

Lol p 5 IN THE BIOAEROSOL OF VALLADOLID (SPAIN) AND ITS IMPLICATIONS ON PUBLIC HEALTH

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Introduction

The grass pollen allergen is the most important in the world and the leading cause of pollinosis. Lol p 5 belongs to the group 5 allergens of grasses and it has ribonucleasa activity. Group 5 has high homology in the amino acid sequence which results in a strong cross reactivity between species.

This study aims to investigate the relationship between the atmospheric concentrations of Lol p 5 aeroallergen, *Poaceae* pollen (Fig. 2) and different air pollutants in the city of Valladolid (Spain).



Fig. 1. *Lolium multiflorum*.



Fig. 2. Pollen grains of *Poaceae* (OM, x40).

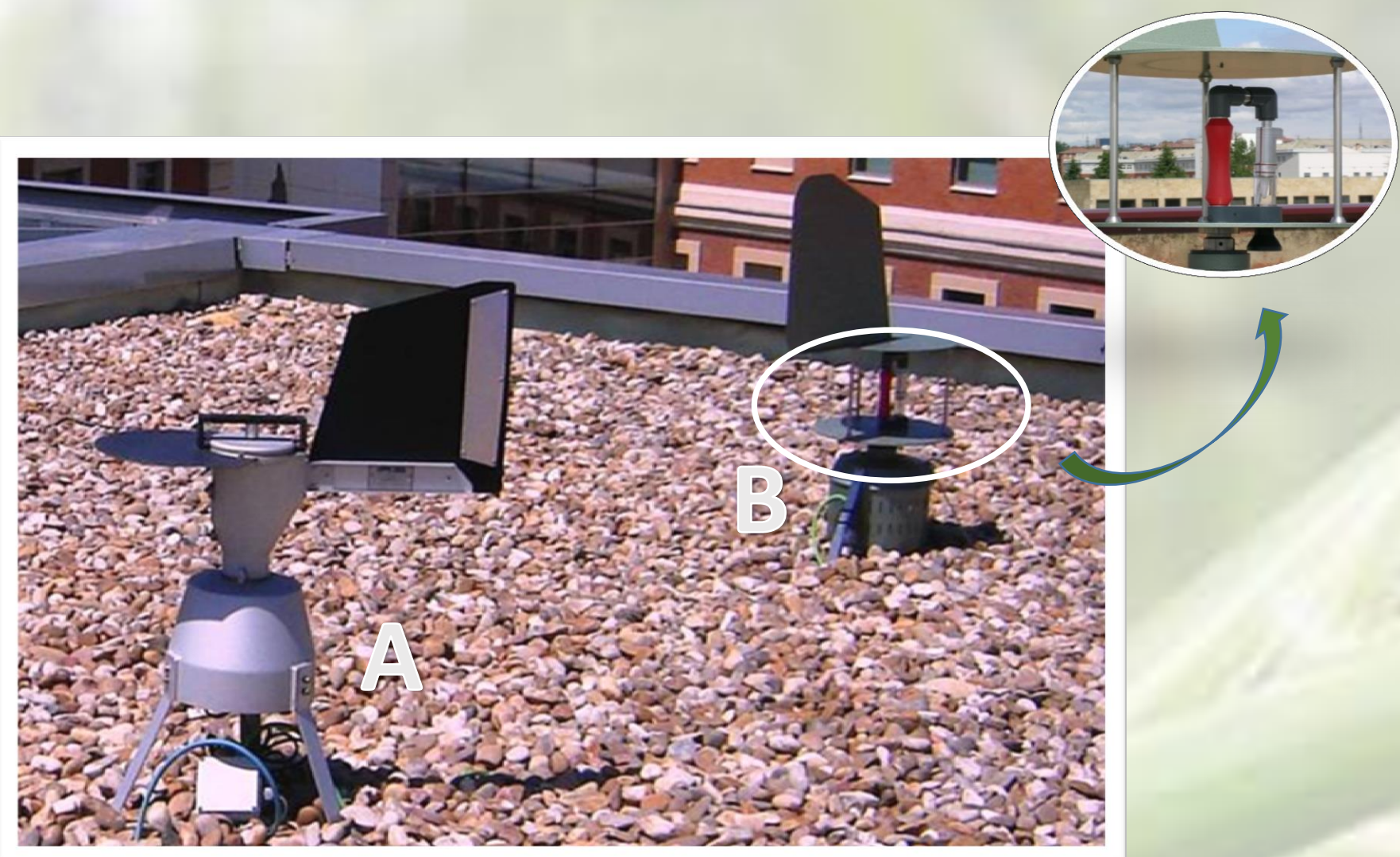


Fig. 3. : A. Hirst-type volumetric trap
B. Burkard Cyclone sampler.

Material and Methods

The pollen sampling was carried out using a Hirst-type volumetric trap (Lanzoni©) for pollen grains (Fig. 3A) and a Burkard Cyclone sampler (Burkard©) for Lol p 5 allergen (Fig. 3B) over a period of 3 years (2009-2011). The samples of pollen were prepared and analysed following the procedure recommended by the Spanish Aerobiology Network (Galán *et al.*, 2007) and allergens were analysed following ELISA sandwich “DAS”, with some modifications.

Air pollutant (PM10, PM2.5, NO and NO₂, carbon monoxide, sulfur dioxide, ozone and bencene) concentrations have been provided by the Valladolid Air Pollution Control Network.

We have used Spearman’s test through the SPSS 14.0 statistical package in order to establish potential correlations between daily pollen and Lol p 5 concentrations and different air pollutants.

Results and Discussion

Poaceae pollen represented the 4.2%, 10.4% and 8.9% of the total airborne pollen in the years 2009, 2010 and 2011, respectively (Table 1). The highest concentrations occur between May and July (Fig. 4).

Lol p 5 was mostly detected in the fortnight between May 20 and June 4 in the three years of study and a different number of days in each year (46 in 2009, 60 in 2010 and 30 days in 2011) (Table 2). The aeroallergen Lol p 5 and grass pollen show a significant and positive correlation (Table 3).

