POLLEN EMISSION AND CLIMATE CHANGE

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According to the World Health Organization (WHO):
- Allergy is the fourth chronic disease in the world
respiratory allergies rank first among infant chronic diseases.
- Pollen is the major source of outdoor allergens.

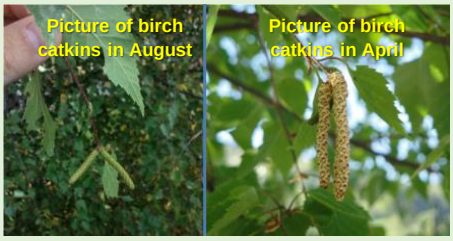
Phenology is the study of the seasonal development phases for plants: leafing, flowering, fruiting, autumn yellowing. These developments are linked to certain climatic parameters. Phenology is an essential parameter for understanding the functioning of forest ecosystems and in particular for tree growth.

The RNSA (French Aerobiology Network) operates a net of pollen monitoring traps with more than 70 sites. For this study we selected 6 historical location : Lyon, Paris, Montluçon, Strasbourg, Toulouse, Amiens.
The RNSA coordinate a net of botanic garden where it monitors phenological data from the main allergic plants.
The most commonly used phenophases are the appearance of inflorescence (stage 5) and flowering (stage 6).

Pollen *traps in France*

Picture of a Hirst pollen trap

The start date of the new production of catkin or buds is not always fixed but depends on the species and seasons.
The beginning of birch pollen season has been trending ahead until about 2004. After the trend reversed, the actual date being nearly the same than 20 years ago (**FigA**).



The pollination needs a period of accumulation of cold degrees (Chilling) and later an accumulation of warm degrees (Forcing). With climate change these periods may be shorter or longer depending on the autumn and winter temperatures. In the most recent period, milder winters delay dormancy release and cancel the advance of spring phenology induced by warmer springs (**Fig. A**).

Birch pollen increased more than 20% (**Fig B**) with an upward trend and a significant correlation with mean temperature.

The effects of climate change are less marked on the pollen of herbaceous plants than on trees (**Fig C**).

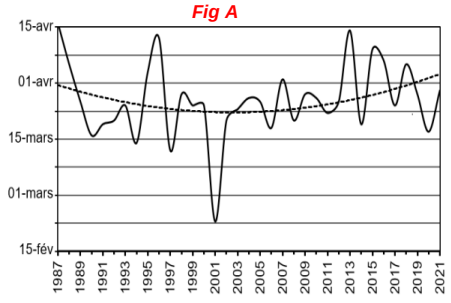


Figure A : Evolution of the beginning of birch pollination in Paris over 30 years

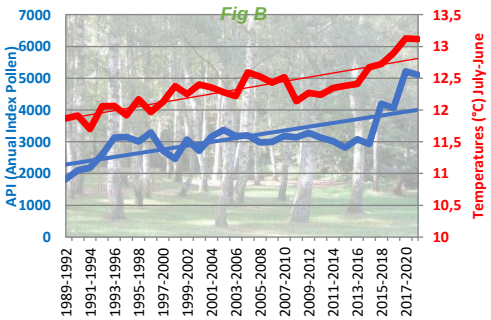


Figure B : Moving average of annual birch pollen integral and mean annual temperature for 6 cities in France over 30 years.

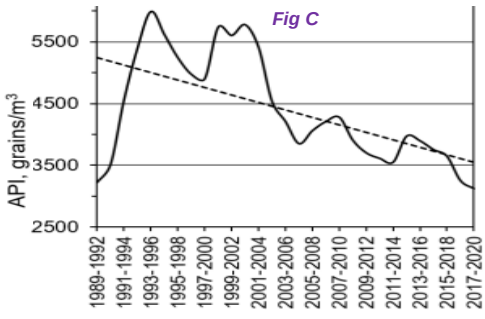


Figure C : Moving average - Evolution of the annual pollen integral (APIn) of Poaceae (grasses) for 6 cities in France over 30 years.

Conclusion

Phenological studies allow a direct follow of pollen sources by determining the flowering interval and peak for each species.
The monitoring of the flowering season over several decades makes possible to study the influence of climate changes.

Reference : (1) *Besancenot JP, Sindt C, Thibaudon M (2019). Pollen et changement climatique. Bouleau et graminées en France métropolitaine. Rev fr Allergol 59 (8) : 563-575.*

Authors have no conflict of interest