



Three-year maintained drought reduces diversity in gypsum annual plant communities

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Background



Which are the main factor affecting the assemblage of these communities?

Observational studies

Luzuriaga *et al.* (2012). *PLoS ONE* 7: e41270.

López-Peralta *et al.* (2016). *Annals of Botany* 117:1221-1228

Experimental studies

López-Peralta *et al.* (sent). *Journal of Ecology*



Variability of the rainfall pattern

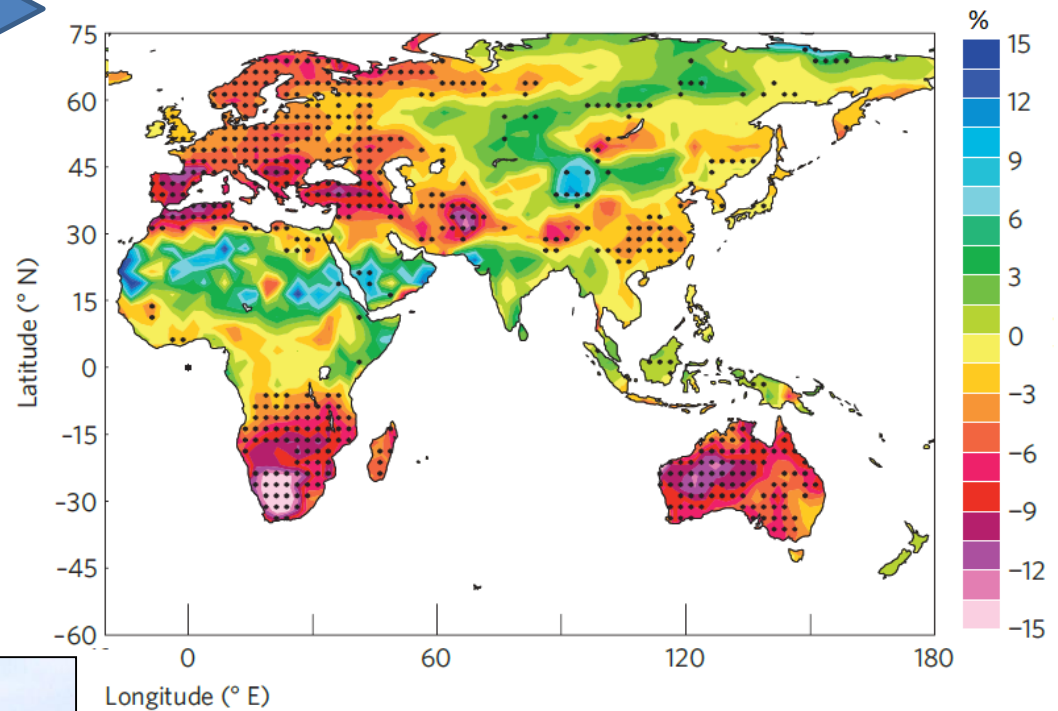
Our study

Experimental field study
under global change
scenario

Our study

MODEL PREDICTIONS:

**Rain reduction of rainfall and soil
humidity**



SIMULATION OF PREDICTED FUTURE CONDITIONS

Field experimental approach

**Partial rain exclusion applied to the
whole community**

How will the drought treatment affect community assembly?

Questions

Will the drought generate a change in species composition?

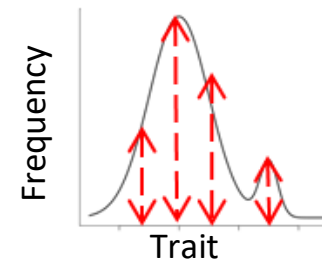
Will this change be based on a functional species sorting?

Will this change produce a decrease in functional diversity?

