

## Comparison of Pollen Levels Between 2 Pollen Traps in Salamanca, Spain

Rodríguez D<sup>1</sup>, Dávila I<sup>2</sup>, Sánchez E<sup>1</sup>, Lorente F<sup>2</sup>, Sánchez J<sup>1</sup>  
<sup>1</sup>Department of Botany and Plant Physiology and Instituto Hispano-Luso de Investigaciones Agrarias (CIALE), Universidad de Salamanca, Salamanca, Spain  
<sup>2</sup>Servicio de Inmunoalergia, IBSAL, Hospital Universitario de Salamanca, Salamanca, Spain

J Investig Allergol Clin Immunol 2016; Vol. 26(2): 116-117  
 doi: 10.18176/jiaci.0023

**Key words:** Pollen. Sampler location. Aerobiology. Salamanca. Spain.

**Palabras clave:** Polen. Localización del captador. Aerobiología. Salamanca. España.

In recent years, an increasing number of aerobiological sampling stations have been installed in urban areas to report airborne pollen content. Several authors have studied the differences in atmospheric pollen levels between cities, which are mainly due to variations in local climatic and geographical conditions and to urban management [1,2]. Other studies in 2 or more areas of the same city showed differences that were attributable to sampler height, variations in vertical movement of air [3], and surrounding vegetation [4].

In the present study, we investigated the airborne pollen content of Salamanca (midwestern Iberian Peninsula [40° 58' N; 5° 40' W], Mediterranean continental climate, 800 m above sea level) by comparing 2 sampling stations located at different heights between February 1, 2007 and February 7, 2008 (372 days). Our objective was to record potential differences in moderate and high pollen concentrations that could cause symptoms in sensitized people.

Aerobiological samples were collected using 2 Hirst type volumetric pollen traps based on the impact principle [5]. Sampler 1, a Burkard 7-day recorder (Burkard Manufacturing Co Ltd) was placed on the roof of a centrally located municipal building 20 m above ground level. The immediate surroundings are characterized mainly by historical buildings and narrow streets with a low number of trees. Sampler 2, a VPPS 2000 (Lanzoni s.r.l.), was placed on the roof of the Faculty of Pharmacy at 30 m above ground level. The building is located on the outskirts of the city near the Tormes River and its riverside forests, 1.5 km west of the first location.

Sampling, slide preparation, and data interpretation were all performed by the same person, who also recorded days with moderate and high pollen levels, following the criteria of the Spanish Aerobiology Network [6]. Total days with moderate and high levels in 2 samplers were obtained when at least 1 type of pollen reached moderate and high concentrations. The Spearman rank correlation coefficient was used to establish the relationship between the daily pollen counts of both samplers. This test was chosen because daily pollen counts are not normally distributed. Statistical analysis was carried out using SPSS Version 12.0.

Table. Aerobiological Data From 2 Samplers During the Study Period and Spearman Rank Correlation Coefficients for Comparison of Levels of the Main Pollen Types

	Sampler 1				Sampler 2				Spearman Correlation Coefficient <sup>b</sup>
	Total Pollen	Peak Value <sup>a</sup>	Peak Day	Days With Moderate/High Levels	Total Pollen	Peak Value <sup>a</sup>	Peak Day	Days With Moderate/High Levels	
Total	31 478	957	June 8	106	28 493	959	March 10	100	0.939
<i>Quercus</i>	9352	689	June 6	38	8368	551	May 13	38	0.845
Poaceae	7764	355	June 30	72	6932	282	June 30	73	0.902
Cupressaceae	4047	550	March 4	26	3728	853	March 10	15	0.700
<i>Plantago</i>	1706	159	July 13	16	1437	106	May 10	13	0.860
<i>Populus</i>	1087	180	March 19	4	1465	322	March 13	6	0.935
<i>Platanus</i>	1017	297	April 16	5	751	117	March 19	7	0.789
<i>Rumex</i>	1012	52	May 11	10	1031	58	May 11	10	0.847
Urticaceae	969	31	June 23	9	950	43	April 29	9	0.799
<i>Olea</i>	678	162	June 8	2	525	107	June 8	2	0.660
<i>Fraxinus</i>	425	51	February 16	1	504	53	March 10	1	0.759
<i>Castanea</i>	410	62	July 8	2	374	60	July 8	1	0.843
<i>Pinus</i>	686	79	June 5	1	236	42	June 6	0	0.646

<sup>a</sup>Pollen grains/m<sup>3</sup>

<sup>b</sup>P<.01.

