

Extreme drought or heavy rainfall drives plant-soil feedbacks of range-expanding and congeneric native plant species

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INTRODUCTION

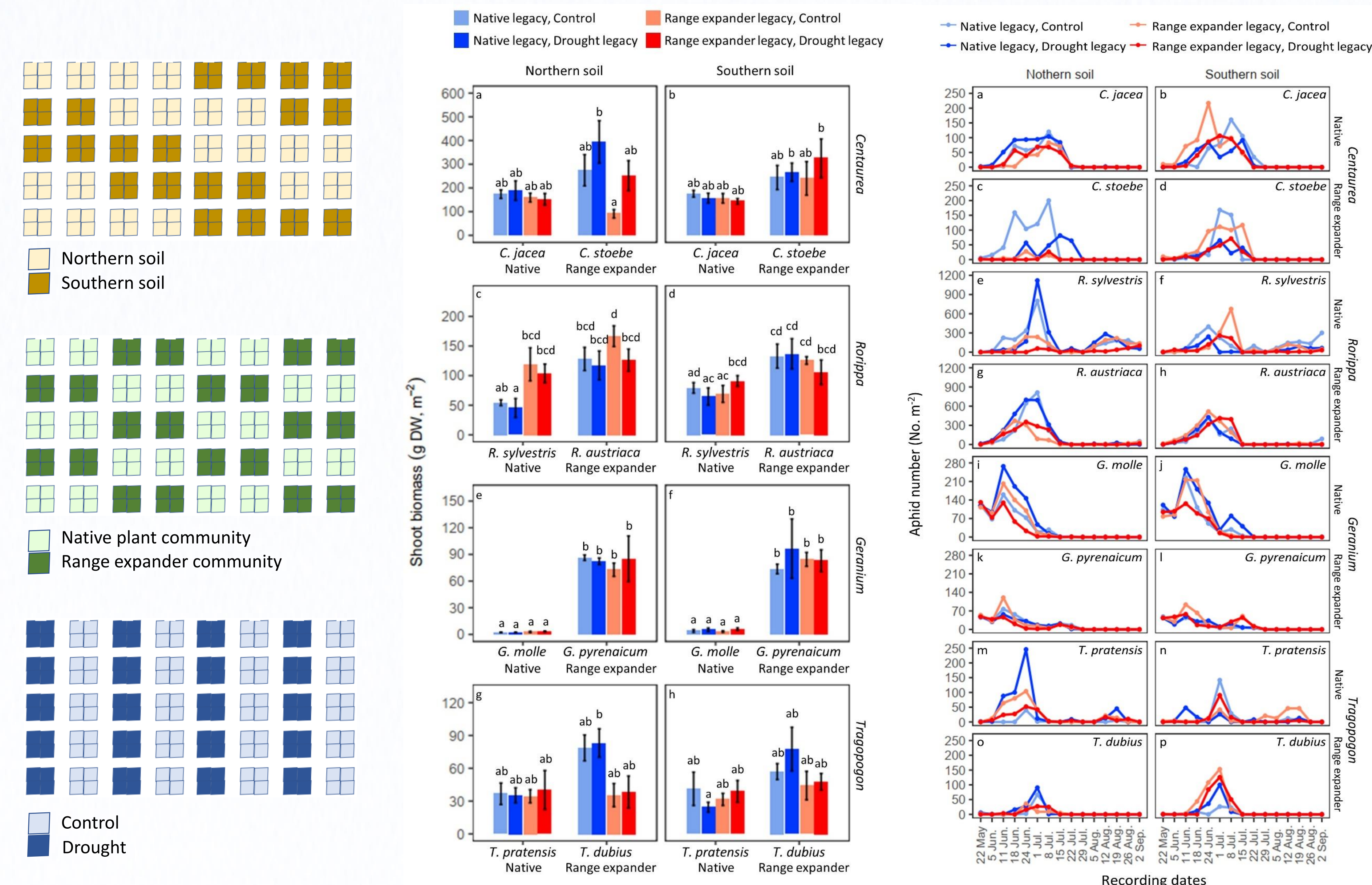
One of the consequences of climate change is the frequency of **extreme weather** incidences, such as extreme drought or heavy rainfall. At the same time, **climate warming** enables certain plant species to expand to higher latitudes. Both of the incidents can directly affect the soil microbes, which may give negative, neutral or positive **plant-soil feedbacks** (PSFs) to **range-expanding and native plants**. Interestingly, such feedbacks may have induction effects on plants associated herbivores.

