

Short communication
Spring airborne pollen data in two sites in Trentino (Northern Italy):
a comparison with meteorological data

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Abstract

In this paper airborne pollen concentration is compared to meteorological data of Trento and S. Michele all'Adige, two sites in the Adige Valley, in Trentino (North Italy). Pollen of *Corylus*, *Alnus*, *Betula* and *Ostrya*, four winter-spring flowering plants are considered. Pollen sampling was carried out in 1996 by volumetric Hirst-type samplers. For all pollen types considered, maximum pollen concentration coincided in both stations and there was a good overlap of the main pollen season length; the pollen curves of S. Michele a/A and Trento showed a highly positive correlation. The daily airborne pollen concentrations, defined as the number of pollen grains per cubic meter of air (P/m^3), were compared to daily meteorological data: minimum and maximum air temperature ($^{\circ}C$), average relative humidity (%), precipitation (mm), global incident radiation (cal/cm^2), average wind direction ($^{\circ}$) and wind speed (m/s). A highly positive correlation was found for *Corylus* and maximum temperature in both monitoring stations. *Betula* was positively, whereas *Ostrya* was negatively correlated to relative humidity. With this first analytical approach sharp differences in the atmospheric pollen presence between the stations located at Trento and S. Michele all'Adige were not found. © 1997 Elsevier Science Ireland Ltd.

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1. Introduction

Aeropalynological and meteorological data from Trento and S. Michele all'Adige, two sites in Trentino, North Italy are examined. Trento, the largest town of the province with a population of 56 000 downtown and 103 000 considering the suburbs, is situated at 194 m above sea level (m a.s.l.). Town vegetation consists of typical plants found in urban surroundings (*Acer* spp., *Aesculus hippocastanum*, *Celtis australis*, *Platanus* spp., *Populus* spp., *Prunus* spp., *Robinia pseudoacacia*,

Sophora japonica, and *Tilia* spp.,....). S. Michele all'Adige, about 20 km north of Trento, is situated at 227 m a.s.l. and has about 2000 inhabitants. The area in which the sampler has been installed is mostly surrounded by vineyards; nearby there is a mixed woodland with *Ostrya carpinifolia*, *Corylus avellana*, *Pinus* spp., and *Quercus* spp.

The aerobiological monitoring station of San Michele all'Adige has been active since 1989 and is part of the Italian Aeroallergen Network; the station of Trento was set up in January 1996. The main aim of this investigation was to verify if there are significant differences between the aeropalynological data of these two localities in order to keep both monitoring stations operative.

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Table 1

Main pollen season (m.p.s.) for *Alnus*, *Corylus*, *Betula*, and *Ostrya* in S. Michele a/A and Trento

Taxa	Sampling stations	Start	Peak	Max value (P/m ³ per day)	End	No. days	Total pollen rains/m.p.s.
<i>Alnus</i>	S. Michele a/A	02 Feb	01 Mar	44.0	24 Apr	83	431
	Trento	05 Feb	01 Mar	40.5	19 Apr	75	576
<i>Corylus</i>	S. Michele a/A	06 Feb	21 Mar	108.5	29 Mar	53	794
	Trento	31 Jan	21 Mar	84.0	31 Mar	61	898
<i>Betula</i>	S. Michele a/A	06 Apr	09 Apr	114.0	22 Apr	17	1138
	Trento	06 Apr	09 Apr	233.5	22 Apr	17	2037
<i>Ostrya</i>	S. Michele a/A	13 Apr	20 Apr	564.5	14 May	32	5701
	Trento	13 Apr	20 Apr	566.5	13 May	31	5093

2. Materials and methods

2.1. Aeropalynological data

Airborne pollen sampling was carried out in 1996 by means of two Hirst type 7-day recording volumetric spore traps (VPPS 2000 Lanzoni) (Hirst, 1952). The sampler at S. Michele all'Adige is placed on the roof of a building of the Istituto Agrario, at a height of 10 m above ground level. The sampler at Trento is located on the roof of the Fire-brigade's barracks, at a height of 15 m. Samples were prepared and analysed following the standard methodology adopted by the Centres belonging to the Italian Aeroallergen Network (Mandrioli, 1990). The airborne pollen concentration data consid-

ered in this paper are those of *Alnus*, *Corylus*, *Betula* and *Ostrya* and they are expressed as number of pollen grains per cubic metre of air per day (P/m³). Pollen identification was based on reference literature (Faegri et al., 1989; Feliziani, 1986; Grant Smith, 1990).

