

Nitrogen and phosphorus resorption efficiencies change under drought and shrub encroachment in a Mediterranean ecosystem

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Mediterranean ecosystems

Climate change

more frequent and intense droughts

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Shrub encroachment



- decrease tree water availability
- affect ecosystem functioning and resilience

Methods

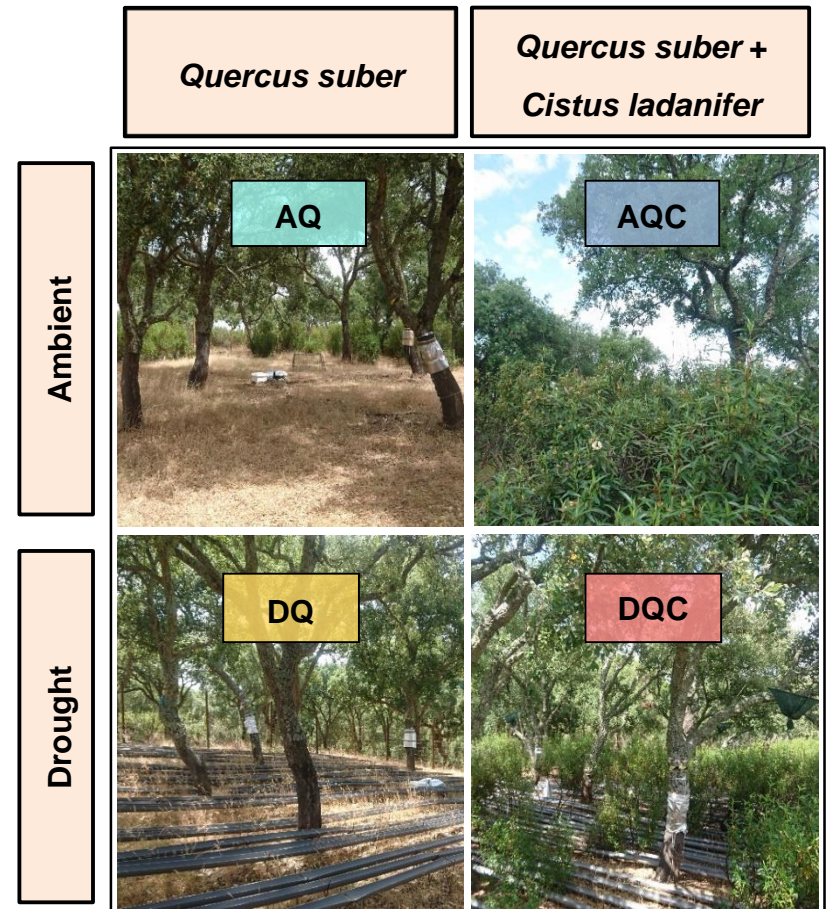
Cork oak woodland in Vila Viçosa, Portugal

- Rain exclusion of 45%
 - Shrub removal in control plots
- 3 blocks, 4 treatments, 36 trees

Measurements (2 years):

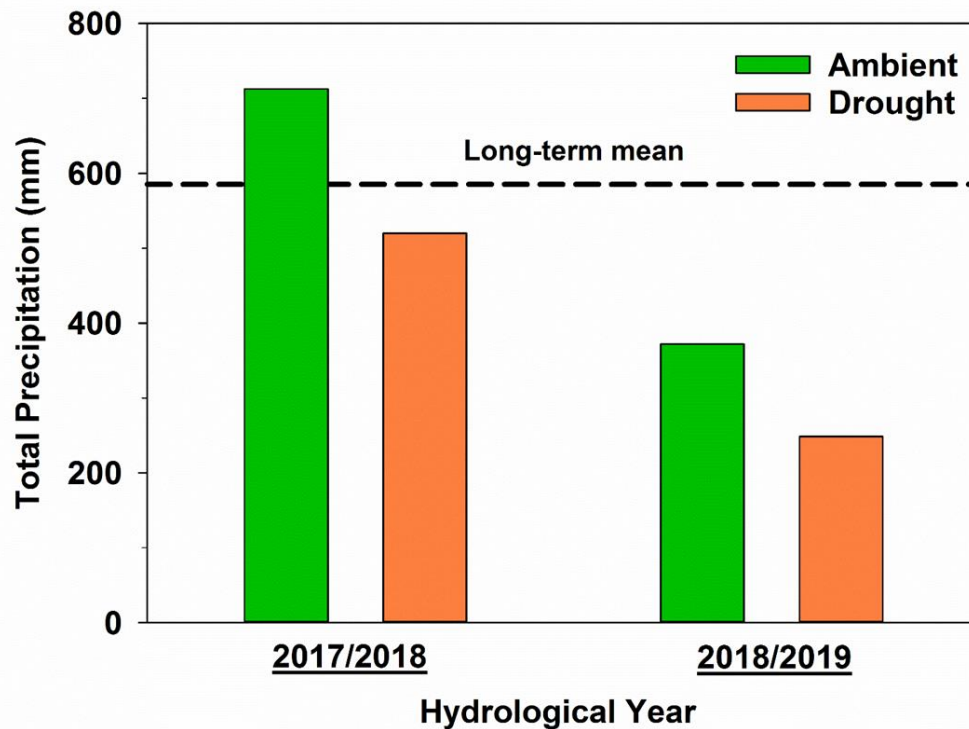
- Litterfall collection (monthly)
- N and P contents in green ([Ngr]) and senescent ([Nse]) leaves
- Nutrient resorption efficiency:

