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BRIEF COMMUNICATION

Parietaria pollen a new aeroallergen in the city of Valparaiso, Chile

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Abstract *Parietaria* pollen has never been considered as a significant cause of pollinosis in Chile; therefore, the sensitization to *Parietaria* study has never been included in the study of patients with clinical suspicion of pollinosis in this region. The objective of this study was to describe the clinical characteristics of pollinosis caused by *Parietaria* in the Valparaíso region, related to air concentrations of this kind of pollen. A cross-sectional study was performed in the city of Valparaíso. It consisted of two stages: In the first, pollen grains were counted between 1999 and 2001. In the second, a sensitization profile on a patient population diagnosed with ARC (allergic rhinoconjunctivitis) was evaluated. *Parietaria judaica* (*P. judiaca*) presented pollination all year long, with aggravation in the spring and summer, and with values reaching 80 grains/m^3 (weekly average). These findings determined the transience of the symptoms in this population, which is mainly perennial with seasonal aggravations. A total of 72 atopic subjects were obtained during the whole sample recollection period. *P. judaica* was the second most frequent cause of sensitization (60 %) after *Dermatophagoides* in the sample overall. Also, in monosensitized subjects, it was the first cause of pollen sensitization. *P. judaica* represents the second cause of allergy in Valparaíso and the first cause of pollinosis. These findings suggest the importance of

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quantifying *Parietaria* in Valparaíso and near cities, plus investigating the presence of sensitization and symptoms to allergies in a significant proportion of patients in this region.

Keywords Allergenic pollen · Airborne pollen · Hypersensitivity · Valparaiso Chile · *Parietaria* pollen

1 Introduction

Parietaria is a perennial dicot weed that belongs to the *Urticaceae* family (Accorsi and Bandini Mazzanti 1980). It can be found in the periphery of urban areas growing on walls and floors high in nitrogen (Colombo et al. 2003). *Parietaria* pollen is one of the most important outdoor allergenic sources across the Mediterranean countries (Hernandez Prieto et al. 1998; Bousquet et al. 1984; Terzioglu et al. 1998), were pollinates from spring to autumn with peaks form May to June (1,000 grains/m^3 of air) (D'Amato 2002). Due to its prolonged pollen season, up to 80 % of patients with pollinosis in the Mediterranean region are sensitized against *Parietaria* allergens. (D'Amato and Labetalol 1989; Pérez and Gorgues 1986; Bousquet et al. 1986). And, about 52 % of these patients have rhinitis and asthma (D'Amato et al. 1992; D'Amato 2002). Although the weed *Parietaria* is one of the most common allergen sources in the Mediterranean countries (Makris et al. 2010; Fotiou et al. 2011), it also can be found sparsely in temperate regions of central and eastern Europe (Holgate et al. 1988), Australia (Ford et al. 1986), and California (Kaufman 1990), where other weeds predominate.

Chile has a large proportion of cities with a Mediterranean weather, which has allowed the introduction of foreign species, mainly from Europe. The city of Valparaiso is Chile's main port and has a particular profile, because, despite being a coastal town where pollinosis is rare, it is often to find patients suffering from seasonal ARC. Valparaiso is located on the Pacific coast in the center of the country, and his geography consists of a bay, a narrow coastal plain and a series of hills. Its coordinates are 33°03′S and 71°37′W. In view of its location and altitude, Valparaiso has a Mediterranean climate with dry and warm summers, and wet winters. The average annual temperature is 14.5 °C, with a low daily temperature range due to the attenuation of the Humboldt Current. In July, which is the coldest month, the average temperature is 11.6 °C, while in the summer is around 18 °C approximately and rarely exceeds the 30 °C. Atmospheric humidity is high (median value of 82 %), while the average total annual rainfall is 372 mm, with July being the wettest month (112 mm). It can be found typical coastal vegetation, with shrubs such as peumo and boldo trees, weeds, and grasses. On the 400 and 1,000 m above sea level, there is the so-called sclerophyll forest.

Parietaria pollen has never been considered as a major cause of pollinosis in Chile; furthermore, there were no data concerning the presence of these weeds in our country. Due to the Valparaiso climatic conditions, beside the clinical features of ARC patients, we wanted to assess the presence of *P. judaica* in this city. Then, we proceeded to study the sensitization pattern to this herb, in order to describe the clinical characteristics of this type of pollinosis, and correlate with their air concentrations along the year. This is the first study about *P. judaica* pollinosis in Chile, and the first report of its presence in the Chilean vegetation.

