Stop #5: Management of Salinity and Rapid Blight Disease on Annual Bluegrass Putting Greens

Marco Schiavon, Pawel Petelewicz, Pawel Orlinski, Chiara Toniatti, Alessio Forconi, Brooke Gomez, and Jim Baird
Department of Botany and Plant Sciences
University of California, Riverside, CA 92521

Objectives:

1. To evaluate the efficacy of biostimulant/nutrient products on a Poa annua green to reduce stress caused by irrigation with saline water.
2. To evaluate various fungicide treatments for effective Rapid Blight disease (*Labyrinthula terrestris*) on annual bluegrass maintained as a golf course putting green.

Materials and Methods:

A 5400-ft^2 research putting green was constructed in 2017. Rootzone was comprised of 8 inches of sand/peat/soil with physical properties conforming to USGA recommendations but simulating a mature putting green with minimum suggested infiltration rate. *Poa annua* was established using aeration cores from Mesa Verde Country Club in Orange County. Due to severe loss of turf in 2017 season, plugs after fall aeration were spread throughout the most injured areas in order to renovate damaged areas. Also, *Poa annua* 'Two Putt' seeded at 2 lbs/ 1000ft^2 in the spring of 2018 to improve turf recovery by the beginning of the trial. During the trial, turf was mowed at 0.125 inches 5 times/week using a triplex mower, topdressed monthly with sand, and received 0.125 lbs N/M and Primo Maxx at 0.125 oz/M every two weeks.

Starting on July 2, 2018, plots were irrigated with saline water (2.0 dS/m) at 130% ET_{os} replacement. The 60' × 90' area was divided into six 30' × 30'areas. Single plot size was 4×6 ft with 1-ft or no alleys. Each area was watered by sprinkler system every night, for a total of 0.06 in./night. The remaining ET_{os} is replaced every day by watering with two irrigation methods replicated 3 times inside the study area:

a) Frequent shallow irrigation: plots are hand-watered twice a day (morning+afternoon)

b) Deep irrigation: plots are hand-watered only once in the afternoon.

For salinity alleviation, treatments (Table 1) focused on biostimulants and nutrients, since these types of products helped improve turf quality under saline conditions in previous studies conducted at UCR. Every two weeks, plots were evaluated for turf quality on a scale from 1 = worst to 9 = best, volumetric soil water content (VWC) and soil Electrical Conductivity (ECe) using POGO, and Naturalized Difference Vegetation Index (NDVI) and Dark Green Color Index (DGCI) using Digital Image

Analysis (DIA). Treatments were applied by hand or using a calibrated CO_2 boom sprayer (TeeJet 8004 VS nozzles; 2 gal/1000 ft^2).

Fungicide treatments were applied every 14 days beginning on July 3, 2018. (before disease symptoms were present) for a total of 8 applications. Treatments were applied using a CO_2-powered backpack sprayer equipped with TeeJet 8004VS nozzles calibrated to deliver 2 gallons/1000 ft^2.

Every two weeks plots were evaluated for visual turf quality (1-9; 9=highest), volumetric water content (VWC) and soil electrical conductivity (EC_e) using POGO, Naturalized Difference Vegetation Index (NDVI) and Dark Green Color Index (DGCI) using Digital Image Analysis (DIA). In addition, injury caused by treatments (0-10; 10=highest), overall turf cover (0-100%), *Poa annua* cover (0-100%) and injury (0-10; 10=highest) as well as Rapid Blight disease pressure (0-100%) were evaluated on biweekly basis starting from July 2, 2018.

Results:

Increasing mowing height from the previous year caused bentgrass to take over annual bluegrass. Irrigation regime had the greater effect on bentgrass quality and NDVI, with deep, infrequent irrigation performing better than shallow irrigation (Fig. 1). However, differences in irrigation regimes may be the result of uneven distribution of sand in the rootzone. Treatment did not have a significant impact on turf quality.

No significant effect of treatments was shown on any of the parameters evaluated in this trial (visual quality, total turfgrass cover, disease cover, disease severity within cover, annual bluegrass cover and injury, NDVI, cover (DIA), DGCI, VWC, EC_e (POGO); results not shown). This is mostly due to decreased annual bluegrass cover within the trial area, as well as to lack of uniformity in terms of its distribution. Furthermore, acervuli of *Colletotrichum cereale,* causing anthracnose, were found within the study area. All of these factors working together contributed to high variability within treatments, resulting in impeded data analysis.

