EFFECTS OF A WILDFIRE ON CORK POROSITY AND CORK GROWTH

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INTRODUCTION

Cork porosity and thickness are two important characteristics that determine the value of the cork raw-material for industrial processing.

Wildfires that damage the cork oaks **may impact on these properties**, thereby also potentially **influencing the cork value.**

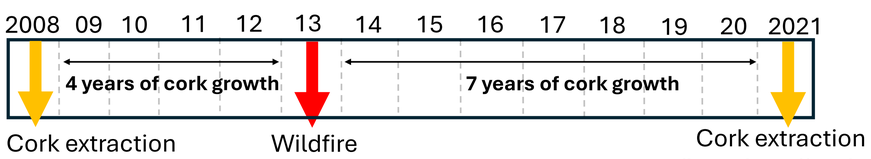
This research aims to **understand the effect of wildfires on the cork growth and porosity**, by comparing unburnt with fire-affected trees, and these cork variables in the years before and after the occurrence of fire.

MATERIALS & METHODS

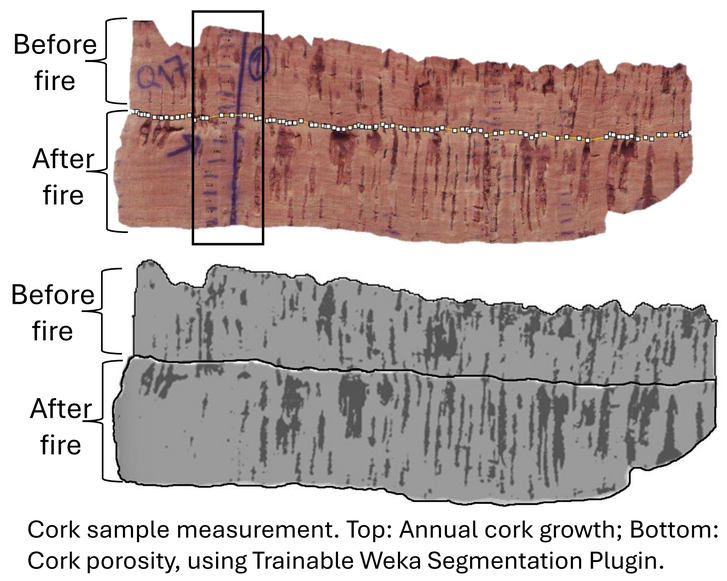
The study focused on a **mature cork oak stand** under cork production located in Coruche, where **a wildfire occurred in 2013**.

Cork extractions were made in 2008 and 2021, corresponding to a **cork production cycle of 13 years**.

In 2021, 20x20cm **24 cork samples** were collected **from fire-affected and 23 from unburned cork oaks**. Samples were taken from the north side at breast height.



Cork annual growth and porosity were **measured using Fiji/ImageJ software.**



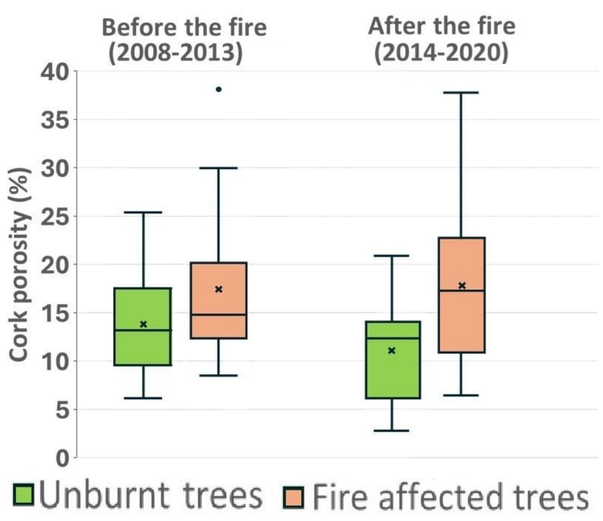
Cork sample measurement. Top: Annual cork growth; Bottom: Cork porosity, using Trainable Weka Segmentation Plugin.

Samples were **compared using t-tests** and cork-related variables were **explained with correlation matrices**.

