Symbiotic N2-Fixation in Small Partridge Pea

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Prescribed burning is the most commonly used management tool in pine forests. A key problem with burning is that it decreases the amount of nitrogen (N), which is the most limiting nutrient to growth in these forests. On the other hand, burning may contribute to N replacement by increasing the abundance of legumes which can symbiotically fix atmospheric N2, and add N back into the ecosystem. Small partridge pea (Chamaecrista nictitans) is a common legume in burned pine forests. The objective of this study was to assess the effects of light, water, phosphorus, and bacterial microsymbionts on the growth and N of this plant. My hypothesis was that plants growing with full sunlight, water, phosphorus, and bacterial microsymbiont additions would have the highest biomass and N. The effect of the four environmental controls were assessed using a full factorial experimental design yielding a total of 24 treatment combinations. This study revealed that each of the environmental controls had an impact on the growth and nitrogen fixation of the small partridge pea plants. In general, the plants receiving the highest levels of light, water, phosphorus, and microsymbiont additions exhibited the highest growth and N responses, thereby supporting the hypothesis of this study. N input by small partridge pea N2-fixation was grossly estimated to be about 0.04 g N m-2 year-1. This is low compared to the typical amount of N lost during burning (about 1.5 g N m-2) emphasizing the importance of understanding other sources of N input to the ecosystems.