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Fertirrigation in a grafted *Pinus pinea* L. (stone pine) stand in central Portugal: impacts on growth, and cone production during 8 years

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What we want to know ?

Can fertirrigation increase **seed production** and **regulate** stone pine interannual masting productions ?

How and where?

Installation of a dripping irrigation system in a 4 years-old grafted plantation which run for 8 years.



Hydrological year	2015	2016	2017	2018	2019	2020	2021
T average (°C)	15.2	15.3	15.6	14.7	15.0	15.7	15.1
Average pp (mm)	654	753	506	633	475	615	637

What we measured ?

- During **6 years** we collected **monthly** measurements
- ✓ Radial (stem and branches) growth
 - ✓ Shoot and needles elongation
 - ✓ Needles N content (different age cohorts)
 - ✓ Female conelet production and mortality

Also annual cone production and kernel yield

Conclusions

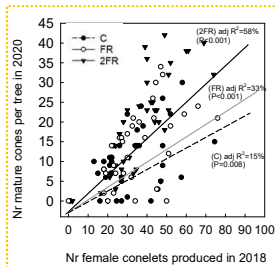
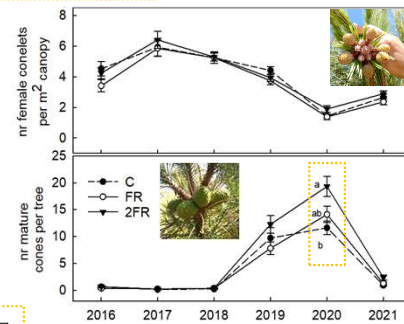
- ✓ Effects of fertirrigation were **late and only significant during mast years**.
- ✓ The year-to-year cone production variability was not changed by fertirrigation > **other environmental factors are regulating reproductive synchrony among individuals**.

Further work: how to increase **flower induction** to maximise the impact of fertirrigation; the proportion and amount of **macro and micronutrients** as well as the timing of application for fruit production needs to be explored.

What did we find ?

- ↑ canopy area and volume
 - ↑ secondary growth during summer
 - ↑ shoot elongation
 - ↑ female conelet survival
- = Female conelets production/m² canopy
= Kernel yield

Higher cone production in 2FR but only significant **7 years** after the continuous treatment application and during the mast year of 2020.



Significantly high female conelets survival on 2FR during the 1st year of conelet development due to a better **tree physiological** condition which allowed to overcome the severe drought of 2019.

For the 2FR trees:



- Current year maximum needle length
- Current needle N content
- Radial growth
- Current year spring shoot length
- Conelets per unit canopy area
- % trees with zero cones
- Kernel yield
- % maturation success (conelets to cones)

	2015	2016	2017	2018	2019	2020	2021
Current year maximum needle length	176	187	166	170.6	136	150	
Current needle N content	12.3	12.8	11.2	13.15	12.1	13.6	9.27
Radial growth	0.17	0.31	0.2	0.2	0.07		
Current year spring shoot length	57	47	54	61	52	50	51
Conelets per unit canopy area		4.1	6.1	5.2	4.0	1.6	2.6
% trees with zero cones		68	87	80	13	9	40
Kernel yield		2%	2%	3%	4%	3%	1%
% maturation success (conelets to cones)		2%	2%	2%	25%	39%	2%
Nr cones per tree		0.5	0.2	0.3	9.9	15.0	1.5

Strong and positive correlation between the 2020 mast year with growth and photosynthetic investment, but with a time lag of 3 years which allowed reserves accumulation and achieve the reproductive success.

