

Re-planning the layout of an inner city park by planting species with a low allergological impact

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SUMMARY. The current situation of parkland in Turin metropolitan area is described. Recently (1979-81) a large area (18 hectares) was turned into a Park named Colonnetti. A project of total re-organisation of the area is proposed. In particular, from the botanical point of view, we suggest the use of non allergenic plants to reduce the allergenic airborne pollen concentration. The multidisciplinary exchange of information among experts such as physicians, botanists, local authorities and the people in charge of the public green areas, may play an important role and contribute to the improvement of the overall situation of airborne pollens in the city atmosphere.

Key words: airborne pollen, allergy, park re-planning.

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INTRODUCTION

The so-called urban «green lungs, parkland or green areas» have become an increasingly important social issue in recent years. As a result, they have come to bear considerable weight in overall metropolitan town planning.

Every main European city shares the problem of green spaces which is highlighted especially in relation to the urban structures of the first lay-out and later development of the city. Some European towns have very few green areas: Athens is the extreme case with 0.9 sqm/a head of public

green, followed by Milan with 3.5-5 sqm (Fig. 1). Cities such as Paris, Rome, Warsaw have larger public green spaces also thanks to the parks created a long time ago in their city-centres. Lastly, Vienna, Zurich and Berlin have 15.5, 30 and 32.5 sqm of public green per head of population to be found both in central and peripheral areas.

Turin's metropolitan area follows: about 1300 hectares of parkland for a population numbering about one million, that is 13 sqm/a head. The city also has tree lined boulevards totalling about 65,000 trees, corresponding to a 240 km strip of trees (Città di Torino, 1983).

Turin's green areas have a long history and information dates back to 1564 when the citadel (La Cittadella) was built. The present distribution (Fig. 2) dates back to the 17th (Giardini Reali e Villa della Regina), and to the 18th century when the following parks were built: Tesoreria, Villa Rignon, Regio Parco, Valentino and Stupinigi. The arboretum in the Botanical Gardens and the extension of the Valentino Park date back to the 19th century, along with smaller gardens in some of the squares built at the time. The tree-lined boulevards, still a feature in our day and age, were also planted in the 19th century.

Turin's 1915-20 Master Plan foresaw the creation of large parks obviously located in the outskirts of that time: Pellerina, Pilorgetto and Sempione. Later Town Plans created new parks, the most important ones being the Valentino Nuovo, Di Vittorio and Colletta as well as re-organising the Cavalieri di Vittorio Veneto and the Colonnetti Parks (Ghisleni and Maffioli, 1971; Istituto di Architettura e Tecnica del Politecnico, 1968).

The lay-outs and the plants in the older gardens and parks are under conservation orders, and can not therefore be changed. The original design and the plant species are kept to protect the historical and cultural heritage. Re-modelling is allowed in the more recent inner city and peripheral parks, making botanical and town planning experimental lay-outs possible. Turin's centre is characterised by the above described so called «historical» gardens, leaving most of the parks in the outskirts. In spite of this, the city green is distributed quite evenly among the ten city districts except for district 1 (the Centre), and districts 7,8 and 10 that include the hilly parts of the metropolitan district (Fig. 3).

The present work is a study for a new lay-out of the Colonnetti Park with the aim of improv-

ing the general plan of the area and of limiting the number of plants producing allergenic pollens.

The suggested re-organisation is based on studies carried out in the Turin area on vegetation (Montacchini and Siniscalco, 1982; Siniscalco and Montacchini, 1983-84), on airborne pollens (Caramiello *et al.*, 1985-86), on the pollen calendar (Caramiello *et al.*, 1990) and on the incidence of the species with a high allergological impact. The results of the quantitative studies of the main airborne pollens in Turin are shown in Tab. I; nomenclature follows *Flora Europea* (Tutin *et al.*, 1964-80; Bailey, 1949).

Among the entities listed below some have been classed for a high allergological impact: *Betula*, *Quercus*, Oleaceae, Urticaceae, Gramineae, Compositae (*Artemisia*, *Ambrosia*), Plantaginaceae, Chenopodiaceae and Polygonaceae. Several studies are underway to ascertain the clinical incidence of the following: Corylaceae, *Castanea*, Cupressaceae and *Acer* (Caiaffa *et al.*, 1988; Macchia, 1986; Bottelli *et al.*, 1982; Feliziani, 1986; Lewis and Elvin-Lewis, 1977; Lewis *et al.*, 1983; Negrini *et al.*, 1986).

