Evaluating the Salinity Tolerance of Bermudagrass Cultivars for Production and Reclamation Purposes

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Introduction

Bermudagrass (*Cynodon dactylon* L. Pers.) is a highly productive, perennial, warm-season grass that has been grown in the United States for forage, pasture, rangeland, roadsides, right-of-ways, and turfgrass uses. Many production and reclamation sites across the world are affected by soil salinity issues (Photo 1). Identification of bermudagrasses with improved salinity tolerance is important for the successful implementation of bermudagrass production and reclamation of salt affected sites and/or with use of saline irrigation water (Koch, 2011, Photo 2). The objectives of this project are to determine the relative salinity tolerances of bermudagrasses, including industry standards and Oklahoma State University experimental lines, through controlled environment research studies.

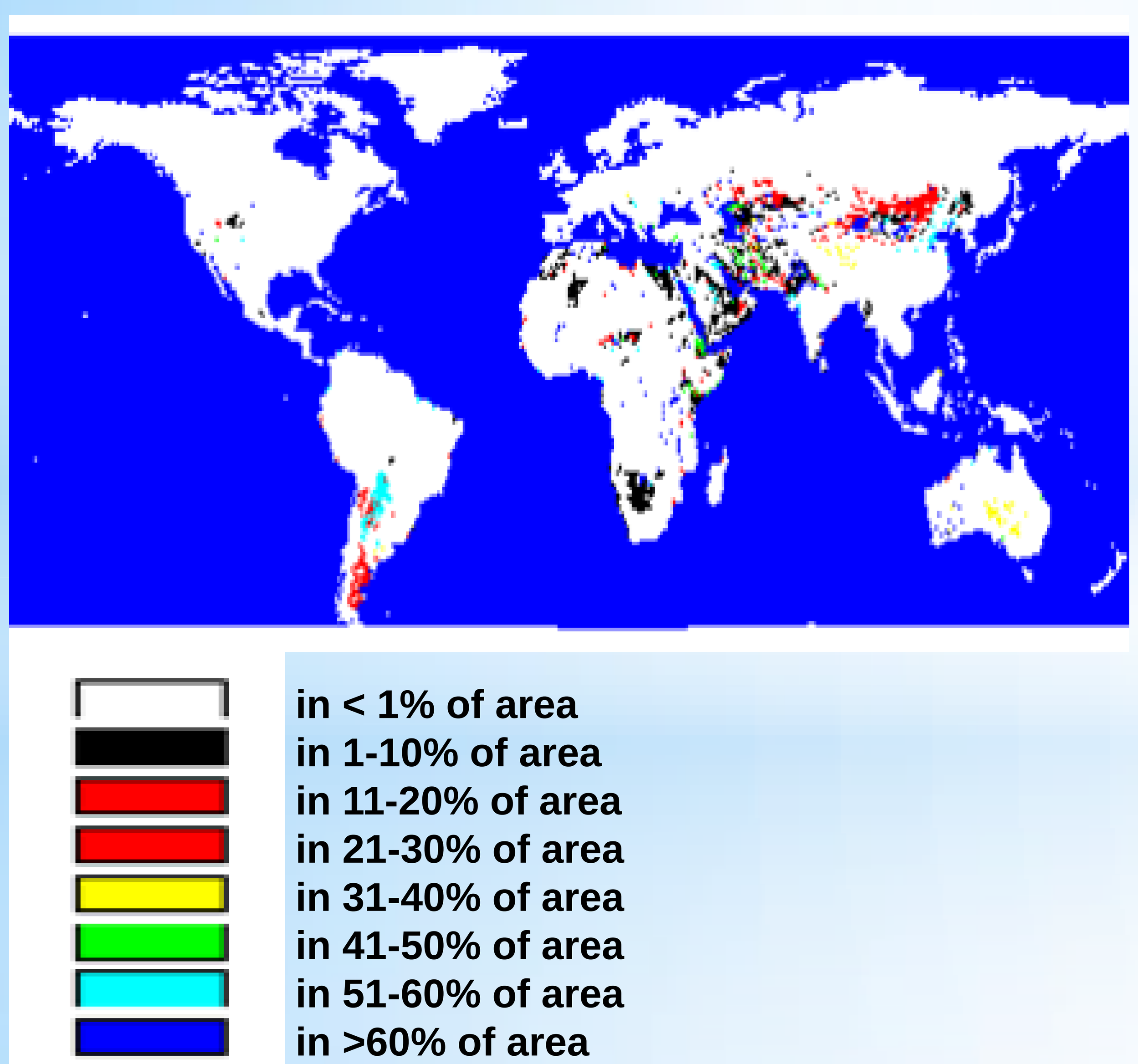

Photo 1. Saline soil of the world

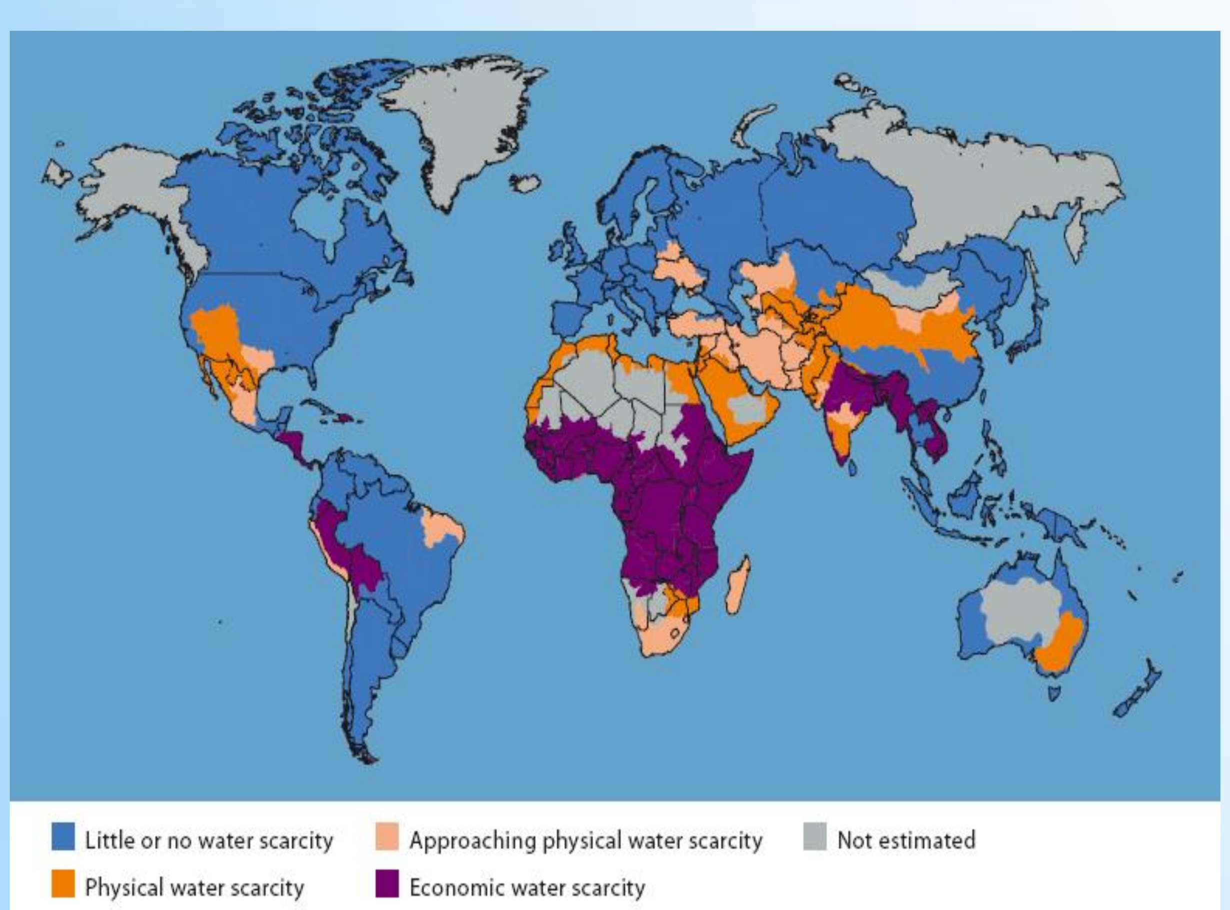

Photo 2. Water scarcity of the world

Materials and Methods

A controlled environment experiment is conducted to evaluate the responses of 7 vegetative and 11 seeded bermudagrass entries, including industry standards and Oklahoma State University experimental lines, in a completely randomized design with six replications (Table 1). The seeded grasses were seeded on several individual flat