Airborne pollen in Sassari (NW-Sardinia): a 3-years survey, comparison between two pollen samplers.

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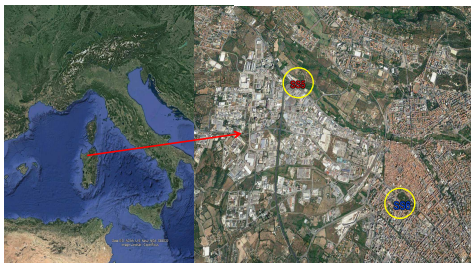
The main aim of the present study was to analyze and compare the results of 3-years (2015-2017) aerobiological sampling in Sassari between two Hirst type volumetric spore traps located in two different areas of the city.

The study was carried out in North Western Sardinia, Sassari Italy (40° 43' 24" N, 8° 33' 13" E , 120 m s.l.m.). The first pollen sampler SS6 (CNR) was located in the center of the city very close to a public garden. The second one SS5 (ARPAS) was placed in the outskirts of the city.

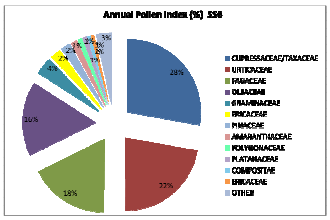
The pollen concentration of the 20 *taxa* more abundant in the atmosphere of Sassari was considered. The following parameters were calculated for each pollen: start, end and duration of pollen season, date of peak pollen concentration, number of days from the beginning of the season to the peak, annual pollen index (API), percentage distribution of API and maximum daily concentration.

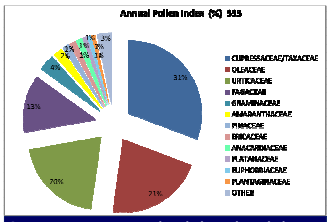


Spearman correlation analysis was performed between daily pollen concentration data collected by the two samplers. To study the effect of different urban location on pollen concentration of various *taxa* an analysis of variance with the GLM procedure of SAS (version 8.2; SAS Institute, Cary, NC) was performed considering the location and the interaction between location and year as fixed factors.

Average pollen season characteristics in both stations (SS5, SS6) Sassari 2015-2017

	Start DOY	End DOY	Duration (N. days)	Peak DOY	N. days Start-Peak	API
Anacardiaceae						
SS5	92	116	25 (±4.6)	99	7.7	550.9 (±182.1)
SS6	85	135	50.7 (±25.6)	102	17.3	171.3 (±150.9)
Betulaceae						
SS5	38	160	124 (± 20.1)	46	8.3	157.2 (±116.9)
SS6	38	140	102.7 (±50.4)	67	28.3	174 (±117.2)
Amaranthaceae						
SS5	137	270	134 (±3.1)	150	12.7	881.2 (±115.5)
SS6	122	263	141.7 (±15.2)	150	27.7	442.7 (±87)
Compositae						
SS5	114	278	164 (±48.2)	143	28.3	251.9 (±73.4)
SS6	115	287	172.7 (±42.5)	184	69.3	225.4 (±122.4)
Corylaceae						
SS5	34	132	98.3 (±25.2)	97	63	158.1 (±104.8)
SS6	37	151	49 (±48.9)	109	71.7	178.6 (±130)
Cupressaceae/Taxaceae						
SS5	24	191	167.3 (±132.9)	55	30.7	13972 (±6903)
SS6	33	279	247.3 (±96.44)	67	34.3	9186.8 (±442.3)
Ericaceae						
SS5	58	185	127.5 (±26.2)	118	60	585.4 (±45.3)
SS6	61	208	148 (±9.9)	117	56	740 (±187.8)
Euphorbiaceae						
SS5	43	280	238.3 (±131.6)	51	8.0	350.8 (±283.6)
SS6	19	298	280.3 (±94.3)	77	56.7	165.6 (±84.3)
Fagaceae						
SS5	109	182	74.7 (±12.4)	127	18.3	5796.2 (±1295.5)
SS6	109	195	87.7 (±6.66)	120	11.3	5820.5 (±3067.3)
Graminae						
SS5	117	207	91.3 (±15.4)	136	19.3	1618.7 (±623.2)
SS6	114	236	123.3 (±18.1)	144	30.0	1249.2 (±775.7)
Oleaceae						
SS5	130	161	31.3 (±9.7)	141	11.0	9746.4 (±4970)
SS6	133	168	35.7 (±5.1)	145	11.7	5402.3 (±990.6)
Olea						
SS5	130	160	30.3 (±8.1)	141	11.0	9314.2 (±4829.7)
SS6	133	163	30.7(±4.2)	145	11.7	4885.9 (±901.1)
Fraxinus						
SS5	27	195	169 (±142)	102	74.7	345.9 (±184)
SS6	30	334	305.3 (±56.8)	167	136.7	318.7 (±92.1)
Pinaceae						
SS5	80	181	101.7 (±48.4)	126	45.3	644.2 (±106.9)
SS6	68	209	142 (±12.53)	125	57.0	672.6 (±177.1)
Plantaginaceae						
SS5	100	224	124.7 (±18.18)	126	26.3	320.6 (±124.2)
SS6	95	241	147.3 (±21.1)	166	71.0	97.1 (±30.2)
Platanaceae						
SS5	85	116	32.7 (±8.7)	97	12.0	388.3 (±212.3)
SS6	82.67	112	30.7 (±19.)	97	14.0	288.9 (±263.9)
Polygonaceae						
SS5	77	159	83.3 (±31.)	100	23.0	299.9 (±82.5)
SS6	59	190	132.3 (±28.7)	96	16.7	295.2 (±115.4)
Salicacea						
SS5	56	115	60 (±13.7)	62	6.0	259.5 (±82.3)
SS6	52	101	50.3 (±7.5)	68	16.7	190.7 (±30.2)
Ulmaceae						
SS5	41	101	60.7 (±31.6)	78	36.4	96.2 (±59.1)
SS6	45	105	61 (±10.4)	67	22	163.2 (±57.7)
Urticaceae						
SS5	78	289	212 (±28.8)	99	21.3	9077.3 (±2512.3)
SS6	75	278	204.7 (±28.5)	113	38.3	7319.2 (±3626.6)





