

Stop 6a: Evaluation of Products to Alleviate Salinity Stress

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Objectives:

To evaluate the efficacy of products on turf to reduce stress caused by irrigation with saline water.

Methods:

The plot area was sodded with 'Tifway II' bermudagrass on 6 August 2012 on Hanford fine sandy loam with no pre-existing salinity issues. All treatments were applied initially on 3 April 2014. The turf is mowed three times per week at 0.75 inches. Standard bermudagrass cultural practices are maintained throughout the study, including 3-6 lbs N/M/yr. Plots are irrigated at 75% ET₀ with water that matches the same ion composition of Colorado River See table below. Every two weeks, plots were evaluated for turf quality, leaf firing, and volumetric soil water content. In addition Digital Image Analysis and leachate are collected on the same day. Soil samples will be collected at the end of bermudagrass growing season separately for each combination of chemical treatment and replication to assess salinity accumulation in the root zone.

Chemical properties of saline irrigation water used in this study compared to potable irrigation water used elsewhere at the UCR turfgrass facility.

| | Saline Irrigation Water | Potable Irrigation Water |
|-------------------------------|--------------------------------|---------------------------------|
| pH | 7.57 | 7.82 |
| Hardness | 938.23 | 215.18 |
| Bicarbonate | 209.84 | 214.72 |
| Carbonate | 0.01 | 0.01 |
| EC (dS/m) | 4.43 | 0.61 |
| Na (ppm) | 523.9 | 53.36 |
| Cl (ppm) | 996.27 | 31.13 |
| Boron (ppm) | 0.11 | 0.08 |
| SAR (meq/L) | 18.3 | 3.24 |
| Nitrate Nitrogen (ppm) | 5.11 | 5.18 |
| Phosphate (ppm) | 0.4 | 0.01 |
| Potassium (ppm) | 129.76 | 4.16 |
| Magnesium (ppm) | 151.99 | 12.24 |
| Calcium (ppm) | 126.03 | 66 |
| Sulfate (ppm) | 707.62 | 78.1 |
| Manganese (ppm) | 0.01 | 0.01 |
| Iron (ppm) | 0.11 | 0.05 |

Treatments:

Treatments are applied by hand or using a calibrated CO₂ boom sprayer. Treatments are watered in with over 2 cm of water immediately following application. For treatment list see table on next page.

Results

DeSal improved bermudagrass quality consistently through the study. CalPlus (both rates), ACA 3217, MST-1410 (5 oz/M) and Turfcare NPN improved quality in comparison to control in at least one rating date (Figure 1). ACA 2994 had a phytotoxic effect on bermudagrass, and was detrimental to turf quality, but was also the only treatment to constantly decrease EC in the leachate (Figure 2). Cal Plus at 1.5 oz/M also decreased EC of the leachate at two collection dates (Figure 2).