$$\text{NRE (\%)} = ([\text{Ngr}] - [\text{Nse}]) / [\text{Ngr}] * 100$$



Credit: Simon Haberstroh

Precipitation and SPEI



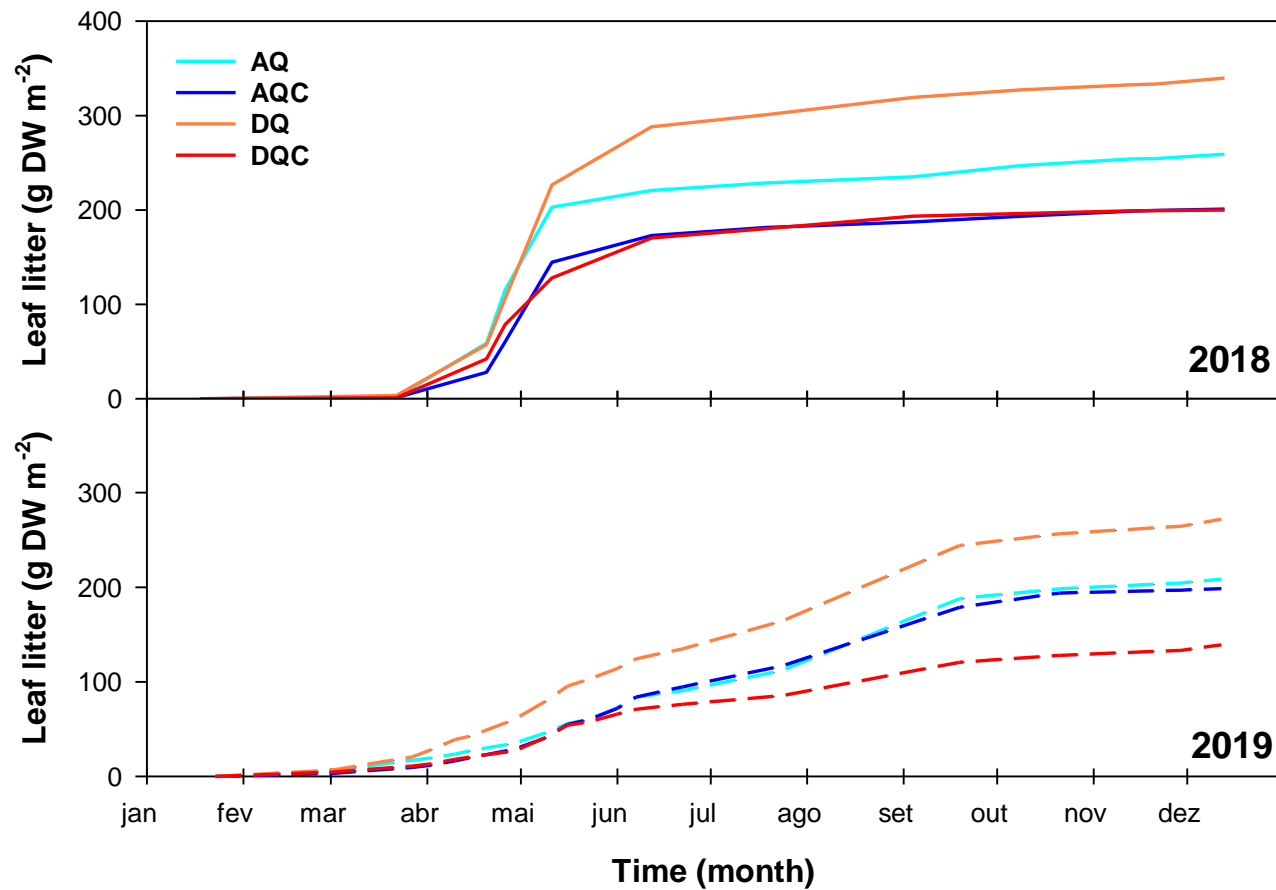
	SPEI_12
Sep2018	-0.12
Sep2019	-1.28

- 2018 was a normal year
- 2019 was a dry year

From Haberstroh et al. 2020, this meeting:

