

The effect of sex and clonality on the climatic–hydrological response of radial growth in white poplar (*Populus alba*)

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In the context of ongoing climate change, clonal plants appear to have an advantage over non-clonal species due to their ability to reproduce both sexually and vegetatively. By reducing the energy costs of reproduction, clonality may enhance the ability of individuals to deal with environmental stressors, allowing populations to persist under suboptimal conditions and thus contributing to their long-term survival. Furthermore, in dioecious species, differences in resource allocation strategies between the sexes may lead to distinct growth responses to environmental factors. However, the combined influence of clonal reproduction and dioecy on tree growth responses remains poorly understood.

The aim of this study was to determine whether sex and reproductive strategy (clonal individuals vs. singletons) influence radial growth and its relationship with climatic and hydrological conditions in white poplar (*Populus alba*). The study was conducted in two riparian forest populations located in the Warta River valley in western Poland (Rogalin Landscape Park in Rogalin and Dębina Forest in Poznań), where relationships between radial growth and temperature, precipitation, river water level, and the Standardized Precipitation-Evapotranspiration Index (SPEI) were analyzed.

Hydrological conditions showed the strongest influence on radial growth. Water level in the Warta River was positively correlated with tree growth during the spring–summer period of the current growing season in both populations. Growth sensitivity to moisture conditions expressed by the SPEI index was significant in both sites, however, differences among groups were detected only in the urban population (Dębina Forest). At this site, radial growth of singletons responded more strongly to moisture variability than that of clonal individuals, and male trees were more sensitive than females.

These results indicate that both clonality and sex may modify tree growth responses to hydroclimatic factors, although their importance also depends on local habitat conditions. The study highlights the need to consider both clonality and sex-related differences in dendroclimatological analyses of dioecious tree species.

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