

The influence of ant nests on *Acacia* seed production, herbivory and soil nutrients

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Summary

1 The ant *Formica perpilosa* nests underneath the shrub *Acacia constricta* in arid regions of south-western United States. The influence of ant nests on seed production, soil nutrient availability and herbivore protection was evaluated.

2 Plants with basal ant nests were found to produce 1.9 times as many seeds on average than plants of similar size and location without ant nests. Seeds from plants with and without ant nests were equal in fresh mass and were equally likely to germinate.

3 Soil from beneath plants with ant nests contained significantly higher concentrations of nitrate, ammonium, phosphorus, and water than soil from beneath plants without nests. Soil from ant nests also had significantly higher nitrogen mineralization rates. Seed production was not, however, significantly correlated with the concentration of any single soil nutrient measured. Nutrients may interact in ways that benefit plant reproduction. In addition, the microenvironment of ant nest soils may lead to the proliferation of soil organisms beneficial to the plant.

4 Because *A. constricta* is capable of forming symbioses with nitrogen fixing bacteria, it was predicted that plants with ant nests, exposed to greater concentrations and fluxes of available nitrogen, would utilize more soil nitrogen and less atmospheric nitrogen than plants without basal nests. Nitrogen isotopic analysis of seed tissue revealed that plants with and without ant nests obtained nitrogen from the same source or combination of sources, suggesting that nitrogen may not have limited *A. constricta* reproduction. Additional interpretations are also discussed.

5 Ants were much more abundant on plants with ant nests at the base than on those without ant nests, but there was little evidence that proximity to ant nests increased protection against herbivory. Plants with and without basal ant nests sustained similar levels of damage to leaves and seeds.

6 If seed production is correlated with reproductive success, then selection may favour *A. constricta* plants which harbour *Formica perpilosa* nests at the base. Enhancement of soil nutrient concentrations may be of general importance in understanding how plants benefit from interaction with ants, especially if ants are more likely to nest near plants bearing extrafloral nectaries.