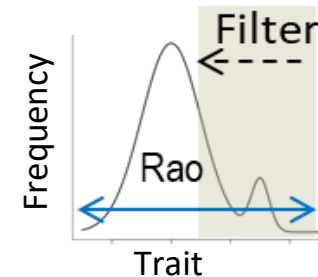
Species richness
and cover



CWM

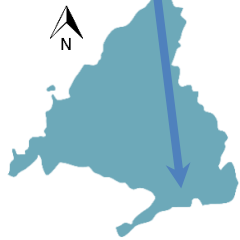


RaoQ



Study site

Study place

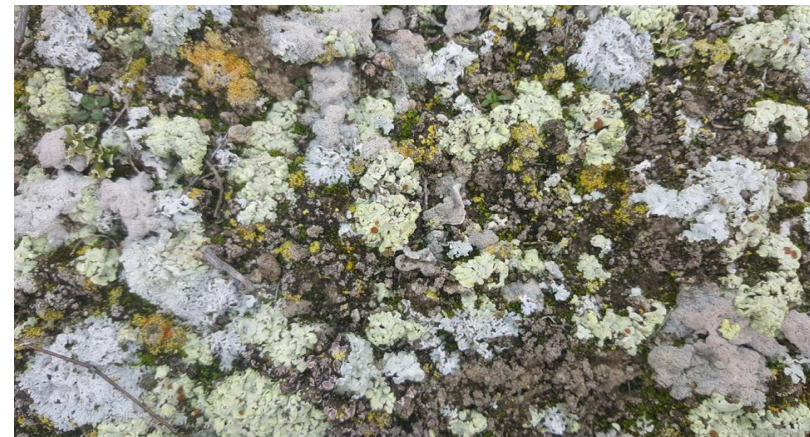


Mean annual
Prec (365 mm) and
 T^a (13-15 °C)



Biotic conditions

Cover of perennial plants around 30 %



Biological Soil Crust

Study site

Biotic conditions

Annual plant community



**More than 100 species and 26 families;
up to 38 species/0.25 m²**

Experimental design

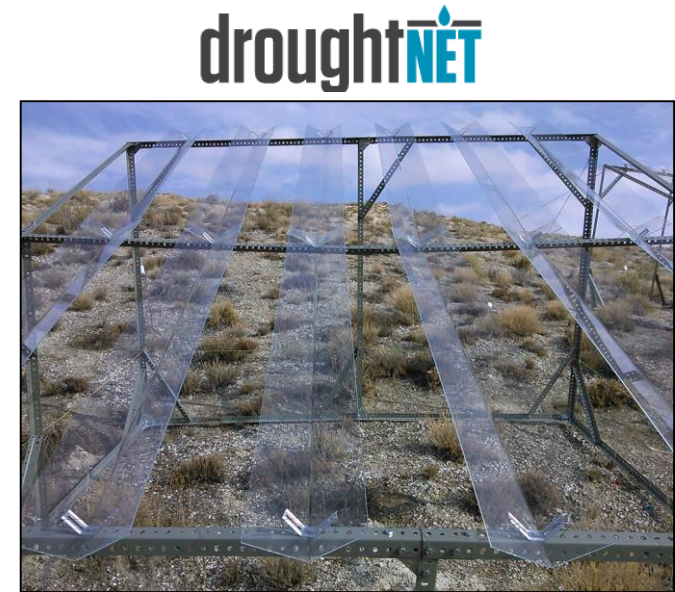
Control

Block

Drought

25 cm

3 m



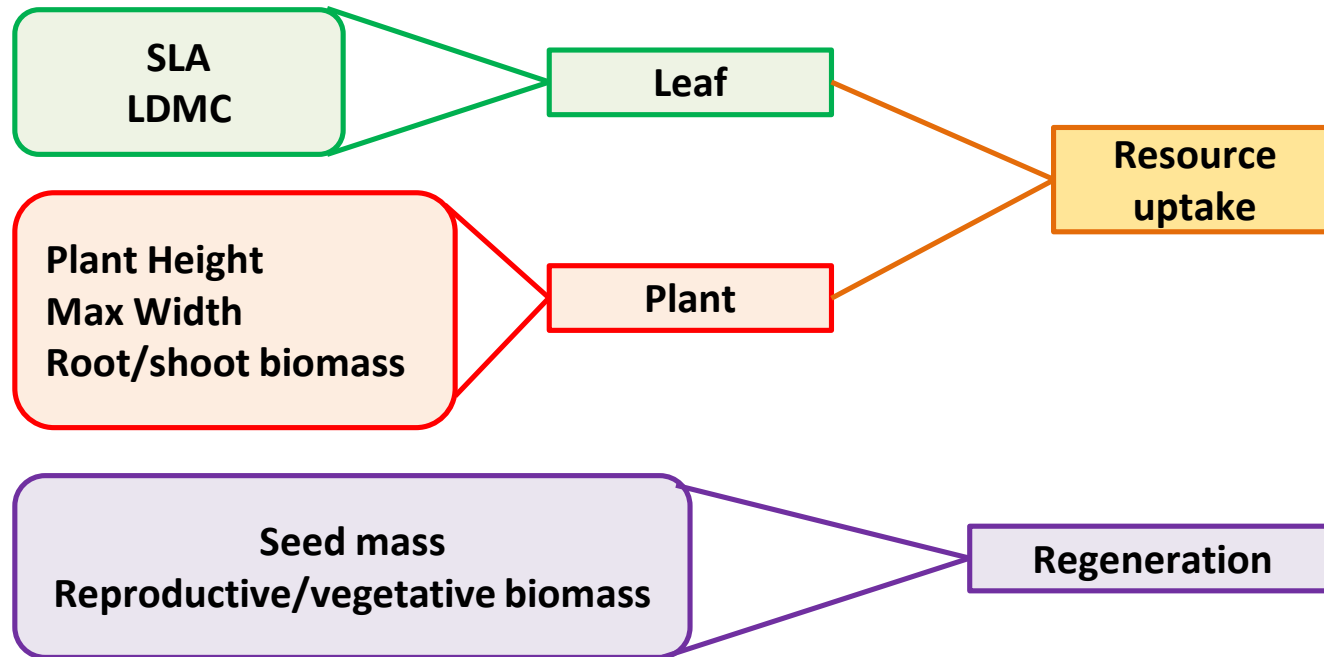
7 Blocks
2 Treatments plot 3x3 m
4 subplot 25x25 cm