Average percentage over the whole study period (2015-2017) for the 20 studied taxa

Over the three years of study Cupressaceae, Oleaceae, Urticaceae, and Fagaceae accounted of about 85% of the total pollen counts recorded in both SS5 and SS6 sites but the percentage contribution of each *taxa* is different.

Significance of Spearman correlation coefficients between daily pollen concentration of SS5 and SS6 samplers

	n	r	sign
Anacardiaceae	162	0.892	***
Betulaceae	376	0.440	***
Amaranthaceae	447	0.520	***
Compositae	441	0.453	***
Corylaceae	414	0.365	***
Cupressaceae/Taxaceae	780	0.917	***
Ericaceae	382	0.580	***
Euphorbiaceae	578	0.599	***
Fagaceae	275	0.783	***
Graminae	375	0.800	***
Oleaceae	116	0.803	***
Olea	100	0.734	***
Fraxinus	937	0.841	***
Pinaceae	436	0.828	***
Plantaginaceae	455	0.310	***
Platanaceae	118	0.310	***
Polygonaceae	406	0.536	***
Salicacea	200	0.410	***
Ulmaceae	219	0.208	**
Urticaceae	593	0.780	***

Significant probabilities: **, P≤0.01; ***, P≤0.001

Spearman correlation analysis between daily pollen concentration recorded during the three years showed a positive correlation and a highly significant coefficient values for all *taxa*.

Some differences between sites were found when data were analyzed for each year separately. The analysis of variance showed highly significant differences in all three years for pollen of Plantaginaceae, and in two years for Anacardiaceae, Amaranthaceae and Euphorbiaceae. No difference among the sites was highlighted for some important *taxa* including Compositae, Corylaceae and Fagaceae.

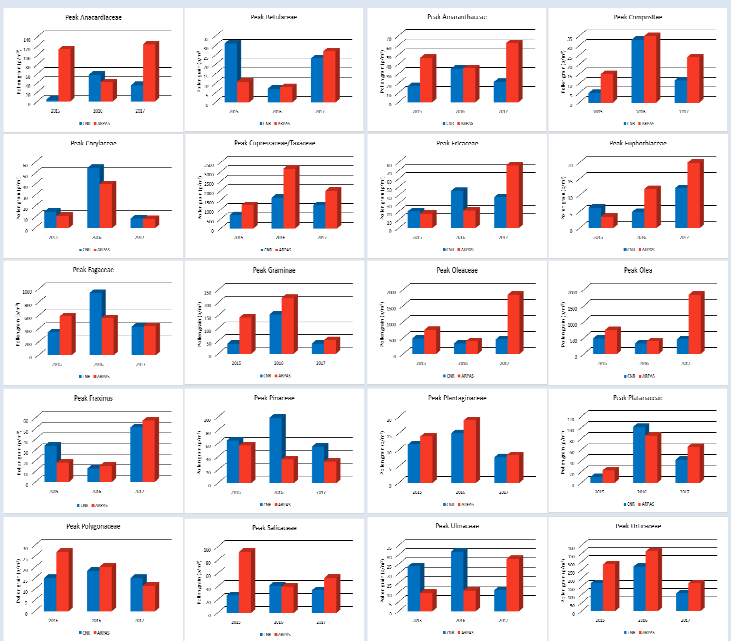
Effect of different urban location on pollen concentration observed in the various taxa