https://presentations.copernicus.org/EGU2020/EGU2020-4901_presentation.pdf

Leaf litterfall



- Lower leaf litterfall in the dry year (2019)
- **Invasion** significantly decreased leaf litterfall
- Invasion extended the period of leaf senescence

Nitrogen resorption efficiency (NRE)

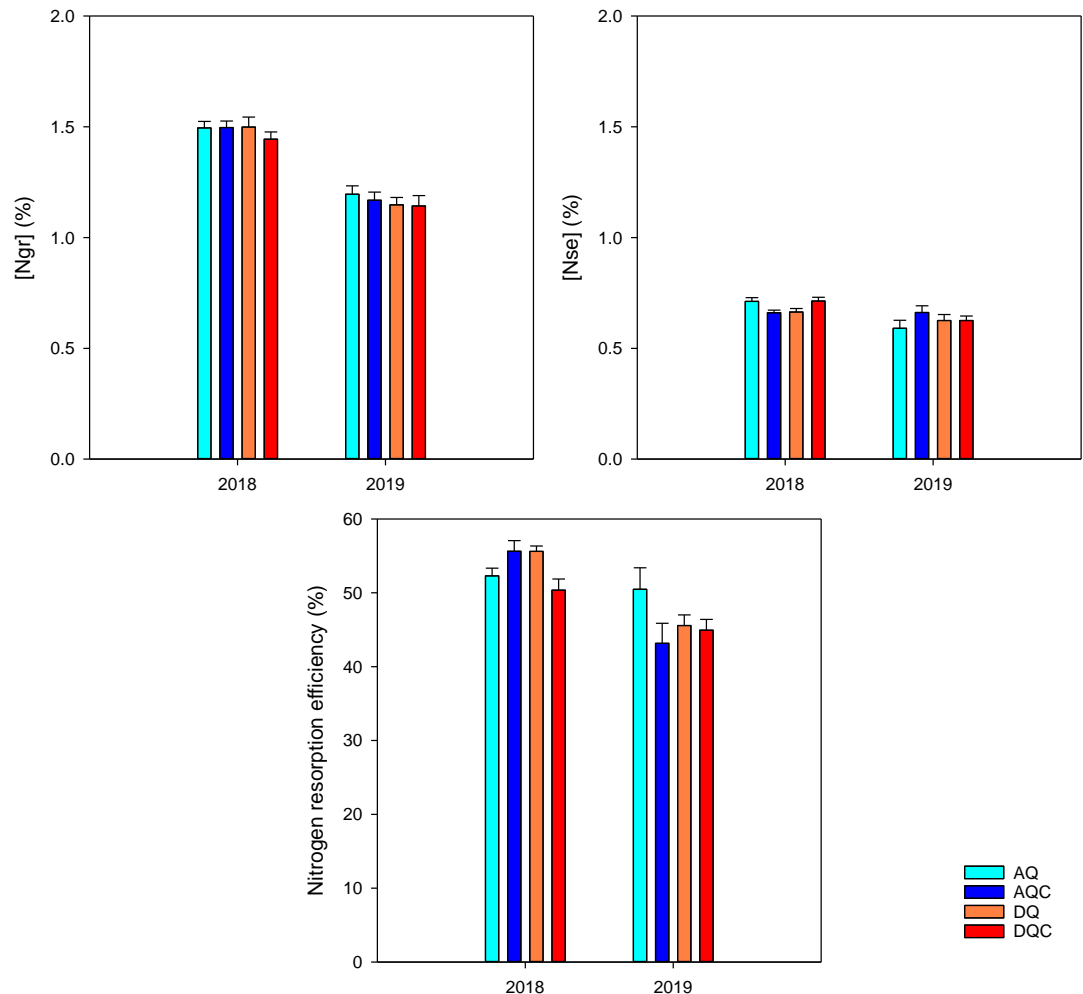
- Natural drought reduced

– [Ngr] (-22%)