Cover is annually recorded at the flowering peak

3 Years of data collection
(by now)

Functional traits



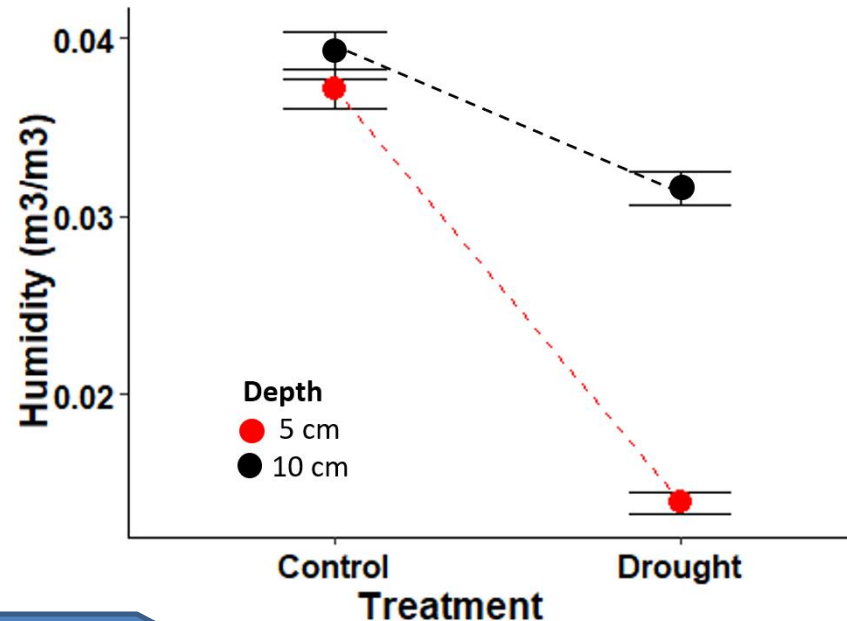
CWM

Mean value of a trait based on
species abundances

RaoQ

Variability of a trait in the
community (Functional diversity)

Soil humidity monitoring



Reduction of:
50-60% at 5 cm
20% at 10 cm

Data analyses

GLMMs

Taxonomic and functional indices

Fix factor

Treatment

Random factors

BSC's cover

+ 1|Year + 1|Block/Subplot

Covariate

PERMANOVAs

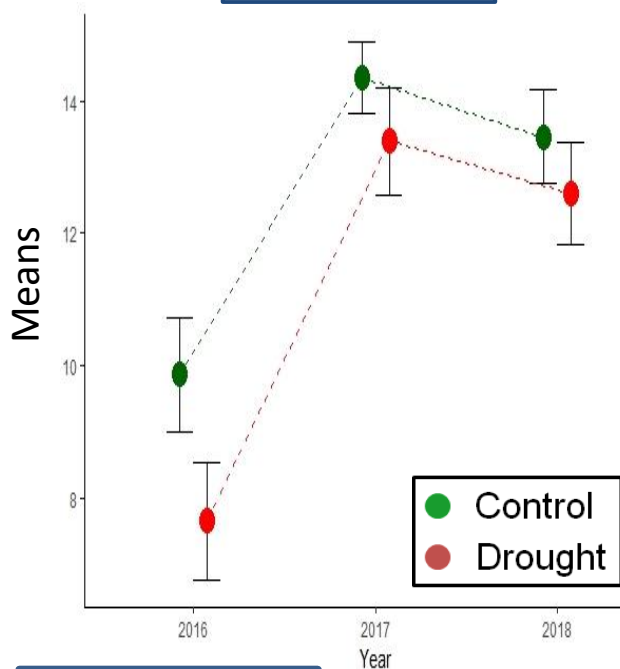
Each year composition ~ Treatment x BSC's cover x Block, 999, Bray-Curtis