	Effect P-value		
	2015	2016	2017
Anacardiaceae			
SS5/SS6	***	NS	***
Betulaceae			
SS5/SS6	***	NS	*
Amaranthaceae			
SS5/SS6	***	NS	***
Compositae			
SS5/SS6	NS	NS	NS
Corylaceae			
SS5/SS6	NS	NS	NS
Cupressaceae/Taxaceae			
SS5/SS6	NS	*	*
Ericaceae			
SS5/SS6	NS	NS	NS
Euphorbiaceae			
SS5/SS6	NS	***	***
Fagaceae			
SS5/SS6	NS	NS	NS
Graminaceae			
SS5/SS6	*	NS	NS
Oleaceae			
SS5/SS6	NS	NS	***
Pinaceae			
SS5/SS6	NS	NS	NS
Plantaginaceae			
SS5/SS6	***	***	***
Platanaceae			
SS5/SS6	NS	NS	*
Polygonaceae			
SS5/SS6	NS	NS	NS
Salicaceae			
SS5/SS6	NS	NS	NS
Ulmaceae			
SS5	***	*	NS
Urticaceae			
SS5/SS6	NS	NS	***

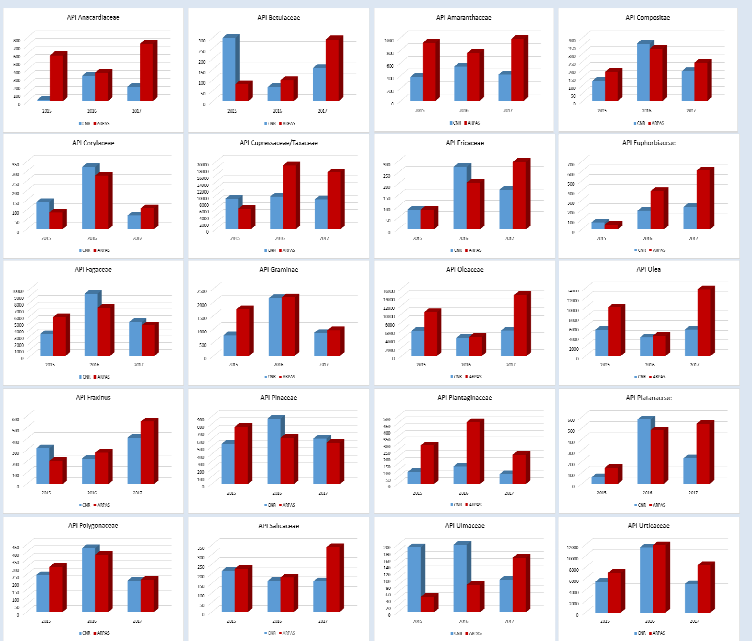
*, P≤0.05; ***, P≤0.001; NS no significant

Pollen of Plantaginaceae

Maximum pollen daily concentration



Annual Pollen Index



Some differences on maximum pollen daily concentration were observed between the two sites. However these differences were not found every year for each *taxa*. We in fact observed, for the same *taxa*, years in which the peak concentration was similar in both sites, and years in which it was really different (e.g. Oleaceaceae and Olea in 2016 and 2017 respectively; Fagaceace in 2017 and 2016 respectively).

Analysis of the pollen index for each pollen type and each study year revealed in some cases evident differences in the amount of pollen produced by the species present in the area surrounding the samplers. Clear differences in annual pollen index values were observed every year in Amaranthaceae and Plantaginaceae *taxa*. This could be probably due to a greater presence of these species in the neighborhood of the traps. For the others *taxa* we observed differences between sites only in some years.