Salinity Alleviation Study Treatment List 2014

| No. | Treatment | Company | Rate | Frequency (wks) |
|------------|-------------------|-------------------|-------------|--|
| 1 | Untreated Control | -- | -- | -- |
| 2 | ACA 2994 | Aquatrols | 8 oz/M | 6 |
| 3 | ACA 2994 | Aquatrols | 8 oz/M | 2 |
| 4 | ACA 1849 | Aquatrols | 3 oz/M | 2 |
| 5 | ACA 1849 | Aquatrols | 3 oz/M | 2 |
| 5 | Gypsum | | 5 lbs/M | 2 |
| 6 | ACA 2994 | Aquatrols | 4 oz/M | 6 |
| 7 | Cal-Vantage | EarthWorks | 5 oz/M | Cal-Vantage and Kick rotated every 2 wks with Proactin and TriCure |
| 7 | Kick | Earthworks | 10 oz/M | |
| 7 | Proactin | Mitchell Products | 1.5 oz/M | |
| 7 | TriCure AD | Mitchell Products | 4 oz/M | |
| 8 | MC TP | Mitchell Products | 2 oz/M | 2 |
| 9 | MC TP3 | Mitchell Products | 2 oz/M | 2 |
| 10 | Crossover | Numerator Tech. | 5 lb/M | 4 |
| 11 | Revert | Numerator Tech. | 6 oz/M | 4 |
| 12 | SST 8%CA | Numerator Tech. | 8 oz/M | 2 |
| 13 | pHAcid Sprayable | Numerator Tech. | 2 oz/M | 2 |
| 13 | Crossover | | 5 lb/M | 4 |
| 14 | Cal Plus 1 | Westbridge Agric. | 0.75 oz/M | 2 |
| 15 | Cal Plus 2 | Westbridge Agric. | 1.5 oz/M | 2 |
| 16 | DeSal | Ocean Organics | 0.75 oz/M | 2 |
| 16 | StressRx | Ocean Organics | 6 oz/M | 2 |
| 16 | EXP 5-0-1 | Ocean Organics | 6 oz/M | 2 |
| 17 | Gypsum | -- | 5 lb/M | 2 |
| 18 | Gypsum | -- | 10 lb/M | 2 |
| 19 | ACA 3217 | Aquatrols | 6 oz/M | 2 |
| 20 | MST-1410* | -- | 3 oz/M | 2 |
| 21 | MST-1410* | -- | 5 oz/M | 2 |
| 22 | Turfcare NPN | Gantec | 0.1 oz/M | 2 (Apr-May) |
| | Turfcare NPN | Gantec | 0.1 oz/M | 4 (Jun-Dec) |
| | Turfcare NPN | Gantec | 2.3 lb/M | Apr/May/Jul/Sep |

*Treatments first applied on 12 June 2014

Plot Plan
Salinity Alleviation Study (Field 12F-4)
North

| | | | | | | | | | | | |
|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|
| 101 | 1 | 201 | 13 | 301 | 8 | 401 | 16 | 501 | 22 | 601 | 9 |
| 102 | 2 | 202 | 6 | 302 | 5 | 402 | 21 | 502 | 19 | 602 | 4 |
| 103 | 3 | 203 | 11 | 303 | 18 | 403 | 1 | 503 | 10 | 603 | 10 |
| 104 | 4 | 204 | 9 | 304 | 7 | 404 | 13 | 504 | 15 | 604 | 22 |
| 105 | 5 | 205 | 18 | 305 | 14 | 405 | 11 | 505 | 7 | 605 | 13 |
| 106 | 6 | 206 | 1 | 306 | 4 | 406 | 17 | 506 | 21 | 606 | 5 |
| 107 | 7 | 207 | 12 | 307 | 19 | 407 | 3 | 507 | 12 | 607 | 11 |
| 108 | 8 | 208 | 10 | 308 | 16 | 408 | 15 | 508 | 20 | 608 | 18 |
| 109 | 10 | 209 | 4 | 309 | 21 | 409 | 22 | 509 | 3 | 609 | 19 |
| 110 | 9 | 210 | 20 | 310 | 2 | 410 | 4 | 510 | 16 | 610 | 15 |
| 111 | 11 | 211 | 14 | 311 | 1 | 411 | 19 | 511 | 5 | 611 | 7 |
| 112 | 12 | 212 | 8 | 312 | 17 | 412 | 14 | 512 | 18 | 612 | 17 |
| 113 | 13 | 213 | 2 | 313 | 11 | 413 | 9 | 513 | 1 | 613 | 20 |
| 114 | 14 | 214 | 5 | 314 | 3 | 414 | 7 | 514 | 8 | 614 | 3 |
| 115 | 15 | 215 | 21 | 315 | 6 | 415 | 2 | 515 | 13 | 615 | 2 |
| 116 | 16 | 216 | 19 | 316 | 12 | 416 | 20 | 516 | 6 | 616 | 14 |
| 117 | 17 | 217 | 16 | 317 | 15 | 417 | 10 | 517 | 11 | 617 | 21 |
| 118 | 18 | 218 | 3 | 318 | 9 | 418 | 6 | 518 | 17 | 618 | 8 |
| 119 | 19 | 219 | 15 | 319 | 22 | 419 | 12 | 519 | 14 | 619 | 1 |
| 120 | 20 | 220 | 7 | 320 | 13 | 420 | 18 | 520 | 2 | 620 | 12 |
| 121 | 21 | 221 | 22 | 321 | 10 | 421 | 5 | 521 | 9 | 621 | 16 |
| 122 | 22 | 222 | 17 | 322 | 20 | 422 | 8 | 522 | 4 | 622 | 6 |

Figure 1. Quality of treatments that performed better than control in at least one rating date.

