This is to certify that the

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The Effects of Plant Growth Regulators on Kentucky bluegrass (*Poa pratensis* L.) and Supina bluegrass (*Poa supina* Schrad.) in Reduced Light Conditions

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John C. Stier

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THE EFFECTS OF PLANT GROWTH REGULATORS ON KENTUCKY BLUEGRASS (*POA PRATENSIS* L.) AND SUPINA BLUEGRASS (*P. SUPINA* SCHRAD.) IN REDUCED LIGHT CONDITIONS

By

John C. Stier

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ABSTRACT

THE EFFECTS OF PLANT GROWTH REGULATORS ON KENTUCKY BLUEGRASS (*POA PRATENSIS* L.) AND SUPINA BLUEGRASS (*P. SUPINA* SCHRAD.) IN REDUCED LIGHT CONDITIONS

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Turfgrass management in reduced light conditions (RLC; < 30% full sunlight) is difficult because turf growth is affected by lack of sufficient light energy. Turf plants in RLC are relatively weak and cannot withstand traffic or other damage due to excessive shoot elongation, reduced tillering, and reduced root growth. In normal light conditions plant growth regulators which inhibit gibberellic acid (GA) biosynthesis are occasionally used on turfgrass to reduce mowing requirements by suppressing shoot growth. The objective of the research was to determine the effects of two GA-inhibitors (flurprimidol and trinexapac-ethyl) on turfgrass in RLC. The primary reason for the research was to develop a set of management strategies to maintain turfgrass in RLC for athletic events, e.g. athletic fields in covered stadia, although the results should be applicable to many turf situations. Three studies were conducted. In the first set of experiments, the effects of flurprimidol were tested at three nitrogen (N) rates (24, 48, and 96 kg ha^{-1} $month^{-1}$) on Kentucky bluegrass, with and without traffic, at two levels of RLC (approximately 1-2 and 8 mol photosynthetically active radiation (PAR) day^{-1}). A second study was undertaken to compare the relative shade tolerance of Supina bluegrass (*Poa supina* Schrad.) to Kentucky bluegrass (*P. pratensis* L.) with different combinations of trinexapac-ethyl and foliar-applied iron. In the third study the effects of trinexapac-ethyl

on photosynthesis of Kentucky bluegrass and Supina bluegrass in RLC were assessed. The effects of trinexapac-ethyl on photosynthesis of Supina bluegrass maintained at low and high N rates (24 and 96 kg ha^{-1} $month^{-1}$) were also evaluated. Both flurprimidol and trinexapac-ethyl effectively suppressed shoot growth and enhanced turf quality in RLC. Supina bluegrass was significantly more tolerant of RLC compared to Kentucky bluegrass although neither grass prospered at 1-2 mol PAR day^{-1}. Supina bluegrass had greater rates of photosynthesis than Kentucky bluegrass on a turf area basis although this was related to the higher leaf area index (LAI) of Supina bluegrass. Trinexapac-ethyl did not affect photosynthetic rates in either species. Nitrogen rate had little effect on photosynthesis in RLC but the high N rate did reduce LAI.

Dedicated to my wife, Valerie Ann Stier

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KEY TO SYMBOLS AND ABBREVIATIONS

CER, carbon exchange rate; PGR, plant growth regulator; GA, gibberellic acid; g_{max}, peak deceleration; TE, trinexapac-ethyl; PAR, photosynthetically active radiation; PPFD, photosynthetic photon flux density; Ly, langley; E, transpiration; g_s, stomatal conductance; g_m, mesophyll conductance; WUE, water use efficiency; LAI, leaf area index; N, nitrogen; P, phosphorus; K, potassium; CSSF, Covered Stadium Simulator Facility.