USING SOIL AMENDMENTS TO **INCREASE TURF WATER USE EFFICIENCY** ON SANDY SOILS: DOES IT WORK?

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Summary of findings:

- Incorporating soil amendments in the top10 cm at a rate of 5-10% (wt/wt) does not necessarily improve turf colour or turf water use efficiency
- Despite our soils being sandy, irrigation water may not drain beyond the root zone
- Finer-grained amendments in the topsoil prevent deep drainage but also slow water infiltration and increase the chance of water loss through soil evaporation and growth
- Incorporating amendments lower in the soil profile (i.e. >3 cm below the soil surface) can improve turf colour and water use efficiency

Background

The demand for water in our cities is expected to increase in the next decade due to population growth and a warming climate. As a consequence, in a city such as Perth, substantial water deficits are predicted to develop as early as 2020. As a significant proportion of metropolitan water is used for turfgrass irrigation, turfgrass managers are facing future water restrictions. Incorporating soil amendments into our sandy soils may reduce deep water drainage and lead to a more efficient use of irrigation water. Although there is a perception that amendment incorporation will be beneficial, this has not been independently tested. The effects of amendment incorporation on soft leaf buffalo turfgrass quality and growth was determined in a two-year field experiment consisting of 96 plots at UWA's Turf Research Facility in Perth.

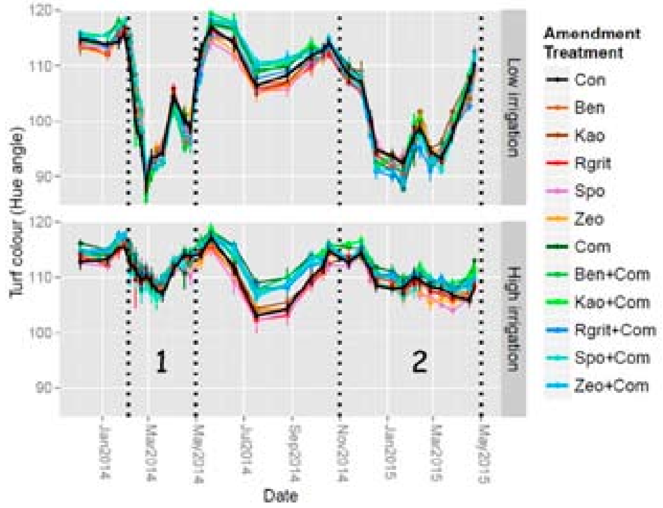

Figure 1 (above): Time course of turf colour as dependent on level of irrigation and amendment treatment. Numbers indicate irrigation seasons. 'Hue values' below 100 were associated with clear loss of colour and development of brown and desiccated patches, whereas values above 110 were indicative of healthy turf. Low irrigation plots were watered twice per week (43-50% ET replacement), whereas high irrigation plots received watering three times per week (65-75% ET replacement). Note that compost amended plots were greener during winter periods. Amendment treatments: Con= Control, Ben=Bentonite, Kao=Kaolinite, Rgrit=ReadyGrit™, Spo=Spongelite, Zeo=Zeolite, Com=Compost.

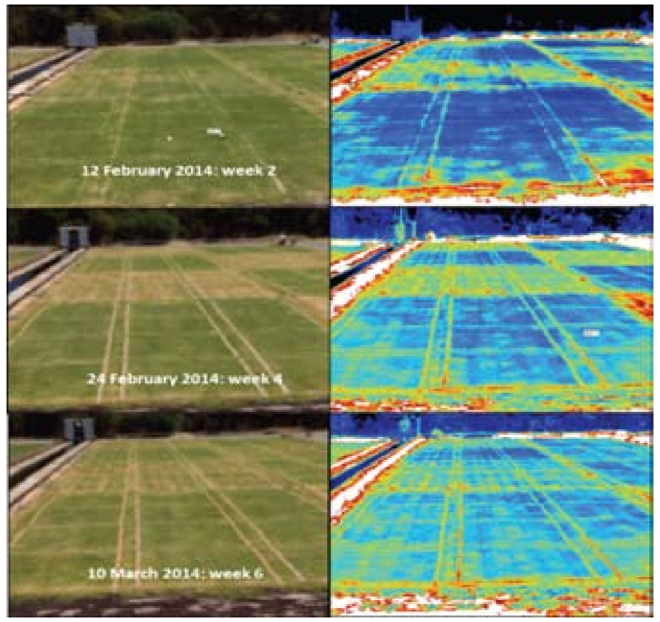

Figure 2: Simultaneous colour and infrared images of the amendment turf trial at the UWA Turf Research Facility during the first irrigation season. Week numbers indicate weeks since the start of the experimental irrigation treatments. Blue colours indicate lower surface temperatures whereas yellow, red and white represent increasingly warmer temperatures.

Incorporating amendments lower in the soil profile (i.e. >3 cm below the soil surface) can improve turf colour and water use efficiency.

