Nutrient use efficiency (NUE) measures an organism’s capacity to grow (to incorporate carbon, C) per unit of resource (nitrogen, N, and phosphorus, P). Stressful environmental conditions may mandate a need for greater NUE in plants. In urban ecosystems, such stresses may derive from horticultural practices such as irrigation and pruning.

We used an experiment to test the general hypothesis that stressful conditions imposed by horticultural practices enhance plant NUE, measured as C:N and C:P ratios. Replicate individuals of both Texas sage (Leucophyllum frutescens) and oleander (Nerium oleander) were treated with high vs. low irrigation crossed with no pruning vs. pruning once per 6 weeks. Plant tissue chemistry was measured during both a damp, cool (February) and hot, dry (July) period. Research was conducted in an experimental plot at the Desert Botanical Gardens.

**Hypotheses & Predictions**

1. Pruning imposes a stress that generates enhanced NUE
   a) C:N & C:P ratios increase with pruning

2. Irrigation relieves drought stress, thus reducing NUE
   a) C:N & C:P ratios decrease with irrigation

3. Combined stress produced by pruning and drought is non-additive
   a) Suppression of the effect of pruning on nutrient ratios
   b) The effect of pruning is relatively small in February and is relatively large in July

4. Environmental conditions can mediate the extent to which horticultural practices stress plants
   a) Irrigation has a stronger effect on nutrient ratios in July than in February.
   b) Irrigation mediates the strength of the pruning effect in July, but does not mediate the strength of the pruning effect in July

5. Horticultural practices in urban ecosystems do not generate stress on plants
   a) Variability in plant nutrient ratios is not related to pruning or irrigation

**General Conclusions**

- Low water availability generally enhanced nutrient use efficiency.
- When multiple stresses affect nutrient use efficiency, their combined effects are non-additive.
- Forms of stress imposed by horticulture do not uniformly enhance nutrient use efficiency.

**Future Hypotheses**

- Though it may be a stress to plants, pruning decreases nutrient use efficiency because it selectively removes nutrient-rich foliage, leaving behind C-rich woody tissue.
- Low-water conditions enhance C:N in plants because:
  - Low water induces improved retention of N in plants
  - Abundant water reduces N availability in soil by several mechanisms (leaching, stimulating uptake by bacteria)

**Soils samples from experimental plots at Desert Botanical Gardens July 2002**

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