

# Is Sensitization to *Cupressus* spp. (Cypress) And *Platanus* sp. Due to Allergen Exposure, or Cross-reactivity?

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## Introduction

The inhalation of *Cupressus* spp. (Cypress) and *Platanus* spp. (London plane tree) pollen are an important cause of allergic sensitization in Southern Europe. However, cross-reactivity between *Cupressus* and *Olea* and between *Platanus* and grass species has been reported. Therefore, it has been suggested that the high prevalence of sensitization to *Cupressus* and *Platanus* could be due to cross-reactivity instead of a primary sensitization caused by exposure to pollen of Cypress and London plane tree in the environment. Both trees are commonly planted with ornamental purposes in many cities worldwide.

*Cupressus sempervirens* is an evergreen tree, forming tall, dark-green column 12 to 20m in height and normally no more than 1 m wide. The tree has a perfect conical shape with a pointed crown. The leaves are scale-like, and with the branches, form tight, thick foliage. The tree is resinous, aromatic and monoecious. Some species live well over 3,000 years. Cypress pollen allergy is a major cause of rhinoconjunctivitis and asthma in the Mediterranean area.

*Platanus hispanica* (also known as *Platanus hybrida*, *P. acerifolia*) is a large deciduous tree growing to 20–35 m (exceptionally over 40 m) tall, with a trunk up to 3 m or more in circumference. The bark is usually pale grey-green, smooth and exfoliating, or buff-brown and not exfoliating. It was first recorded as occurring in Spain in the 17th century, where the Oriental Plane and the American Plane had been planted in proximity to one another.

Plane trees are widely grown for shade in streets and gardens. It is an anemophilous tree with many anthers per inflorescence, each anther producing large amounts of pollen. Research has shown that *Platanus* pollen is a major contributor to pollinosis symptoms during March and April. A high prevalence of positive skin prick tests has been recorded for *Platanus hybrida* in Spain.

While the *Cupressus* species pollinate mainly from January to March, the pollen season for *Platanus* is mostly limited to March and April (see Figure 1).

The aim of this study was to investigate if there is a significant correlation between *Cupressus* and *Platanus* atmospheric pollen counts and sensitizations in different cities of Spain.

## Material and methods

Thirteen allergy clinics from 13 different Spanish cities participated in this study. However, in 3 of these cities, less than 100 patients were tested and their data was therefore excluded since we considered that the data collected would not be representative of pollen sensitization prevalence in those geographical areas. The following centers participated in the study:

**Badajoz:** Drs J.M. García Menaya, I. González Galán and C. Cordobés; **Barcelona:** Drs J. Belmonte, J.M. Roure, A. Cadahia and J.L. Eserverri; **Bilbao:** Drs I. Antepara, Y. Alvarez and J. San Atilano; **Burgos:** Drs P. Carretero, S. Porres and S. Juste Picón; **Ciudad Real:** Drs F. Feo Brito, P. Mur Gimeno and E. Gómez Torrijo; **Coruña:** Drs M. Ferreiro Arias and M.A. Rico Díaz; **Logroño:** Dr T. Lobera; **Madrid:** Drs J. Subiza, M. Masiello, M.J. Narganes and C. Barjau; **Santander:** Drs V. de Benito and J. Soto; **Sevilla:** Drs A. Chaparro, J. Delgado and J. Conde; **Toledo:** Drs A. Moral and C. Senent; **Vitoria:** Drs G. Gastaminza, Y. Álvarez, J. San Atilano and D. Muñoz Lejarazu; **Zaragoza:** Drs J. Pola, C. Zapata and E. Sanz

Pollen counts were carried out for 1 year in each selected city using a Burkard sampler (Burkard Manufacturing Co. Ltd).

Patients were selected on the basis of a history of seasonal or perennial rhinitis and/or asthma. Patient evaluation was performed by a physician and included case history, clinical examination and skin prick tests. From this group, we selected the patients with positive skin prick tests to pollens and with seasonal clinical symptoms. There were 1,536 patients (48% male and 52% female), all born and still living in or around each city studied. The mean age was 32 years (range 8 to 81 years).