greenhouse trays and uniform sprigs were transferred to 11.4 cm diameter pots, the vegetative grasses were transplanted from the field nursery. The growth medium for each pot was sand mixed with gypsum on the rate of 57 grams per gallon to avoid a Ca deficiency (Raymer et al., 2005).

After a two month bench acclimation period, a synthetic sea salt mix was gradually added to individual benches to achieve the desired EC level. The salt concentrations for each salinity treatment were increased by 5 dS/m daily until 15 dS/m were reached. Treatment grasses were held at 15 dS/m for 1 wk, then pots were visually rated for turf quality, leaf firing and NDVI (Normalized Difference Vegetation Index), DGCI (Dark Green Color Index) (Photo 3), followed by clipping at 4 cm with the vegetative bermudagrass and 5 cm for the seeded bermudagrass. The cycle was repeated at 15 dS/m internal (15, 30, 45 and 60 dS/m) until 60 dS/m were achieved.

The fertilizer levels were monitored daily by testing the EC level of the freshwater tank which was the solution mixture of 2 gram of Excel brand fertilizer and 0.6 grams of $MgSO_4$ per gallon and EC were measured using a conductivity meter. When the EC of the freshwater control went below 1dS/m, Excel fertilizer was added at the rate of 0.26 gram of fertilizer/L of solution to all tanks. The solution was replaced every 10 days to ensure minimal changes in nutrient ion concentrations (Marcum and Pessarakli, 2006; Photo 4).

