



# Nitrogen and Cutting Height Influence Root Development during Warm-Season Turfgrass Sod Establishment

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## ABSTRACT

Effective water conservation in the landscape requires identification of cultural management practices that maximize the genetic rooting potential of establishing turfgrass sod. Nitrogen is critical for successful turfgrass establishment; however, there has recently been debate over whether to restrict N fertilization during summer periods in parts of Florida and the United States. This study was undertaken to examine within four warm-season turfgrass species, the relative influences of cutting height and N fertility on the (i) rate of root extension and (ii) root biomass produced over a 10-wk period. 'Tifway 419' bermudagrass (*Cynodon dactylon* (L.) Pers. × *C. transvaalensis* Burt Davy), 'Empire' zoysiagrass (*Zoysia japonica* Steud.), 'Argentine' bahiagrass (*Paspalum notatum* Flugge), and 'Floritam' St. Augustinegrass (*Stenotaphrum secundatum* Walt. Kuntze) were established from 10-cm diam. by 5-cm deep plugs of turfgrass sod into 90-cm tall, clear acrylic tubes. Experimental treatments were arranged in a complete factorial that was repeated over two growing seasons. Rates of root extension were calculated from weekly measures of the deepest visible root in each column. Root extension rates ranged from ~1.0 to 1.8 cm d<sup>-1</sup> during the studies, with bahiagrass exhibiting the most rapid root extension of the four species. The results demonstrated that increasing N fertility during establishment increased rates of root extension into deep soil, particularly in bermudagrass. Height of cut had no effect on rate of root extension for most species, but higher cutting height did promote more rapid root extension in bermudagrass. Although not significantly accelerating vertical root extension in most species, maintaining sod at the higher cutting heights resulted in significantly greater root proliferation within both upper and lower soil depths for all species. The results emphasize the importance of proper N fertility and cutting heights for optimizing root development of different turfgrass species during sod establishment.

**I**NCREASING SCRUTINY AND regulation of landscape irrigation for the purposes of water conservation emphasizes the importance of research that seeks to optimize the genetic rooting potential of turfgrasses during sod establishment. Depending on the species, environment, and season, the establishment period may last from weeks to months, during which time relatively high amounts of irrigation are needed to meet the transpirational demand of plants lacking an established root system. In the absence of rainfall, irrigation recommendations for establishment of Florida lawns are to provide a minimum 13 mm of water per day for approximately 2 to 3 wk, (Trenholm et al., 2003). During this time, cultural practices promoting more rapid root extension into deep soil are important for allowing plants to access deeper reservoirs of soil water, and in doing so, become less dependent on supplemental irrigation for continued survival. Increased root proliferation within the soil allows newly establishing turfgrass to efficiently capture available water and nutrients essential to growth and

establishment. Nitrogen application and mowing are two important cultural practices that may affect root proliferation and vertical root extension of sod during this time.

Nitrogen fertility and mowing guidelines for sod establishment vary, and a range of mowing heights and N application rates are commonly offered specific to a given species, depending on its intended use and location (Beard, 2002; Christians, 1998). Beard (1973) recommended that mowing height and frequency for newly sodded areas should be the same as that normally practiced on established turf, and that N fertilization of new sod should generally not be needed because residual levels of soil or plant nutrients remaining from production should be sufficient (Beard, 1973). Current establishment fertility recommendations for Florida lawns are to apply fertilizer no sooner than 30 d following sod establishment, thereafter applying no more than 49 kg N ha<sup>-1</sup> in a single application (Trenholm et al., 2009). However, due to environmental concerns, a growing number of municipalities throughout Florida and the United States have proposed restricting N and/or P fertilizer application to landscapes during summer months (Hochmuth et al., 2011). Research that examines the developmental implications of decreased N during sod establishment is critical to the development of science-based best management practices.

While N fertility and mowing influences have been well documented within established turfgrass systems, there is a lack of published information regarding their impacts on root development during sod establishment of warm-season turfgrasses. When carbohydrate reserves in the plant are plentiful, effects of cutting are often minimized; however, when reserves are low, the opposite is true (Madison, 1971). Because roots

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