QUANTITATIVE AEROPALYNOLOGY IN THE ATMOSPHERE OF TIMISOARA CITY, ROMANIA

Ianovici Nicoleta
West University of Timișoara, Faculty of Chemistry-Biology-Geography
e-mail: nicole_ianovici@yahoo.com

Key words: airborne pollen types, allergenic taxa, aeroplankton, *Ambrosia* sp.

Abstract
Many airborne pollen grains and fungal spores are important biopollutants responsible for human respiratory allergy. In the conditions of România the most important cause of pollinosis is allergenic pollen of some deciduous trees as well as grasses and weeds. The measurements of pollen concentration in the aeroplankton of Timișoara were carried out in 2003 by the volumetric method. The highest concentrations are noted in April and August. A total of 23 types of pollen taxa were recorded in the air of the study area in the 2003-year: *Acer, Alnus, Ambrosia, Artemisia, Betula, Carpinus, Chenopodiaceae/Amaranthaceae, Corylus, Fraxinus, Juglans, Morus, Pinaceae, Platanus, Plantago, Populus, Poaceae, Rumex, Salix, Quercus, Taxaceae/Cupressaceae, Tilia, Urtica, Ulmus*. The highest values of annual total of pollen grains in a group of trees were reached by *Populus* and *Betula*, as well as in a group of grasses and weeds – *Ambrosia, Urtica* and *Poaceae*. Trees pollen predominantly contributed to the total pollen sum with a percentage of 53.56%, followed by herbs 37.54% and grasses 8.9%.

INTRODUCTION
Development of civilisation, often at the expense of the natural environment by pollution, stimulates the appearance of new health problems, among others an increase in cases of allergy diseases. The number of people suffering from allergy reaches 15–30% of population and pollinosis - the most often observed - occurs in about 10–15% of the inhabitants of our planet [19]. Irrespective of the type of symptoms, allergies are chronic diseases weakening the physical condition and the ability to concentrate in the sufferers. Fighting with them may demand a change of lifestyle, or even profession, adhering to a diet and maintaining allergen avoidance, long-term symptomatic treatment and immunotherapy [12; 28]. Minimisation of the symptoms of pollen allergy is strictly related to avoidance of exposure to large doses of the allergen. The knowledge of the potentially allergenic pollen count and its changes throughout the pollination period in a given area is of great importance for allergic persons, and for determination of the origins of the disease and recommendation of an effective therapy [7]. The recognition of allergens’ properties, mechanisms of pollen allergy and factors conducing their appearance is of great importance in prophylaxis of allergic diseases becoming a social problem on all continents [12; 25; 40]. The qualitative and quantitative composition of the spectrum of airborne pollen grains in any given area mainly depends on the vegetal cover in that area. Most of the airborne pollen originates from anemophilous plants [50], and its production depends not only on the condition of a plant or on the degree of its ploidity but also on the number of flowers and inflorescences and the size of the anthers [36; 49]. Studies have demonstrated that urbanization and high levels of vehicle emissions and westernized lifestyle are correlated with the increasing frequency of pollen-
induced respiratory allergy in urban areas [13]. People who live in cities tend to be more affected by pollen-induced respiratory allergy than those from rural areas [21]. In towns the biodiversity is reduced and plants form characteristic synanthropic communities. Theoretically, the sources of pollen in such urban environments are scarce; additionally, the compact form in which towns develop considerably limit the spread of pollen and its reaching the upper layers of the atmosphere. This is particularly true for herbaceous plants [16; 26; 47]. On the other hand, thermal wind systems, which are frequently noted in larger urban agglomerations, can transport pollen grains from suburban areas into the town centre, thereby increasing their concentrations in the air [38]. In open areas the movement of air is free, and pollen can be easily transported even farther [16]. Other important factors influencing the content of pollen in the air and its seasonal dynamics are weather conditions and the climate. The current opinion is that a town is a climate-shaping factor. The so-called heat urban island is frequently formed, causing thermal contrasts between a town and suburban territories or open spaces [52]. The higher temperatures in a town can cause a longer vegetative period. The microclimate of towns is characterized by reduced levels of relative air humidity, specific winds, an increased content of aerosols in the air, and a greater frequency of fogs. The generally accepted conclusion is that the participation of arboreal pollen in the pollen fall reflects regional conditions, while the content of pollen of herbaceous plants reflects local ones. Successive comparative studies on herbaceous plant pollen content in the air were based chiefly on results obtained in towns [3; 16; 17; 18; 24; 44]. The objective of working out pollen calendars is obtaining the information about the concentration of allergenic pollen at plant vegetation in an individual region, as well as aiming at elaborating the forecasts of the occurrence of allergenic pollen taxa in different geographic conditions [10; 20; 34; 53]. Annual pollen calendars have been prepared in many countries [1; 4; 5; 6; 8; 14; 15; 20; 22; 23; 25; 30; 37; 39; 41; 43; 45; 46; 53; 51].