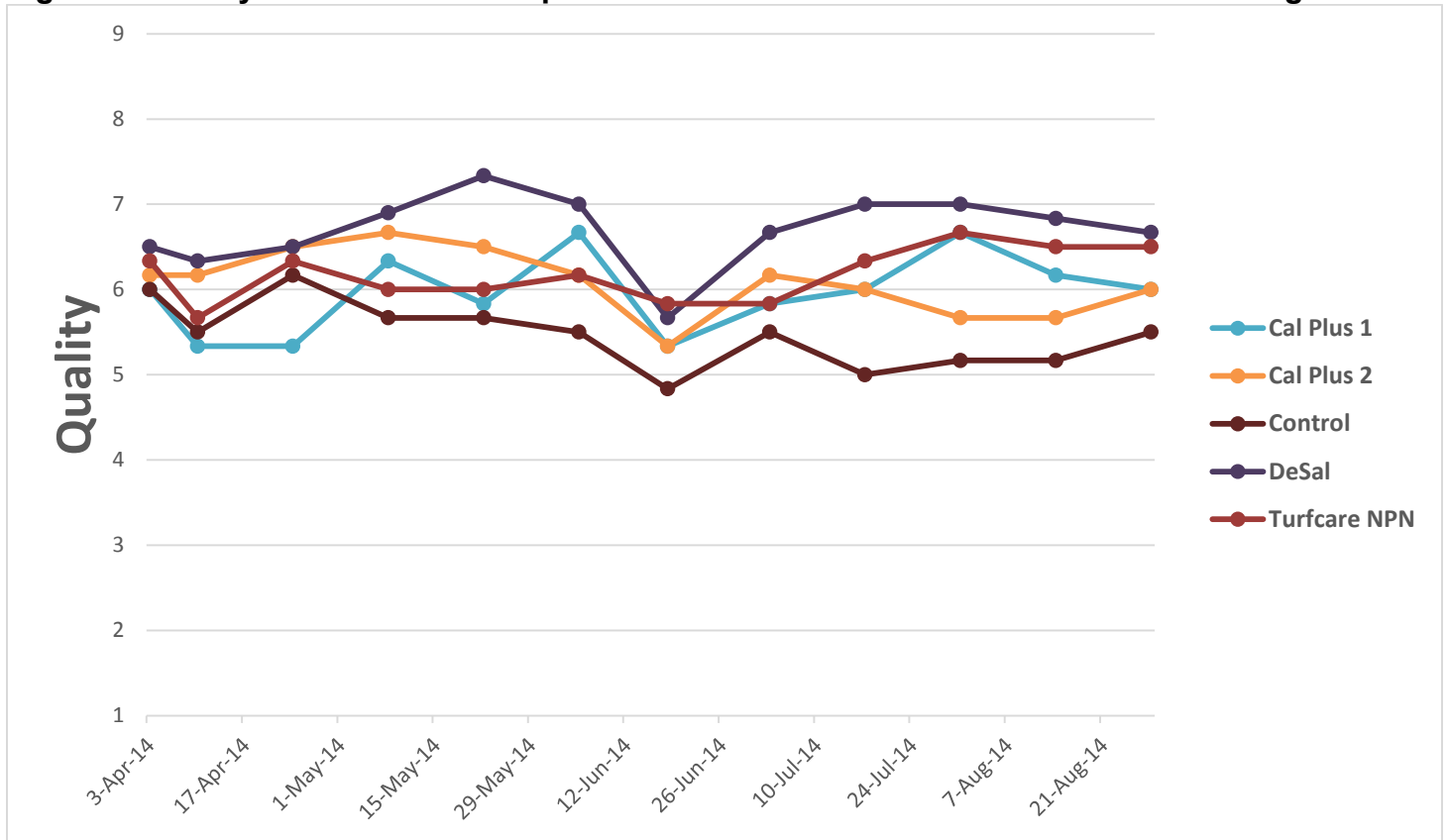


Figure 2. EC of leachate collected from plots that decreased salinity in comparison to control in at least one rating date.