2.2. Meteorological data

Meteorological data from 'Spartac-type' stations located at S. Michele all'Adige and Trento (airport) were provided by the Provincial Agro Meteorological Centre. The daily values considered are minimum and maximum air temperature (°C), average relative humidity (%), precipitation (mm), global incident radiation (cal/cm²), average wind direction (°) and wind speed (m/s).

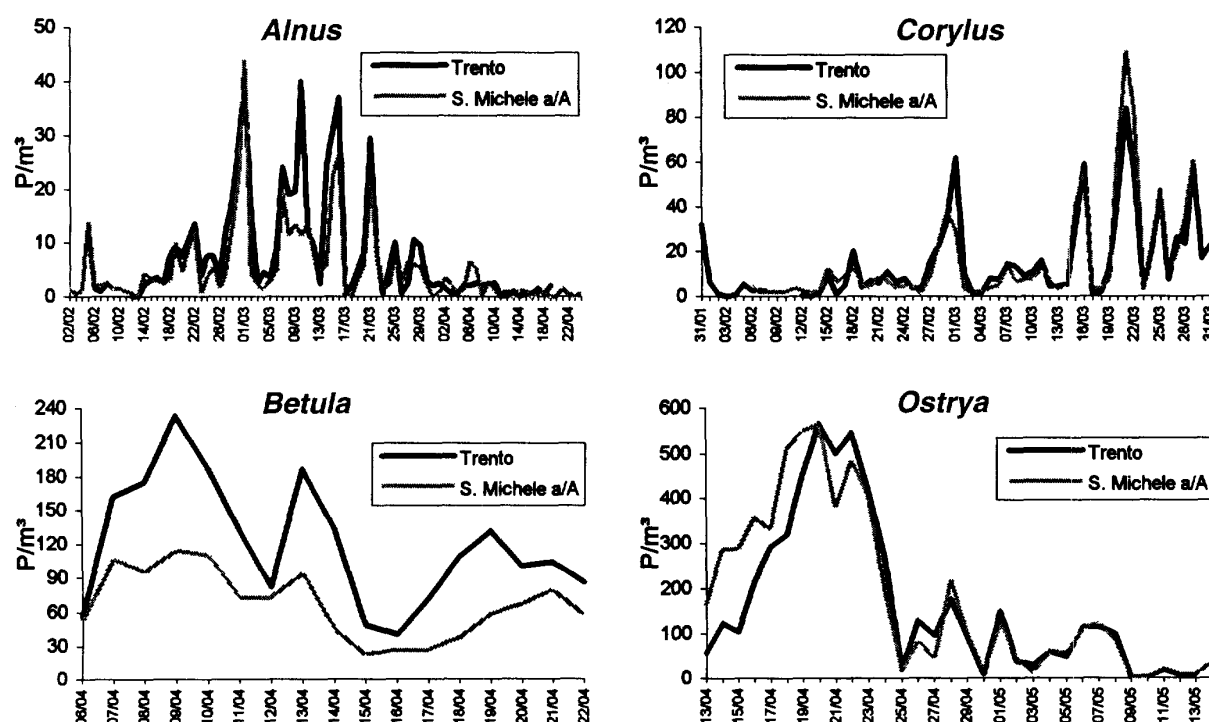


Fig. 1. Daily airborne pollen concentrations for two stations (Trento and S. Michele a/A) during the main pollen season, 1996.

