

Nodulation of *Shepherdia × utahensis* Topdressed with Controlled-release Fertilizer

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Introduction

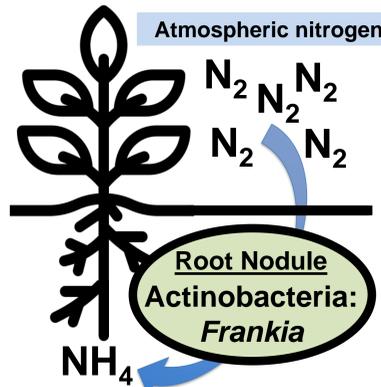


Fig. 1. The actinorhizal symbiosis.

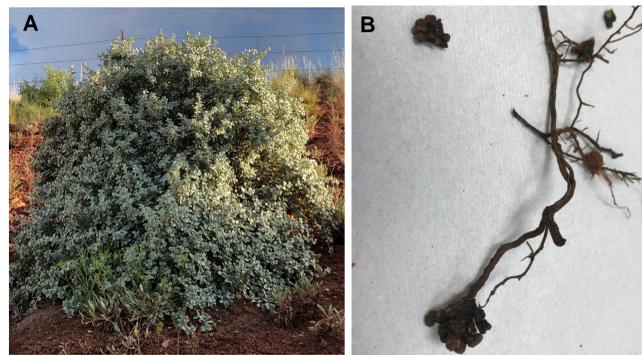


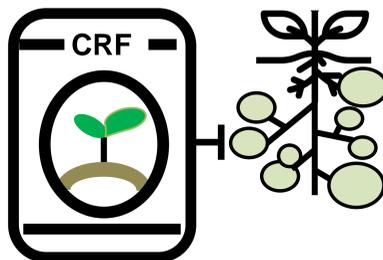
Fig. 2. *Shepherdia rotundifolia*, an actinorhizal plant native to the Intermountain West (A), and its symbiotic root nodules (B).

Significance

Using Nodulated N-Fixing Actinorhizal Plants in the Landscape



Controlled-release Fertilizer (CRF) Inhibits Nodulation



Objectives

- To determine the effects of CRF on the growth, development, nitrate-nitrogen in leachate of *S. × utahensis* 'Torrey'.
- To determine the effect of CRF application rates on nodulation of *S. × utahensis* 'Torrey'
- To compare performance of inoculated *S. × utahensis* treated with CRF (0-32 g/plot) with non-inoculated plants treated with manufacturer's prescribed rate of CRF (12 g/pot)

Materials and Methods

- Shepherdia × utahensis* 'Torrey' plants are clones propagated by cuttings.
- Plants were inoculated, topdressed with Osmocote 15N-3.9P-10K and then grown for 8 weeks.
- Weekly nitrate-nitrogen concentration of leachate was recorded.
- Plant height, number of shoots, dry weight of leaf, stem and root, photosynthesis rate (P_n), stomatal conductance (g_s), transpiration rate (E), number of nodules, and nodule dry weight were recorded to compare with non-inoculated plants receiving manufacturer's prescribed rate at 12-g CRF



