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Allergenic *Asteraceae* in urban air: DNA- based analysis and relevance for human health

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Ragweed (*Ambrosia artemisifolia*) and mugwort (*Artemisia vulgaris*) are highly important allergenic weeds belonging to the Asteraceae plant family (Wopfner et al., 2005). Their pollen are one of the main causes of allergenic reactions accompanied by asthma and other severe health problems in late summer and autumn. While mugwort is a native plant in Europe, ragweed reached Europe e.g. by bird seeds as a neophyte from North America about a hundred years ago and spreads rapidly into new areas of central and southern Europe. It is now abundant in the Rhone valley (France), northern Italy, and eastern parts of Austria, Hungary, Croatia and Bulgaria (D' Amato et al., 1998). A small ragweed plant can produce up to 3000 seeds per year, whereas large plants produce up to 62,000 seeds, causing highest concentrations of ragweed pollen in the air in August and September (800 grains/m^3) (Gadermaier et al., 2004).

As the spread of ragweed has been observed in Germany during the last years, we were interested to see if the DNA of ragweed in air and thus the number of bioaerosols originating from these allergenic plants, also increased during the past years. Mugwort DNA was studied as a control.

As genetic analysis methods have been shown to be a good strategy for analyzing bioaerosols (Després et al 2007), filter samples were collected with a High Volume Sampler separating fine and coarse particles (aerodynamic cut-off diameter ~3 µm) for a period of three years (2006 - 2008) in Mainz, Germany. The samples were analyzed for the presence of ragweed and mugwort deoxyribonucleic acid (DNA).

Real Time PCR was used to quantify the amount of ragweed and mugwort DNA mainly in the pollen seasons during this three year period. While the abundance of mugwort DNA stayed constant in this measurement period - only correlating with the climate conditions during the flowering period - we found a steady increase of the ragweed pollen during the last 3 years, which might be associated with the constant spread of *Ambrosia artemisifolia* over Germany in the course of the last years.

There is a need for a more comprehensive and longer study analyzing the spread of ragweed accompanied by the increase of pollinosis in late summer and autumn in Germany.

Still, the constant increase of ragweed DNA in air illustrates the ongoing expansion of this highly allergenic plant and encourages to closely observe this phenomenon in future for ensuring human health.

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