MATERIAL AND METHOD

Generally, the seasonal and diurnal periodicities of aeropollen and spores are monitored by volumetric traps [27; 2; 11; 9] to prepare pollen/spore calendars. The measurements of pollen concentration in the aeroplankton of Timişoara were carried out in 2003 by the volumetric method. A Lanzoni Volumetric Pollen Sampler 2000 was placed on the roof of the West University. The qualitative and quantitative analysis of pollen grains in the aeroplankton was performed according to the IAA regulations [35]. Pollen concentration was expressed as the daily average of pollen grains per cubic meter of air (PG/m³).

RESULTS AND DISCUSSIONS

Monitoring station are placed in urban area. The vegetation is in the region typical urban because of the introduction of ornamental plants and trees. Pollen grains registered in the aeroplankton of the measurement site come from the plants growing in the neighbourhood as well as areas several kilometers distant. Airborne pollen of allergenic plants was found to predominate in the air of the city of Timisoara. We identified in March 11 types of pollen. The earliest airborne pollen grains recorded in March originated from the following species: Corylus sp., Alnus sp., Ulmus sp. and plants of the genera Taxus/Juniperus. Populus sp. accounting for 27,16% of all pollen sampled. In April the number of various species increased, with the pollen
originating from *Betula* sp. as the most common, accounting for 22.53% of total pollen sampled. This month was the quantitative peak of the 2003 (7359 PG). 15 pollen types were identified in April (fig.1). The highest number of various plants, as many as 16, was recorded in May, with an absolute predominance of plants from the family *Poaceae* (*Gramineae*), which accounted for 24.1% of total pollen. In June, pollination of plants from the family *Poaceae* continued, accounting for 22.4%. Also, an increasing presence of the pollen from herbaceous plants of the family *Urticaceae*, accounting for 27.5%, was recorded in June, to become predominant in July with 51.3%. From July, the pollen grains of weeds became dominant, but the amount of pollen was lower than in springtime. The reason for this decrease was associated with the end of the pollination periods of arboreal plants which produced and released high amounts of pollen grains into the atmosphere. In August (fig.2) pollen grains number reaches the second quantitative peak of the year (3240 PG). *Ambrosia* sp., the most allergenic plant of our climate, was in full bloom in August, when it accounted for as much as 44.8% of total airborne pollen. This percentage rose further to 71% in September. The pollen season of the plants of the continental climate terminates in October. Classification of the plant species into groups of trees, grasses and weeds reveals exclusively tree airborne pollen to be found in March and April then in May and June the grass and weed pollen occurred, whereas an absolute predominance of weed pollen was recorded in July, August and September.

