Influences of Drip Irrigation Rate and Frequent Pruning on Electrical Conductivity of Soil Surrounding Two Landscape Shrubs

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Introduction

Drip irrigation of landscape plants is a common water conservation practice in southwest desert cities. However, soluble salts in drip irrigation water derived from relatively saline sources might exacerbate long-term accrual of salts in urban soils. Saline soils can detrimentally impact landscape plant performance, but the effects of horticultural practices on patterns of salt accrual in soil surrounding drip irrigated landscape plants are poorly understood.

Materials and Methods

We measured electrical conductivity (EC) of soil surrounding two shrub taxa, *Nerium oleander* 'Sister Agnes' and *Leucophyllum frutescens* var. green cloud shrubs, that had been previously subjected for four years to a factorial arrangement of two drip irrigation rates, high and low, (water EC=0.61 dS/m) and two pruning regimes, pruned every 6 weeks and not pruned as a control (Stabler, 2003). Surrounding each shrub replicate, the EC of eight soil cores [two contiguous depths (0 to 20 and 20 to 40 cm) and four distances (0, 0.5, 1.0 and 1.5 m) away from the shrub base) were collected and assayed for EC using the saturated paste method.

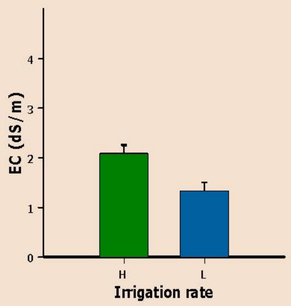

Figure 1. Mean soil electrical conductivity (EC) surrounding *Leucophyllum* and *Nerium* shrubs after four years of drip irrigation at either a high (H) or low (L) rate, n=48.

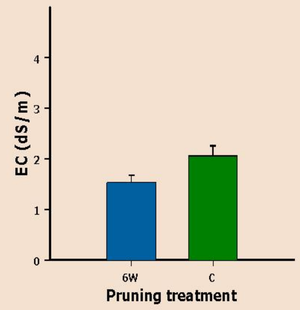

Figure 2. Mean soil electrical conductivity (EC) surrounding *Leucophyllum* and *Nerium* shrubs after four years of having either been pruned every six weeks or not pruned. N=32, control; n=64, 6 wk.

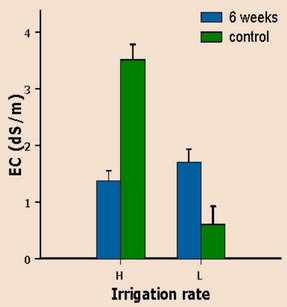

Figure 3. Mean soil electrical conductivity (EC) surrounding *Leucophyllum* and *Nerium* shrubs after four years of pruning treatments (every six weeks and not pruned (control)] grouped by high and low irrigation rate. N=16 low rate, control; n=16 high rate, 6 wk, n=32 high rate, 6 wk; n=32 high rate 6 wk.

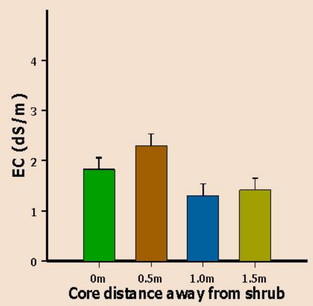

Figure 4. Mean soil electrical conductivity (EC) at four distances away from the base of *Leucophyllum* and *Nerium* shrubs, n=24.

Results

- **Soil EC was positively related to drip irrigation rate (Fig. 1, P<0.0001).**
- **Soil EC was higher in soils surrounding shrubs pruned every 6 weeks than in soils surrounding unpruned control shrubs (Fig. 2, P=0.037).**
- **Soil EC was effected by an interaction of drip irrigation rate and pruning (Fig. 3, P<0.0001).**
- **At the high drip irrigation rate, soil surrounding shrubs not pruned had higher EC than the soil surrounding those pruned every 6 weeks**
- **At the low drip irrigation rate, soil surrounding shrubs that had been frequently pruned had higher EC than the soil surrounding the shrubs that were not pruned.**
- **Regardless of irrigation rate or pruning, soil EC was generally highest 0.5m away from the base of each shrub (Fig. 4, P=0.014).**
- **Shrub taxa and sampling depth did not affect patterns of soil EC.**

Conclusion

This study shows that salt accrual in soil is positively related to drip irrigation rates and might after four years become concentrated enough to have a detrimental effect on landscape plant performance. Moreover, as drip irrigation rate is increased the frequent pruning of shrubs like *Leucophyllum* and *Nerium*, maybe a horticultural management strategy for amelioration of salt accrual in soil possibly by the frequent removal of salt sequestered in shoot tissues. However, pruning plants at the low drip irrigation rate appeared to exacerbate soil salinity possibly because of reduced growth rates.

Soil surface profiles of four years of salt accumulation surrounding *Nerium oleander*. *Nerium* shrubs were severely pruned to increase surface profile visibility for these images captured by Catherine Singer, January 2004.

Zone of salt deposition surrounding *Leucophyllum frutescens* and *Nerium oleander*. Image captured by Catherine Singer, January 2004.

Reference

Stabler, LB. 2003. Ecosystem response of urban plants in response to landscape management. PhD Dissertation, Arizona State University.

Acknowledgements

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