All patients were skin tested with a standardized, commercially available aeroallergens battery, at 50,000 BU/mL, or 1:20 w/v (Immunotek S.L., Madrid, Spain). The pollens included were *Cupressus arizonica*, *Juniperus communis*, *Cupressus sempervirens*, *Platanus hispanica* and a further 25 species which we considered to be the most representative of the atmosphere of these 10 geographical areas based on pollen counts (pollen types that accounted for at least 3% of the yearly total).

Spearman's rank correlation was used to correlate the quantity of Cypress and *Platanus* pollen grains collected at each site with the prevalence of positive skin tests to these pollen extracts in each region.

## Results

We observed a rhinitis prevalence of 93%, conjunctivitis 89% and asthma 41%. Sensitization prevalence was as follows: grasses 87%, *Olea* 43%, *Chenopodium* 27%, *Platanus* 22%, *Cupressus* 13% and *Parietaria* 11%. The high prevalence of pollen polysensitization was surprising. This was noticeably higher in the dry interior regions of Spain and the Mediterranean coast (Ciudad Real 95%, Toledo 91%, Madrid 88%, Zaragoza 85%, Barcelona 84%, Sevilla 82%, Burgos 74%) than in the green areas of northern Spain (Vitoria 55%, Santander 53%, Bilbao 45%).

In spite of this polysensitization, a significant correlation between total annual atmospheric pollen counts for *Platanus* and the prevalence of positive skin prick tests for *Platanus* extracts was obtained ( $r_s = 0.66$ ,  $p=0.03$ ) (Fig. 2). A non-significant, but close correlation was obtained for *Cupressus* ( $r_s = 0.57$ ,  $p=0.08$ ) (Fig. 3).