2 Materials and methods

2.1 Study design

A cross-sectional study was performed in the city of Valparaíso. It consisted of two stages: In the first, pollen grains were counted between 1999 and 2001. In the second, a sensitization profile on a patient population diagnosed with ARC was evaluated.

2.2 *Parietaria judaica* pollen count

The pollen counts in the city of Valparaíso were performed between 1999 and 2001. A Hirst Volumetric trap was used to study de pollen count (Burkard Seven Day Spores-Trap®). The trap was located 20 m above the ground, on the roof of Carlos Van Buren Hospital, in Valparaíso, at the foothills and 500 m retired from the seashore, according to the proposed methodology and regulations established by the World Allergy Organization (Hasnain et al. 2003) but counting was improved with standards based in Methodology used by the Spanish Aerobiological Network (Red Española de Aerobiología 2002). The identification and subsequent pollen grain count was performed with an optic microscope observing a range of vision with a zoom of 400 × 10. The counting was performed along four

longitudinal and equidistant traverses of each slide, obtaining an average pollen count of these traverses, so each slide represents the "average" prevalence of pollen concentration over 24 h. For easier medical interpretation and according to a format commonly used in allergological literature, we represent the graphics as the juncture of the points representing each point the weekly average of daily pollen counts.

2.3 Patients

A non-probability sampling was performed on those subjects that went for medical advice to Carlos Van Buren Hospital's Immunology and Allergy Service, Valparaiso, Chile, between December 1998 and January 2000. Inclusion criteria were a diagnosis of ARC and/or asthma, according to international criteria (Bousquet et al. 2008; Kroegel 2009), of at least one year of progression and place of residence in Valparaíso for at least one year at the moment of consultation. The study was approved by the Bioethical Committee for Human Research of the Carlos Van Buren Hospital. All patients signed an informed consent.

2.4 Skin prick test

All patients were tested by a skin prick test (SPT) against 8 aeroallergens (Table 1). The SPT was performed according to international guidelines (Bousquet et al. 2012). The positive and negative controls and all allergens were provided by the Laboratory of Immunology of the Clinical Servet Clinic.

2.5 Statistical analysis

The Kolmogorov–Smirnov test was used for quantitative variables. Differences were considered significant when $p \leq .05$, with a 95 % of trust level and alpha error of 5 %. All statistical analyses were performed using SPSS v15.0 software.

3 Results

3.1 Demographic characteristics

A total of 72 atopic subjects were obtained during the whole sample recollection period. The quality of the data was checked and found none missing. The patients age ranged from 13 to 76 years and 81.9 % of them were female. Age presented a non-normal distribution (Kolmogorov–Smirnov $p < .001$). 60 % of subjects presented ARC related to Asthma, while 28 % presented just ARC. From the latter, 44 % presented perennial symptoms with seasonal aggravation, and 33 % were just seasonal.

Table 1 Prick test sensitivity profile in 72 subjects with ARC and/or Asthma, Valparaíso

Allergens	*n* (%)
Dermatophagoides mix	45 (62)
Parietaria judaica	43 (60)
Grass mix	36 (50)
Weeds mix	31 (43)
Fungi mix	25 (35)
Trees mix	25 (35)
Cat and dog epithelium	24 (33)
Cockroach	23 (32)

ARC allergic rhinoconjunctivitis

3.2 *Parietaria judaica* pollen count

During the three years of air sampling, *P. judaica* presented pollination all year long, with higher concentrations in the spring and summer, with values reaching up 80 grains/m^3 (weekly average) and 150 grains/m^3 as a daily count (Fig. 1). Constantly in the monitored period, weekly average levels over 15 grains per cubic meter of air were registered between months of September to February.

October to December showed the highest concentrations, and the average weekly peak was reached in the last weeks of October and the first weeks of November.

We observed differences in total pollen counts between the years studied with 1,253 grains for the first year, 1,356 grains for the second year and 1,209 grains for the third year.

3.3 Sensitization profile

Parietaria judaica was the second most frequent cause of sensitization (60 %) after *Dermatophagoides* (Table 2). Even more, in monosensitized subjects, it was the first cause of pollen sensitization (Table 2). On the other hand, in those subjects sensitized to *P. judaica* pollen, 86 % were poly-sensitized and 14 % were mono-sensitized.

