



# Impact of irrigation period and dose on the growth of *Tuber melanosporum* in young truffle orchards

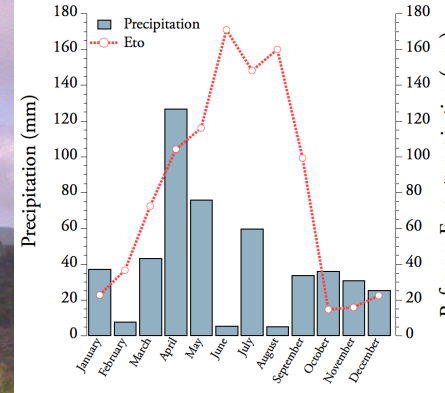
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# BACKGROUND



In Mediterranean climate, the young truffle-oak plantations are subjected to drought episodes that can compromise their development

**Irrigation** is used to mitigate the negative effects of the drought periods although the water needs to optimize fungal growth remain uncertain



# Water needs?

## Water balance methods



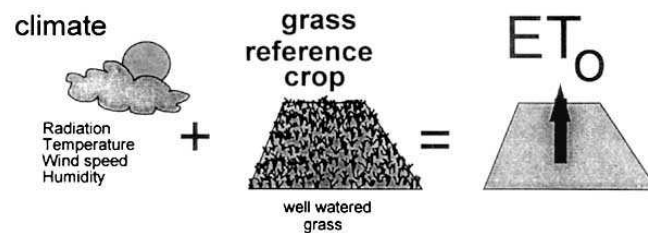


# BACKGROUND

Crop water needs can be estimated by water balance methods, through which irrigation supplies the amount of water required to compensate the crop evapotranspiration (ET<sub>c</sub>)

The FAO official method for estimating ET<sub>c</sub> is the evapotranspiration of reference ET<sub>o</sub> (Allen et al. 1998)

$$ET_c = ET_o \cdot k_c$$



The **ET<sub>o</sub>** can be calculated from several weather variables, and **k<sub>c</sub>** is the crop coefficient representing a crop type and can be obtained from published recommendations.

In our knowledge, crop coefficients are still not developed for truffle plantations

# AIMS AND METHODS

The main aim of this study was to explore the effects of irrigation doses based on five crop coefficients on root tips colonized by *T. melanosporum* in young truffle plantations

Five irrigation doses were established: **0, 25, 50, 75** and **100%** of the reference evapotranspiration

As seasonal growth of *Quercus ilex* is greater before summer, the irrigation doses were applied in three periods:

- May - July,
- August - October
- May - October

The frequency of irrigation was between 2 and 3 weeks

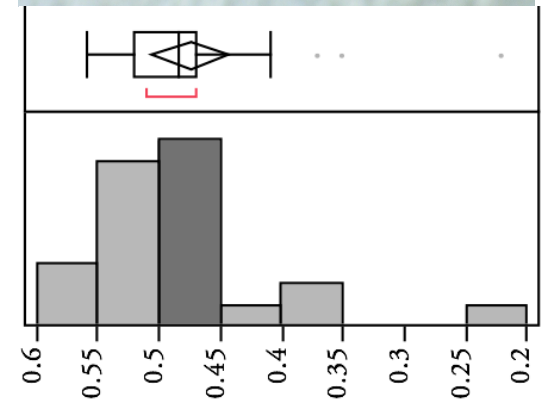
# METHODS

**Five truffle plantations** were planted in the Eastern Pre-Pyrenees with holm oaks inoculated with *T. melanosporum*.

In each plantation, we arranged a two-factorial design with an **irrigation period** and an **irrigation dose** as main factors to test the interaction between them on the growth of both *T. melanosporum* and holm oaks after three years in the field.

Each truffle plantation was treated as a block.

The seedlings that were evaluated before planting for the **quality of ectomycorrhizal colonization** did not have any ectomycorrhizae other than *T. melanosporum*.