Photo 3. The NDVI sensor applied in this study.

Table 1. Bermudagrass cultivars entries and growth type.

Cultivar	Growth Type	Cultivar	Growth Type	Cultivar	Growth Type
Tifway	Vegetative	OKC 13-02	Vegetative	'Southern Star'	Seeded
Tifsport	Vegetative	'Pyramid 2'	Seeded	'Numex-Sahara'	Seeded
Latitude 36	Vegetative	'Royal Bengal'	Seeded	OKS 2011-1	Seeded
Northbridge	Vegetative	'Riviera'	Seeded	OKS 2011-4	Seeded
Midlawn	Vegetative	'Yukon'	Seeded	OKS 2009-3	Seeded
Celebration	Vegetative	'Princess 77'	Seeded	OKS 2004-2	Seeded

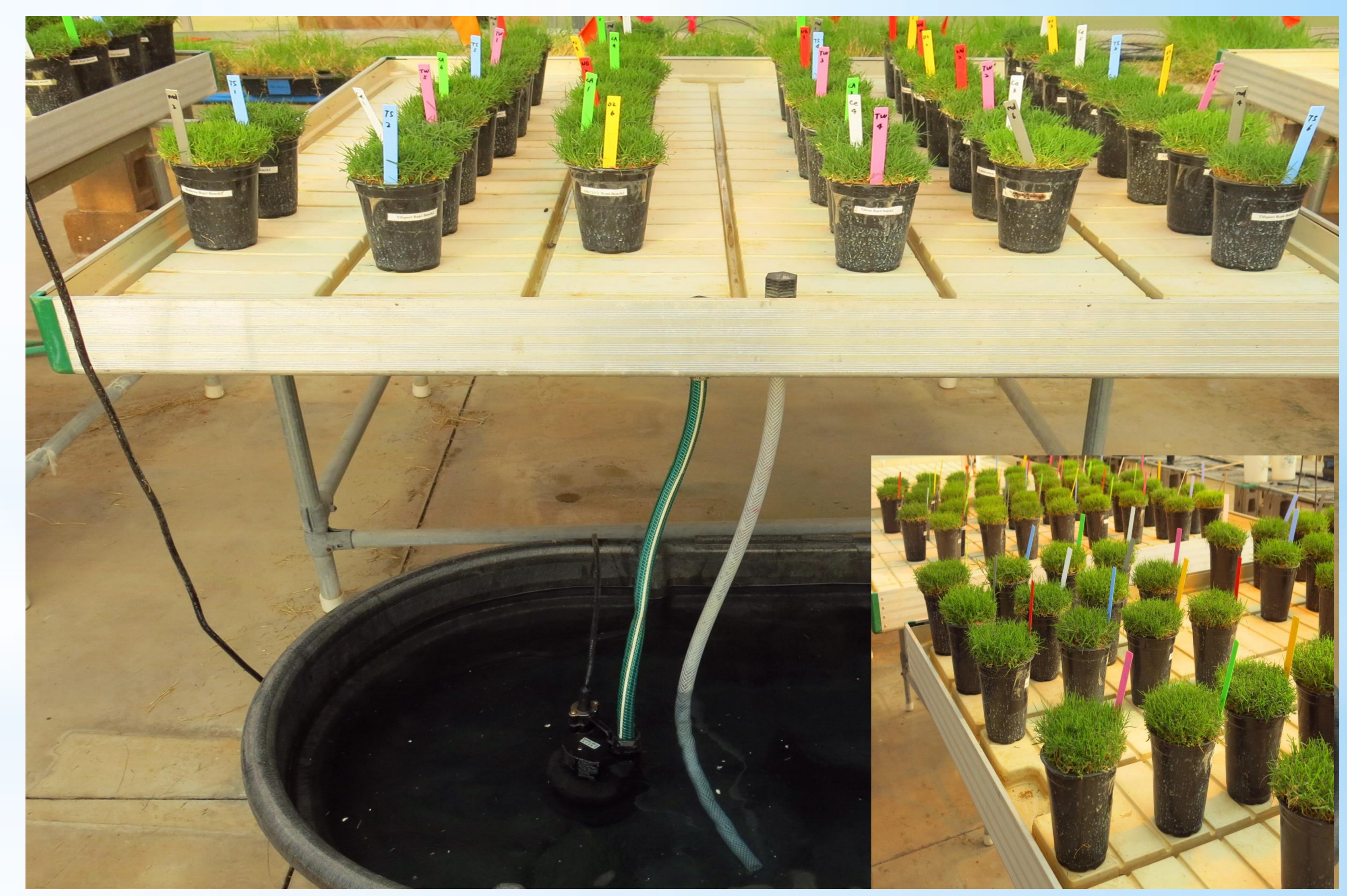

Photo 4. The setting up of the greenhouse benches.

Expected Result

There are significant differences among 18 bermudagrass cultivars. Shoot dry weight of all cultivars decreased linearly with increasing salinity (Marcum and Pessarakli, 2006). Therefore we will get a relative ranking of the 18 bermudagrasses from the most salinity tolerant to the least salinity tolerant.

References

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