Results and Discussion

Richness

65 species and 26 families
90% cover

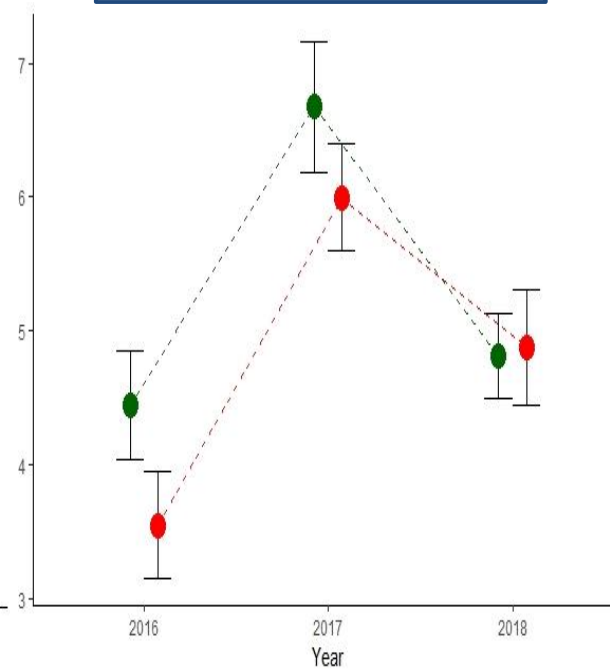
Richness



Treatment

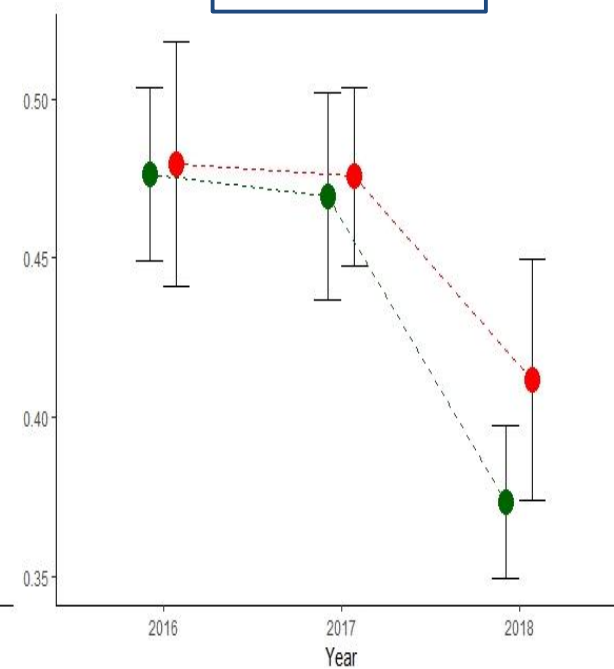
$P < 0.05$

Inverse Simpson index



$P < 0.05$

Evenness



n.s.