# METHODS

Seedlings were extracted from the ground and taken to the laboratory where the root systems were carefully washed

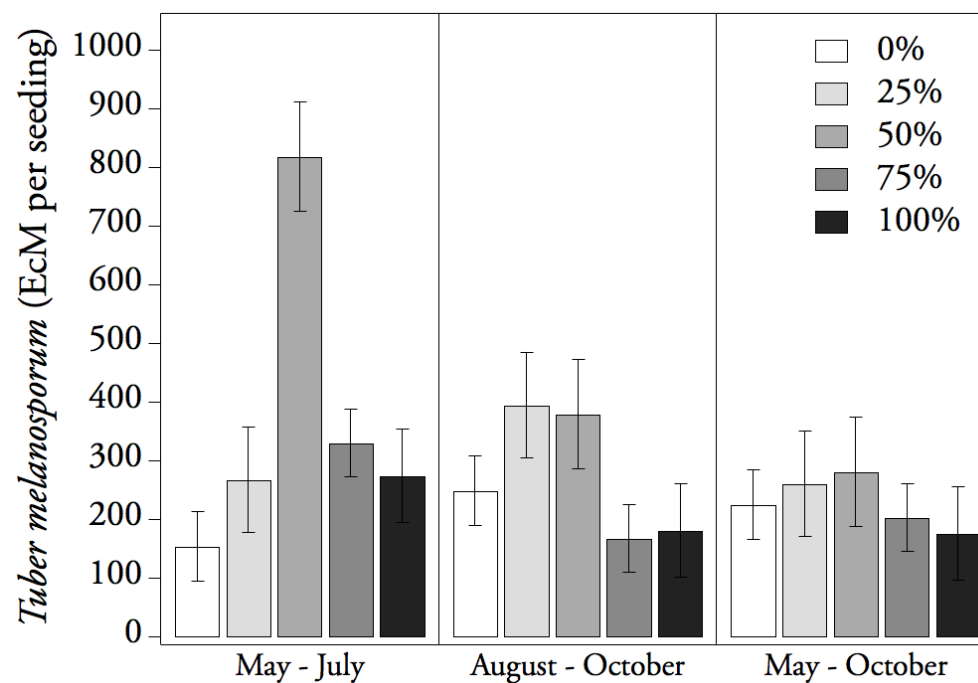
After 3 years in the field, seedlings were extracted from the ground and taken to the laboratory where the root systems were carefully washed

Ectomycorrhizae of *T. melanosporum* were identified following the description of Rauscher and Chevalier (1995).



# RESULTS

Source of Variability	Significance
Irrigation period	0.0024
Irrigation dose	0.0003
Interaction	0.0012