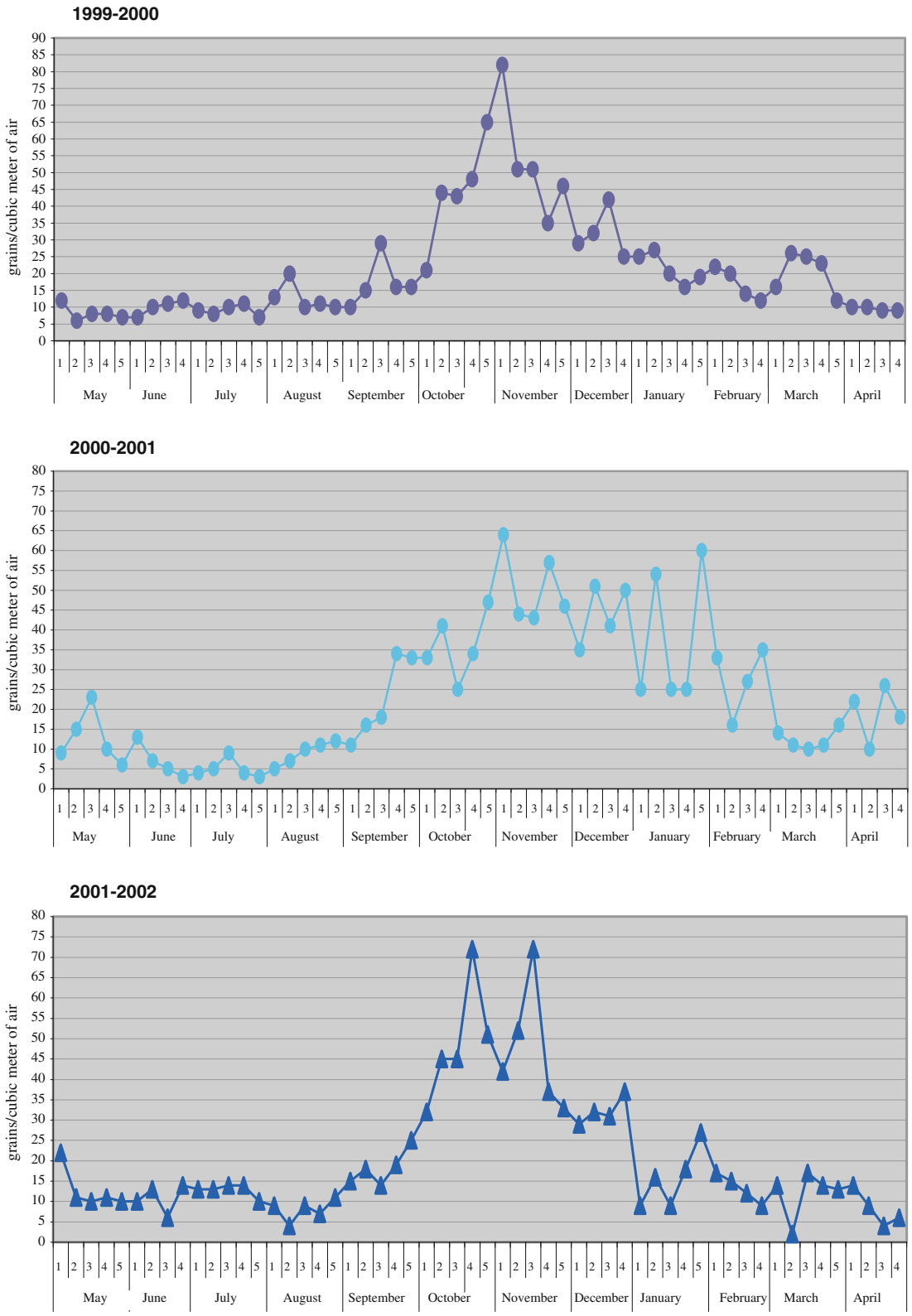

Fig. 1 Weekly *Parietaria judaica* pollen concentrations average between 1999–2000, 2000–2001, and 2001–2002

4 Discussion

The pollen dynamic and its atmospheric records vary ostensibly depending on the different vegetables and weather conditions with seasonality as its most important characteristic; therefore, the availability of a kind of pollen is not the same over the 12 months of the year, which is also dependant on the geographic surroundings (Guzmán 2004; Luengo and Cadahia 2003). *P. judaica* presents pollination all year long, with aggravation in the spring and summer, and with values reaching 80 grains/m^3 (weekly average). These findings determine the transience of the symptoms of patients with pollinosis that lives in this city, characterized by persistent symptoms with seasonal exacerbations.

Furthermore, sensitization to *Parietaria* pollen is very variable according to the geographical area and is more frequent among subjects living in coastal cities (Liccardi et al. 1996; D'Amato et al. 1996; Fotiou et al. 2011). Naples, port city with Mediterranean weather, presents a sensitization prevalence to this pollen of about 80 % (D'Amato et al. 1991). Given these records along with the similarities between the two cities, it is expected the high proportion of allergic patients sensitized to *Parietaria* in the port of Valparaiso.