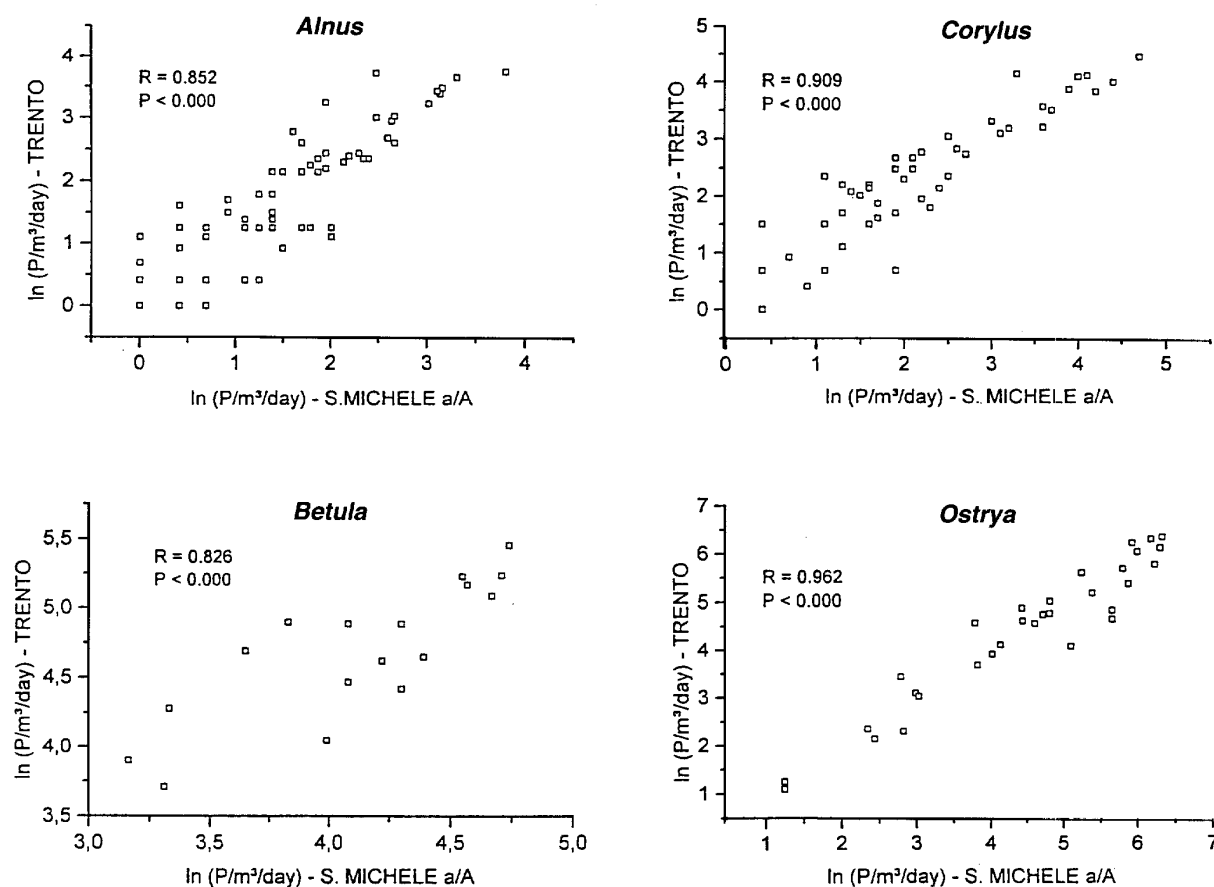


Fig. 2. Pollen-by-pollen correlation coefficients.

2.3. Data elaboration

For each pollen type, the peak pollen season was calculated considering 90% of the recorded concentrations for 1996. Start and end dates were set which corresponded to the days when 5 and 95% of the season's total pollen concentration for each type were found (Nilsson and Persson, 1981). The two aeropalynological data sets from Trento and S. Michele all'Adige were compared for each pollen type by correlation after natural logarithmic transformation of the concentration data. Each pair of data sets was plotted on an xy graph and the Pearson's correlation coefficient R was calculated (Fig. 2).

