IADFS IN TREE-RINGS OF *ERICA ARBOREA* L. (ERICACEAE): TOOLS FOR THE INTERPRETATION OF WOOD GROWTH DYNAMICS

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Intra-Annual-Density-Fluctuations (IADFs) in tree rings can be considered "favourable" anomalies during wood growth when they can be used as signals to better understand the dynamics of tree growth. Their anatomical and isotopic features can be related to the variation of environmental factors during tree-ring formation, thus being indicators of wood phenology with intra-annual resolution.

During the vegetative period, IADFs can be formed after: a) a sudden decrease of plant growth due to drought, or b) an abrupt increase of plant development due to unexpected precipitation. In the first situation, xylem in the region of IADF is characterised by narrower wood cells with thicker walls in comparison with cells formed before and after the stress. In the second instance, xylem conduits show larger lumen and thicker cell walls in the region of IADF than in absence of stress.

In this study, a multidisciplinary approach, based on the combination of dendro-ecological information with quantitative wood anatomy (QWA) and the analysis of stable isotope composition along tree-rings, was applied to reconstruct a more continuous view of the process of wood formation in *Erica arborea* L. The research was conducted on Isola d'Elba, an island in the Tyrrhenian sea (Italy), where two study sites, characterized by different water availability, were selected. Cores and thick cross sections were sampled from the main stem and subjected to dendro-chronological analyses including the measurement of ring-width, identification of IADFs and their classification according to the position along ring width (Fig. 1).

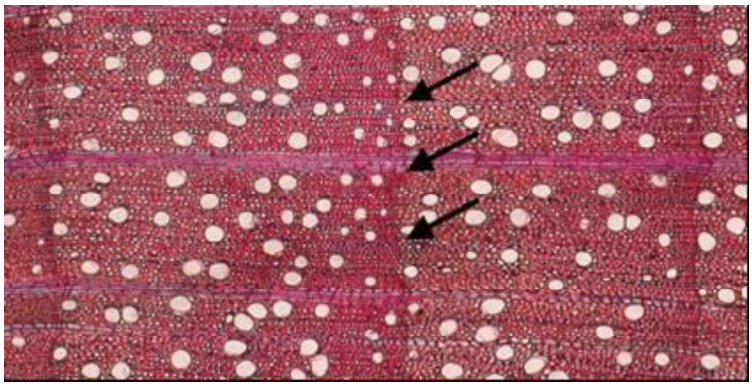

Fig. 1. Boundary of an IADF (false ring) in tree-rings of *E. arborea*

Rings were dissected under a light microscope to obtain two series of sub-samples for anatomical and stable isotope measurements. For anatomical analyses, semi-thin cross sections were obtained through a sliding microtome and observed under a light microscope. Photomicrograph were subjected to digital image analysis (DIA) to measure parameters including size and shape of conduit lumen and cell wall thickness.

The same selected rings were analyzed for $\delta^{13}C$ using an elemental analyser linked to an isotopic ratio mass spectrometer via a variable open split interface. Correlations between anatomical, eco-physiological, isotopic and environmental variables (e.g. precipitation, temperature, water availability) were calculated.

The comparison of intra-annual anatomical and isotopic traits in tree-rings sampled in the two sites showed that the features of IADFs can be related to the type, duration and intensity of the stress experienced. This combined approach was valuable to gain information about the relationship between environmental factors and tree growth at the seasonal level. Results showed that this method is useful for dating problematic samples in Mediterranean woods such as those of shrubs that, being very plastic, can be considered ideal models for studying climatic variations.

INDICE