

<u>Subject</u> Forest Ecophysiology <u>Topic</u> Morphological and Physiological Plant Responses to Drought Stress in Thymus citriodorus <u>Lecturer</u> Prof. Dr. Paolo De Angelis <u>Student</u> Marusya Arakelyan

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## Introduction



The genus Thymus is considered as a polymorphic one and belongs to the family Lamiaceae. It is one of the largest genera and comprises 350 around species of perennial, aromatic herbs, and subshrubs; it was found predominantly in Mediterranean region, Asia, Southern Europe, and North **Africa** 

## Water suply and drought stress



#### **Plant Responses to Drought Stress**

### Aim of this study

This study aims at understanding the Thymus citriodorus response to drought stress by examining the morphological and physiological changes on plants after PEG application and estimating the influence of water scarcity on oil biosynthesis.



## **Materials and Methods**



## For measure plant growth were used



**Mettler PM4600** 



Polyethylene glycol (PEG6000) was used as a drought agent and was added to the irrigation water in three different concentrations: 0 (control), 2%(moderated drought), and 4% (high drought stress).

#### For measure plant physiological responses were used





#### **Plant vegetative growth responses**



Figure1: Effects of PEG levels (0,C 2%, D1; and 4% ,D2) on shoot and root fresh weight (FW) of Thymus citriodorus. Values are mean ± SD of nine replicates

## Plant physiological responses, relative water content (RWC) and nitrogen plant status



FIGURE 2: Effects of PEG levels (0, C; 2%, D1; and 4%, D2) on relative water content (RWC) and leaf chlorophyll content expressed as N-tester values of *Thymus citriodorus*. Values are mean ± SD of nine replicates.

#### Plant physiological responses, Gas exchange parameters



FIGURE 3: Effects of PEG levels (0, C; 2%, D1; and 4%, D2) on transpiration rate (*E*), stomatal conductance ( $g_s$ ), net photosynthesis (*A*), and water use efficiency (WUE) of *Thymus citriodorus*. Values are mean  $\pm$  SD of nine replicates.

#### Plant physiological responses, Yield of Oil components



FIGURE 4: Effects of PEG levels (0, C; yield of *Thymus citriodorus*.

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# Conclusion

- Thyme plants showed a water stress adaptive mechanism by restricting their growth and allocated more competitive carbohydrate to roots to promote the root absorption capacity.
- The plants were able to maintain the WUE and root to shoot ratio upon adding PEG which might indicate a strong relation between root water uptake and water use efficiency
- The supplementing of PEG affected the water fluxes and caused higher stomatal closure and accordingly reduction in water loss through transpiration
- The main oil components were influenced by drought stress. Thus, desired pharmacological components of thyme might be oriented by manipulating water supply.