According to the age range, this pollinosis is less frequent before age 10, which is coherent with our study in which subjects showed sensitization to *P. judaica* over age 13 (Luengo and Cadahia 2003). Both D'Amato et al. (1992) and Guerra et al. (1998) have reported a greater frequency of sensitization to *Parietaria* in females than in males. These findings match our results due to the increased frequency of female in this study.

In relation to the clinical relevance of sensitization to *Parietaria*, the Spanish epidemiologic study Alergológica (Navarro et al. 2009) describes this pollen as the main cause of sensitization in patients with ARC versus Asthma (10.9 vs. 7.3 % $p < .05$ %), similar to Valparaiso's case, where the figures were 28 and 12 %, respectively.

In relation to the sensitization profile, the results showed that in the poly-sensitization cases, allergy to *Parietaria* was associated with an increased sensitization frequency to pollen of other weeds, grasses, and *Dermatophagoides.* Masullo and col. confirm this information when they describe that in poly-sensitized subjects the allergy to *Parietaria* pollen relates to sensitization to gramineae pollen (84.8 %) and *Dermatophagoides farinae and pteronyssinus* (37.4 and 36.2 %, respectively) pollen (Masullo et al. 1996).

An important limitation of our study was the small size of our sample, taken into account the amount of subjects expected to present ARC. This challenge appeared due to administrative issues with Chile's Public Health System related to the few possibilities patients affected with ARC had to receive treatment in hospitals at a medical specialty level and the fact that patients rarely met the research physicians to receive attention.

In conclusion, *P. judaica* represents the second cause of allergy in Valparaíso and the first cause of pollinosis. These findings suggest the importance of quantifying *Parietaria* pollen in Valparaíso and near cities. These data are of great importance, both for a better understanding of the clinical profile of patients with ARC, as further immunotherapeutic options. More studies must be performed in Chile to make available the aerobiological information of its regions and its clinical relevance on subjects with allergic respiratory diseases.

Table 2 Monosensitivity profile and reaction to other sensitized allergens and *P. judaica* pollen in subjects with ARC and/or Asthma, Valparaíso ($n = 72$)

Allergens	Monosensitivity *n (%)*	Reaction to other allergens plus *P. judaica* *n (%)*
P. judaica	6 (8)	–
Dermatophagoides mix	5 (7)	25 (58)
Fungi mix	3 (4)	11 (26)
Grass mix	2 (3)	24 (56)
Trees mix	–	17 (40)
Weeds mix	–	25 (58)
Cat and dog epithelium	–	13 (30)
Cockroach	–	15 (35)

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References

Accorsi, C. A., & Bandini Mazzanti, M. (1980). Studi sui pollini allergogeni. *Parietaria officinalisL.* e *Parietaria JudaicaL.*: posizione sistematica, morfologia e biometria del polline. *Webbia, 34*, 643–661.

Bousquet, J., Cour, P., Guerin, B., & Michel, F. B. (1984). Allergy in the Mediterranean area. I. Pollen counts and pollinosis of Montpellier. *Clinical and Experimental Allergy, 14*(3), 249–258.

Bousquet, J., Heinzerling, L., Bachert, C., Papadopoulos, N. G., Bousquet, P. J., Burney, P. G., et al. (2012). Practical guide to skin prick tests in allergy to aeroallergens. *Allergy, 67*(1), 18–24.

Bousquet, J., Hewitt, B., Guerin, B., Dhivert, H., & Michel, F. B. (1986). Allergy in the Mediterranean area. II: Cross-allergenicity among Urticaceae pollens (*Parietaria* and Urtica). *Clinical and Experimental Allergy, 16*(1), 57–64.

Bousquet, J., Khaltaev, N., Cruz, A. A., Denburg, J., Fokkens, W. J., Togias, A., et al. (2008). Allergic rhinitis and its impact on asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). *Allergy, 63*, 8–160. Suppl 86.

Colombo, P., Bonura, A., Costa, M., Izzo, V., Passantino, R., Locorotondo, G., et al. (2003). The allergens of *Parietaria*. *International Archives of Allergy and Immunology, 130*(3), 173–179.

D'Amato, G. (2002). Urban air pollution and respiratory allergy. *Monaldi Archives for Chest Disease, 57*(2), 136–140.

D'Amato, G., Liccardi, G., Russo, M., Saggese, M., & D'Amato, M. (1996). Measurement of serum levels of eosinophil cationic protein to monitor patients with seasonal respiratory allergy induced by *Parietaria* pollen (treated and untreated with specific immunotherapy). *Allergy, 51*(4), 245–250.

