YMEA medium contained thiamine, inositol, pyridoxine and biotin (12) and minor elements iron, manganese and zinc (7). The agar plates were maintained at room temperature [26°C (79°F)] and usually produced pure cultures of *M. rosae*.

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