We conducted an out door **mesocosm experiment** to study how the previous years' soil inoculation and soil legacy effects on the shoot biomass production and insects of range-expanding plant communities with co-occurring natives.

To explore the mechanisms, we carried out an **greenhouse experiment** and conditioned the soils under extreme drought and heavy rainfall, and tested the plant-soil feedbacks using *Centaurea jacea* as native and *Centaurea stoebe* as range expander.



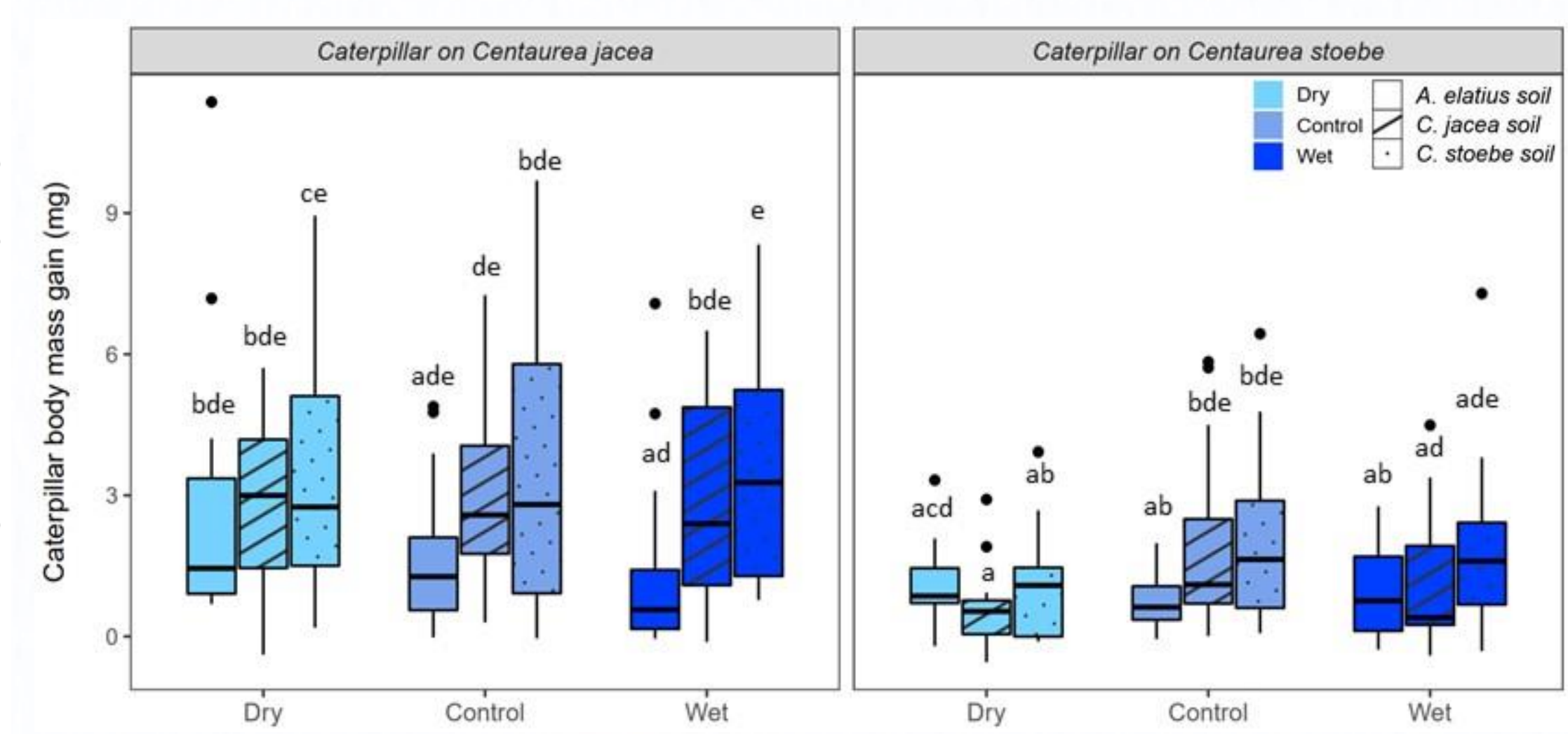
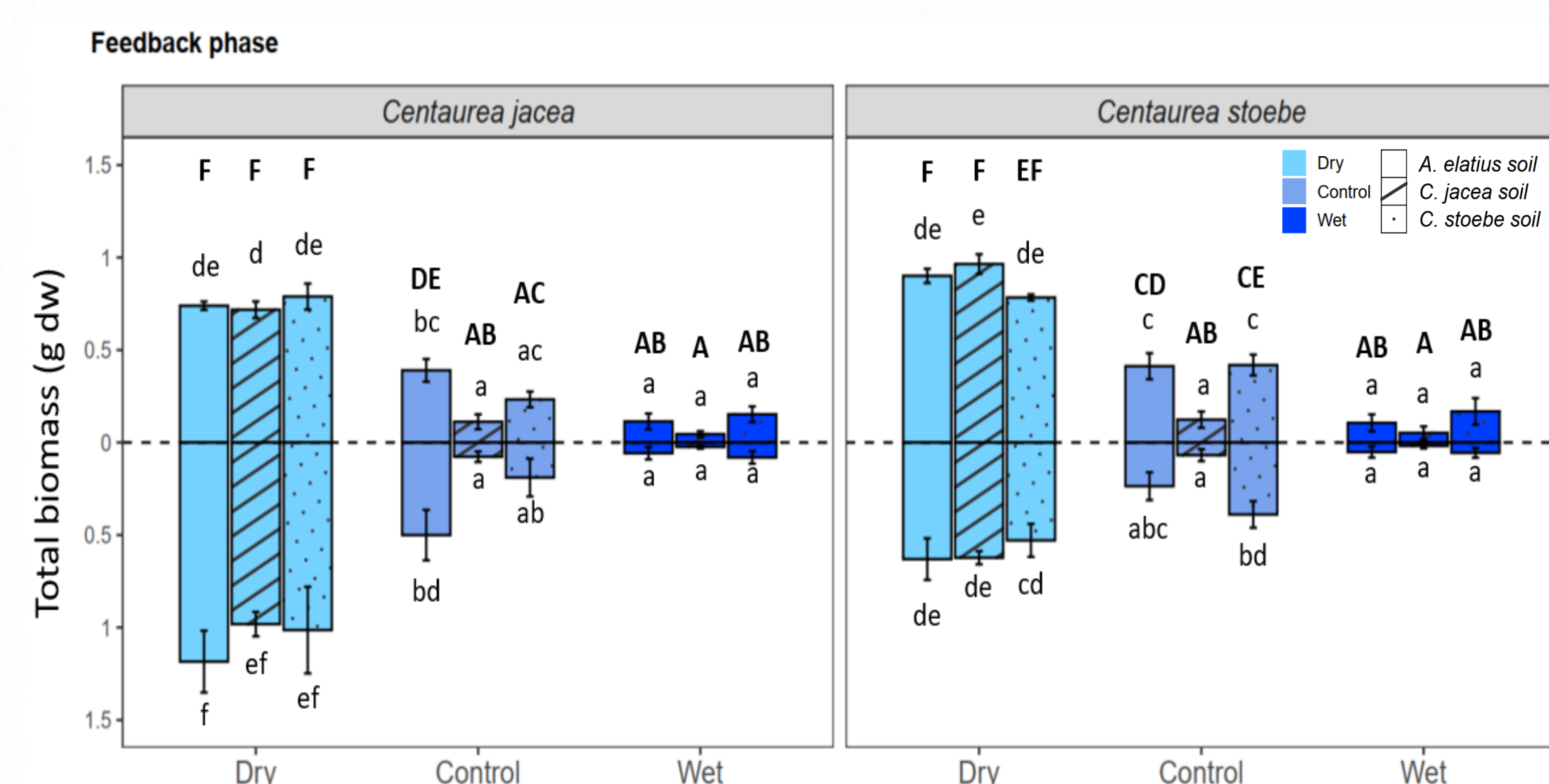
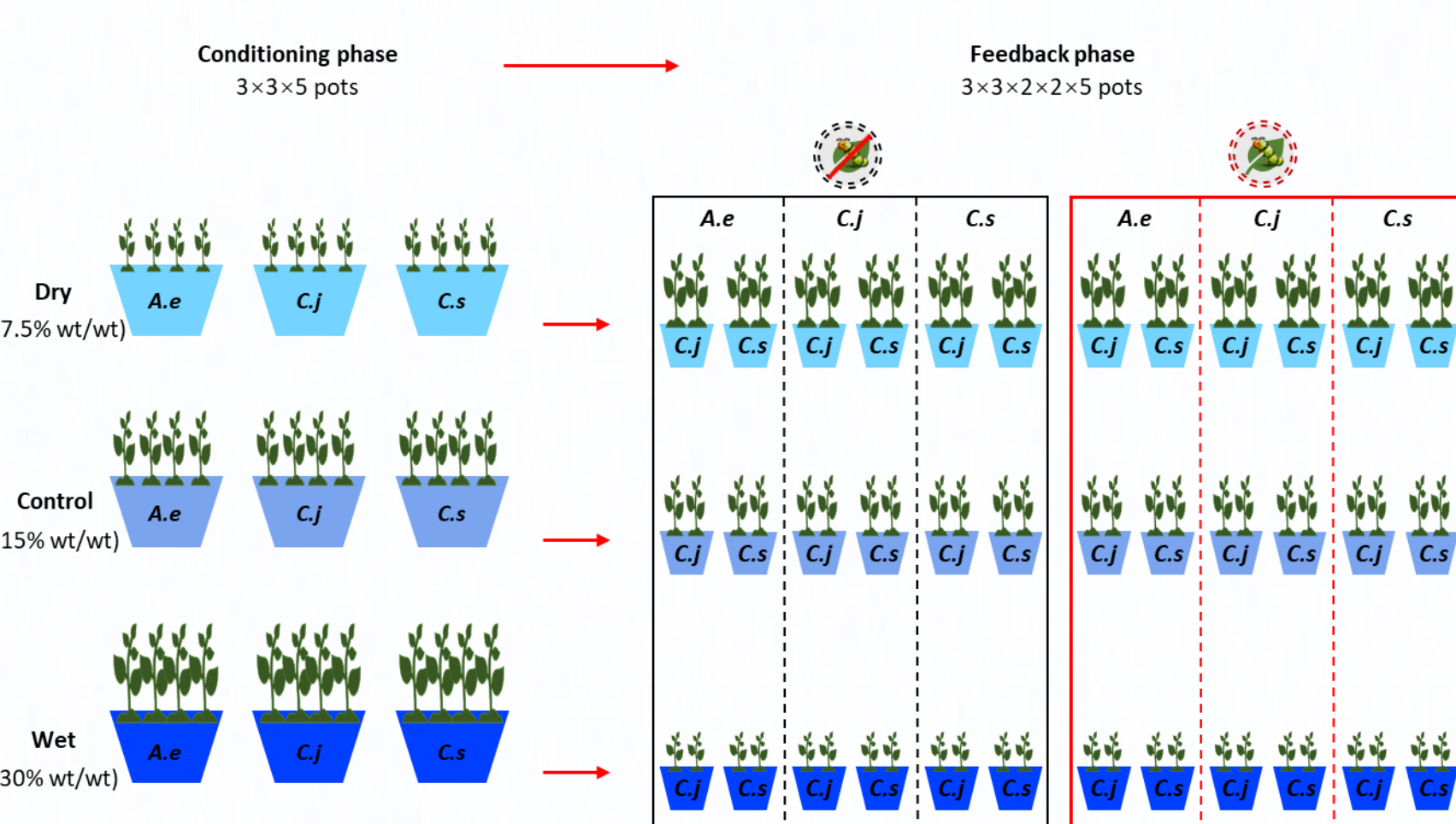
OUT DOOR EXPERIMENT



- The semi-natural experiment was set up in 2012, previously inoculated with northern soil and southern soil, later we created **soil legacy effects** of plant origin community and extreme drought.
- Soil legacy effects of plants, extreme drought and their interactions can influence **plant biomass** and **the aboveground insects**, but depended on the soil inoculations.
- The legacy effects between range expander and natives were **genus-specific**.
- Legacy effects of plants (2015-2017) was **stronger** than extreme drought events (2016-2018).



GREENHOUSE EXPERIMENT



Measurements

Conditioning phase

- Shoot biomass
- Soil nutrients
- Soil microbes (bacteria & fungi)

Feedback phase

- Shoot/root biomass
- Caterpillar body mass
- Leaf total phenolics/CN ratios



Preliminary results

- There was an increase in shoot biomass in drought, control & wet treatments in the conditioning phase; but the pattern was opposite in the feedback phase.
- Centaurea jacea* generally received negative PSFs in soils conditioned with control and wet.
- Centaurea stoebe* generally received positive PSFs in only native soil conditioned with control and wet.
- In this study, drought either had neutral or negative PSF, while wet either had neutral or positive PSF.
- Caterpillar gained more mass when feeding on native plants than range expanders, but differed between the conditioned soils.