D'Amato, G., & Labetalol, G. (1989). Allergenic pollens in the southern Mediterranean area. *The Journal of Allergy and Clinical Immunology, 83*(1), 116–122.

D'Amato, G., Ruffilli, A., Sacerdoti, G., & Bonini, S. (1992). *Parietaria* pollinosis: A review. *Allergy, 47*(5), 443–449.

D'Amato, G., Spieksma, F. T. M., & Bonini, S. (1991). *Allergenic pollen and pollinosis in Europe*. Oxford: Blackwell.

Ford, S. A., Baldo, B. A., Geraci, D., & Bass, D. (1986). Identification of *Parietaria judaica* pollen allergens. *International Archives of Allergy and Applied Immunology, 79*(2), 120–126.

Fotiou, C., Damialis, A., Krigas, N., Halley, J. M., & Vokou, D. (2011). *Parietaria judaica* flowering phenology, pollen production, viability and atmospheric circulation, and expansive ability in the urban environment: Impacts of environmental factors. *International Journal of Biometeorology, 55*(1), 35–50.

Guerra, S., Allegra, L., Blasi, F., & Cottini, M. (1998). Age at symptom onset and distribution by sex and symptoms in patients sensitized to different allergens. *Allergy, 53*(9), 863–869.

Guzmán, M. (2004). *Alergias. Guía Clínica (1° ed.)*. Santiago de Chile: Editorial Mediterráneo.

Hasnain, S. M., Katelaris, C., Newbegin, E., & Singh, A. B. (2003). Aeroallergen monitoring standard for The Asia Pacific region. A WAO manual for the use of the Burkard volumetric spore trap and Burkard personal volumetric air sampler. *World Allergy Organization*, 3–28. http://www.worldallergy.org.

Hernandez Prieto, M., Lorente Toledano, F., Romo Cortina, A., Davila Gonzalez, I., Laffond Yges, E., & Calvo Bullon, A. (1998). Pollen calendar of the city of Salamanca (Spain). Aeropalynological analysis for 1981–1982 and 1991–1992. *Allergologia et Immunopathologia.(Madr), 26*(5), 209–222.

Holgate, S. T., Jackson, L., Watson, H. K., & Ganderton, M. A. (1988). Sensitivity to *Parietaria* pollen in the Southampton area as determined by skin-prick and RAST tests. *Clinical and Experimental Allergy, 18*(6), 549–556.

Kaufman, H. S. (1990). *Parietaria*: An unrecognized cause of respiratory allergy in the United States. *Annals of Allergy, 64*(3), 293–296.

Kroegel, C. (2009). Global initiative for asthma (GINA) guidelines: 15 years of application. *Expert Review of Clinical Immunology, 5*(3), 239–249.

Liccardi, G., Visone, A., Russo, M., Saggese, M., D'Amato, M., & D'Amato, G. (1996). *Parietaria* pollinosis: Clinical and epidemiological aspects. *Allergy and Asthma Proceedings, 17*(1), 23–29.

Luengo, O., & Cadahia, A. (2003). Polinosis por *Parietaria*. *Revista Española de Alergología e Inmunología Clínica, 18*, 61–85.

Makris, M., Koulouris, S., Koti, I., Aggelides, X., Sideri, K., Chliva, C., et al. (2010). Temporal relationship of allergic rhinitis with asthma and other co-morbidities in a Mediterranean country: A retrospective study in a tertiary reference allergy clinic. *Allergologia et Immunopathologia (Madr), 38*(5), 246–253.

Masullo, M., Mariotta, S., Torrelli, L., Graziani, E., Anticoli, S., & Mannino, F. (1996). Respiratory allergy to *Parietaria* pollen in 348 subjects. *Allergologia et Immunopathologia (Madr), 24*(1), 3–6.

Navarro, A., Colas, C., Anton, E., Conde, J., Davila, I., Dordal, M. T., et al. (2009). Epidemiology of allergic rhinitis in allergy consultations in Spain: Alergologica-2005. *Journal of Investigational Allergology and Clinical Immunology, 19*, 7–13. Suppl 2.

Pérez, O. A., & Gorgues, R. R. M. (1986). *Alergia a la Parietaria*. Madrid: Bencard Publ, Beecham Pharm Res Div.

Red Española de Aerobiología. (2002). Accessed 15 January 2013.

Terzioglu, E., Sin, A., Kokuludag, A., Kirmaz, C., Erdem, N., Sebik, F., et al. (1998). Sensitivity to *Parietaria* pollen in Izmir, Turkey as determined by skin prick and serum specific IgE values. *Journal of Investigational Allergology and Clinical Immunology, 8*(3), 180–183.