

Comparison between airborne pollens in Torino and Perugia (Italy) 1982-83-84

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SUMMARY. By means of two Burkard Volumetric Spore-Traps situated in the center of Torino and Perugia, pollen was sampled between March and August for three years (1982 - 83 - 84). The two pollen spectra, with special reference to trees, were compared for pollen levels and duration of season in the two cities.

Comments on vegetation in and around Torino and Perugia and meteorological data are compared with the two pollen spectra.

RIASSUNTO. Sono stati eseguiti negli anni 1981, 82, 83, nel periodo di massima pollinazione, da marzo ad agosto, campionamenti di pollini aerodiffusi in Torino e Perugia, utilizzando spore-traps volumetrici tipo Burkard.

I due spettri pollinici hanno consentito di paragonare i livelli di concentrazione, l'inizio del periodo di emissione del polline e la sua durata, con particolare riferimento ai granuli delle specie arboree.

Sono inoltre stati posti in relazione i dati aerosporologici con quelli meteorologici e vegetazionali delle due aree prese in considerazione.

Key words: Airborne pollens in Torino and Perugia (Italy).

Parole chiave: Airborne pollen, Torino, Perugia.

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INTRODUCTION

This is a comparative study between the airborne pollens of the most common trees in the cities of Torino and Perugia. The study

is also a result of the fact that collaboration between several Italian Universities has become more active in recent times. Research lasted three years and was carried out between March and August each year, both because of the

flowering seasons and because the research is included in the pollen calendar project, with the aim of improving the knowledge on allergies. Similar comparative studies have already been carried out (Spieksma et Coll. 1980; Michel et Coll. 1979; Fuckerieder 1979; Stix et Coll. 1977; Lejoly-Gabriel & Leuschner 1983).

As well as tree pollens, has been also compared total pollen production to the general climatic conditions in the two cities.

MATERIAL AND METHODS

Airborne pollen was collected using Hirst spore traps with a weekly head absorbing 10 l of air/min. in both cities. Pollen grains were identified by comparing them to standard slide sets for each city and by consulting other source (Hyde & Adams 1958; Charpin et Coll. 1974; Moore & Webb 1978; Ciampolini & Cresti 1981). Data were processed as ten day averages and the number of pollen grains were expressed in terms of grains per cubic metre of air. Microscope slides were prepared according to Frenguelli et Coll. (1981). In both cities the spore-trap was located on the roof of the Dept. of Plant Biology at about 20 m from the ground. Nomenclature follows Tutin et Coll. (Flora europaea 1964-80) and Bailey (Manual of cultivated plants 1949).

THE VEGETATION AROUND TORINO AND PERUGIA

Most of Torino (45° N, 7°39' E, 260 m above sea level) is located in a plain with a prevalence of agricultural land (crops: wheat, maize, forage and grassland), and of ruderal and riparian species along the Po, Dora and Stura Rivers. Tree-wise, the urban area is characterized by the plants in parks and bordering the city's avenues, mostly *Platanus* sp. *Tilia* sp. and *Aesculus hippocastanum* L. The hills flanking the Po River are so near that they can reasonably be considered part of the metropolitan area.

There are mostly woods with a prevalence of *Ulmus* sp., *Carpinus betulus* L., *Quercus* sp. and a very limited number of *Fagus* sp. The city is also quite near the Alpine system, the border of which offers *Quercus pubescens*, Willd. *Pinus sylvestris* L., *Fagus* and *Castanea sativa* Miller.

Perugia (43°63' N, 12°23' E, 493 m above sea level) has in general a sub-mediterranean-mountain vegetation. Woods consist of various trees: broad-leaved trees, mostly *Ostrya carpinifolia* Scop., *Castanea sativa* Miller, *Quercus cerris* L., *Fraxinus ornus* L. and *Populus tremula* L. *Fagus* woods are rare. Hilly districts mostly have xeric woods of *Quercus pubescens* Willd. substituted by *Quercus ilex* L. in the warmer areas. The plain near the metropolitan district presents agricultural land: olive groves, vineyards and land fit for seed crops (tobacco, maize, sunflowers and wheat). The river banksone mostly present riparian vegetation, ie: Salicaceae, Betulaceae and Ulmaceae. The most common ruderal plants belong to Urticaceae, Gramineae, Compositae, Chenopodiaceae and to Plantaginaceae.

RESULTS AND DISCUSSION

Figure 1 shows the rain and temperature graphs in Torino and Perugia from March to August (1982 - 84) as well as the rainfall distribution from 1921 to 1955 and the temperatures between 1926 and 1955. Rain and temperature graphs in the above mentioned 30 Years show a glacial regression in the N-W (Bollettini Comitato glaciologico italiano 1928-55). Perugia registered a dry period in summer, while Torino did not, though, in July temperature and rain result similar.