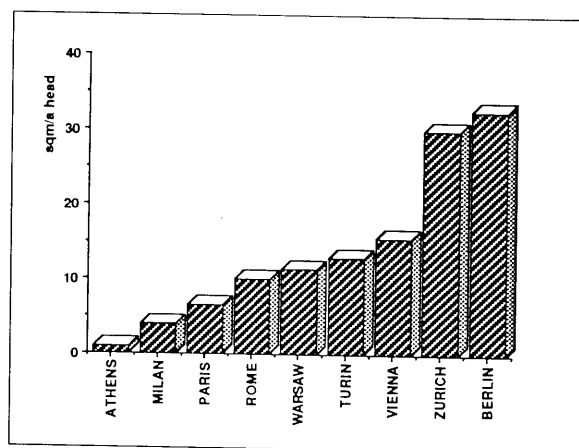


Figure 1. Square meters of green area for each inhabitant in some European city.

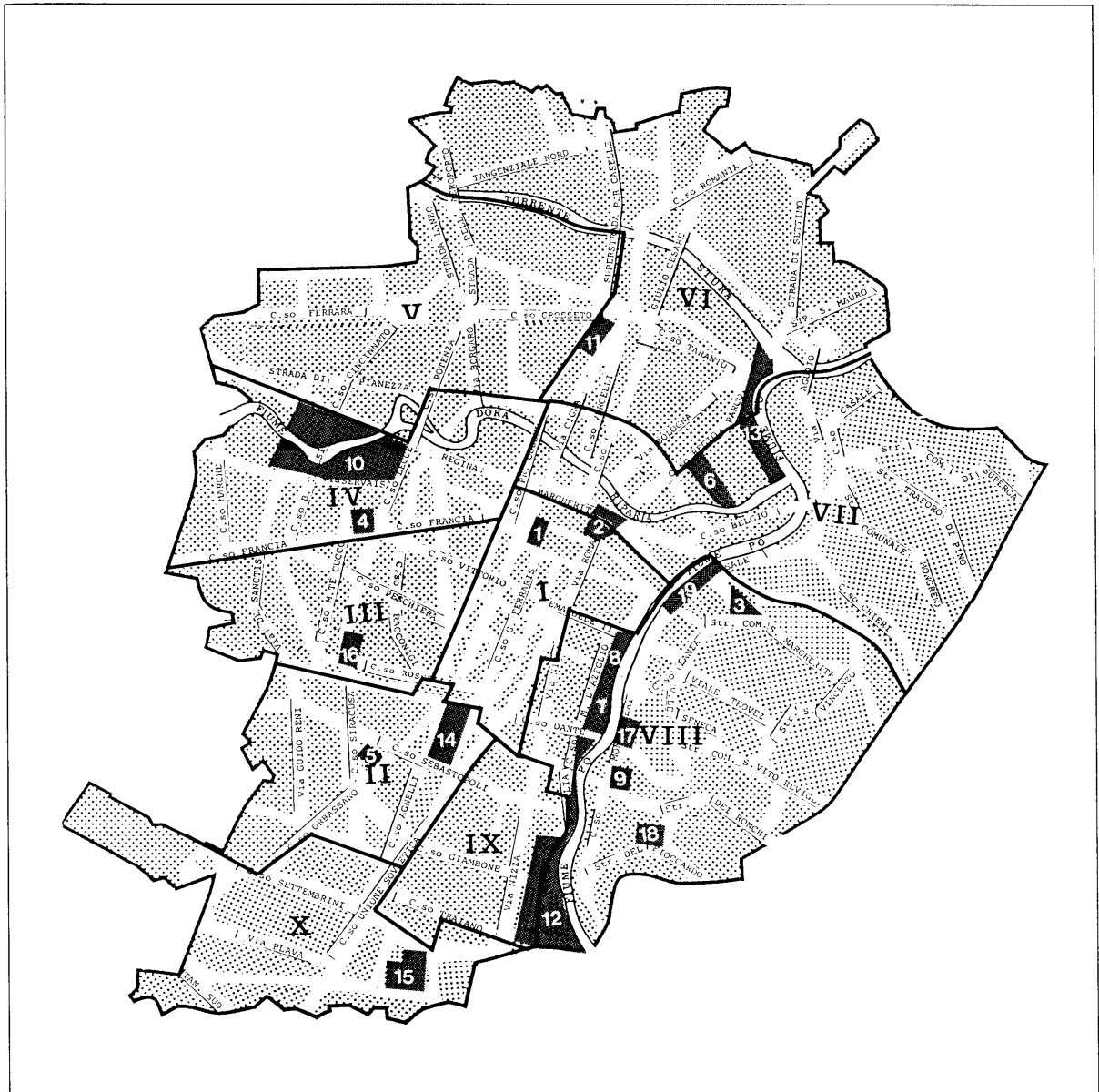


Figure 2. Map of the city of Turin with the most important gardens and parks. (1 - Cittadella; 2 - Giardini Reali; 3 - Villa della Regina; 4 - Tesoriera; 5 - Villa Rignon; 6 - Regio Parco; 7 - Valentino; 8 - Giardino Botanico; 9 - Pilonetto; 10 - Pellerina; 11 - Sempione; 12 - Valentino Nuovo; 13 - Colletta; 14 - Cavalieri di Vittorio Veneto; 15 - Colonnetti; 16 - Ruffini; 17 - Leopardi; 18 - Europa; 19 - Michelotti).

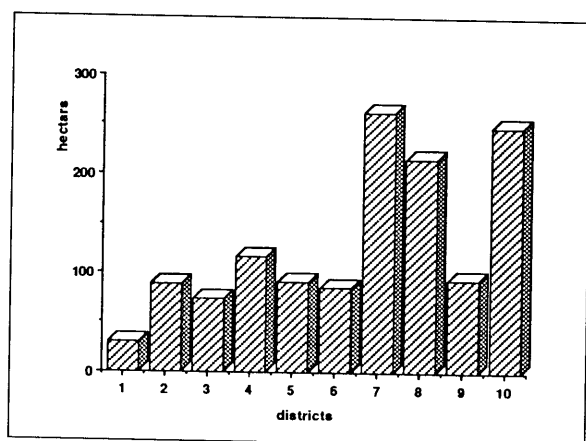


Figure 1. Distribution of green areas in the districts of the city of Turin.

Table I. Total pollen quantities for the 25 principal entities (1981-88) calculated as sum of the daily concentrations (grains/m³). Each entity is also listed as a percentage of the total amount.

	Mean 1981-88	%
Ulmaceae	866	.72
Betula	8408	6.97
Populus	970	.80
Salix	209	.17
Alnus	2818	2.34
Acer	3854	3.20
Platanus	16859	13.98
Quercus	5709	4.73
Fagus	672	.56
Castanea	5992	4.97
Corylaceae	7612	6.31
Cupressaceae	2940	2.44
Pinaceae	4661	3.87
Juglans	1010	.84
Oleaceae	3027	2.51
Tilia	128	.11
Urticaceae	28406	23.56
Graminaeae	16625	13.79
Compositae	955	.79
Artemisia	2693	2.23
Plantaginaceae	1020	.85
Chenopodiaceae	723	.60
Polygonaceae	2462	2.04
Humulus	1482	1.23
Ambrosia	476	.39
Total	120577	100

PRESENT SITUATION AND SUGGESTED NEW LAY-OUT

The Colonnetti Park was planted between 1979 and 1981. The area had previously been wasteland, and at one time it had housed the Gino Lisa Airport. It was made into a park in relation to the International Year of the Child.

