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Influence of atmospheric pollutants on pollen concentrations of Chenopodia-Amaranthaceae, Fraxinus and Myrtaceae

Air plays an important role in the health of the population (World Health Organization, 2021). Airborne bioaerosols such as pollen grains cause pulmonary and cardiovascular diseases in allergic citizens, around 30% of the world's population (Brunekreef et al., 2000). Among the most allergenic pollen grains are those of the families of Poaceae, Oleacea, Urticaceae, Compositae, and Chenopodia-Amaranthaceae. The allergenicity of these pollen types can be increased due to atmospheric pollution (Cuinica et al., 2015).

On the other hand, atmospheric compounds such as carbon dioxide can increase pollen production(Zhang et al., 2013), and pollutants as ozone, sulfur dioxide, carbon monoxide, nitrogen oxides, and particulate matter, as well as meteorological variables show effects on pollen concentrations, highlighting the importance of environmental conditions on pollen levels(Cariñanos et al., 2021). The aim of our study is to analyze the influence of O3, NO, NO2, NOx, SO2, CO, PM1, PM2.5 and PM10 on the concentrations of Fraxinus, Chenopodia-Amaranthaceae and Myrtaceae pollen types in the city of Badajoz (SW, Spain).

The concentrations of atmospheric pollutants were obtained from the studied city air quality monitoring unit from 2010 to 2019. The concentrations of the pollen types under study were determined using a volumetric sampler with the Hirst methodology. The relationship between atmospheric pollutants and pollen concentrations was studied through Spearman correlations, testing for a significance level of 95 and 99% with the R studio software.

The obtained correlations for the different pollen types vary depending on the pollutant. Ozone showed the highest correlation, being positive for Chenopodia-Amaranthaceae (0.42) and Myrtaceae (0.37) and negative for Fraxinus (-0.36). The positive and negative values obtained are in line with the literature (Oduber et al., 2019; Rahman et al., 2019). Nitrogen oxides had statistically significant negative correlations with Chenopodia-Amaranthaceae (-0.26 NO, -0.07 NO2 and -0.12 NOx) and with Myrtaceae (-0.20 NO, -0.10 NO2 and -0.13 NOx) positive correlations for the pollen type Fraxinus (0.24 NO, 0.19 NO2 and 0.23 NOx), the latter being similar to a previous study (Puc, 2012). Particulate matter levels had statistically significant positive correlations for Chenopodia-Amaranthaceae and negative correlations for Fraxinus as well as the values published in the previous studies (Oduber et al., 2019; Puc, 2012; Rahman et al., 2019). Carbon monoxide levels had statistically significant positive values for Chenopodia-Amaranthaceae, similar to studies cited above. The results showed different influences of pollutants on pollen grain concentrations. In general, pollutants have a similar correlation on
Chenopodia-Amaranthaceae and Myrtaceae pollen types but the opposite correlation on Fraxinus pollen types.

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Keywords

Pollen, Pollutants and Correlation

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