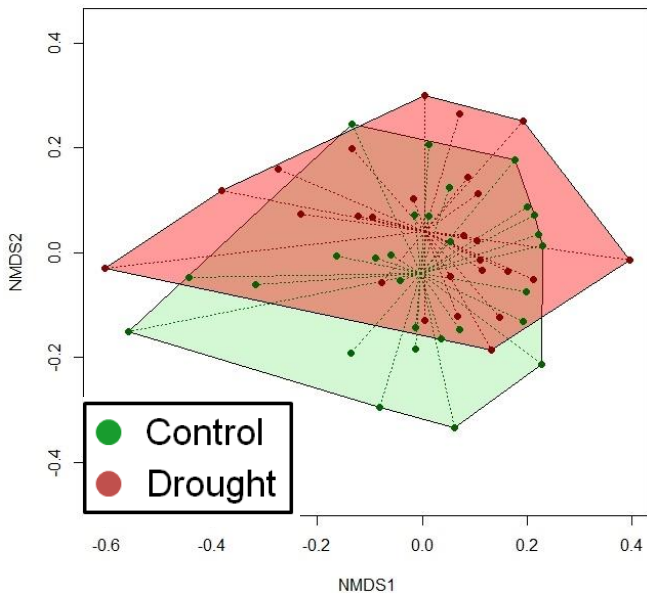
Treatment*BSC

No significance in any model

Results and Discussion

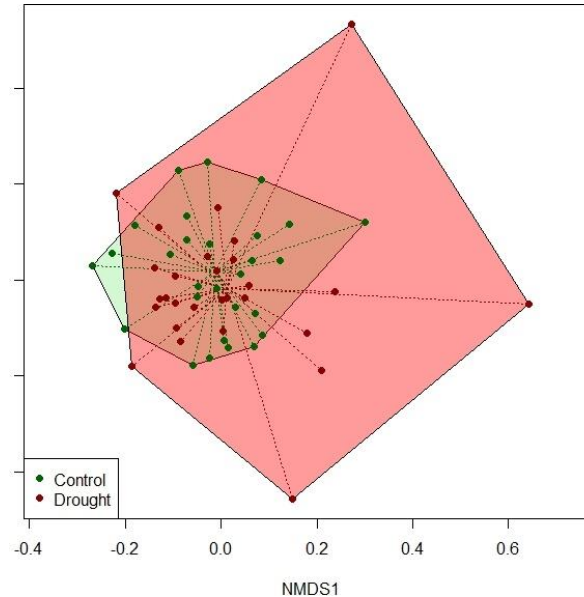
Composition

2016



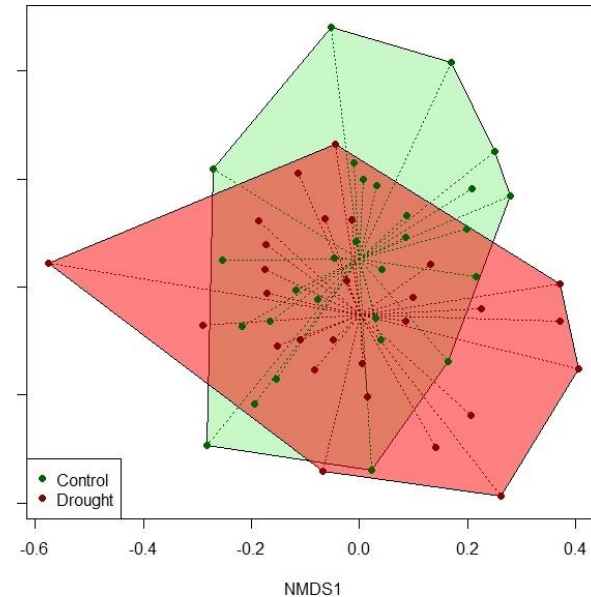
n.s.