The situation of the plants planted at the time of its establishment is not satisfactory: difficulties started with rooting and continued with a stifled growth because of the nature of soil. Water supplies are not good enough either, since there is only a thin layer of soil placed over the old airport's tarmac that has never been removed.

Tab. II shows the species currently to be found in the park with little or no growth; Tab. III lists the species whose growth is considered satisfactory. Definite or probable allergological impact is marked in both tables. All the species listed in Tab. II are going to be eliminated, as are the species with a high allergenic impact shown in Tab. III.

In spite of its size, the location and the nature of the soil of this area lead to a garden rather than to a strictly speaking park lay-out. This allows for the use of some exotic species alongside the local ones, as happens already in the city's gardens and boulevards. These exotic plants are introduced because of their greater resistance to air pollutants, to fungal pathogens as well as for their beauty. On the contrary, the option of using exotic plants in the new lay-out, where the semi-natural conditions are sought or maintained, is not suggested.

The species eliminated because of their allergological impact or because of the lack of growth will have to be replaced by other local or exotic plants with a comparable or even better ornamental effect. For instance in the case of spring blossoms, the *Forsythia* genus can be replaced by species of the Saxifragaceae family,

known for their abundant blossom (for example the *Deutzia* genus) or several Rosaceae, including *Crataegus*, *Prunus* and *Cotoneaster* that also display a colourful and abundant fruit production in Autumn.

Table II. Species with low or absent growth rate which are actually present in the park. Those with the asterisk are allergenic.

