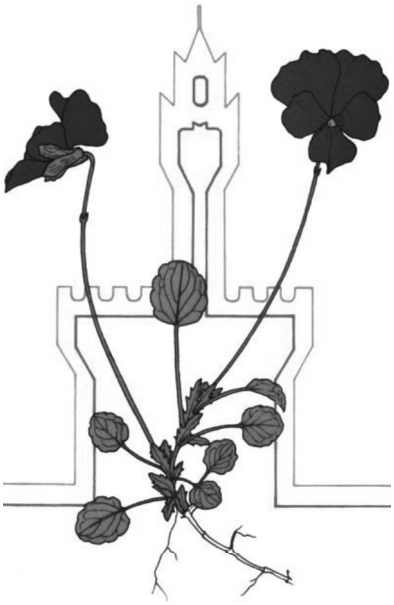

110° Congresso della Società Botanica Italiana onlus

Pavia, 14 - 17 September 2015

ABSTRACTS

KEYNOTE LECTURES, COMMUNICATIONS, POSTERS

II INTERNATIONAL PLANT SCIENCE CONFERENCE (IPSC)

"NOT ONLY FOOD: SUSTAINABLE DEVELOPMENT, AGRO-BIODIVERSITY CONSERVATION & HUMAN WELL BEING"

ISBN 978-88-85915-16-9

5. = A COMPARISON BETWEEN PEDUNCULATE OAK AND BLACK LOCUST VESSELS IN TREE RINGS: IT IS ALL A MATTER OF SIZE

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By means of tree-ring anatomy investigation, it is possible to assess wood cell anatomical features (i.e. vessel number, size, and distribution) along a series of dated tree-rings and to characterize the relationships between tree growth and environmental factors (1). Recent methodological improvements allow today to identify new parameters that contain valuable information on wood response to environment, this providing new knowledge on tree plasticity to climate. As regards European broadleaves, in the last years several studies have investigated anatomical features of different oak species. On the contrary, only few data are available on tree-ring anatomy of black locust, one of the most widespread non-native tree species in Italy.
Herein we present preliminary results of an investigation conducted in the "Siro Negri" Forest Reserve (Pavia, N-Italy), a natural broadleaves mixed forest, in which anatomical features of pedunculate oak (*Quercus robur* L.), the dominant tree species, are compared with those of black locust (*Robinia pseudoacacia* L.), established in the Reserve more than 70 years ago. Within the Reserve, we sampled 10 oak and 15 black locust trees by a 5-mm increment borer. After dendrochronological preparation, tree-ring measuring and cross-dating, a core from each tree was scanned at 2400 dpi resolution and 24-bit colour depth. Digital images were processed with ROXAS (2), an automated image analysis system, specifically designed for tree-ring anatomy, which allows the extraction of xylem vessels according to morphometric criteria. A large set of vessel variables was directly obtained by ROXAS or subsequently calculated. We finally retained 23 variables, related to total ring (i.e. ring width, total ring area, net wood area), to vessel number, size and distribution within the ring (i.e. mean and total vessel area, vessel size corresponding to 10°, 50°, 90° percentile of intra-ring distribution), and concerning particular groups of vessels (vessels of the first row or vessels larger than the mean). Some additional derived variables were calculated, i.e. vessel density, accumulated potential hydraulic conductivity, percentage of conductive area. For each variable, raw time series were transformed into residual series, removing autocorrelation. Descriptive statistics were then obtained for both raw and residual series in the common period 1954-2005. Correlation analyses were performed to compare variables within and between the species.
A total of 47289 vessels were measured for the two species (27853 in black locust, 19436 in oak). Number and size of measured vessels varied greatly. In general, the mean vessel area was much lower in black locust then in oak (27100 and 42600 μm^2 respectively). This difference was only partially balanced out by the higher number of vessels per ring in black locust (31 against 18), so that the accumulated potential hydraulic conductivity (proportional to squared vessel ray) was higher for oak. Both the species produced larger vessel at the beginning of the vegetative period (fig. 1), so that mean vessel area from the first row was higher than the mean area for all the vessels, but oak concentrated about 40% of all the vessels near the ring boundary, while black locust 34%. Correlation between inter-annual variations of anatomical parameters in the species was variable depending on the considered parameter: significant values were found comparing tree-ring width, tree-ring and net wood area, vessel density and percentage of transport surface within the ring, but the highest correlation was obtained when considering mean area of the vessels above the fiftieth percentile. All the other parameters had specific inter-annual variability, which probably reflected specific ecological requirements. Despite both the investigated species are considered ring-porous, differences in wood anatomy and intra-ring vessel distribution indicated diverse wood structure. Different intra-annual variations in the investigated parameters suggested that the species have distinct modes to adjust the xylem system, and thus the capacity to transport water, to environmental variations.

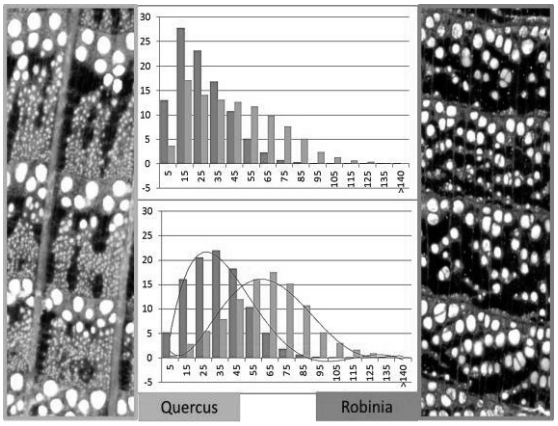

Fig. 1. Vessels in *Quercus* (right) and *Robinia* (left) and their size distribution within the ring (up) and in the first row (down).

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