2017



$P < 0.01$

2018



$P < 0.001$

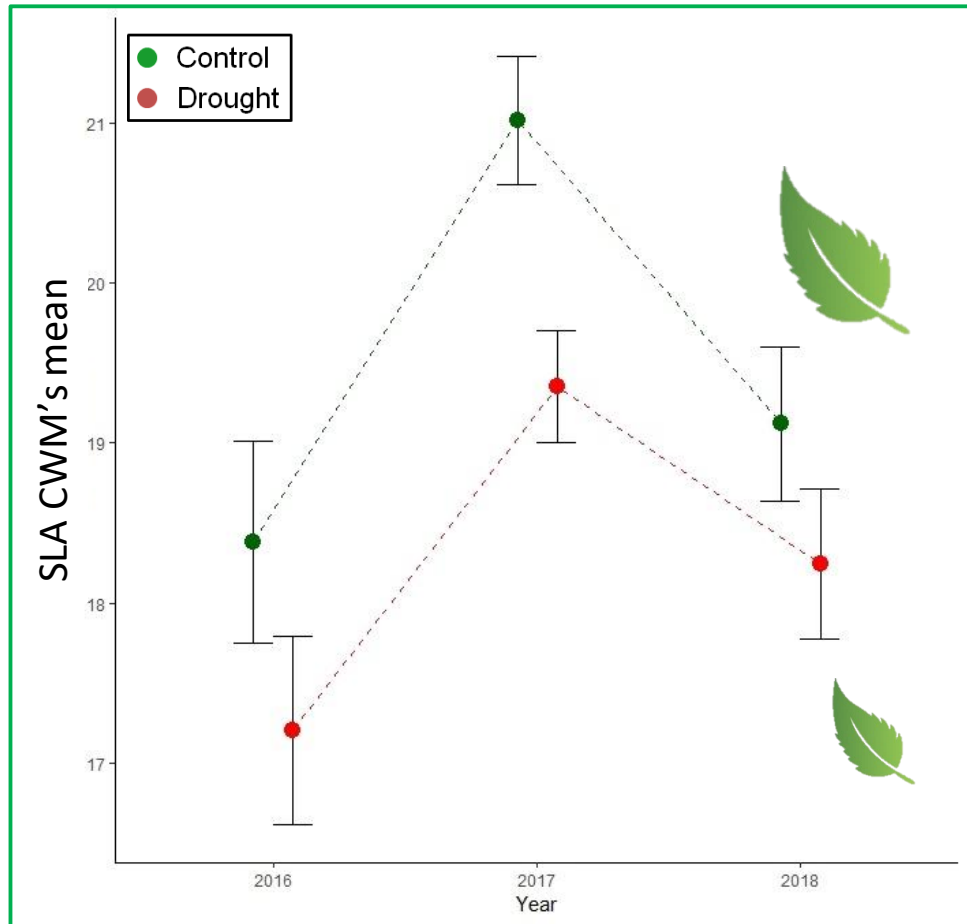
Results and Discussion

Functional composition

Leaf

Plant

Regeneration



$P < 0.001$

Results and Discussion

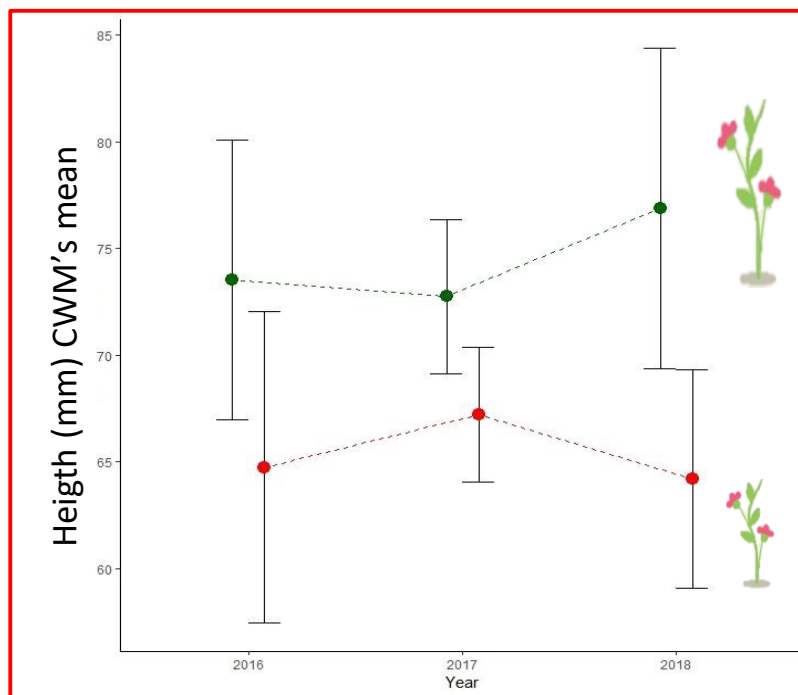
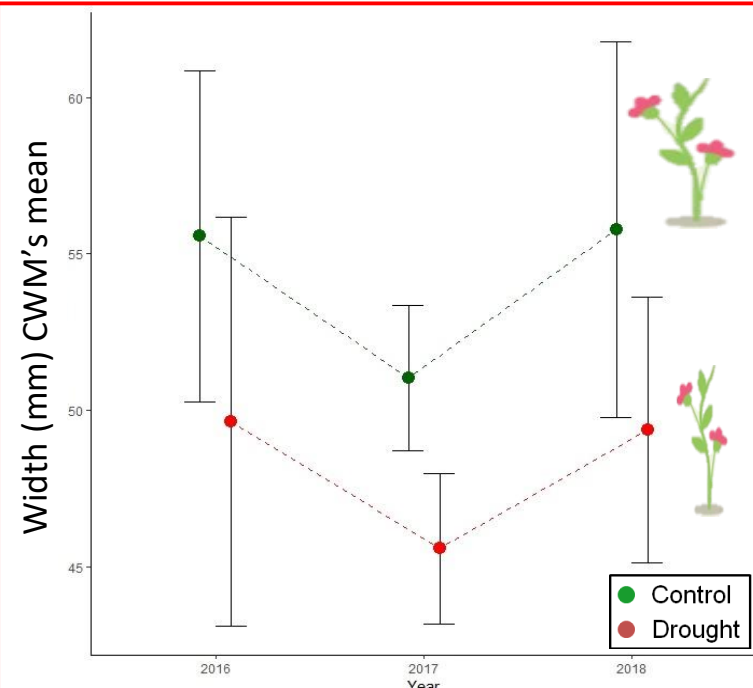
Functional composition