Results

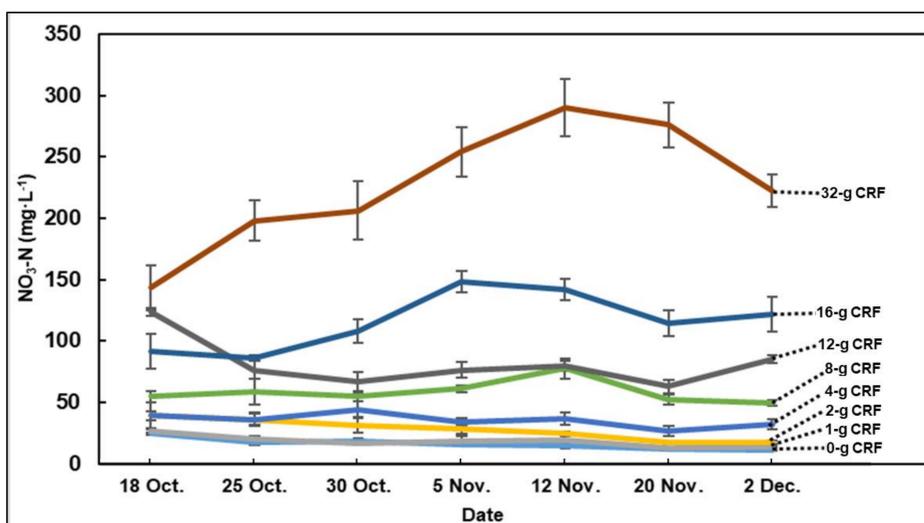


Fig. 3. Nitrate-nitrogen ($\text{NO}_3\text{-N}$) concentration of leachate solution recorded after irrigation. The error bars represent standard errors of five samples.

Results

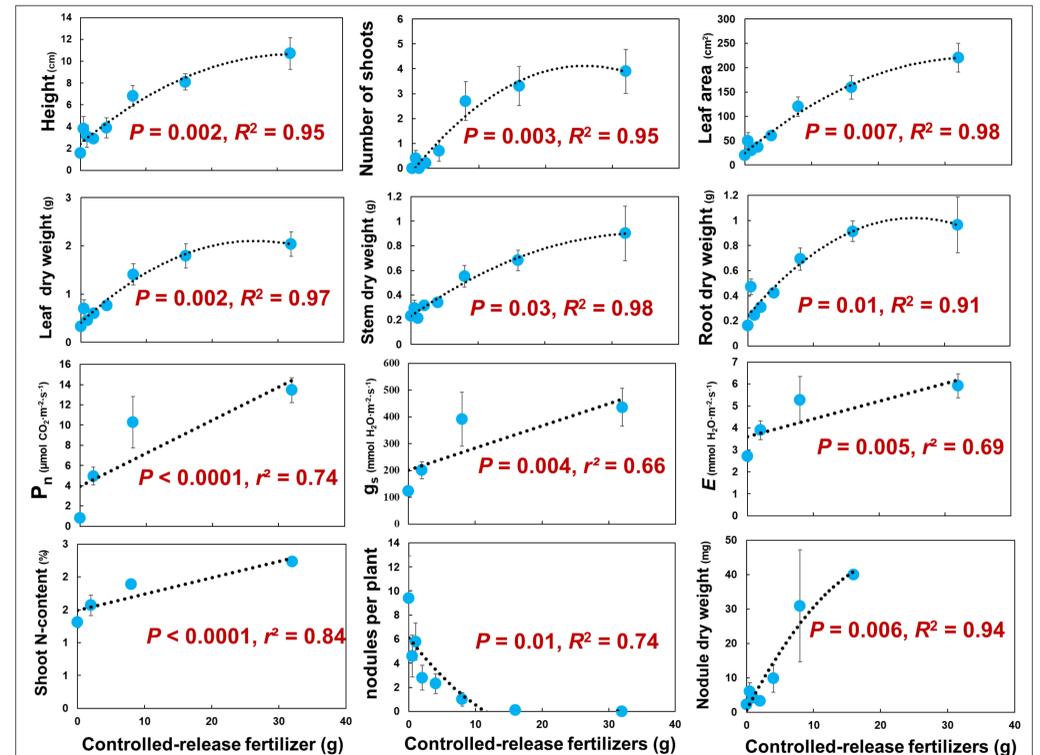


Fig. 4. Quadratic or linear correlations were found between controlled-release fertilizer and growth and gas exchange parameters, nodulation, and nitrogen content. The error bars represent standard errors of 10 samples.