The total number of airborne pollen grains counted during the 372 study days was higher in sampler 1 than in sampler 2 (64 and 61 types of pollen, respectively). Boraginaceae, *Pittosporum*, Scrophulariaceae, *Sophora*, and Thymelaeaceae grains were not found in sampler 2, and *Convolvulus*, *Medicago*, and *Philadelphus* grains were not found in sampler 1. The main types of pollen in both samplers were *Quercus*, Poaceae, and Cupressaceae, which together accounted for 67% of the total pollen levels recorded. Sampler 1 showed higher total pollen levels and higher peak values for all but 18 pollen types (mainly *Populus*, *Fraxinus*, *Rumex* and Ericaceae). Levels of Cupressaceae pollen grains were higher in sampler 1, although their maximum daily concentration was higher in sampler 2. With respect to the moderate and high daily levels reported for the main pollen types, sampler 1 revealed more days with moderate and high levels in most cases, except for Poaceae, *Populus*, and *Platanus*, for which moderate and high levels were observed on more days in sampler 2 (Table). The number of days with high levels for *Fraxinus*, *Olea*, *Rumex*, and Urticaceae was the same for both samplers.

The Spearman rank correlation coefficient revealed high correlations between the total daily counts of the 2 sampling sites, with significant values ( $P < .01$ ) for the main types of pollen.

Knowledge of atmospheric pollen levels can improve the diagnosis and treatment of pollen allergy. Another study conducted in the same area showed that sensitization was most frequent to Poaceae, followed by *Olea*, Cupressaceae, *Plantago*, *Artemisia*, and *Platanus* [7]. Few differences were obtained after comparison of the 2 samplers, revealing a close statistical correlation between them, as reported in other southern European cities [8,9]. Small variations recorded in the occurrence of peak days in both samplers and even lower correlation coefficients in some pollen types during the study period could be due to differences in the distribution of urban flora throughout the city. In addition, local differences in the timing of the peak could be significant for some people with pollen allergy [10]. Our results indicate that 1 volumetric sampler is sufficient to record the main airborne pollen types, their atmospheric behavior, and daily high levels in an urban area.

#### Funding

The study was partially supported by Castilla y León Regional Government (Public Health Council, agreement code H42).

#### Conflicts of Interest

The authors declare that they have no conflicts of interest.

#### References

- Alcázar P, Cariñanos P, De Castro C, Guerra F, Moreno C, Domínguez-Vilches E, Galán C. Airborne plane-tree (*Platanus hispanica*) pollen distribution in the city of Córdoba, South-western Spain, and possible implications on pollen allergy. *J Invest Allergol Clin Immunol*. 2004;14(3):238-43.
- Recio M, Rodríguez-Rajo FJ, Jato V, Trigo MM, Cabezero B. The effect of recent climatic trends on Urticaceae pollination in two bioclimatically different areas in the Iberian Peninsula: Malaga and Vigo. *Clim Change*. 2009;97:215-28.
- Alcázar P, Galán C, Cariñanos P, Domínguez-Vilches E. Diurnal variation of airborne pollen at two different heights. *J Invest Allergol Clin Immunol*. 1999;9(2):85-9.
- Gonzalo-Garijo MA, Tormo-Molina R, Muñoz-Rodríguez AF, Silva-Palacios I. Differences in the spatial distribution of airborne pollen concentrations at different urban locations within a city. *J Invest Allergol Clin Immunol*. 2006;16(1):37-43.
- Hirst JM. An automatic volumetric spore trap. *Ann Appl Biol*. 1952;39(2):257-65.
- Galán C, Cariñanos P, Alcázar P, Domínguez E. Spanish Aerobiology Network (REA): Management and Quality Manual. Córdoba: Servicio de publicaciones de la Universidad de Córdoba; 2007.
- Rodríguez D, Dávila I, Sánchez E, Barber D, Lorente F, Sánchez J. Relationship between airborne pollen counts and the results obtained using 2 diagnostic methods: Allergen-Specific Immunoglobulin E Concentrations and Skin Prick Tests. *J Invest Allergol Clin Immunol*. 2011;21(3):222-8.
- Arobba D, Guido MA, Minale P, Montanari C, Placereani S, Pracilio S, Troise C, Voltolini S, Negrini AC. Airborne pollen in Genoa (NW-Italy): a comparison between two pollen-sampling stations. *Aerobiologia*. 2000;16:233-43.
- Velasco-Jiménez MJ, Alcázar P, Domínguez-Vilches E, Galán C. Comparative study of airborne pollen counts located in different areas of the city of Córdoba (South-Western Spain). *Aerobiologia*. 2013;29:113-20.
- Fernández-Rodríguez S, Tormo-Molina R, Maya-Manzano JM, Silva-Palacios I, Gozalo-Garijo A. Comparative study of the effect of distance on the daily and hourly pollen counts in a city in the South-Western Iberian Peninsula. *Aerobiologia*. 2014;30:173-87.

■ Manuscript received July 20, 2015; accepted for publication August 24, 2015.

#### David Rodríguez de la Cruz

Department of Botany and Plant Physiology  
University of Salamanca  
Licenciado Méndez Nieto, s/n  
37007 Salamanca  
Spain  
E-mail: droc@usal.es