Fig. 1

2012 *Platanus* and Cupressaceae pollen counts in Madrid, Spain

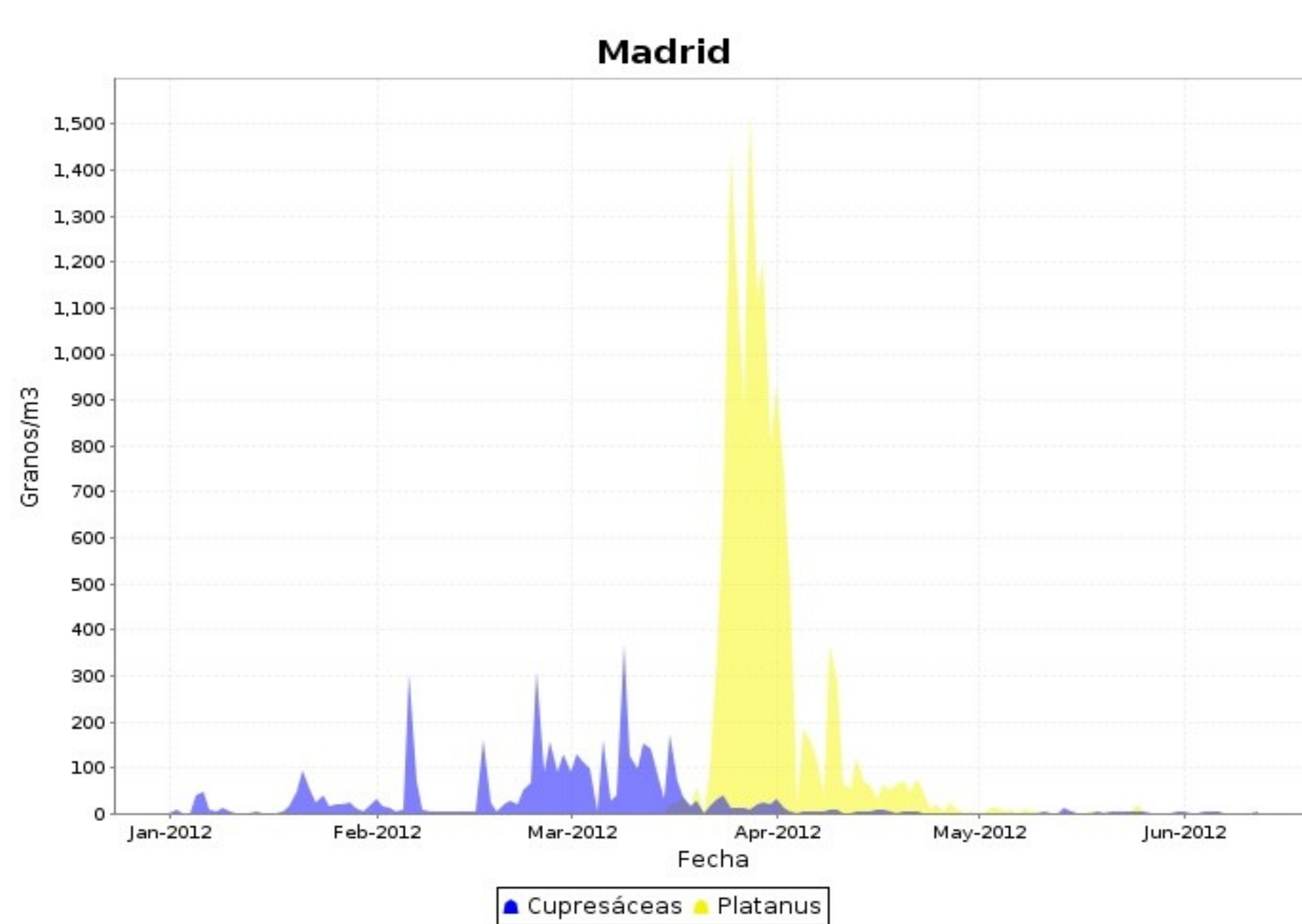


Fig. 2

Correlation between *Platanus* positive skin prick tests among pollinosis patients in Spain and *Platanus* annual pollen counts

