Effect of Backfill Composition on Post-Transplant Root Growth

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Significance to Industry: Results of this research indicate that post-transplant root growth of container-grown mountain laurel (*Kalmia latifolia*) may be improved by amending the backfill with pine bark to overcome the differences in physical properties between container substrate and landscape soil. Planting such that the root ball is above the surface of the soil and mulch is applied around the exposed root ball may also improve initial post-transplant root growth.

Nature of Work: Physical properties of pine bark based nursery container substrates can differ dramatically from those of a landscape soil or backfill. These dissimilarities can hinder root growth, and may also impact plant available water (1,3,4,5). Until a plant's roots grow out from the original root ball and into the surrounding soil, a plant is unable to exploit the soil for water and nutrients and must rely solely on those resources in the original root ball (1). Mountain laurel (*Kalmia latifolia*) is a native evergreen shrub that frequently does not survive transplanting from containers into the landscape. By attempting to improve survival of transplanted mountain laurel, it may be possible to identify important factors that could improve survival of difficult-to-transplant ornamental shrubs in general. Previous research with mountain laurel has shown that amending the backfill with peat and/or pine bark improves its post-transplant shoot growth and survival (2). In the wild, the majority of mountain laurel roots proliferate horizontally in leaf litter, surface organic matter, and the uppermost soil layer (personal observation). The benefit of a soil amendment at transplanting and the plant's natural root distribution in the soil indicate that mountain laurel may benefit from specialized planting practices. Most research today that evaluates transplant success does so on the basis of survival and above ground growth. Factors affecting transplant survival may be further elucidated by studying root growth responses to different transplant conditions and/or practices. Therefore, the objective of this study was to determine the effect of different backfill compositions on post-transplant root growth of mountain laurel.

Plants of 'Olympic Wedding' mountain laurel were removed from 5 gal containers, and one plant each was situated in the center of each Horhizotron. The Horhizotron is a new instrument that can be used to easily measure root growth under a wide range of rhizosphere conditions (7). Each Horhizotron had four wedge-shaped glass quadrants extending outward away from the root ball, and each quadrant within a Horhizotron was filled with a different substrate: 100% pine bark (PB), 100% field soil, mixture of 50:50 (by vol) PB:soil, or 100% soil in the lowest 4 in and 100% PB in the top 4 in (hereafter referred to as mulched).

This last treatment was meant to mimic a planting situation in which a plant is planted such that the top of the root ball is above the surface of the ground and then mulch is piled up around the root ball. Plants were greenhouse grown in Auburn, AL from July 1 – Oct 4 and outdoors in Blacksburg, VA from June 15 – Oct 31. Plants were hand watered as needed. Treatments were applied in a randomized complete block design with five blocks (each Horhizotron represents one block). Root growth was measured once a week in Blacksburg and every two weeks in Auburn. Root growth into each quadrant was quantified by measuring the length of the five longest roots along each of the two glass faces of each quadrant. Data were analyzed using GLM procedures, regression analysis, and means separation using Least Significant Differences (6).

Results and Discussion: Throughout the course of both experiments (locations), substantially less root growth occurred in the 100% soil compared to all other treatments (Figure 1). Root growth increased linearly in all substrates and at a more rapid rate in all treatments that included pine bark compared to 100% soil (Figure 1). Amending field soil with 50% (by volume) pine bark improved root growth over the 100% soil, and when pine bark was layered on top of soil (mulched), roots grew only in the pine bark and did not grow into the soil. This is similar to results of field research conducted by these authors in which roots proliferated in the mulch applied to plants that were planted with their root ball above the soil surface (unpublished data). While roots grew at a faster rate in Auburn than in Blacksburg, likely due to higher temperatures, the effect of substrate on post-transplant root growth was similar at both locations. These results agree with previously published research that show that survival of mountain laurel was improved when the soil was amended with pine bark (2).

Literature Cited:

1. Barnett, D. 1986. Root growth and water use by newly transplanted woody landscape plants. Public Garden 1:23-25.
2. Bir, R.E. and J. Conner. 1991. Kalmia revisited. Am. Nurs. 174:56-63.
3. Costello, L. and J.L. Paul. 1975. Moisture relations in transplanted container plants. HortScience 10:371-372.
4. Nelms, L.R. and L.A. Spomer. 1983. Water retention of container soils transplanted into ground beds. HortScience 18:863-866.
5. Nicolosi, R.T. and T.A. Fretz. 1980. Evaluation of root growth in varying medium densities and through dissimilar soil surfaces. HortScience 15:642-644.
6. SAS Institute, Inc. 2004. SAS User's Guide. Release 9.1. SAS Institute, Inc. Cary, NC.
7. Wright, A.N. and R.D. Wright. 2004. The Horhizotron™: a new instrument for measuring root growth. HortTechnology 14:560-563.

Figure 1. Effect of backfill composition on post-transplant root growth of mountain laurel in (A) Auburn, AL (July 1 – Oct 4) and (B) Blacksburg, VA (June 15 – Oct 31). DAP = days after planting.