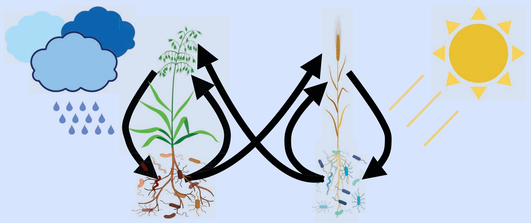


DROUGHT WEAKENS NEGATIVE PLANT-SOIL FEEDBACK IN MEDUSAHEAD

Presenter: Leslie E. Forero

BACKGROUND

Medusahead (*Taeniatherum caput-medusae)* is a noxious weed that reduces annual rangeland productivity. Because severe invasion is economically devastating, controlling medusahead is an important goal for land managers.

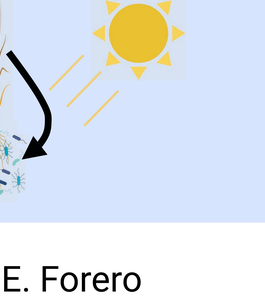
Soil microbes may help or hinder plant invasion. Drought slows microbial processes and may alter how plant-soil feedbacks impact invasion dynamics. We explored whether plant-soil feedbacks in medusahead and the desirable forage grass, wild oat (*Avena fatua*), would promote or inhibit invasion under ambient rainfall and simulated drought conditions.

METHODS

Phase 1: Soil Conditioning

Monocultures of wild oat and medusahead were maintained for two years in a factorial design including litter and excluding litter, and including and excluding drought.

Phase 2: Plant Response



Monocultures were subdivided into a factorial design with four seeding treatments and two litter treatments. Phase 1 rainfall regimes were maintained.

Plants can influence soil microbial communities. These altered belowground microbial communities can **feed back** to influence future plant performance.

If a species performs better on soil conditioned by conspecifics ("self" soil) than by heterospecifics ("other" soil), it is experiencing a positive plant-soil feedback.

If a species performs better on soil conditioned by heterospecifics ("other" soil) than by conspecifics ("self" soil), it is experiencing a negative plant-soil feedback.

Plant-soil feedback is calculated by comparing the growth of a plant on "self" versus "other" soil.

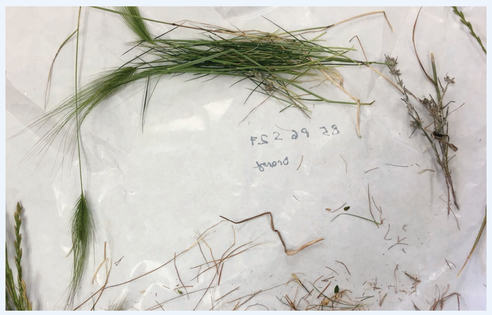
$$PSF = \frac{\overline{Self} - \overline{Other}}{Max(\overline{Self}, \overline{Other})}$$

VISUAL OBSERVATIONS

Seeded plots before the growing season.

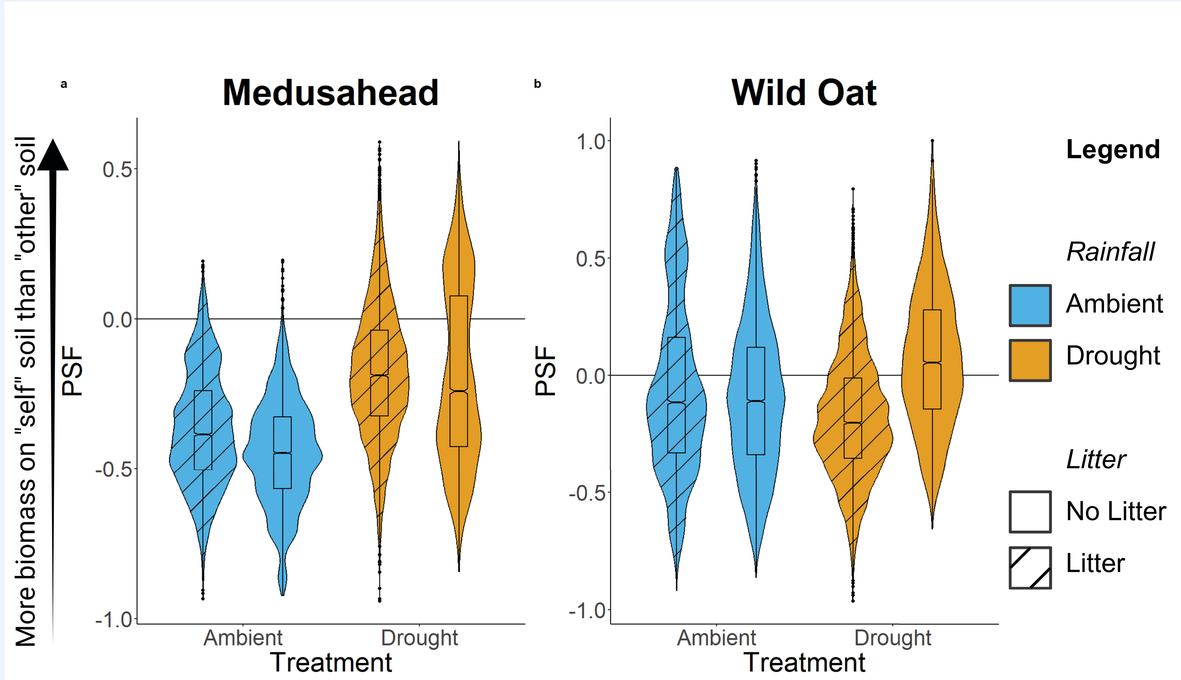
Fully matured plots during harvest.

Rainout shelters at Sierra Foothill Research and Extension Center deployed over drought blocks.



Harvested biomass was sorted to target species, dried, and weighed.

RESULTS



- Plant-soil feedbacks were predominantly neutral or negative. Out of 64 combinations of soil conditioning phase monoculture, litter, rainfall, seeding density, and seeding ratio, we observed 38 neutral feedbacks, 23 negative feedbacks, and 3 positive feedbacks.
- Wild oat plant-soil feedback in drought conditions was more negative in plots containing medusahead litter (PSF = -0.1438) than plots without medusahead litter (PSF = 0.0704 , Wilcoxon test P = 0.0207).
- Plant-soil feedback of medusahead was more negative in ambient rainfall plots (PSF = -0.6577) than in drought plots (PSF = -0.2072, P=0.02). This effect was not seen in any of the wild oat plots (P = 0.19 in plots without litter and 0.44 in plots with litter).

Implications: If plant-soil feedback of medusahead becomes less negative in drought, medusahead patches will become more persistent in the future. Additionally, wild oat patches will become less persistent if medusahead litter is introduced to the patch. Earlier intervention by land managers will be needed to control medusahead invasion.

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