THE USAGE OF DENDROCHRONOLOGICAL DATA OF PINUS SYLVESTRIS AND THE POSSIBILITIES OF ITS EXPANSION

T. Bitvinskas, R.Pikšrytė
Botanical Gardens of Vytautas Magnus University, Kaunas, Lithuania

Pinus sylvestris is a common tree species in almost all Europe and northern Asia up to the Verkhojansk mountain range. Pine trees reach 30 m in high and 1 m in diameter. In favorable conditions pine can live some hundred years. For example, the oldest living pine tree found by laboratory workers in Karelia was 525 years old. Pinus sylvestris is ecologically flexible species. It grows well in rich habitats but is week in competition with other tree species there. Species can grow in oligotrophical acid peat bogs and stand hard mountain environment.

Both in Europe and in Asia Pinus sylvestris is one from main tree species that provides very important dendrochronological material. On the one hand, it can be used for the large scale investigations, when dendrochronological material is collected from the sites distributed in profiles or chess - board order over the vast territories (dendrochronological profiles Murmansk - the Carpatian Mountains, Arkhangelsk - Moscow - the Caucasus, along the Ural Mountains from the North to the South, Lithuania - the Baikal). On the second hand, cross - dating method allows to create long-term (for several thousand years) tree ring width series by using material from living pine trees, archaeological and ethnographic timber, tree remnants preserved in acid peat.

Two main fields of using data from the tree ring width series can be divided. 1) Dating of any wooden objects: old buildings, archeological findings, frames of paintings, and other wooden ware. 2) Dendroclimatic and dendroecological investigation. They are important in forest and agriculture sciences, climatology, etc. Dendroecology is especially important because of its possibility to provide proxy data about the ecological conditions for the periods without any instrumental measurements. Results of research in the Dendroclimatolochronological laboratory show that climatic conditions during 2000 years' period can be reconstructed from the growth dymanics of peat bog pine.

For dendrochronological needs, scientists working in this field and mathematicians create and use special computer programs that help to synchronize tree ring series, to model correlations between annual radial growth and ecological factors.

Additional information is achieved from the Pinus sylvestris tree ring series when early wood and late wood parts of tree ring are measured separately. They are formed in the different environmental circumstances. Hydrothermic conditions of the previous autumn and winter influence early wood formation, late wood has better relations with the spring and early summer months.

In different foreign dendrochronological laboratories equipped with good radiodensitometric technique an interesting environmental information is obtained from the maximum wood density chronologies. The researchers report that the maximum wood density is closely related with the thermal conditions of the summer months.

Research works in the world during the last decade show that using chemical and physical methods for the analysis of accurately dated tree rings provided new data about the dynamics of the environmental radioactivity, changes in climate, industrial contamination, etc.

The Dendroclimatochronological laboratory of the Vytautas Magnus University carries out dendrochronological minimonitoring in Lithuania Republic. Changes in the tree rings formed during the last years are checked, and their connections with the hydrometeorological factors (temperature and precipitation are studied in the main forest habitats). Timber samples for the long-term chronology construction are collected from old living trees and from the archaeological objects: medieval Vilnius, Kaunas, Kernavė, Klaipėda, etc. (Brukštus, Sturys, Sturienė). Collected and analyzed dendrochronological material from peat bogs is also used to build long-term

dendrochronologies which are important for the dating and reconstruction of the past climatic changes.

To reveal more exact relations between tree ring width and meteorological factors the laboratory carries out both meteorological and dendrochronological investigation in the same point in the Botanical and Dendrochronological Station (Aukštaitija National Park). The results obtained during these observations show that meteorological observations carried out in the point of the dendrochronological analysis help to get strong relations with the meteorological parameters of the separate months. For example, correlation between the mean temperature of January, February, and March and the pine early wood is 0.899, late wood 0.817, yearly wood 0.880.

The comparison of dendrochronological data and harvests of agriculture crops have revealed relations between the annual growth of separate tree species and the fluctuations in the harvests of separate crops. For example, Pinus sylvestris annual growth fluctuations are related with the harvests of multiannual grasses: correlation with clover is +0.475; correlation with beet is opposite - 0.396.

The results of the research in the laboratory show, that dendrochronological material because of its possibility to cover long time periods and its connections with climate, agriculture crops and other nature phenomena is a good source of knowledge about nature dynamics.