<table>
<thead>
<tr>
<th>Table 1. Monthly pattern of airborne pollen (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>III</td>
</tr>
<tr>
<td><strong>ALNUS</strong></td>
<td>100%</td>
</tr>
<tr>
<td><strong>CORYLUS</strong></td>
<td>95.05%</td>
</tr>
<tr>
<td><strong>TAXACEAE/CUPRESSACEAE</strong></td>
<td>38.68%</td>
</tr>
<tr>
<td><strong>ULMUS</strong></td>
<td>99.85%</td>
</tr>
<tr>
<td><strong>CARPINUS</strong></td>
<td>16.26%</td>
</tr>
<tr>
<td><strong>FRAXINUS</strong></td>
<td>33.48%</td>
</tr>
<tr>
<td><strong>POPULUS</strong></td>
<td>39.6%</td>
</tr>
<tr>
<td><strong>SALIX</strong></td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>ACER</strong></td>
<td>9.5%</td>
</tr>
<tr>
<td><strong>QUERCUS</strong></td>
<td>4.6%</td>
</tr>
<tr>
<td><strong>PLATANUS</strong></td>
<td>1.52%</td>
</tr>
<tr>
<td><strong>JUGLANS</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>BETULA</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>MORUS</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>POACEAE</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>PINACEAE</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>URTICA</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>RUMEX</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>TILIA</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>PLANTAGO</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>CHENOPODIACEAE/AMARANTHACEAE</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>AMBROSIA</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>ARTEMISIA</strong></td>
<td>0</td>
</tr>
</tbody>
</table>

During 2003 we identified 23 pollen types (table1) coming from anemophile taxa: trees (*Acer*, *Alnus*, *Betula*, *Carpinus*, *Juglans*, *Morus*, *Pinaceae*, *Platanus*, *Corylus*, *Fraxinus*, *Populus*, *Poaceae*).
Salix, Quercus, Taxaceae/Cupressaceae, Tilia, Ulmus - accounting for 53.56% of the total), grasses and weeds (Ambrosia, Artemisia, Chenopodiaceae/Amaranthaceae, Plantago, Rumex, Urtica - accounting for 37.54% of the total). In Europe, the dominant airborne taxa have been determined as Gramineae, Alnus, Artemisia, Urtica, Betula in Leiden, The Netherlands [48; 46]; Gramineae, Urticaceae, Oleaceae, Artemisia in Ascoli Piceno, Italy [42]; Betula, Pinus, Alnus, Platanus, Plantago in Brussels, Belgium [48;46]; Cupressaceae, Gramineae, Quercus, Plantago in Montpellier, France [46]; Pinaceae, Alnus, Betula, Quercus, Betula, Gramineae, Artemisia in Jyvaskylan, Finland [33; 48]; Alnus, Betula, Gramineae, Corylus in Ostrowiec Swietokrzyski, Poland [32]; Betula, Quercus, Gramineae, Urticaceae in Vienna, Austria [46]. The airborne pollen types mentioned above are responsible for many cases of pollinosis in Europe. The results of the present study provide useful data for allergologists to reach accurate diagnoses, and timely information on airborne pollen types and concentrations to individuals with pollen hypersensitivity, thus allowing them to adjust their daily activities so as to minimize the contact with allergens and improve their quality of life both at home and at work.

The greatest concentrations in relation to the annual total were registered in spring. The highest pollen concentration was recorded in April (7359 PG) and August (3240 PG). The airplankton was dominated by the pollen produced by Ambrosia (14.6%), Urtica (11.5%), Populus (10.2%), Betula (9.9%) and Poaceae (8.9%).

CONCLUSIONS

The greatest concentrations in relation to the annual total were registered in spring. The highest pollen concentration was recorded in April (7359 PG) and August (3240 PG). The airplankton was dominated by the pollen produced by Ambrosia (14.6%), Urtica (11.5%), Populus (10.2%), Betula (9.9%) and Poaceae (8.9%).
BIBLIOGRAPHY


421
31. Kasprzyk I., 2006, Comparative study of seasonal and intradiurnal variation of airborne herbaceous pollen in urban and rural areas, Aerobiologia 22, pp.185–195
33. Koivikko A, R. Kupias, Y. Makinen, A. Pohjola, 1986, Pollen seasons: forecasts of the most important allergenic plants in Finland. Allergy, 41, pp.233-242
49. Subba Reddi C., N.S. Reddi, 1986, Relation of pollen release to pollen concentration in air. Grana, 24, pp.109–113