Incorporating amendments in the topsoil

Incorporating finer grained amendments (i.e. bentonite and kaolinite clays and compost) clearly increased topsoil water holding capacity and reduced deep drainage when compared to control plots or plots with smaller grained amendments (Fig. 3). However, also in control plots none of the irrigation water drained beyond the root zone. In addition, plots with finer grained amendments, by retaining most water in the topsoil appeared more likely to lose irrigation water through soil evaporation. Therefore, under both irrigation rates, plots with topsoil incorporated amendments did not differ in colour from control plots (Figs 1-2).

Incorporating amendments lower in the soil profile

In contrast, a subsequent soil column experiment (Fig. 4) showed that placing amendments (bentonite or compost) in a band lower in the soil profile (i.e. 5-15 cm deep) did improve turfgrass colour under limiting irrigation (Fig. 5). The lower banded columns also tended to evaporate more water and had cooler surface temperatures, both observations suggesting a better water supply. Hydrological modelling suggested that deeper amendment bands can reduce soil evaporation by maximally 20% when compared to non-amended controls. A surface layer of sand of at least 3 cm would allow irrigation water to infiltrate fast thereby reducing initial evaporative losses associated with slow infiltration. Once in the amendment layer the water would be more tightly bound and less likely to escape back to the atmosphere, reducing overall evaporative losses.

Fact Sheet supplied by Dr Pieter Poot
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Publications and citations:
http://www.researcherid.com/rid/B-3457-2011
School of Plant Biology
Faculty of Science
University of Western Australia

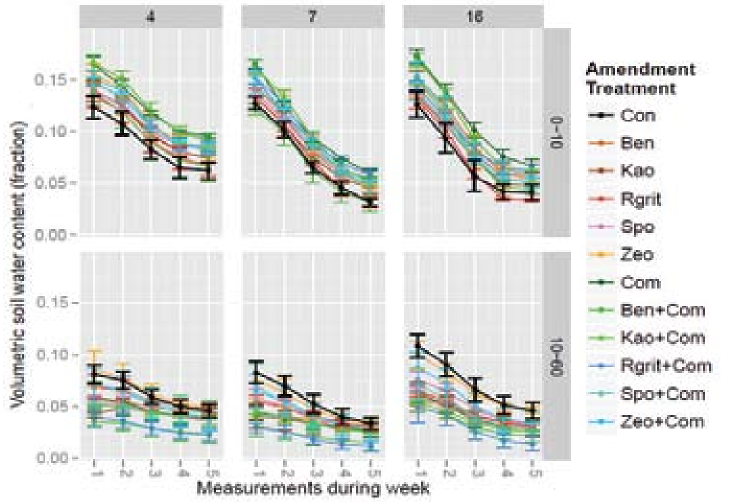

Figure 3: Weekly decline in soil volumetric water content in the low irrigation treatment at 0-10 cm depth (i.e. in the amendment band, top panels), or 10-60 cm depth (below the band, bottom panels), during the second irrigation season. Plots were irrigated early Monday morning and were not watered again until early Friday morning. Note that the first two points in each panel are morning and afternoon measurements on day 1, whereas the last three points represent measurements on day 2, 3 and 4. The numbers at the top of the figure represent weeks since start of the irrigation season (week starting 17 Nov, 8 Dec, 9 Feb).

Figure 4: Example of differential turfgrass desiccation during severe drought stress in February 2016 in the soil column experiment (right), and a soil column at the final harvest with compost incorporated in a band at 5-15 cm depth (left).

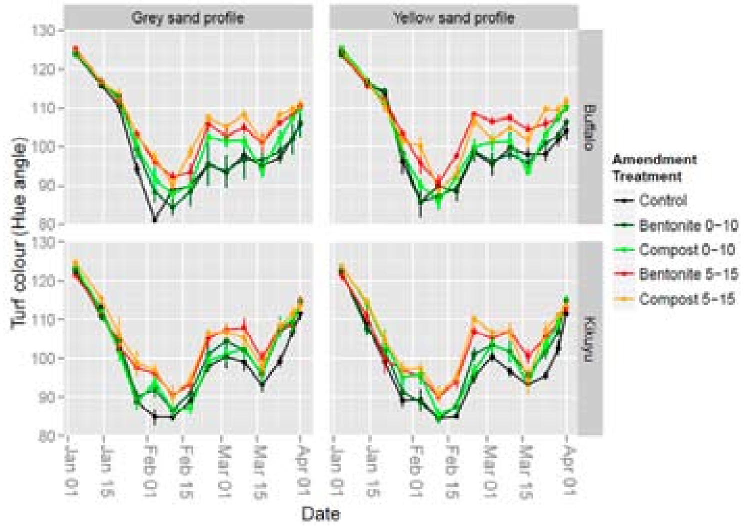

Figure 5: Time course of turfgrass colour ('Hue value') as dependent on turf species, sand profile and amendment treatment, during the summer of 2016 in a soil column experiment. Amendments were either placed at 0-10 or at 5-15 cm depth.