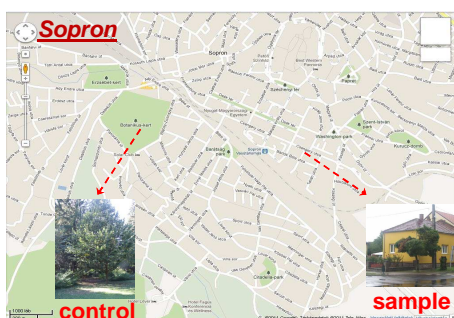


Possibility of Surveying the Physiological Condition of Trees Growing in Urban Areas by Means of Total Phenol Content and Antioxidant Capacity Determined from the Leaves

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The goal of the present research was to investigate how some specific chemical parameters of the leaves could reflect the physiological and health state of individuals of a given tree species (Norway maple, *Acer platanoides* L.) growing in an urban area. Two trees were considered for research, from which leaves were collected and analysed. The trees originated not only from different parts of Sopron, Hungary but they could also be characterized with different living environments in terms of environmental load. Seven leaves were collected during the growth season between May and September, 2011 at altogether nine occasions from each tree. The total phenol content and antioxidant capacity (DPPH assay) was determined from the leaves and the correlations of the two parameters were studied. Comparing the two parameters and investigating the environmental-load-sensitivity of the correlations new possibilities could open up for the characterization of the physiological state of the plant as whole and for the characterization and quantitation of the differences between control and sample individuals.



Extraction,
total phenol assay,
DPPH assay

DPPH assay (AO capacity)

	sample		control	
	IC ₅₀	sd	IC ₅₀	sd
June 2	0.0071	0.0038	0.0158	0.0046
July 13	0.0264	0.0234	0.0296	0.0138
July 27	0.0159	0.0131	0.0273	0.0113
August 9	0.0113	0.0067	0.0379	0.0216
August 24	0.0348	0.0204	0.0259	0.0060
September 14	0.0527	0.0341	0.0676	0.0241
Group mean	0.0247	0.0169	0.0340	0.0136

Total phenol content

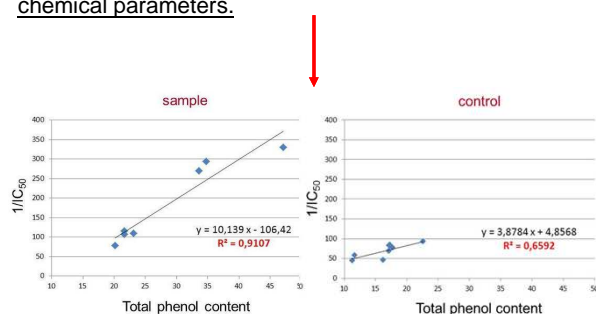
	sample		control	
	total ph.	sd	total ph.	sd
June 2	28.873	10.022	16.209	3.862
July 13	19.384	14.056	11.899	3.044
July 27	28.959	20.736	13.123	4.063
August 9	27.300	9.641	10.846	3.633
August 24	9.874	5.379	10.972	2.045
September 14	11.777	8.299	7.962	4.051
Group mean	21.027	11.355	11.835	3.449

The sample tree can be characterized with lower IC₅₀ mean values (higher antioxidant capacity) than the leaves from the control tree. The values of the IC₅₀ show a clear increase in time. The leaves of the sample tree have higher levels of phenolic compounds than the leaves of the control tree. Standard deviation is significantly higher in the case of the sample tree. The mean total phenol contents decrease with time. Possible connection between the two measured chemical parameters.

The mean values of the IC₅₀ and total phenols and the standard deviations for the seven leaf samples for each sampling occasion

	sample			control		
	a	b	R ²	a	b	R ²
June 2	10.139	-106.42	0.9107	3.878	4.858	0.6592
July 13	6.924	-41.16	0.8606	4.488	-13.833	0.7708
July 27	9.711	-101.89	0.8711	3.660	-6.038	0.9040
August 9	7.407	-78.44	0.9439	5.647	-23.163	0.5796
August 24	4.203	-1.93	0.8573	3.184	5.283	0.6154
September 14	2.046	3.31	0.8937	1.198	7.089	0.6017
Group mean	6.738	-54.424	0.8896	3.676	-4.300	0.6885

The parameters of the linear correlations between total phenol content and 1/IC₅₀ values for each sampling occasion. a: slope, b: intersection, R²: coefficient of determination



Linear correlation between total phenols and 1/IC₅₀ values for the sampling occasion of June 2 (example)

It can be established that there are large differences between control and sample in terms of the a, b and R² values and their temporal change. Based on the measured data and the linear correlations between them, as well as on the temporal change of these parameters the two individuals of the same tree species could be distinguished chemically. The cause for this could be tracked back to the differing environmental and physiological conditions under which these trees live. Besides of that the diverging genetic potentialities of the trees could not be excluded as a possible cause too, however. Further evaluations are required to find direct relations between the measured data and climatic conditions as well as air-pollution parameters.