Nutrient status: a missing factor in phenological and pollen research?

Phenology ranks among the best ecosystem processes for fingerprinting climate change since temperature explains a high percentage of the interannual or spatial variation in phenological onset dates. However, roles of other environmental variables, such as foliar nutrient concentrations, are far from adequately understood. This observational study examined the effects of air temperature and 11 nutrients on spring phenology of Betula pendula Roth (birch) along an urban-rural gradient in Munich, Germany, during the years 2010/2011. Moreover, the influence of temperature, nutrients, and air pollutants (NO2 and O3) on the amounts of pollen and catkin biomass in 2010 was evaluated. In addition to the influence of higher temperatures advancing phenological onset dates, higher foliar concentrations of potassium, boron, zinc, and calcium were statistically significantly linked to earlier onset dates. Since flushing of leaves is a turgor-driven process and all the influential nutrients are involved in cell extension, membrane function, and stability, there might be a reasonable physiological interpretation of the observed association. The amounts of pollen were negatively correlated with temperature, atmospheric NO2, and foliar iron concentration, suggesting that these variables restrict pollen production. The results of this study suggested an influence of nutritional status on both phenology and pollen production. The interaction of urbanization and climate...
change should be considered in the assessment of the impact of global warming on ecosystems and human health.