The concentration data of each pollen type was then correlated to the corresponding meteorological data. Linear regression analysis was performed, assuming log concentration as the dependent y variable and the meteorological parameter as the independent x variable; linear regression lines were plotted. Regression variance analysis was carried out to verify the signifi-

cance of the regression (Frank and Althoen, 1994; Parker, 1984).

3. Results

Table 1 provides information about the pollen season for *Alnus*, *Corylus*, *Betula* and *Ostrya* in S. Michele all'Adige and Trento for 1996. The peak date, that is the day in which the highest concentration value was reached, coincides in both sites for the four pollen types. The start and end dates and, consequently, the length of the pollen season do not vary very much between Trento and S. Michele all'Adige. Unlike the other pollen types considered, *Betula* had twice the maximum concentration in Trento with respect to S. Michele all'Adige. Also, the sum of the daily concentrations recorded during the main pollen season is higher in Trento. This probably depends on the higher density of birch plants used as ornamentals in the city, rather than on the spontaneous vegetation near S. Michele all'Adige.

The daily concentration data of the two stations, comparing pollen-by-pollen (Fig. 1) show a similar trend. This observation is confirmed by the correlation coefficients 'R', highly significant for the four pollen types.

The correlation coefficients between pollen data and meteorological data are given in Table 2. A highly positive correlation exists between airborne concentration of *Corylus* pollen and maximum temperature (Fig. 3), and between airborne concentration of *Ostrya* pollen and relative humidity in both stations (Fig. 4). The analysis of variance confirms that the regressions are statistically significant because the observed *F* values are higher than the corresponding critical value (Table 3, Table 4).

4. Discussion

Thanks to this first analysis of the data, no sharp differences have been found between the presence of pollen in the atmosphere in Trento and S. Michele a/A.

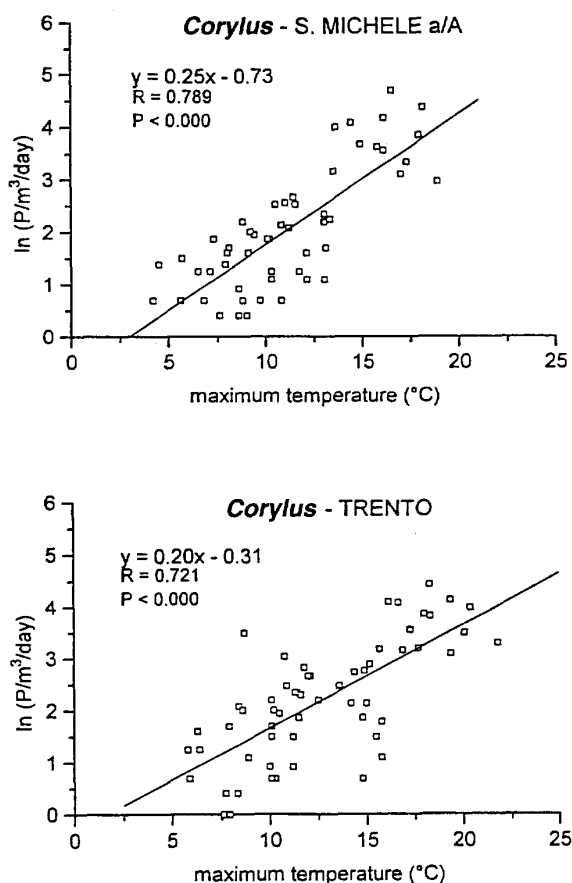


Fig. 3. Correlation between airborne concentration of *Corylus* pollen and maximum temperature.