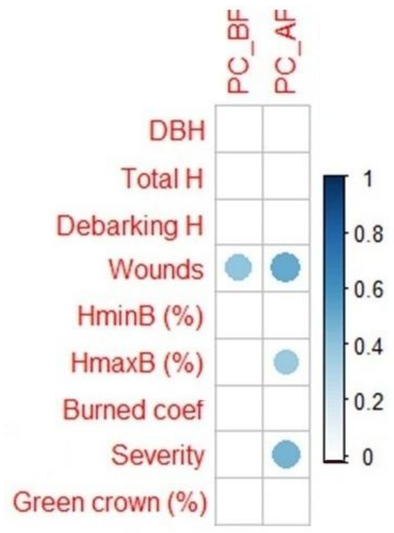
Tree-related and fire-related variables were measured.

Variable description	Variable
Cork-related variables	
Cork porosity before fire (%)	PC_BF
Cork porosity after fire (%)	PC_AF
12-year cork growth (mm)	20XX
Tree-related variables	
Diameter at breast height (cm)	dbh
Total height (m)	Total h
Cork debarking height (m)	Debarking h
Fire-related variables	
Area of the 3 largest wounds (cm^2)	Wounds
$\frac{\text{Min height of charred trunk}}{\text{Total height}} * 100$	HminB (%)
$\frac{\text{Max height of charred trunk}}{\text{Total height}} * 100$	HmaxB (%)
$\frac{\text{Total burned area}}{\text{dbh}}$	Burned coef
% of trunk burned in the first two meters from the ground	Severity (%)
$\frac{\text{Green crown volume}}{\text{Total crown volume}} * 100$	Green crown (%)

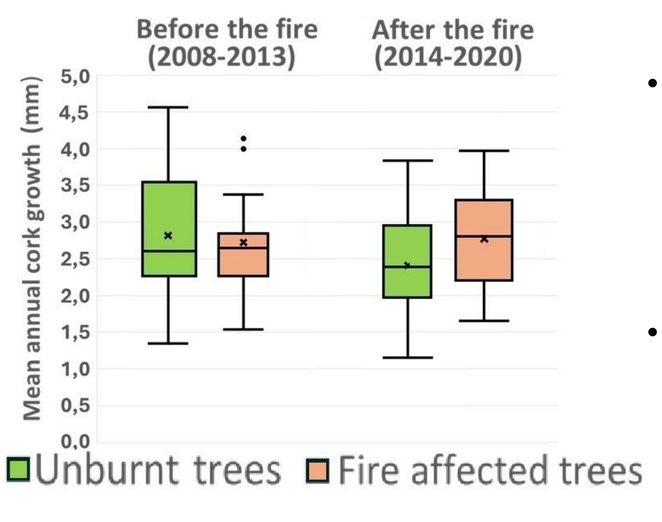
RESULTS



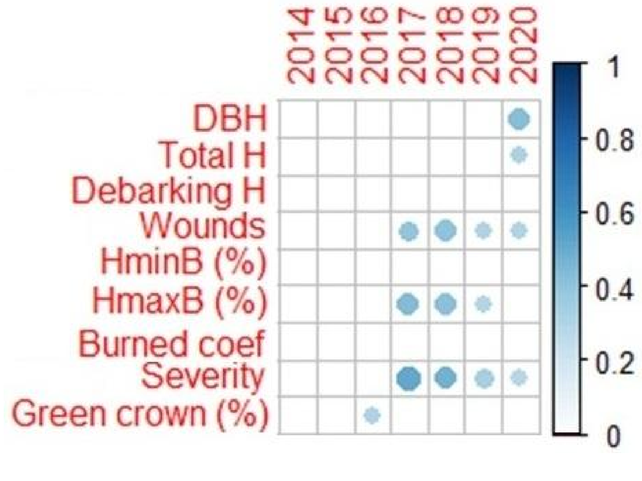
- **Before the fire,** cork porosity showed **no difference** between unburnt and fire-affected trees.
- **After the fire,** cork porosity in the fire-affected trees was **significantly higher** than the unburnt trees.



- Mean cork porosity **before the fire** was correlated to the **Wounds**.
- Mean cork porosity **after the fire showed a** strong positive correlation with **Severity,** moderate with **Wounds,** and weak with **HmaxB**.



- **Before the fire,** mean cork growth showed **no difference** between unburnt and fire affected trees.
- **After the fire, m**ean cork growth of unburnt trees was **significantly lower** than fire affected trees.



- 2017, 2018, and 2019 cork growth was positively correlated with **Wounds, HmaxB, and Severity**.
- 2020 cork growth was positively with only **Wounds and Severity**.

CONCLUSIONS

After the fire, cork porosity increased by 38% which may result in a **decrease of cork quality** and value for production of cork stoppers.

After the fire, **cork annual growth increased by 13%** which may be associated with a **protective adaptation** of cork formation.

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