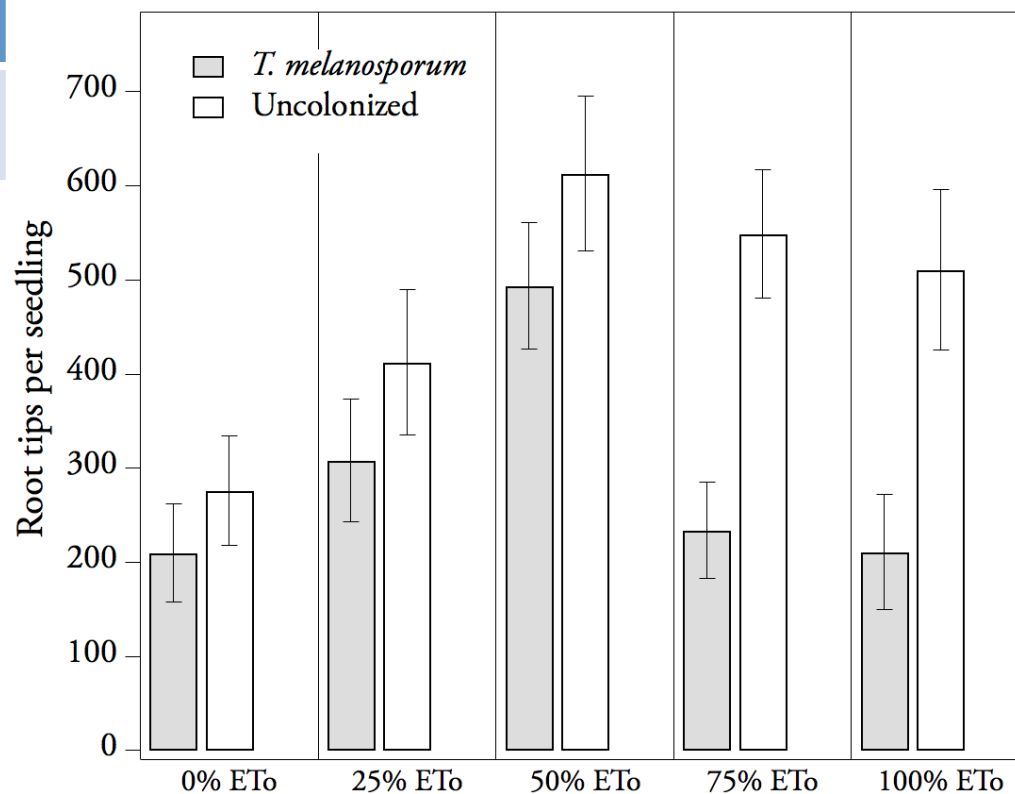


- The irrigation period significantly interacted with irrigation doses for the absolute root tips colonized by *T. melanosporum*



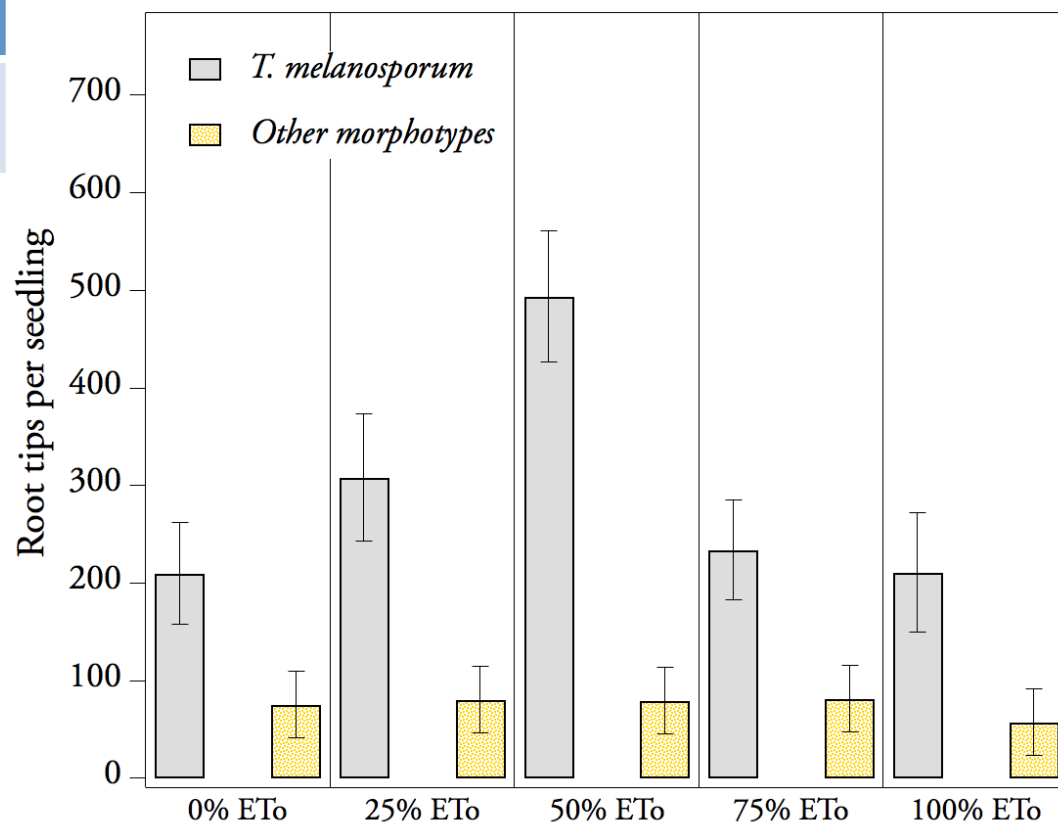
# RESULTS

Source of Variability	Significance
Irrigation doses on differences between <i>T. melanosporum</i> and uncolonized root tips	0.0096