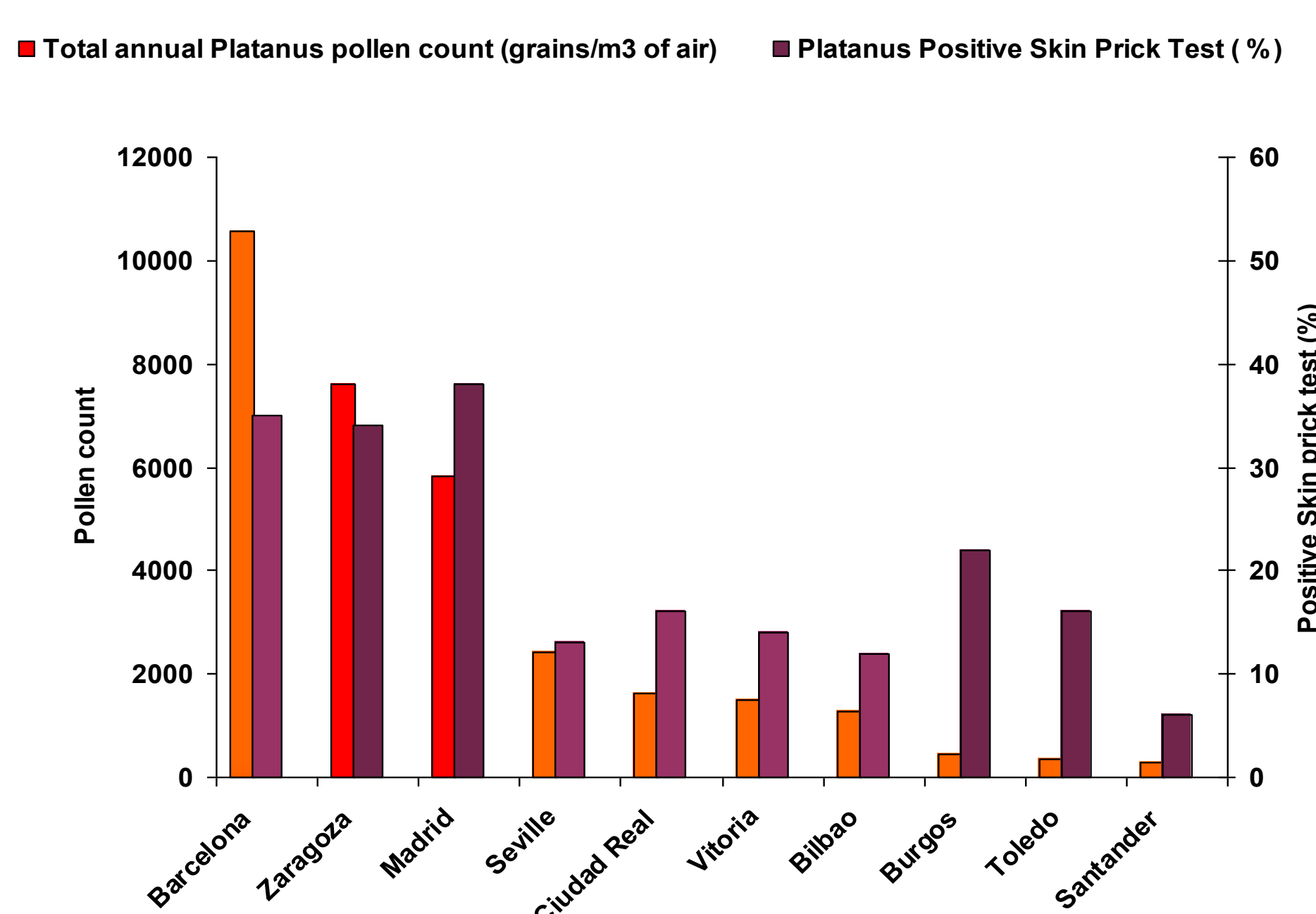