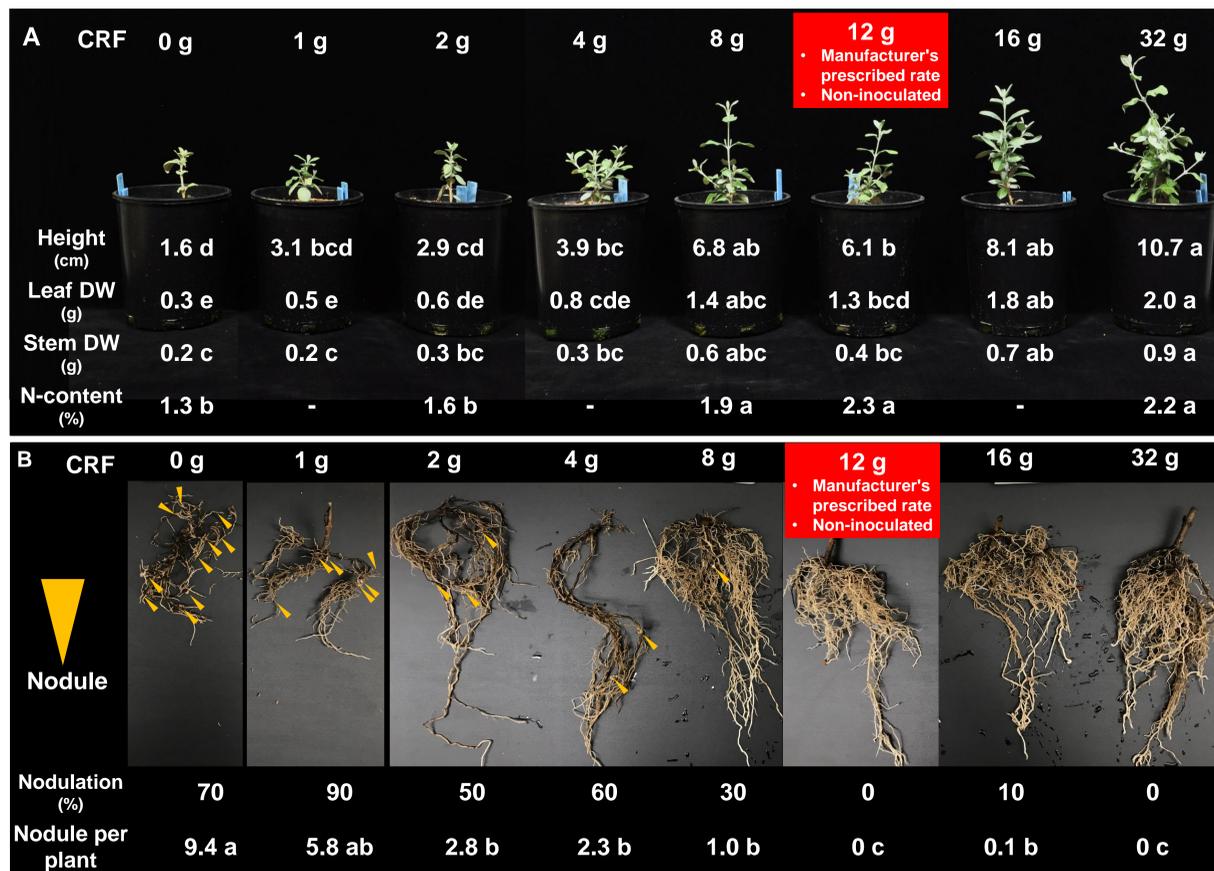


Fig. 5. *Shepherdia × utahensis* 'Torrey' plants (A) and roots (B) topdressed with controlled-release fertilizer (CRF) and grown for eight weeks. Means within a row with same lowercase letters are similar at $p < 0.05$ according to Tukey's Honest Significant Difference multiple comparison. Inoculated plants treated with 4 and 8 g of CRF had similar performance to the non-inoculated plants receiving manufacturer's prescribed rate.

Conclusions

- Nitrate-nitrogen concentration of leachate increased and nodules number decreased along with the amount of CRF.
- Nodulation of *S. × utahensis* 'Torrey' was completely inhibited at 11-g CRF.
- Compared with those receiving manufacturer's prescribed rate of CRFs, less fertilizer was needed for *S. × utahensis* 'Torrey' to sustain acceptable plant quality when inoculated with *Frankia*.
- Using actinorhizal plant may help reduce nitrate leachate and fertilizer use at nursery to prevent excessive N contamination.

Acknowledgements

USDA NIFA Hatch project UTA01381, New Faculty Start-Up Funds from the Office of Research and Graduate Studies, the Center for Water-Efficient Landscaping, and the Utah Agricultural Experiment Station at Utah State University.