The aerobiological dynamics of Lol p 5 and particulate matter and nitrogen oxides are quite similar, particularly during the *Poaceae* pollination period.

The higher concentrations of Lol p 5 have been recorded when ozone levels decreased, which has been shown in other studies (Albertine *et al.*, 2014) (Fig. 5). High concentrations of sulfur dioxide were able to inhibit the release of Lol p 5 in 2011, which has been shown in studies in vitro (Behrendt *et al.*, 1997; Sousa *et al.*, 2012; Cuinica *et al.*, 2013, 2014).

Conclusions

Poaceae pollen was the most important pollen type between the herbaceous plants in the atmosphere of the city of Valladolid.

The higher levels of Lol p 5 coincide with a high concentration of *Poaceae* pollen. In Valladolid, the last days of May and the first week of June may be considered periods of risk to human health. The influences of meteorological variables and air pollutants on pollen and allergenic proteins must be taken into account together due to atmospheric photochemical reactions.

Poaceae pollen	2009	2010	2011
IPA	839	1538	1969
PPP	22 February-30 August	2 March-1 August	18 March-16 August
Number of days in PPP	190	153	152
% of the total airborne pollen	4.2%	10.4%	8.9%
Peak day	12 July	24 May	21 June
Pollen/m ³ of the peak day	30	259	114

Table 1. Data grass pollen.

Lol p 5	2009	2010	2011
Sampling period	20 May-31 August	7 April-31 August	1 April-24 August
Study days	104	147	146
Screening days	46	60	30
Annual Index	373	5837,94	217,60
Peak day	20 May	4 June	25 May
Pg/m ³ of the peak day	69.9	901.2	67.6

Table 2. Data aeroallergen Lol p 5.

	Year		Lol p 5
Poaceae pollen	2009	Study period	0.66(**)
		MAP	0.18
	2010	Study period	0.78(**)
		MAP	0.67(**)
	2011	Study period	0.41(**)
		MAP	0.01
	2009-2011	Study period	0.52(**)
		MAP	0.04

Table 3. Spearman correlation indices among Lol p 5 and *Poaceae* pollen, during the study period of allergen and during the Main Allergenic Period (MAP). Significance level (**) 0.01.