* <i>Quercus rubra</i> L.
* <i>Quercus robur</i> L.
* <i>Juglans nigra</i> L.
<i>Fagus sylvatica</i> L.
* <i>Betula pendula</i> Roth.
<i>Ulmus</i> sp.
<i>Magnolia grandiflora</i> L.
<i>Cedrus atlantica</i> Manetti

Table III. Species which are actually present in the park with good growth. Those with the asterisk are allergenic.

<i>Platanus orientalis</i> L.
<i>Pinus excelsa</i> Wallich
<i>Pinus sylvestris</i> L.
<i>Pinus strobus</i> L.
<i>Ginkgo biloba</i> L.
<i>Cedrus deodara</i> Loudon
<i>Cercis siliquastrum</i> L.
<i>Acer campestre</i> L.
* <i>Fraxinus excelsior</i> L.
* <i>Forsythia viridissima</i> Lindl.
* <i>Ligustrum vulgare</i> L.
* <i>Celtis australis</i> L.
* <i>Carpinus betulus</i> L.
* <i>Acer negundo</i> L.
* <i>Juniperus communis</i> L.
<i>Tilia</i> sp.

Autumn flowering may be provided by *Hibiscus syriacus*, *Lespedeza thunbergii* and *Clerodendrum trichotomum* which have not so far given any indication of allergological impact. Rich foliage varying in the course of the year can be

obtained from sterile red leaf hybrids of *Corylus*. *Cedrela sinensis*, which have already proved extremely effective in Parisian boulevards (Johnson, 1974), can also be used for its rapid growth.

Leguminosae such as *Gleditsia*, *Albizia* and *Robinia* are especially suited for rows and are always an option.

A number of local and exotic prevalently entomophile maple trees (Lewis *et al.*, 1983) are suited to create large patches of red turning to yellow in the Autumn (*Acer palmatum*, *A. japonicum*) (Tab. IV).

Table IV. Non allergenic exotic species, with good possibilities of growth.

<i>Gleditsia triacanthos</i> L.
<i>Morus alba</i> L.
<i>Morus nigra</i> L.
<i>Tamarix gallica</i> L.
<i>Hibiscus syriacus</i> L.
<i>Weigela florida</i> (Burge) DC.
<i>Albizia julibrissin</i> Durazzo
<i>Ailanthus altissima</i> (Miller) Swingle
<i>Aesculus hippocastanum</i> L.
<i>Robinia pseudoacacia</i> L.
<i>Prunus pissardii</i> Carr.
<i>Acer palmatum</i> Thunberg
<i>Acer japonicum</i> Thunberg
<i>Crataegus</i> sp.
<i>Ribes</i> sp.
<i>Deutzia</i> sp.
<i>Mahonia aquifolium</i> DC.
<i>Berberis</i> sp.

Other local European species with little or no allergological impact are also suitable and are listed in Tab. V (Bailey, 1949; Simon, 1965; Johnson, 1974; Fenaroli and Gambi, 1976; Lewis and Elvin-Lewis, 1977; Bottelli *et al.*, 1982; Lewis *et al.*, 1983; Vedel *et al.*, 1983; Feliziani, 1986).

Many of the aforementioned species are not often used in parks as ornamental plants and have therefore not yet been experimented in an urban environment.

Table V. Native species with good possibilities of growth in urban environment of Turin.

