Cork Oak Transplant: A New Reality?
A Physiological Approach to Maximize Success Rate


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Introduction and Objectives

Tree transplant promote a water imbalance at tree level caused by depression in water uptake, thus predisposing trees to water stress. The success of transplantation depends on physiological recovery capacity of tree water status. In order to improve transplantation success, available commercial products to reduce transpiration and an irrigation/fertiirrigation protocol were tested. Real time monitoring eco-physiological parameters such as water potential and sap flow has a huge advantage allowing a fast and quick observation of stress impact during transplant operation and recovery. This study aimed to analyze if current transplant methodologies and technologies available in the domestic and international markets can be successfully applied in cork oak tree transplants, of medium to large sizes in the Montado ecosystems and to infer its success rate in early stages when coupled with ecophysiology monitoring. This Poster presents some of the results included in the research project.

Methodology

- Study site: SW Portugal. Sample: 10 cork oak trees (ø between 23 and 47 cm)
- Treatments to limit canopy transpiration and to improve root systems prior to transplant were addressed (mycorrhiza, fertilizer, foliar antitranspirant)
- Tree’s transplants were performed with a truck-mounted hydraulic spade transplanter
- Tree ecophysiological indicators (sap flow, leaf water potentials (pre-dawn and midday) and stomatal conductance) and climatic indicators were investigated
- Water stress avoidance practices were established to promote post-transplant tree status recovery, including irrigation to match average daily accumulated sap flow
- Physiological status monitoring before, during and after transplant operation

Results and Discussion

Evaluation of roots and trunk sap flow behavior demonstrate that roots are delayed from low soil—tree atmosphere

- Continuous recording of sap flow and the correlation with solar radiation identifies anomalies in the dynamics of sap flow and a way to diagnose the status of the tree and infer the short-term success or failure of the transplantation process
- Sap flow continuous monitoring combined with leaf water potential and stomatal conductance is a suitable methodology to apply to the transplant process, giving real time responses of the trees to impacts
- 90% of transplant success
- No significant differences were observed between treatments

Irrigation before, during and after transplant is crucial for survival rate

Conclusions

- By following the proposed methodology the sampled cork oak trees exhibited a transplant success rate of 90% during the experimental period (1 year)
- Transplant operations were considered successful when the tree’s water uptake inferred from sap flow exhibited a high correlation with solar radiation and returned to its undisturbed or pre-transplant water potential gradients in the following 2 to 3 weeks
- Real-time sap flow monitoring provides reliable results to establish an automated assessment method of tree status during O. suave transplant operations.
- In case of success, the sap flow measurement methodology allows to identify the time elapsed after transplantation from which the tree recovers its normal transpiration thresholds and response

References
