

BIOLOGICAL RESPONSE OF SOME ARBOREAL SPECIES TO CLIMATE TRENDS IN A MEDITERRANEAN AREA

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One of the oldest definitions of phenology was made by Lieth in 1974 in which phenology was described as “the art of observing life cycle phases or activities of plant and animals in their temporal occurrence throughout the year”. In its present meaning phenology for plants is the study of the events that contribute to the manifestation of phenomena associated with the functioning of some plant’s organs, or of a plant as a whole also, some factors such as photoperiod, air and soil temperature, solar illumination and snow cover influence phenology of every species (Reed, 1994). Among the observable phenomena there are flowering, growing new leaves and losing old ones, or any other observable cyclic phenomenon.

These data permit us to create the maps of pollen and spore flows, which, when integrated with meteorological models, allow us to elaborate regional phenological calendars. In ecology and climatology, both phenology and symphenology are used to determine the degree of climatic changes and their potential consequences (Kramer et al., 2000; Orlandi et al., 2005).

There is also a new application of phenology in which it is possible to predict tree species distribution by a process-based model. In this case some processes such as survival and reproductive ones are considered the functions of phenology. Therefore, phenology is considered as one of the best ways to analyze climate and its shifts which cause consequences in ecosystems. In the Northern hemisphere global warming which has influenced plants phenology was registered, this influence mirrored in an earlier flowering and a longer period of active growth. The main factors which contribute to determinate phenological shifts are air temperature (Chmielewski et al., 2001) and day length, especially in temperate zones.

The aim of this study was to analyse the average trends of vegetative and reproductive development of some vegetative species (*Cornus sanguinea* L., *Crataegus monogyna* Jacq., *Corylus avellana* L., *Ligustrum vulgare* L., *Robinia pseudoacacia* L., *Salix acutifolia* Willd., *Salix smithiana* Willd., *Sambucus nigra* L.) typical ones or adapted to the Mediterranean environment, over a ten-year period (1997-2006). The study was carried out in the phenological garden situated near Perugia, central Italy. In addition, the use of climatic variables, which show yearly temperature accumulation, allowed us to examine for some species the correspondence between climate and reproductive development, using phenology as a tool for studying climate-plant relationships and, in particular, for monitoring actual and eventual climate changes. The results of the statistical analyses show a strong relationship between the temperature trends and vegetative-reproductive seasonal evolutions interpreted by phenological data for all the species considered. Moreover, it was demonstrated that the plants studied may approach or close completely the timing gaps eventually created during the first phenological phases, adjusting thus the beginning of subsequent phenophases.

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