R & T graphs over the three years understudy highlight relatively stable climatic conditions in Perugia, while Torino registered dry summers. It is quite difficult to assess these data as those years were part of the period of glacial expansion-the beginning of which is set in the '50s (Geografia fisica e dinamica Quaternaria Cam-

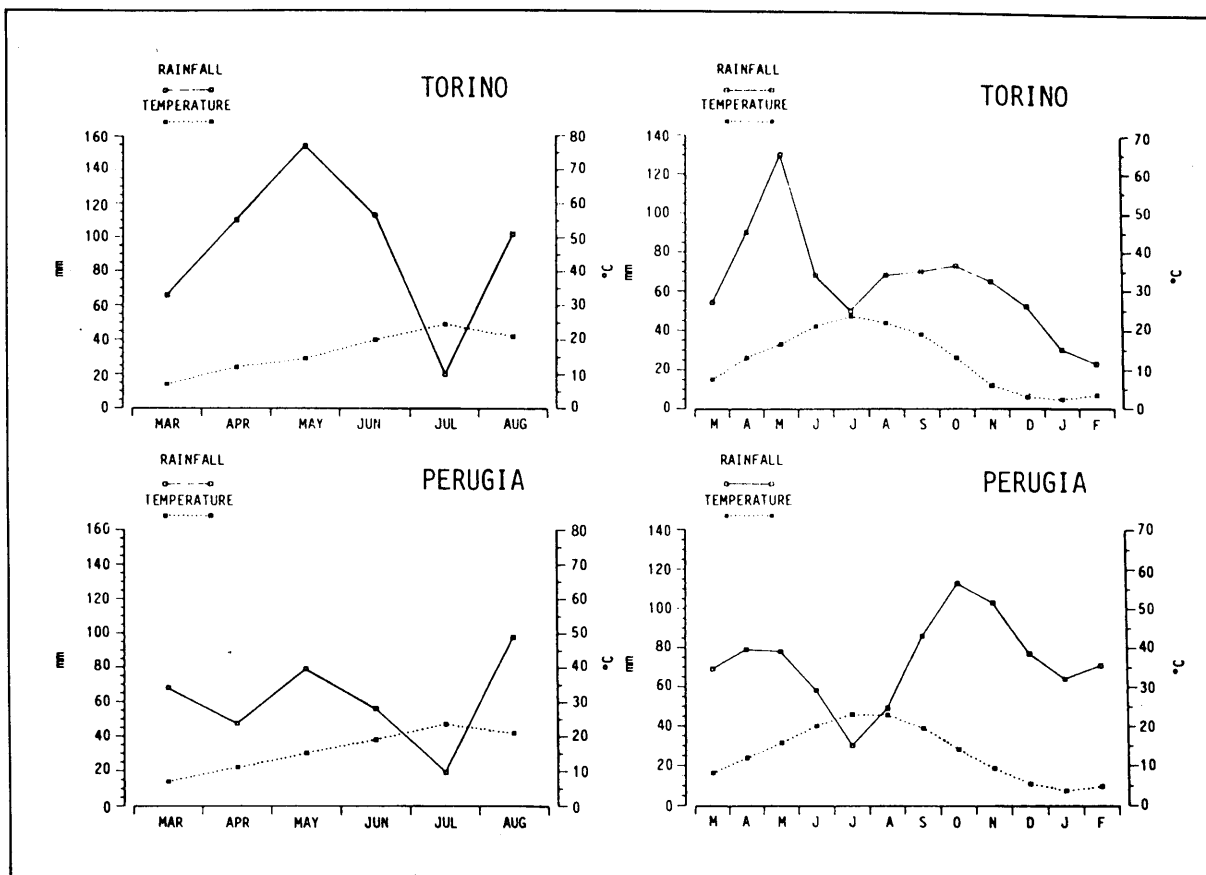


Figure 1. Rainfall and temperature in Torino and Perugia; on the left data related to the periodo March-August (monthly means for 1982 - 83 - 84); on the right monthly means for the years between 1926 and 1955.

pagna glaciologica 1982 - 84).

Figure 2 refers to the airborne pollens of both the herbaceous and arboreous species found in the atmosphere of both cities for the considered period of time. The figure clearly illustrates global concentrations of both the arboreous and the herbaceous components: Torino figures are definitely lower than Perugia's, especially for the arboreous pollens.