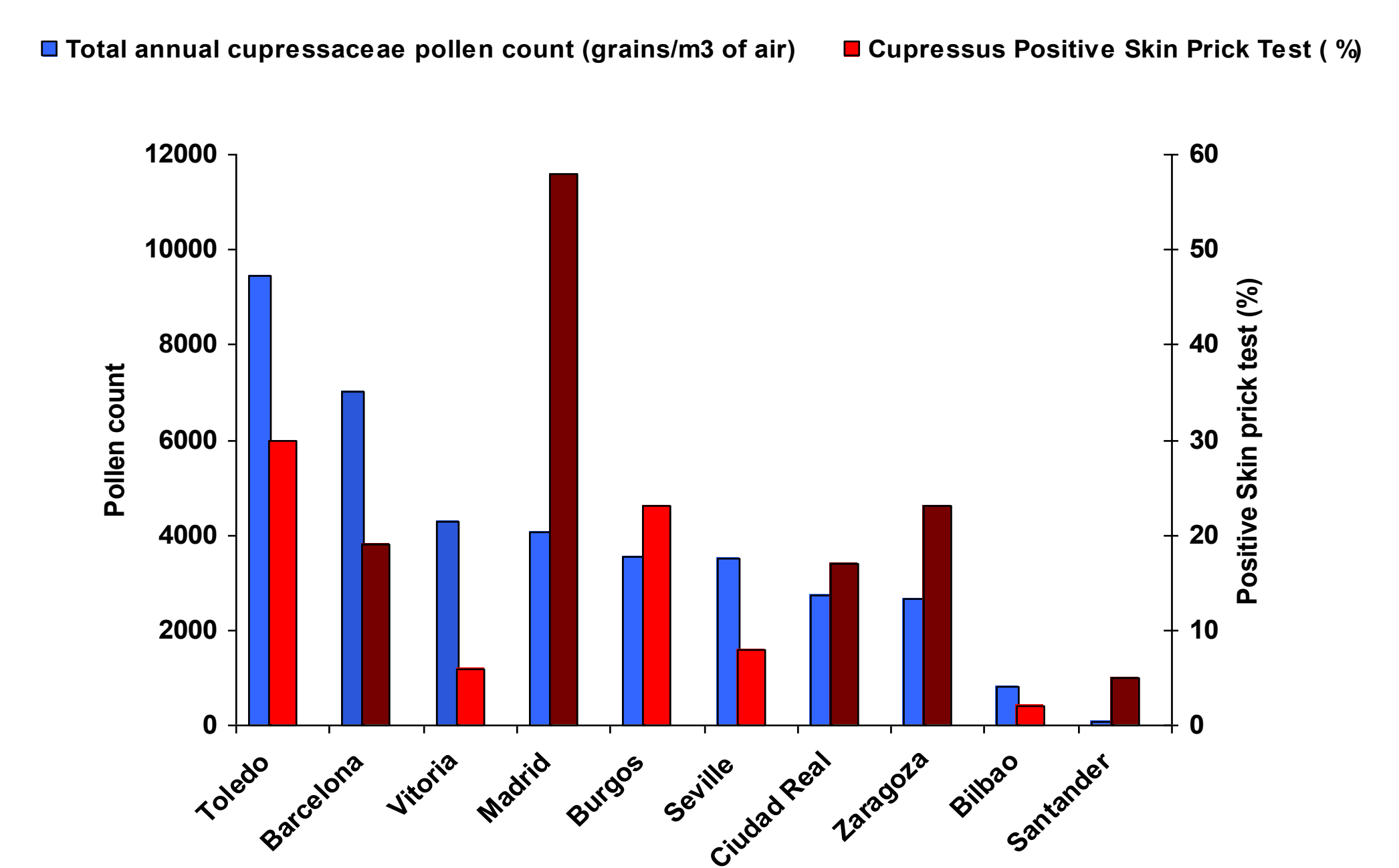