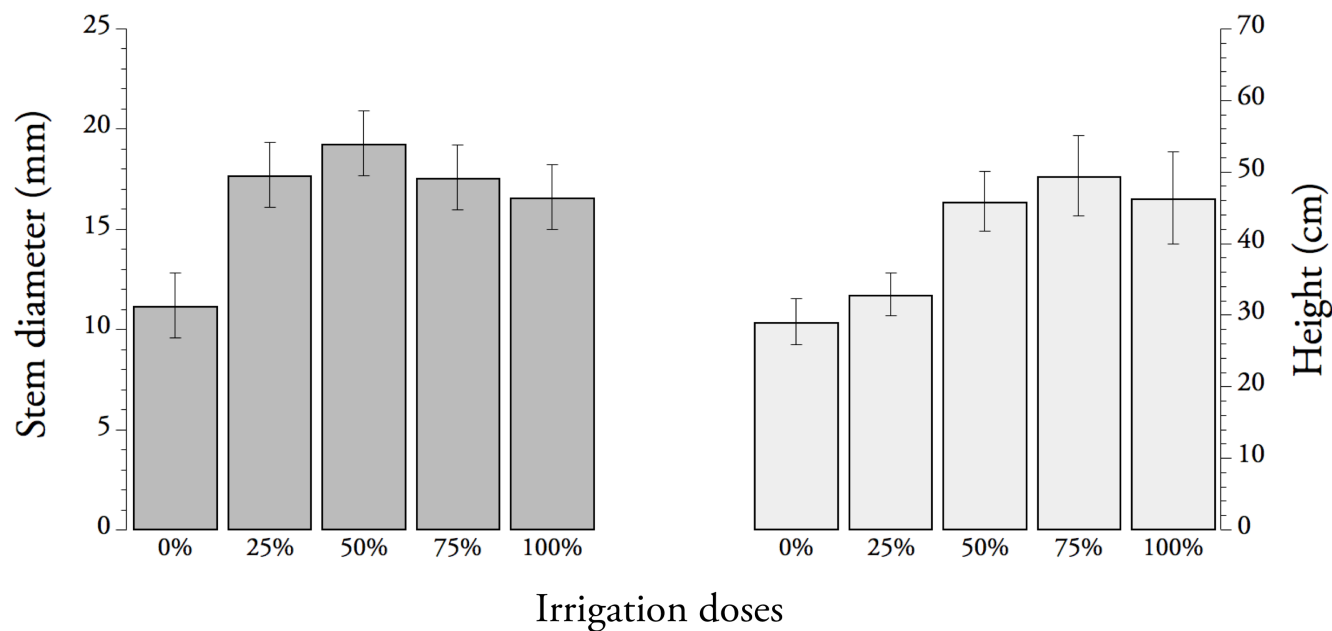
# RESULTS

Source of Variability	Significance
Irrigation doses on differences between <i>T. melanosporum</i> and other ectomycorrhizal morphotypes	0.0002





