2016-32-602

Dealing with Salinity Issues and More on Fairways by Topdressing and Aeration

Deying Li[1] and Huisen Zhu[2]

[1]Department of Plant Sciences, North Dakota State University, Fargo, ND 58108, USA

[2]College of Animal Science and Veterinary Medicine, Shanxi Agricultural University, Taigu, Shanxi 030801, China

ADDITIONAL INDEX WORDS. Organic matter, recycled water, salt, saline, topdressing, turfgrass.

SUMMARY. Based on a national survey, golf course management in the United States used 2.3 million acre-foot of irritation water per year during 2004 to 2005, with 12% of all golf facilities using recycled water as one of the water sources (Throssell et al., 2009). Recycled water usage increased from the 14.7% in 2005 to about 25% in 2013 of all water used on golf course (Gelernter et al., 2015). Most of the recycled water has elevated amounts of salts (Marcum, 2006; Harivandi, 2007). Golf courses that are developed on saline soils, or where the major water sources contain high levels of salts also experience salinity problems. The objective of this study was to investigate if using humus on golf fairways by topdressing or spray can alleviate soil salinity problems and improve turfgrass quality. The study was conducted from 2015 to 2016 on Valley Country Club, Aurora, CO, and from 2016 to 2017 on Bully Pulpit Golf Course, Medora, ND. Treatments included an untreated control, topdressing (sand, sand/peat), and spray of humic acid. Treatments were applied in the first week of May, July, and September each year. Topdressing was applied at 1/8 inch depth. Humus was sprayed at a spray volume of 30 gal/acr. The treatments were arranged in randomized complete block design with 3 replications. Our results showed that application of humus increased the soil microbial biomass and improved turf quality on fairways either with inherent soil salinity problem or irrigated with recycled water with elevated salt content. The effects on turfgrass health and turf quality were dependent on the rates of humus. Humic acid at 3 gal/acr was equivalent to topdressing sand/peat (80/20), and consistently showed improved turf quality over the untreated control. Soil properties also were affected by the application of humus and the effects on soil pH, EC, bulk density, water infiltration, and soil microbial biomass may have contributed to the ultimate turfgrass quality.

Literature cited

Gelernter, W.D, L.J. Stowell, M.E. Johnson, C.D. Brown, and J.F. Beditz. 2015. Documenting trends in water use and conservation practices on U.S. golf courses. Crop, Forage & Turfgrass Management. DOI:10.2134/cftm2015.0149.

Harivandi, M.A. 2007. Using recycled water on golf courses. Golf Course Management 75(6):98-108.

Marcum, K.B. 2006. Use of saline and non-potable water in the turfgrass industry: constraints and developments. Agric. Water Mgt. 80:132-146.

Throssell, C.S., G.T. Lyman, M.E. Johnson, G.A. Stacey, and C.D. Brown. 2009. Golf course environmental profile measures water use, source, cost, quality, and management and conservation strategies. Appl. Turfgrass Sci. doi:10.1094/ATS-2009-0129-01-RS.

Figure 1. Golf courses that are developed on saline soils, or where the major water sources contain high levels of salts experience salinity problems.

Table 1. Soil and water analysis at two fairways in 2015 and 2016 prior to the initiation of study.

	EC	pH	OM	Carbonate	Bicarbonate	Available P	Available K	Na	Ca	Mg	S	Cu	Mn	Zn	Fe	B
	dS m^{-1}		%	ppm												
17th fairway of Valley Country Club (VCC), Aurora, CO																
Soil	0.93	7.8	6.3	2.2	/	9	212	148	2816	274	60	0.75	2.7	11.46	31.3	2.69
Water	1.08	7.8	/	3.0	277.4	/	14.1	89	100	13.5	154.2	<0.02	0.026	0.07	0.01	0.16
1st fairway of Bully Pulpit Golf Course (BPGC), Medora, ND																
Soil	3.37	7.6	4.2	2.0	/	10	287	660	3686	405	271	2.7	7.1	8.3	40.4	1.1
Water	2.47	8.3	/	2.4	209.6	0.007	11.4	409	52.2	63.1	372.4	/	0.01	/	0.09	0.46

Table 2. Turfgrass quality on the 17th fairway of Valley Country Club, Aurora, CO during 2015 to 2016; and the 1st fairway of Bully Pulpit Golf Course, Medora, ND during 2016 to 2017.

	VCC					BPGC				
Treatment	May	June	July	August	September	May	June	July	August	September
Control	5.5b	6.0c	5.9d	5.9c	6.0d	0.50c	0.54c	0.65b	0.68c	0.70c
Sand	5.5b	6.2bc	6.0d	6.0c	6.5c	0.52c	0.56c	0.68b	0.72c	0.79b
Sand/Peat (90/10)	5.7ab	6.5b	6.5c	7.0b	7.2b	0.56b	0.66b	0.76a	0.79b	0.80b
Sand/Peat (80/20)	5.7ab	6.7b	7.0b	7.2ab	8.2a	0.61a	0.72a	0.78a	0.83a	0.84a
Humic acid (1 gal/acr)	5.7ab	6.7b	7.0b	6.8b	7.0b	0.59ab	0.68ab	0.77a	0.78b	0.77b
Humic acid (3 gal/acr)	6.0a	7.2a	7.5a	7.6a	8.1a	0.62a	0.70ab	0.79a	0.84a	0.85a