Leaf

Plant

Regeneration

$P < 0.05$



$P < 0.05$

Results and Discussion

Functional composition

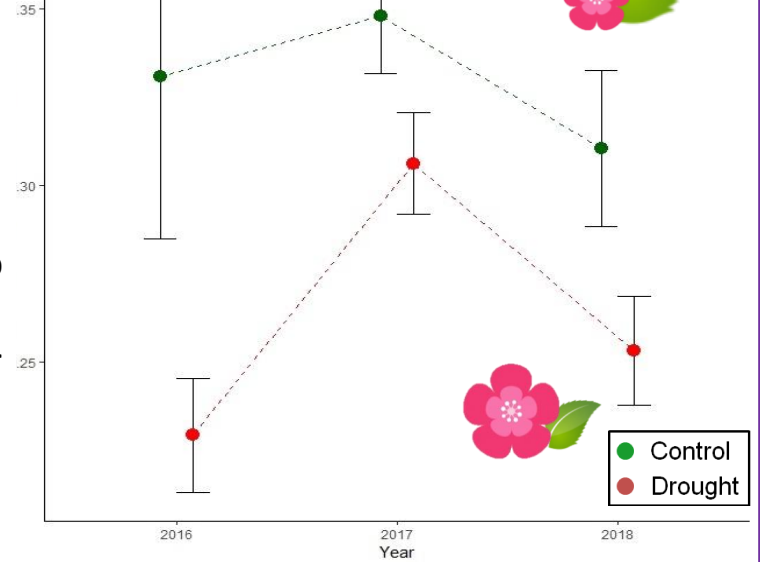
Leaf

Plant

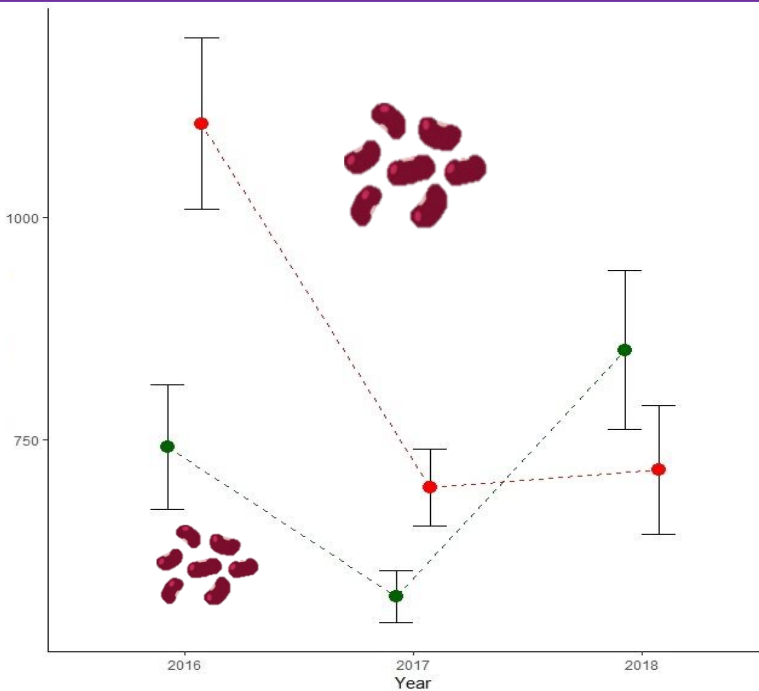
Regeneration

$P < 0.01$

Rep/Veg CWM's mean



Seed mass (μg) CWM's mean



$P < 0.05$

Results and Discussion

Functional composition

Leaf

Plant

Resource uptake

Regeneration

Control

Drought

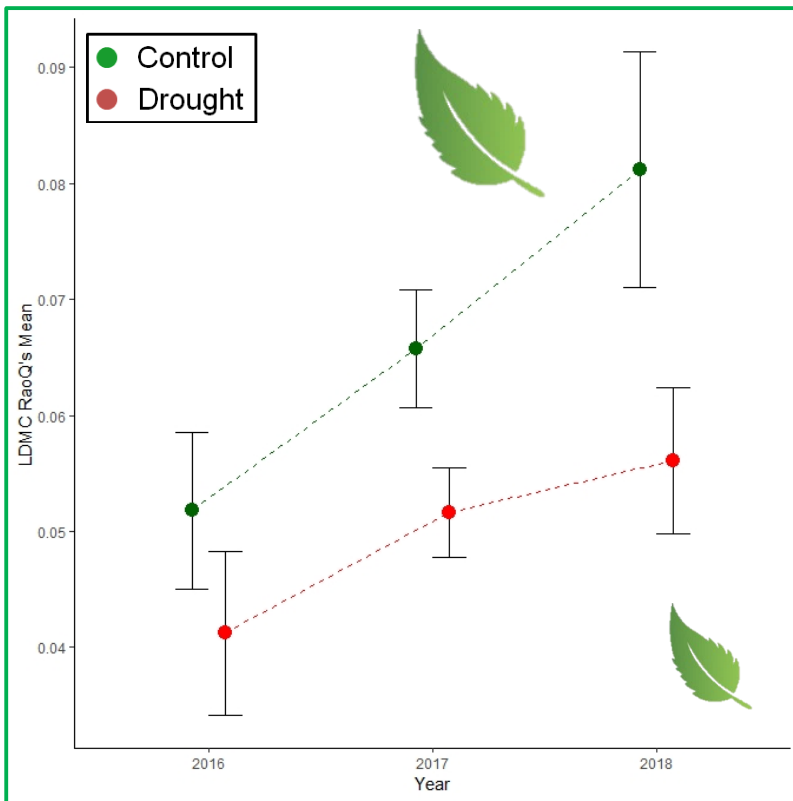


Communities under the rain exclusion have a more stress-resistant functional design

