

## Relationship between airborne pollen grains, wind direction and land use in SW of Iberian Peninsula using Geographic Information Systems (GIS)

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**Introduction.** Assessment of the airborne content (mainly pollen grains and fungal spores) in an extensive territory, with different landscapes is a difficult task because both vegetation diversity and winds affect directly the results. Thus, an application of the Geographic Information Systems (GIS) software and circular statistics in aerobiology can be found as helpful tools for this purpose. The aims of this study were: 1) to analyze the behaviour of airborne pollen grains using daily mean concentrations of 15 pollen taxa, 2) to discuss the hourly trends in the distribution of the main 5 pollen types and their relationship with the predominant wind direction, and 3) to analyze the influence of land use nearby the pollen traps, in areas of 10 and 20 km in diameter, surrounding the three cities studied.

**Material and Methods.** Maps of the main land use in the areas (buffer) of 10 and 20 km in diameter surrounding the pollen traps were created using GIS software, and image analysis software was used for quantifying the surface occupied by for each land use category based upon colour assessment.

Daily concentrations of pollen grains (15 taxa, measured with Hirst type traps) were analysed and compared with predominant wind directions measured in three localities of the SW Iberian Peninsula, i.e: Don Benito, Plasencia and Zafra, from March 2011 to March 2014.

**Results.** The main land use in Don Benito were irrigated crops and pastures (*Poaceae* sp. *Plantago* sp., *Astaraceae* sp.), in Plasencia, hardwood forests (mainly from *Quercus pyrenaica*, *Q. suber* and *Castanea sativa*), and in Zafra, pastures and hardwood forests (*Q. rotundifolia* and *Q. suber*). Comparison of the daily concentrations of pollen grains with the predominant winds and land use shows that the atmospheric concentrations of collected pollen grains in the trap reflect the source areas identified in the inventory, as happened with pollen types *Alnus glutinosa*, *Amaranthaceae*, *Anthemideae*, *Castanea sativa*, *Echium*, *Eucalyptus*, *Fraxinus-Phillyrea*, *Plantago*, *Poaceae*, *Rumex* and *Salix*. Nevertheless, these relationships were not found for the pollen types *Olea europaea*, *Quercus*, *Urticaceae* p.p. and *Urtica membranacea*.

**Conclusions.** This method could be helpful in order to estimate the contribution and potential risk of some pollen types. Airborne pollen concentration is related with the surrounding vegetation and land use distribution nearby traps most of the time. However, other factors as transport of particles to medium or long-distance, or even location of pollen trap within a city, also have a direct influence in the aerobiological content.

**Keywords:** wind direction, land uses analysis, GIS.