In the April-June trimester however, Torino's rainfall was twice Perugia's, a fact which undoubtedly caused a drop in the concentration of airborne pollens.

Local flora, such as *Cupressus*, *Quercus* and *Olea* produced the high concentrations in Perugia. These plants are rare in Torino, except for the *Quercus*.

Figure 3 gives the pollen calendar listing the most significant and comparable components in the pool of arboreous species present in both cities for the specified period of time.

Cupressaceae-Taxaceae: pollen counts were equivalent timewise in the two stations. A higher count (pollen grains/cube m) registered in Perugia was due to the great number of ornamental plants of *Cupressus sempervirens* L. and *C. arizonica* E.L. Greene that were introduced in the urban and suburban areas.

Corylaceae: in both cities *Corylus*, *Carpinus* and *Ostrya* were responsible for the pollen production. *Ostrya carpinifolia* Scop. produced the greatest amount of pollen and for the longest

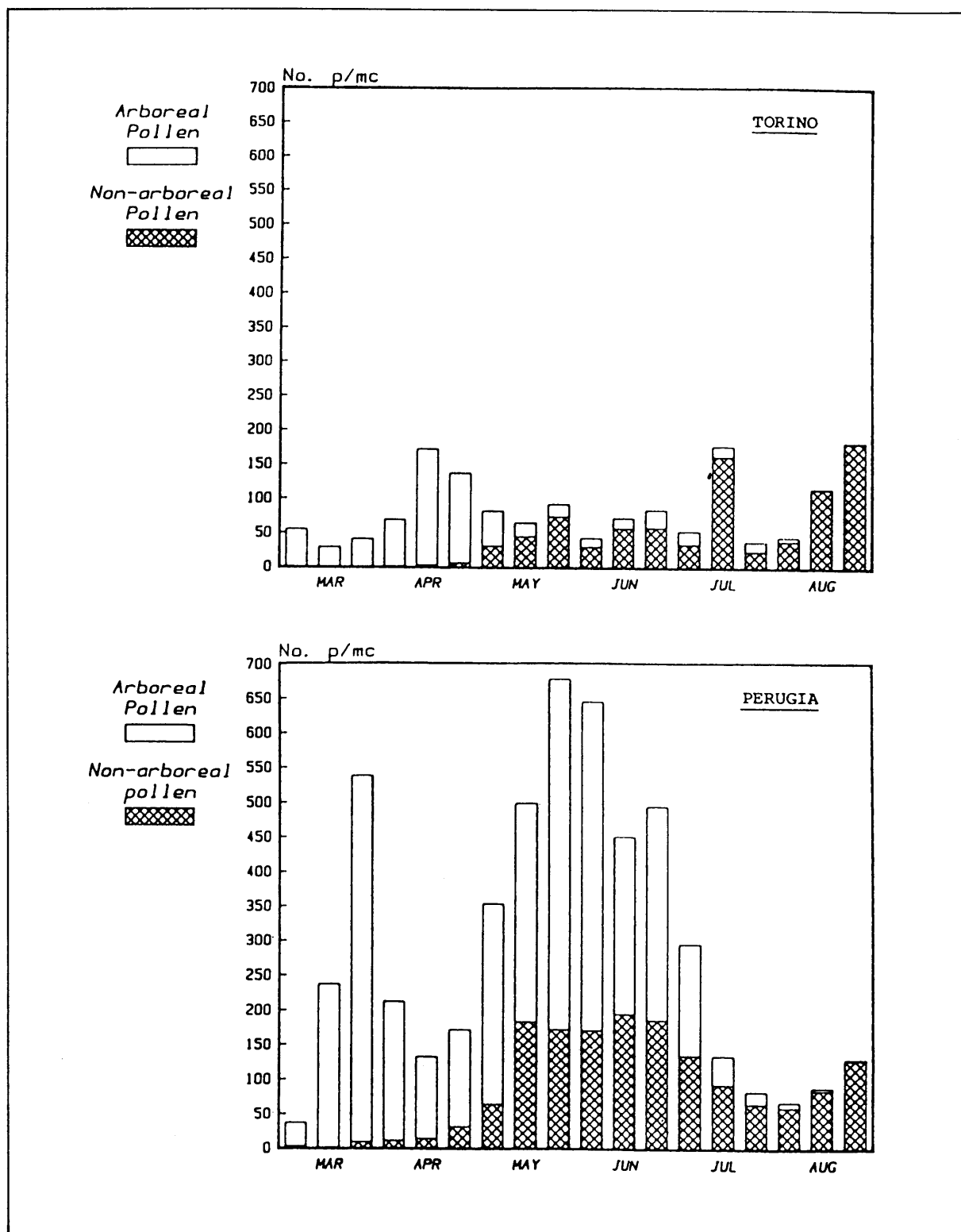


Figure 2. Arboreal and non-arboreal pollen component in Torino and Perugia for the period March-August. Torino shows lower concentration levels than Perugia's especially for arboreal pollens.