	Origin and distribution	Requirements	Flowering period	Other characteristics
<i>Pinus sylvestris</i> L.	Spontaneous in Europe from Sweden, Norway and Finland	Heliophilous and xerophilous	April-June	Indifferent to substrate, also in pure soils. Rapid growth rate.
<i>Pinus nigra</i> Arnold	Circummediterranean species (Spain and Africa)	Also in dry area	May-July	Survives in calcareous soil, chalk and marl. Resists to wind and frost.
<i>Taxus baccata</i> L.	South Scandinavia, Central and South Europe and North Spain	Prefers shade and calcareous soils	January-April	Poor requirements
<i>Salix caprea</i> L.	Very common in Europe and Asia	Prefers humid soils	March-May	Pioneer species
<i>Populus tremula</i> L.	From Europe to a great part of Asia and N-Africa	Heliophilous species, in woody areas, on fresh and humid soils	March-May	Indifferent to substrate
<i>Morus nigra</i> L.	Cultivated in Europe	Fresh, deep and permeable soil does not tolerate clay and damp soils	April-May	Indifferent to substrate
<i>Sorbus aucuparia</i> L.	All Europe	Heliophilous species	May-July	Also on poor soils
<i>Sorbus torminalis</i> (L.) Crantz	C-S-Europe	Heliophilous species prefers calcareous soils	May-June	
<i>Prunus mahaleb</i> L.	S-Europe	Heliophilous and thermophilous species	March-May	Prefers calcareous soils
<i>Prunus padus</i> L.	Europe-Asia	On humid soils, rich in humus content	April-June	Optimum siliceous soils
<i>Ceratonia siliqua</i> L.	Native of W-Mediterranean and Asia Minor, now in all Mediterranean basin	Heliophilous and thermophilous species on dry and calcareous soils	May-September	Growths also on poor soils
<i>Cornus mas</i> L.	From E-C-Europe to Caucase	Thermophilous, xerophilous species, on calcareous soils	December-March	Poor requirements
<i>Berberis vulgaris</i> L.	Europe	Calcareous soils	May-June	Poor requirements
<i>Ribes uva-crispa</i> L.	Spontaneous in W-Europe except the Mediterranean area	Calcareous soils	May-July	Frequently cultivated
<i>Rosa canina</i> L.	Spontaneous in Europe, also in Mediterranean area	Brushwood	May-July	Indifferent to substrate
<i>Ilex aquifolium</i>	Spontaneous in West and South Europe	Thermophilous species in zones with a humid climate	May-June	Resists to calcareous soils
<i>Evonymus europaeus</i> L.	Europe, W-Siberia, Asia Minor	Brushwood, sciaphilous	May-June	Frequently cultivated
<i>Hippophae rhamnoides</i> L.	C-W-E Asia and Europe	Sand soils	May-June	High asexual reproduction rate
<i>Lycium halimifolium</i> Miller	S-C-Europe, N-Africa	Heliophilous species	May-August	High asexual reproduction rate
<i>Lonicera xylosteum</i> L.	S-Scandinavia, Europe, Caucase	Calcareous soils	May-June	Rarely cultivated
<i>Mespilus germanica</i> L.	Spontaneous in Asia Minor	Moderately sciaphilous	May-June	Indifferent to substrate. Slow growth rate.

The cost and time required for the maintenance of well rooted trees and shrubs is usually low and limited, the management of turfs is costly and time consuming. This is partly due to the climate, the dry summer period specifically, and to the wear due to people walking over it. The Gramineae and Leguminosae are among the mixes used for wide open spaces with no weekly maintenance scheme. The turf has to be cut at least 7-8 times a year for a satisfactory coverage of the soil. The lack of regular cuts leads to the flowering of the Gramineae and to the dispersion of large amounts of pollen with a high allergological impact. Cultivars of *Poa pratensis* (Cintia, Benson A34 and Geronimo) have recently become available on the market, their advantage being the low number of cuts required, an extremely low re-flowering rate and a good tolerance to drought. In these cultivars the ratio vegetative/reproductive effort is higher than in other older cultivars with consequent lower production of airborne pollen. The use of some recent cultivars of *Festuca rubra* (Victor, Novorubra) is also suggested for their resistance to drought and their low flowering rate.

Turin suffers from very cold winters, the average temperature for January being around 2° C, and 46 days frost a year (calculated over 37 years from 1951 to 1988) (Caramiello *et al.*, 1990); consequently *Dichondra repens* (Convolvulaceae) which is commonly used in Central Italy can not live in Turin.

The elimination of ruderal areas and of the spread of weeds commonly found in turfs is vital to reduce the airborne pollens with an allergological impact. Specifically, this is the case with *Parietaria* (Errigo e Monti, 1986; Pereira-Barbosa *et al.*, 1989), *Artemisia* (Caramiello *et al.*, 1989) and *Ambrosia* which is spreading rapidly in the urban environment (Gallesio and Caramiello-Lomagno, 1986; King, 1989; Lomagno *et al.*, 1984). The problem will be tackled with selective weed control to be

used at the beginning of the project. Regular mowing will also be carried out to complete and maintain the initial action, since a frequent use of chemical selective weed control is not advisable in densely populated areas.

CONCLUSIONS

The comparison between the data on airborne pollens, and those on the vegetation in the urban area seems to suggest that most airborne pollens origins in the city and in its immediate neighbourhood (Caramiello *et al.*, 1986). In view of the large and increasing number of people allergic to pollens in the city, every attempt must be made to reduce the allergological impact of plants.

One practical attempt may be made considering the tree, shrub and herbaceous component in parks. Pollens travel considerable distance which means that is impossible to create a hypo-allergenic area. However, in spite of this, plants in newly established gardens and small green areas inside courtyards ought to be carefully selected to cut down the overall allergogenous impact.

The conditions which have determined the unsatisfactory development of Colonnetti Park make it possible to attempt a new lay-out. This may therefore become a case to test the effectiveness of the suggestions described in this paper. Pollen concentrations can be measured with mobile traps and results will be compared with those in other city parks.

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