Although soil salinity increased (Table 4), presence of *Labyrinthula terrestris* has not yet been identified.

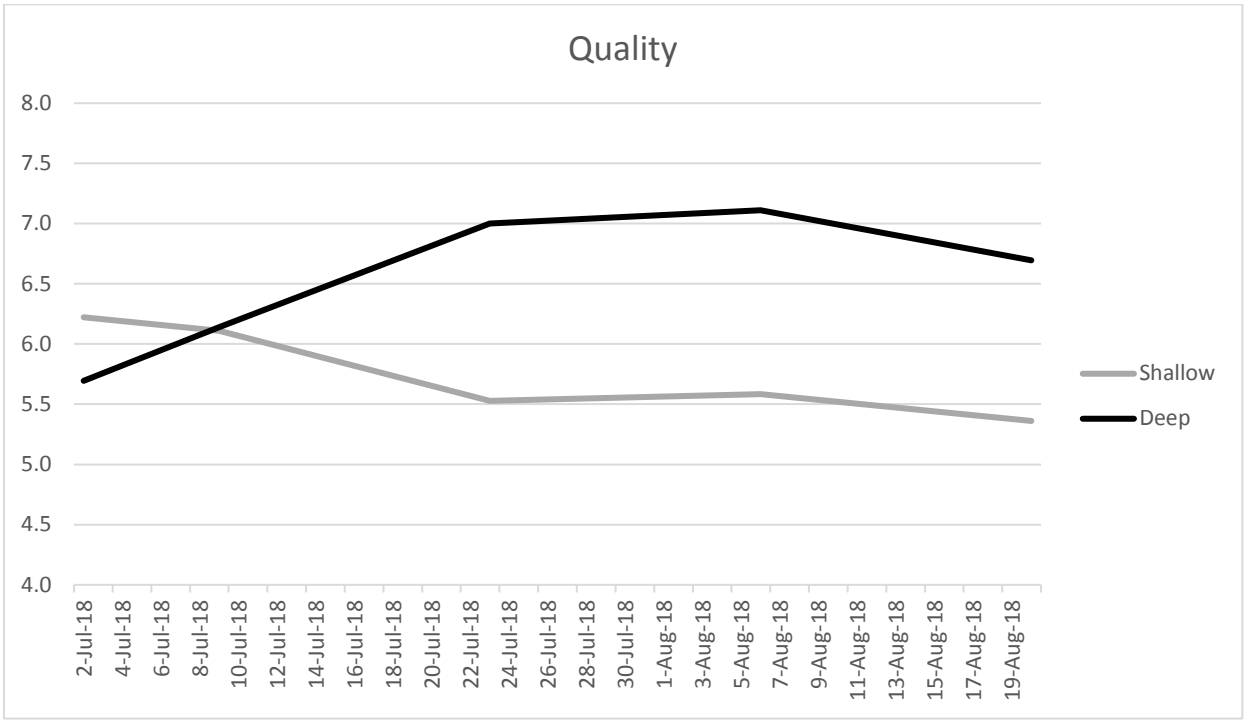
Acknowledgments:

Thanks to the CTLF, Harrell's, OGT, Ocean Organics, Solutions 4Earth, Target, Wilbur-Ellis BASF, Intelligro, NuFarm and Syngenta for supporting this research and/or for providing products.

Table 1. Treatment list for the salinity alleviation trial. 2018. Riverside, CA.

No.	Treatment	Company	Rate	Frequency (wks)
1	Untreated Control	--	--	--
2a	NutriMend (10-3-0)	Solutions 4Earth	16 fl oz/M	1
2b	Komodo Pro (0-0-16)		8 fl oz/M	1
3a	StressRx	Ocean Organics	6 oz/M	2
3b	XP Micro		6 oz/M	2
4a	Aquaplex amino	Wilbur-Ellis	4.5 oz/M	2
4b	Nutrio Unlock P&K		1.5 oz/M	2
4c	Puric humic acid		1.5 oz/M	2
5a	Link Fourtyplex (2-0-3)	Wilbur-Ellis	6 oz/M	2
5b	Nutrio Unlock P&K		1.5 oz/M	2
6a	NutriMend (10-3-0)	Solutions 4Earth	16 fl oz/M	1
6b	Komodo Pro (0-0-16)		8 fl oz/M	1
7	Earthmax	Harrell's	4 oz/M	2
8	SWE	Harrell's	4 oz/M	2
9	Max Amino	Harrell's	1 oz/M	2
10	Soil Surge	Harrell's	1.5	1
11	Algae Green	OGT	8.8 oz/M	2
12a	Element 6	Target	3 oz/M	1
12b	Respo Fuel	Target	3 oz/M	1
12c	Minors Fuel	Target	3 oz/M	1
12d	Root Down 18-0-0	Target	3 oz/M	1

