

## Introduction

As drought conditions prevail in the Southwestern US, golf courses rely on irrigation water to maintain the playability and quality of their fairways. Groundwater from the Ogallala Aquifer is the main source of irrigation in our region, but the rapid depletion of water has diminished water quality by increasing salt concentration. The continual use of this water source with limited leaching rainfall events has allowed for salt accumulation in the soil. Cleaner water sources are not available for leaching, and many of the golf courses may not be able to apply the additional water needed to effectively leach salts with their irrigation alone. Therefore, additional methods to move salts below the effective rootzone need to be evaluated further. Current recommendations include the use of cultivation practices and product applications to improve leaching potential, but limited research is available on their effectiveness alone or in combination. Therefore, the purpose of this study is to provide golf course superintendents with best management practices for salinity remediation for all golf courses.

## Materials and methods

- Study conducted at two golf courses in 2015
- The Rawls Golf Course uses ‘TifSport’ hybrid bermudagrass, while Meadowbrook Golf Club uses common bermudagrass
- Randomized complete block design with strip-split plot treatment arrangement
- Cultivation practices core aerification, Aerway, and uncultivated were main plot factors
- Nine products and an untreated control randomized with each cultivation treatment (Table)
- Visual turf quality, DIA, NDVI, and volumetric water content (VWC) were collected every two weeks
- Soil samples were obtained within sub-plots in Jun, Aug, and Oct, air-dried and ground to pass 2 mm sieve
- Element levels were obtained with PXRF
- Salinity parameters such as EC and pH were measured
- Statistical analysis in SAS 9.4 using Proc Mixed

## Table. Products applied with rate and timing of application for each treatment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Products</th>
<th>Rate</th>
<th>Application timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Untreated</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Kelly’s gypsum</td>
<td>488 kg/ha</td>
<td>Applied once a month</td>
</tr>
<tr>
<td>3</td>
<td>ACA 2994</td>
<td>25.5 l/ha</td>
<td>Applied once per two months</td>
</tr>
<tr>
<td>4</td>
<td>ACA 2786</td>
<td>14.3 l/ha</td>
<td>Every two weeks</td>
</tr>
<tr>
<td>5</td>
<td>ACA 1900</td>
<td>25.5 l/ha</td>
<td>Initial application and 6 weeks after</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two applications two weeks apart between ACA 1900</td>
</tr>
<tr>
<td>6</td>
<td>Oars PS</td>
<td>15.9 kg/ha</td>
<td>Applied once a month</td>
</tr>
<tr>
<td>7</td>
<td>Vertical-G</td>
<td>586 kg/ha</td>
<td>Applied once a month</td>
</tr>
<tr>
<td>8</td>
<td>Oars PS</td>
<td>15.9 kg/ha</td>
<td>Applied once a month with liquid applied</td>
</tr>
<tr>
<td></td>
<td>Vertical-G</td>
<td>586 kg/ha</td>
<td>over the top of granular</td>
</tr>
<tr>
<td>9</td>
<td>DG Gypsum</td>
<td>586 kg/ha</td>
<td>Applied once a month</td>
</tr>
<tr>
<td>10</td>
<td>Cal-Pull</td>
<td>19.1 l/ha</td>
<td>Applied once a month</td>
</tr>
</tbody>
</table>

## Results

- Core aerifcation practices at Meadowbrook Golf Club
- Initial product applications at Meadowbrook Golf Club
- Application of dry product using shaker
- Soil samples obtained with a soil profile sampler
- Soil samples were air-dried and ground to pass 2 mm sieve

## Preliminary conclusion

### Meadowbrook Golf Club

- Core aerified treatments had lower VWC at both depths
- Both cultivated treatments significantly improved measurements on RVI and WICI in August and September
- Liquid products maintained lower soil EC
- Grass type and soil characteristics may have limited above ground quality, cover, and color differences

### Rawls Golf Course

- Core aerification reduced turf quality, percent green cover, NDVI, RVI, and WICI throughout the summer (Figs 2-5)
- Visible symptoms of aerification holes through October
- Soil structure and texture difference to Meadowbrook GC
- Elevation change and reduced water infiltration
- ACA 1900 caused phytotoxicity; ACA 2786 improved turf color following application (Fig 6)
- Dry products had poorer color than liquid products (Fig 6)
- Liquid products maintained EC levels in August while gypsum and Vertical-G increased EC levels (Fig 7)

## Future work

- PXRF data analysis and EC and pH measurements of soil samples collected in June and October will be completed soon. This trial will be conducted at same plots in 2016 to interpret the effects of cultivation practices and products in two consecutive years.

## Acknowledgements

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