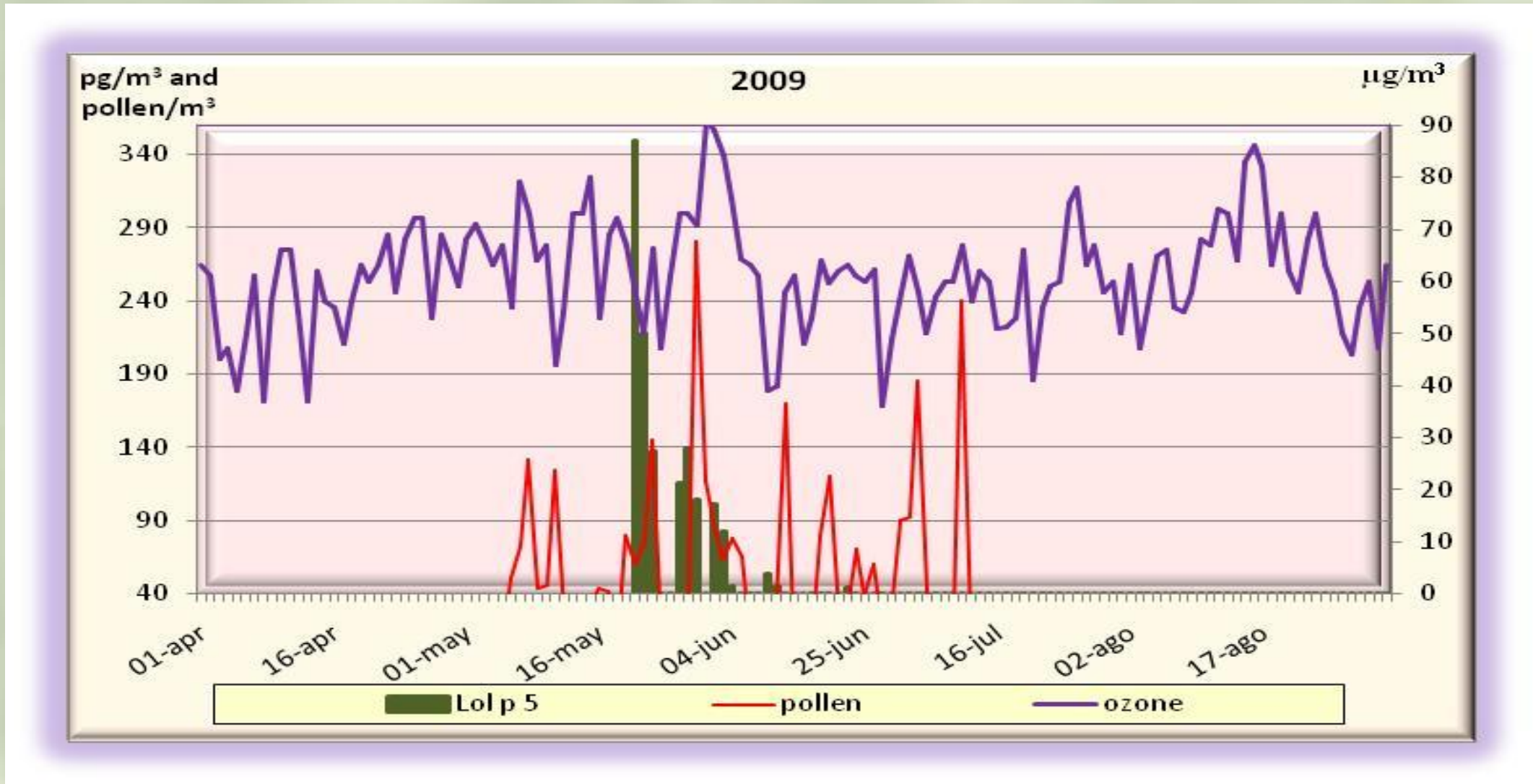


Fig. 5. Variations of daily concentrations Lol p 5 (pg/m³), *Poaceae* pollen (pollen/m³) and ozone (ug/m³) in Valladolid in 2009.

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