– [Nse] (-9%)

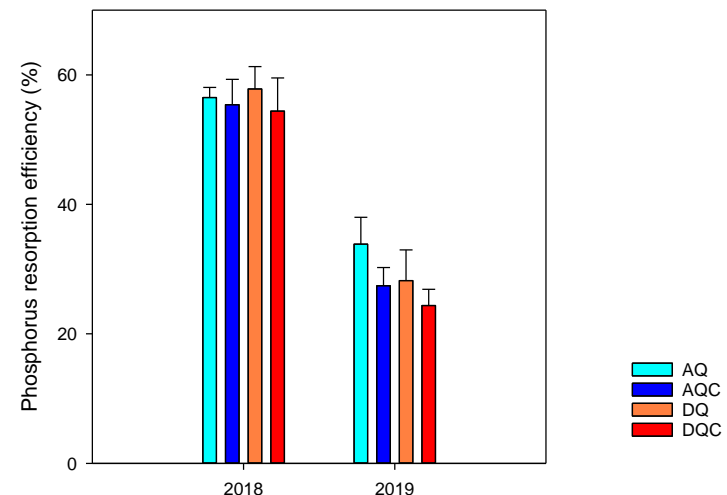
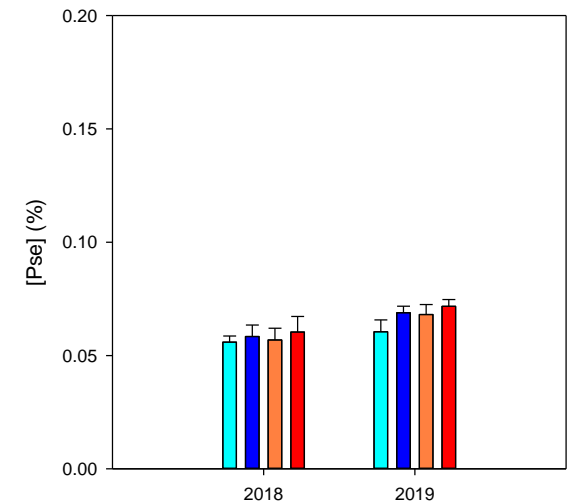
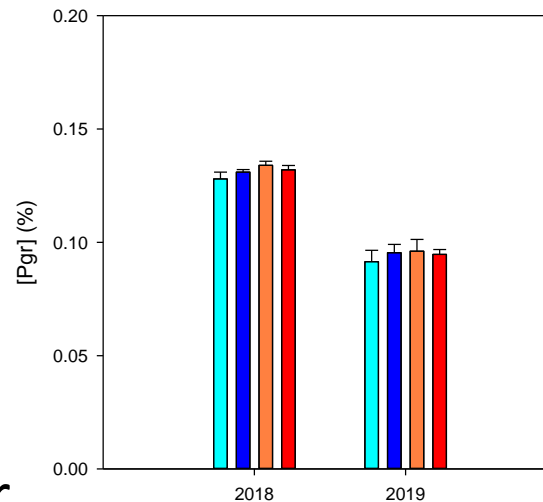
→ NRE was slightly, but significantly, lower in the dry year (-14%)

- No significant treatment effects were observed



Phosphorus resorption efficiency

- Natural drought reduced [Pgr] (-28%) but [Pse] increased (16%)
→ PRE was highly reduced in the dry year (-49%)
- No significant treatment effects were observed



AQ
AQC
DQ
DQC

Preliminary remarks

- The natural drought in 2019 overlapped treatment effects
- The observed decrease in N and P contents in green leaves is likely to reflect a limitation in nutrient uptake by the roots during drought
- The maintenance of the low contents of N and P will lead to a nutritional imbalance, with consequences on the functioning of cork oak woodlands
- Contrary to our expectations, cork oak trees at this site were not able to increase NRE, probably limited by resorption proficiency.
- More data is needed.

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