# RESULTS

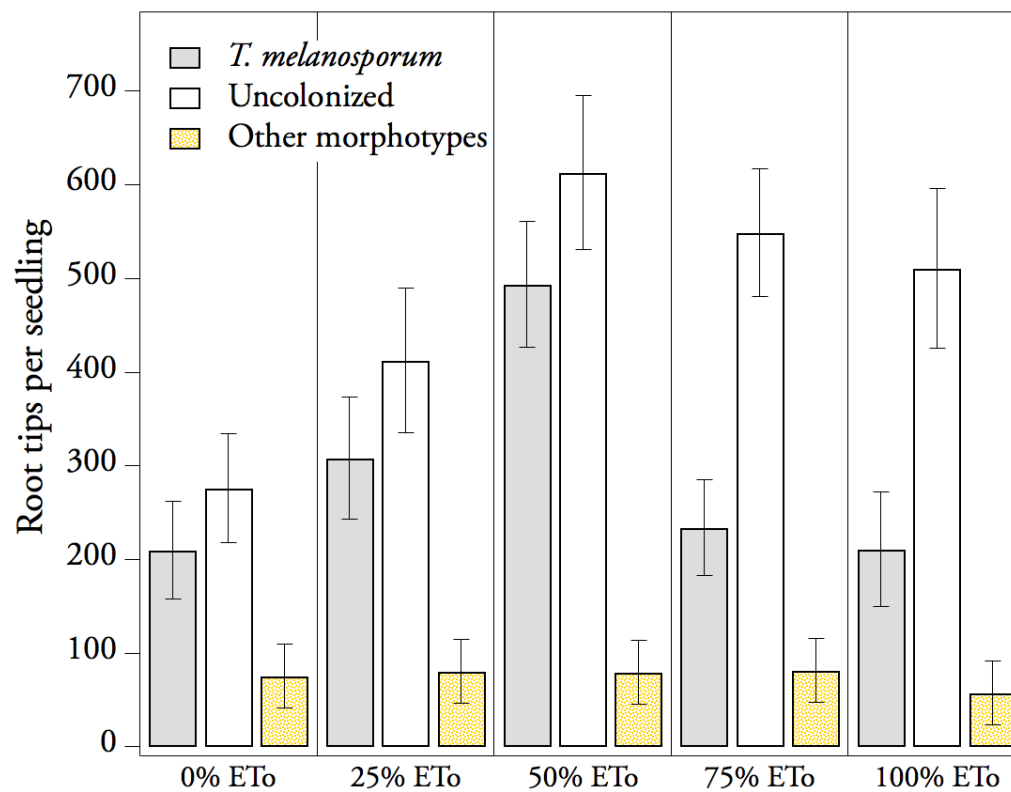
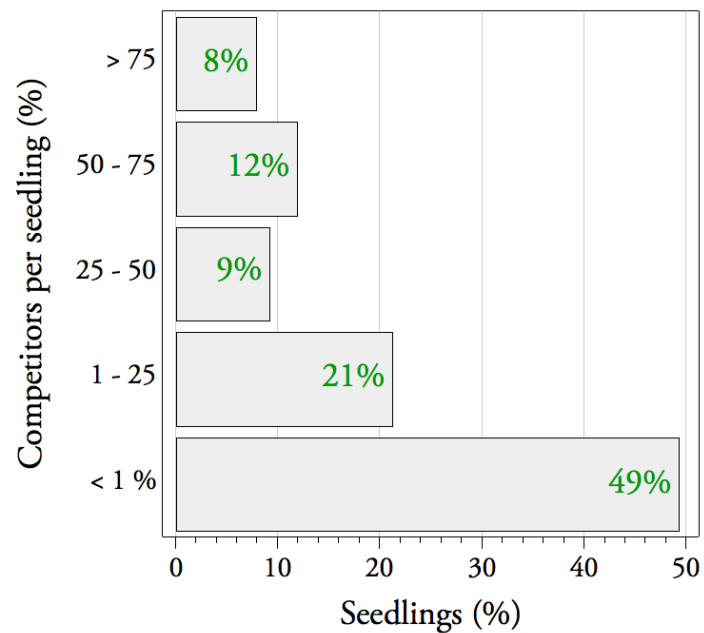


Source of Variability (Stem Diameter)	Significance
Irrigation dose	0.0001

Source of Variability (Height)	Significance
Irrigation dose	0.0001

Water supply promoted the growth of seedlings, but.....

# RESULTS





# CONCLUSIONS

- The moderate irrigation promotes the growth of *T. melanosporum* although the crop coefficient should not be more fixed in long irrigation programs
- The high irrigation doses hinder the progress of *T. melanosporum*, maintain the uncolonized root tips, and do not improve the seedling growth compared with the moderate doses
- Further studies are needed to improve the irrigation programs of truffle plantations, which should pay attention to the growth periods of the symbionts

# Thank you for your attention

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1<sup>st</sup> International Congress of  
TRUFFICULTURE

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