Results and Discussion

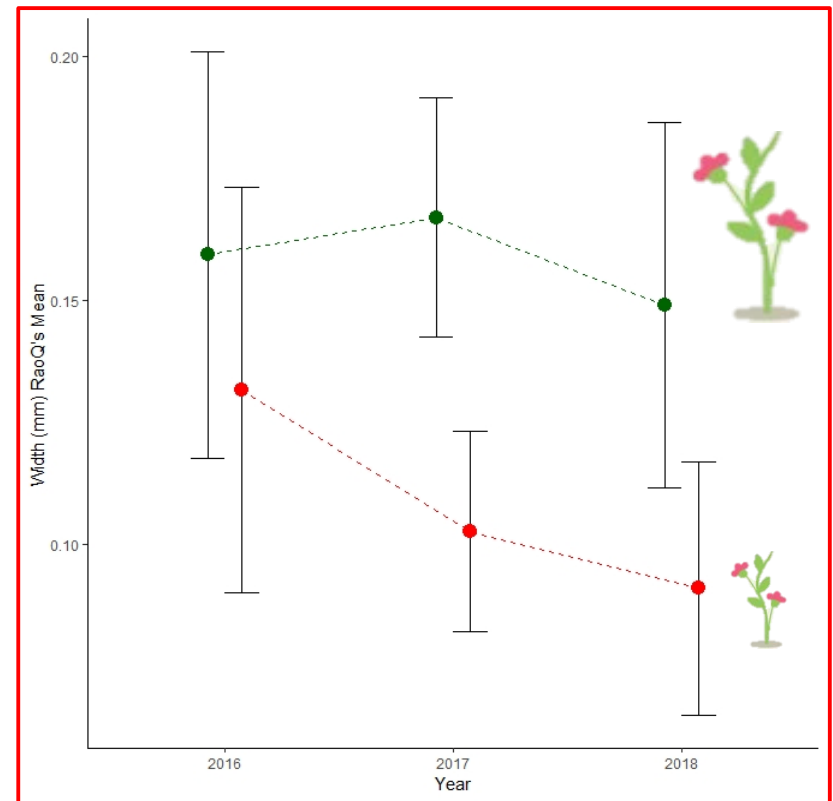
Functional diversity

Leaf



$P < 0.01$

Plant



$P < 0.05$

Conclusions

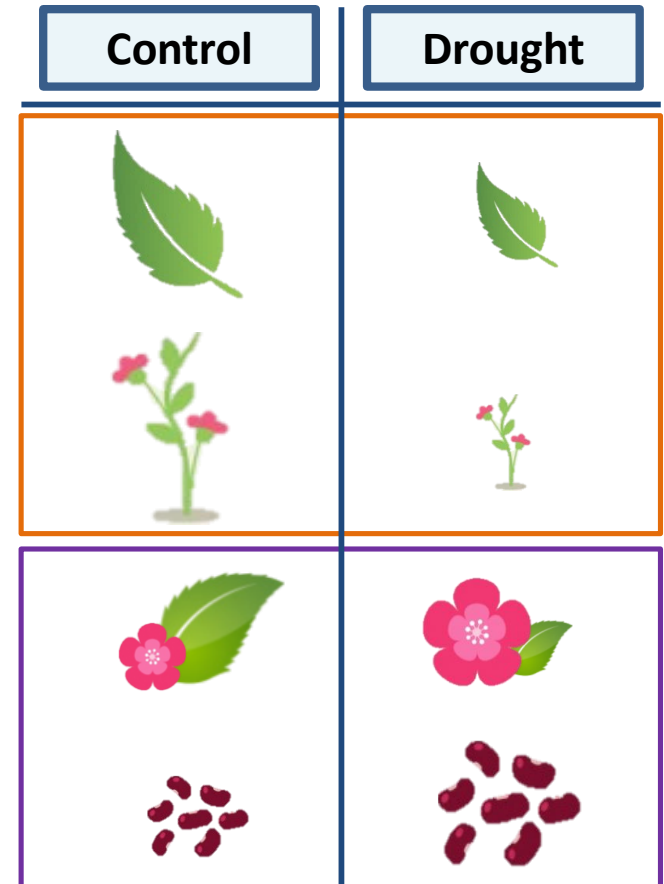
Drought treatment reduced both taxonomic and functional diversity

We observed a functional convergence towards a more stress-resistant design when drought treatment was applied

This was possibly due to a reduction in growth period associated with the drought treatment

Future lines

Measure the importance of intraspecific trait variation





Thank you for your attention

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