Creeping Bentgrass Putting Green Response to Foliar Nitrogen Fertilization

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ABSTRACT

Within the range of environmental conditions for which creeping bentgrass (Agrostis stolonifera L.) is adapted, cultural management significantly influences golf course putting green (PG) growth and quality. The experimental objective was to identify PG quality and growth response to rate, type, and/or timing of foliarly-applied N fertilizer. In 2009 and 2010, three independent fertility trials were conducted on a sand-based PG established to a 1:1 blend of Penn A-1 and Penn A-4 creeping bentgrass. Excepting the zero-N control, treatments were prepared using amine or salt 15–0–7 liquid fertilizer comprising wholly-soluble nutrient forms and applied at 24.5+24.5, 37, or 49 kg N ha⁻¹. Clipping yields were collected weekly and digested for N content. Canopy reflectance was used to calculate normalized differential vegetative (NDVI) and dark green color (DGCI) indices. Nitrogen rate directly influenced PG mean NDVI, DGCI, clipping yield, and N removal. Likewise, the amine supported greater mean PG quality than the salt fertilizer. Availability of fertilizer, estimated by PG growth and N removal rate, declined dramatically over the 6-wk experiments. Initial PG growth response to the single 49-kg N application significantly exceeded the 24.5+24.5 kg N “split” application. However, beneficial response to split applications, relative to the single 49 kg N treatment, was observed in latter weeks. While commercially-available liquid fertilizers vary in their suitability, managers are recommended to employ a <15-<15 application interval in meeting the 15 to 49 kg N ha⁻¹ monthly creeping bentgrass PG requirement.

MATERIALS AND METHODS

In 2009 and 2010, three independent fertility trials were conducted on a PG managed within the Pennsylvania State University Joseph Valentine Turfgrass Research Center (University Park, PA). The internally-drained PG, comprising a 30-cm deep 19:1 (vol.) sand/sphagnum peat moss rootzone, was established using a 1:1 blend of Penn A1 and Penn A4 creeping bentgrass seed in 2005. The PG was maintained at a 3.1-mm mowing height, six to seven times each week. (May 2010). Conversely, long-term field studies have shown PG response to certain fertilizer N forms within an equally-soluble array of liquid treatments (McCrimmon and Karnok, 1992; Pease et al., 2011; Schlossberg and Schmidt, 2007). Type and/or proportion of unavailable/controlled-release N-form(s) within a liquid fertilizer more typically influence short-term turfgrass response (Spangenberg et al., 1986).

Penn A-4 creeping bentgrass is categorized as a “high-density” bentgrass (Sweeney et al., 2001), and demonstrates aggressive growth habit and exceptional heat tolerance (Landry and Schlossberg, 2001). In National Turfgrass Evaluation Program (NTEP) trials, quality ratings of Penn A-1 typically reside in the highest statistical grouping for overall quality (NTEP, 2009; Voigt et al., 2006). Considering the vast hectarage of Penn A-1 and A-4 creeping bentgrass currently managed as PGs; information that relates color, density, and growth response to N fertilization may benefit numerous golf course superintendents. The objective of this study was to identify Penn A-1/A-4 creeping bentgrass PG quality and growth response to rate, type, and/or timing of foliarly-applied N fertilizer.

Abbreviations: DAT, days after treatment; DGCI, dark green color index; NDVI, normalized differential vegetative index; PG, putting green; SI, salt index; SOM, soil organic matter; WAT, weeks after treatment.