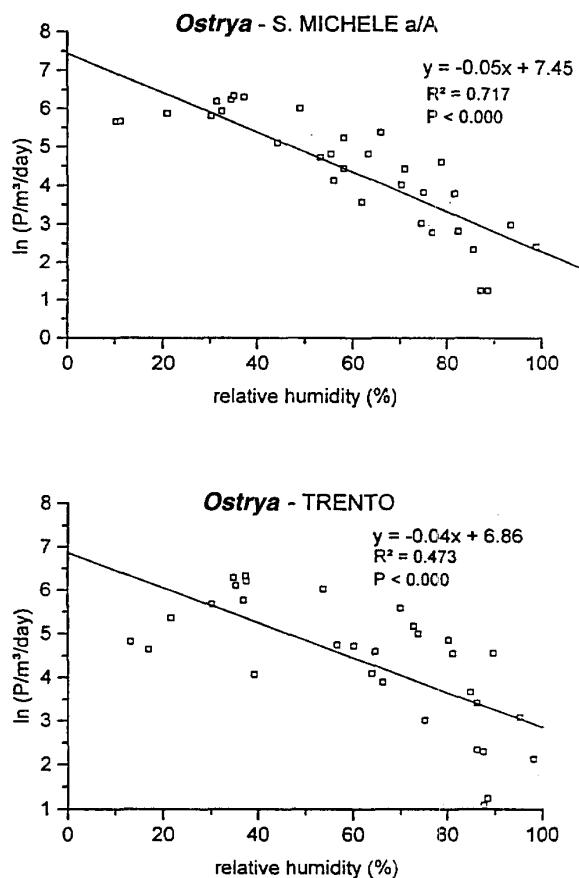


Fig. 4. Correlation between airborne concentration of *Ostrya* pollen and relative humidity.

El-Ghazaly et al. (1993) reached a similar conclusion with work done at two sites in Sweden. It is interesting to notice the similarity in the two papers about the beginning and the duration of the main pollen season observed for *Betula*: respectively, the 10th of April and 17–18 days in Sweden (mean of the observed period), the 6th of April and 17 days in North Italy.

The research carried out from Fornaciari et al. (1996) in Central Italy confirms that there are not significant differences in the main period of pollination between areas with similar climate.

In this paper the various correlations with meteorological data underline a symmetry between the two stations.

Consequently, only one pollen trap seems to be enough to describe the pollen in the atmosphere of the two stations. In order to verify this hypothesis, it will be necessary to extend the analysis of airborne pollen data collected during the rest of the year and for more years.

Table 2
Correlation analysis of meteorological factors vs. atmospheric pollen concentration

Taxa	Sampling stations	Minimum temperature (°C)	Maximum temperature (°C)	Relative humidity (%)	Precipitation (mm)	Radiation (cal/cm ²)	Wind direction (°)	Wind velocity (m/s)
<i>Alnus</i>	S. Michele a/A Trento	-0.29 -0.34	-0.19 -0.16	-0.05 -0.02	-0.01 -0.09	-0.17 -0.13	0.00 0.07	0.02 0.02
<i>Corylus</i>	S. Michele a/A Trento	0.41 0.3	0.79 0.72	0.08 -0.17	0.00 -0.14	0.30 0.53	0.34 0.17	0.11 0.36
<i>Betula</i>	S. Michele a/A Trento	0.52 0.74	0.03 0.02	0.7 0.39	0.25 0.11	-0.59 -0.52	0.35 -0.33	-0.35 -0.10
<i>Ostrya</i>	S. Michele a/A Trento	-0.64 -0.53	0.59 0.58	-0.85 -0.69	-0.61 -0.57	0.64 0.53	-0.28 0.26	0.68 0.51

Table 3
Variance regression analysis

Source of variation	Deviance	d.f.	Variance	F	P
<i>Corylus</i> (S. Michele)—maximum temperature					
Total	69.78	52			
Regression	43.42	1	43.42	83.97	< 1%
Residual	26.37	51	0.52		
<i>Corylus</i> (Trento)—maximum temperature					
Total	87.16	60			
Regression	46.15	1	46.15	66.39	< 1%
Residual	41.01	59	0.7		

Table 4
Variance regression analysis

Source of variation	Deviance	d.f.	Variance	F	P
<i>Ostrya</i> (S. Michele)—relative humidity					
Total	67.25	31			
Regression	48.20	1	48.20	75.91	< 1%
Residual	19.05	30	0.64		
<i>Ostrya</i> (Trento)—relative humidity					
Total	64.06	30			
Regression	30.32	1	30.32	26.06	< 1%
Residual	33.74	29	1.16		

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