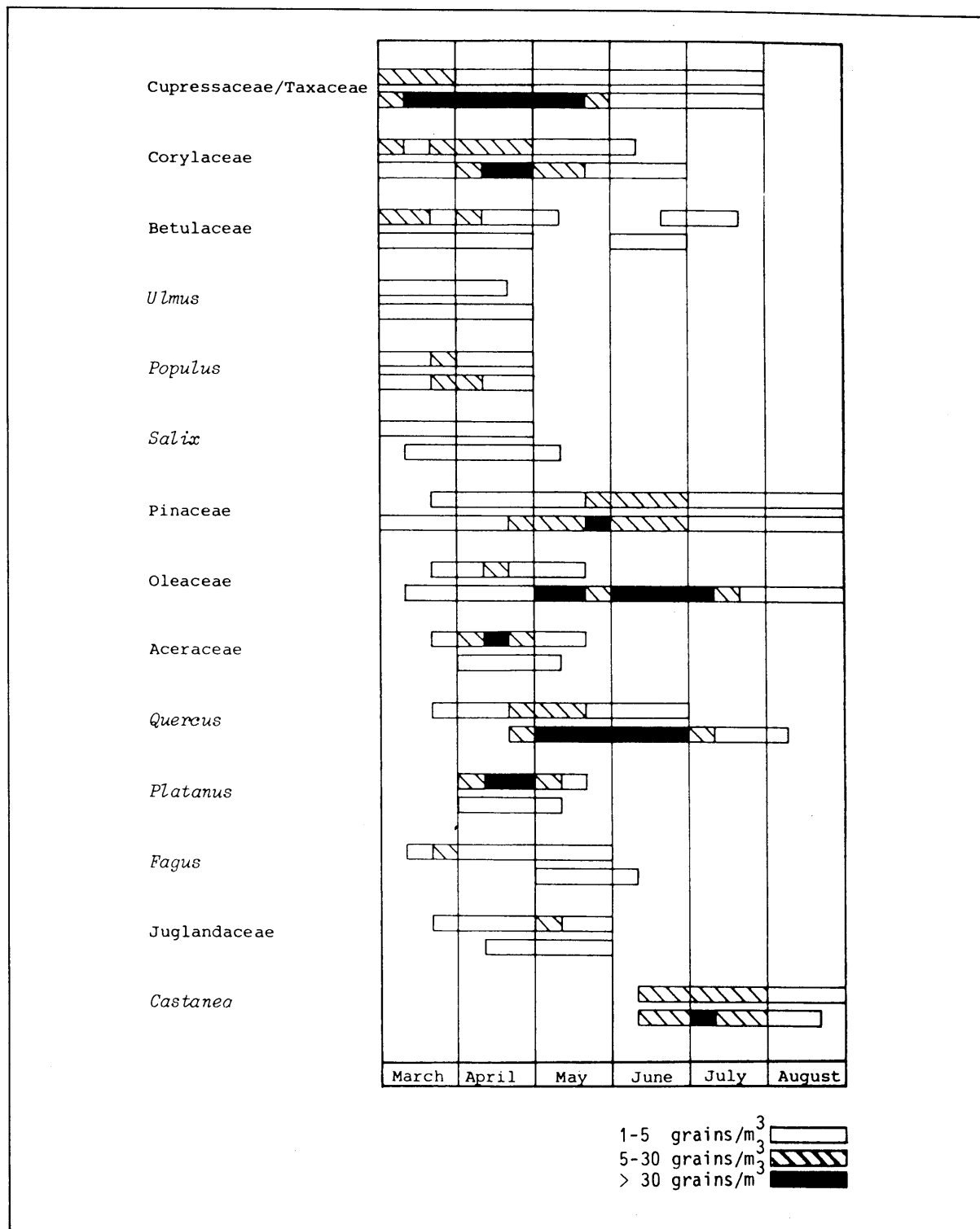


Figure 3. Pollen calendar for the most significant components in the pool of arboreal species present in Torino and Perugia. The upper line represents Torino's values, the lower line Perugia's. Data are related to the average of three years (1982 - 83 - 84) of ten day totals.

period of time in Perugia. This tree can be found in the sub-mediterranean xeric woods and on sub-mountainous slopes.