Fig. 3

Correlation between *Cupressus* positive skin prick tests among pollinosis patients in Spain and Cupressaceae annual pollen counts



Olive and Cypress trees in Granada



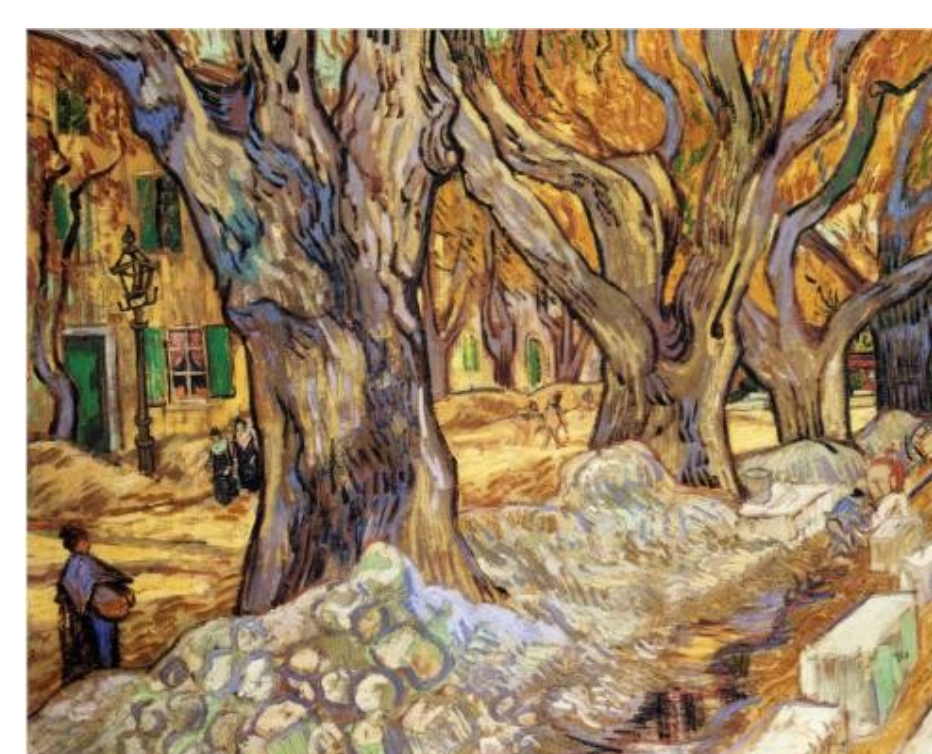
SEM picture of Cypress pollen



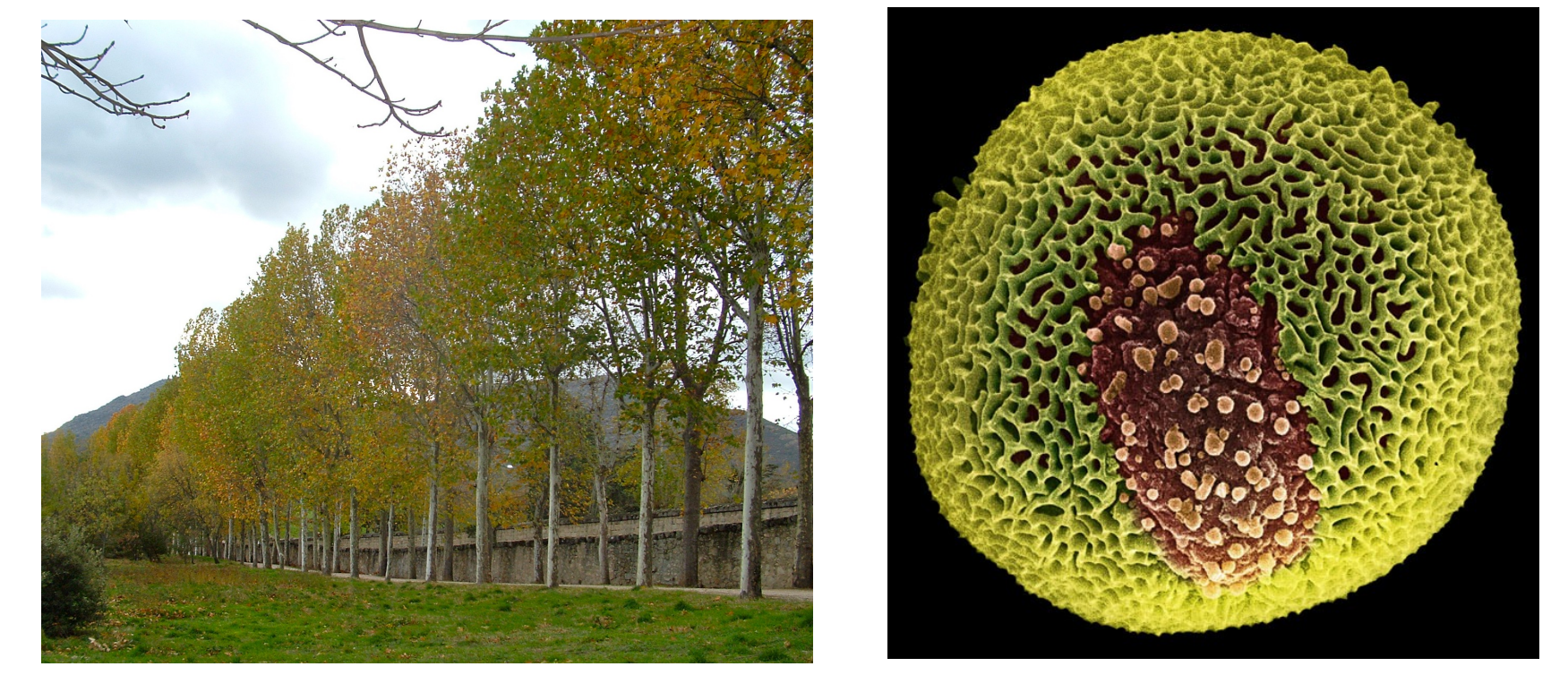
Pollinating Cypress pollen tree



Plane trees by Van Gogh



Plane tree plantation and false color SEM picture



## Conclusions

1. The high rate of sensitization detected in Spain to *Cupressus* and *Platanus* seems to be due to a natural exposure to pollen and not to cross-reactivity.
2. The large amount of trees planted during the last years and global climate change in Spain, may account for these findings.
3. Further studies are underway to evaluate *in vitro* cross-reactivity and allergen composition.