Figure 1. Quality and NDVI of plots hand-watered either every day in the morning and afternoon (shallow), or only in the afternoon (deep). 2018. Riverside, CA.



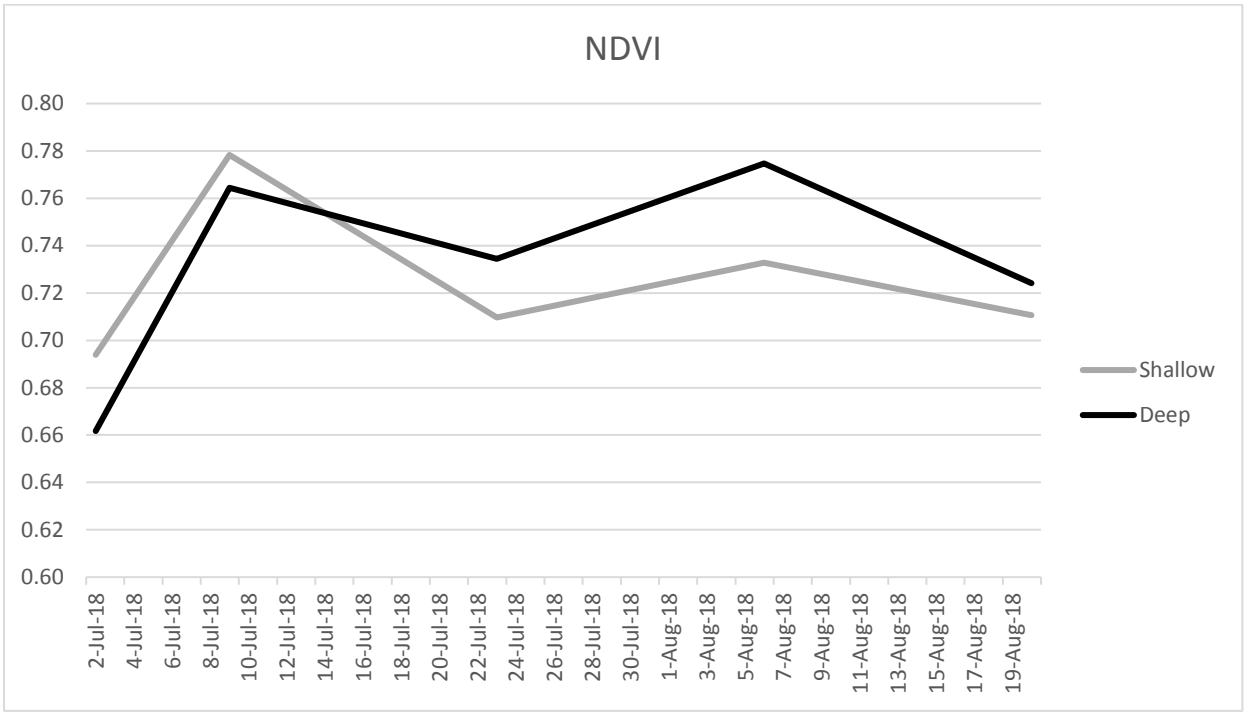


Table 2. Fungicide treatments evaluated for Rapid Blight control. Riverside, CA, 2018.