Betulaceae: pollen concentration were higher in Torino's atmosphere in March and April and this is due to the presence of both *Alnus* and *Betula* in great numbers in the city's parks. Pollen counts fell between May and June in both cities and then production briefly resumed previous levels. In both stations.

Alnus incana L. (Moench) trees are responsible for the late flowerings. In Torino they can be found on the surrounding hills and in Perugia on the Western Appenines between the Regions of Umbria and Marche.

Ulmus: both stations sampled low amounts of pollen, most of which produced by *Ulmus minor* Miller and *Ulmus pumila* L.. The latter is often grown as an ornamental tree in Northern and Central Italy.

Salicaceae: this family and its two genera, *Populus* and *Salix* produced low pollen concentrations and registered an identical production period in the two cities. These low levels were due to the *Populus* and *Salix* distribution—currently limited to river banks; to the fact the species are dioecious and to the entomophilous character of many *Salix*.

Pinaceae: *Pinus* pollen is found throughout the specified period. The highest pollen count in Perugia was registered in May. The main producers were *Pinus pinea* L. grown as an ornamental tree and *P. halepensis* Miller used for reafforestation of dry hill slopes. The highest count in Torino was registered in June. *P. sylvestris* L. and *Cedrus* (with its Autumn flowering and long release period) were the main producers.

Oleaceae: *Fraxinus* is the main Oleaceae pollen producer in Torino. It gives a low concentration over a short period of time. Maximum concen-

trations sampled in Perugia are due to *F. ornus* L. in May and to *Olea europaea* L. in June and the first decade in July.

Aceraceae: the vast number of maple trees in Torino and the fact the spore trap was in an area rich in *Acer negundo* L. trees, determined a high pollen concentration for a longer period of time, if compared to Perugia values.

Quercus: early *Quercus* flowering in Torino is due to the presence of a series of species grown in the metropolitan area. *Q. ilex* L. is the main pollen producer in Perugia and is also responsible for the longer production period. This species is the most common one among the ornamental trees in the urban area and is late flowering compared to other oak trees.

Platanus: high pollen counts were registered in Torino as well as an extended duration. This is due to the great number of trees along avenues and in city parks. This species is the most common among the ornamental trees in the urban area.

Fagus: micro-climatic conditions in Torino result in an early *Fagus* pollen production, i.e. the early flowering of *Fagus sylvatica* L. and of *F. sylvatica* L. var. *purpurea* Ait. commonly found as ornamental trees along avenues and in parks. In the Perugia district *Fagus* woods are located far from the spore trap, on the mountain and sub-mountainous slopes of the Appenines. Low pollen counts in both cities are also due to the higher sedimentation rate (5 cm/sec), to the volume ($51770 \mu m^3$ — and weight (37.10^{-9})) of the pollen grain (Erdtman 1969).

Juglandaceae: in Perugia this family is represented only by *Juglans regia* L. which is not very common and is mostly found in the countryside. In Torino as well as *J. regia* L. there are also *J. nigra* L. and *Pterocarya fraxinifolia* (Poiret) Spach, both present as ornamental trees. The explain the higher counts in this family and the

longer production period registered in Torino.

Castanea: *Castanea* pollen production lasted nearly the same amount of time in both cities, though in Perugia higher concentrations were registered especially during the first ten days of July. In both stations trees of this genus grow on the hills or on sub-mountainous slopes far from the spore trap.

CONCLUSIONS

Aeropalynological surveys illustrate the duration and the maximum pollen concentrations according to families and genera observed. Comparative studies highlighted some significant differences-both as far as airborne pollen levels and duration are concerned- in several taxa. Torino showed a clear prevalence of *Platanus* and *Acer* pollens, while Perugia had a prevalence of Cupressaceae-Taxaceae, Oleaceae, *Quercus*,

Corylaceae, Pinaceae and *Castanea*. This is due to the different quality and to the different pollen production of the several arboreal plants, both spontaneous and cultivated. Pollen production period in *Populus*, *Platanus* and *Castanea* genera coincided though pollen production levels varied. This fact may be justified by the comparison of P & T graphs related to the considered months.

Some Aceraceae, *Quercus*, *Fagus* and Juglandaceae in particular are common in Torino along avenues and in parks. They are affected by the city's microclimatic conditions and have early flowerings. In Perugia, these trees are mainly found outside the metropolitan areas and are therefore not affected by the city.

This type of aerosporological surveys and a greater knowledge of the climate will enable us to establish more reliable statistical correlations between anthesis, levels of airborne pollens and weather conditions.

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