No.	Treatment	Active ingredient	Company	Rate (oz/M)	Timing*
13	Untreated Control	-	-	-	-
14	Daconil Action	chlorothalonil, acibenzolar-S-methyl	Syngenta	3.50	A-H
	Medallion SC	fludioxonil	Syngenta	1.00	
15	Secure Action	fluazinam, acibenzolar-S-methyl	Syngenta	0.50	A-H
16	Secure Action	fluazinam, acibenzolar-S-methyl	Syngenta	0.50	A-H
	Velista	penthiopyrad	Syngenta	0.50	
17	Secure Action	fluazinam, acibenzolar-S-methyl	Syngenta	0.50	A-H
	Daconil Action	chlorothalonil, acibenzolar-S-methyl	Syngenta	3.50	
18	A18126B	*classified*	-	0.16	A-H
19	Maxtima	mefentrifuconazole	BASF	0.80	A-H
20	Navicon	mefentrifuconazole, pyraclostrobin	BASF	0.85	A-H
21	Velista	penthiopyrad	Syngenta	0.50	A-H
22	Insignia	pyraclostrobin	BASF	0.70	A-H
23	UCR 001	-	-	-	A-H
24**	Intelligro Program				
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	A
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Banner Maxx II	propiconazole	Syngenta	1.00	
	Medallion SC	fludioxonil	Syngenta	1.00	B
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	C
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Velista	penthiopyrad	Syngenta	0.30	
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	D
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Insignia	pyraclostrobin	BASF	0.90	
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	E
	Affirm WDG	polyoxin D zinc salt	Nufarm	0.88	
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	F
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Medallion SC	fludioxonil	Syngenta	1.00	
	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	G
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Velista	penthiopyrad	Syngenta	0.30	

** Continued on the following page

*** Continued from the previous page

24***	Alude	mono- and dibasic sodium, potassium, and ammonium phosphites	Nufarm	5.50	H
	CIVITAS TURF DEFENSE Pre-M1xed	mineral oil	Intelligro	8.50	
	Insignia SC	pyraclostrobin	BASF	0.50	

Table 3. Fungicide treatments used on control for salinity alleviation trial. Riverside, CA, 2018.

No.	Treatment	Active ingredient	Company	Rate (oz/M)	Timing*
SA	Insignia SC	pyraclostrobin	BASF	0.70	ACEG
	Velista	penthiopyrad	Syngenta	0.50	BDFH

***Timing**

A 7/3/2018
B 7/17/2018
C 8/1/2018
D 8/15/2018
E 8/29/2018
F 9/12/2018
G 9/26/2018
H 10/10/2018

Management of Salinity and Rapid Blight Disease Trials Plot Plan

(12 F 4) ↑N

Rep 1, 2

A

13	**1**		**7**	19
14	**2**		**8**	20
15	**3**		**9**	21
16	**4**		**10**	22
17	**5**		**11**	23
18	**6**		**12**	24

B

18	**5**		**4**	16
15	**10**		**6**	22
23	**8**		**11**	24
13	**2**		**1**	20
19	**12**		**3**	14
17	**7**		**9**	21

Rep 3, 1

C

18	**5**		**8**	22
23	**11**		**3**	14
21	**4**		**6**	16
24	**12**		**9**	19
13	**10**		**7**	17
20	**2**		**1**	15

D

17	**6**		**1**	21
24	**7**		**5**	19
15	**2**		**4**	20
22	**12**		**8**	13
14	**11**		**3**	18
23	**9**		**10**	16

Rep 2, 3

E

24	**12**		**2**	18
17	**10**		**6**	13
22	**8**		**11**	20
19	**9**		**3**	16
14	**1**		**7**	15
23	**5**		**4**	21

F

21	**8**		**5**	19
16	**11**		**4**	15
14	**12**		**3**	24
18	**10**		**6**	23
13	**7**		**1**	17
20	**9**		**2**	22

Table 4. Change of ECe within the Rapid Blight trial. Riverside, CA, 2018.

No.	Treatment	EC_e	
		07/02	08/20
13	Untreated Control	0.56	1.75
14	Daconil Action (3.5 oz/M) + Medallion SC (1.0 oz/M)	0.68	1.43
15	Secure Action (0.5 oz/M)	0.70	1.75
16	Secure Action (0.5 oz/M) + Velista (0.5 oz/M)	0.56	1.47
17	Secure Action (0.5 oz/M) + Daconil Action (3.5 oz/M)	0.80	1.53
18	A18126B (0.16 oz/M)	0.67	1.75
19	Maxtima (0.8 oz/M)	0.58	1.50
20	Navicon (0.85 oz/M)	0.51	1.41
21	Velista (0.5 oz/M)	0.70	1.65
22	Insignia (0.7 oz/M)	0.73	1.35
23	UCR 001	0.67	1.41
24	Intelligro Program	0.72	1.63

*Means followed by the same letter in a column are not significantly different (P=0.05)