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Studies on Foliar Apparatus Development of the Norway Maple (*Acer platanoides*) during the Growing Season

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Abstract. Studies werw carried out on Norway maple canopy developement during the growing season, which is a very important factor in conducting physiological processes, having a direct impact on tree growth and developement All solar radiation reaching inside tree canopy define photosynthesis procese. Thus, quantitative measurements were carried out on the flow of light radiation inside of the leaf apparatus, solitary trees were subjected in the research in facilities outside the forest. The differences of the existing lighting was recorded inside the canopy according exhibition, the measurements were made for six months, from budding to full expansion of leaves. After processing the experimental data, it was showed the fact that on the western exhibition the light penetration shows a higher value in both years of the study, between 3.1% and 4.1% from the average recorded in the canopy. In March, April, May and June, the light flow inside the canopy is higher, with values ranging between 0.7% and 27.6% compared to the average of the growing season. According to expectations, the northern exhibition presents the lowest values in terms of light penetration, showing very significantly distinct negative values compared to the control variant. Together with the development of the trees foliage mass, in August were recorded the smallest amount of light radiation, were seen a decrease up to 48.1% compared to the mean, which can be explained by the reaching of maximum physiological development of the leaves.

Keywords: canopy, Norway maple, lihgt flow, exhibition

INTRODUCTION

The crown of the Norway maple (*Acer platanoides*) has a oval shape, which do not hinders many species that are growing in mixture forests. Although its wood is quite valuable, it is a spread growing tree species and has a low economic importance. Because of its wide crown and the yellow coloration of the leaves, especially during autumn, Norway maple is much used as a decorative tree in parks or along roads (Negulescu *et al.*, 1957).

The ccomplex structure of forests offers very diverse light conditions between the canopy leafs. Individual photosynthetic capacity of leaves depends on light conditions, the productivity and growth rate of branches are strongly influenced by their position in the canopy and by the light conditions (Parker, 1995, Osada *et al.*, 2001).

The light, both by quantity and by specific wavelengths has a role in the onset of vegetative processes in woody species. The amount of light energy in conjunction with temperature is one of the determinants of the growing season. According to the Sun exhibition, there are quantitative and qualitative differences in terms of leaf mass density and development so that we can not consider the canopy homogeneous.

Under the influence of light radiation, there are significant differences between light and shadow leaves. Light leaves have distinct morphological characters, which are usually thicker than shade leaves and they contain large quantities of carboxylase, but the shadow

leaves have a higher content of chlorophyll, so photosynthesis process is more effective in lower light conditions.

The distribution of solar energy inside the canopy has a significant influence on the dry mass accumulation of woody species, thus Szabo *et al.*, (2009) determine that in case of Norway maple the maximum useful matter accumulation it is at 12 o'clock. Between 12 and 16 o'clock, the value of useful matter it is smaller for the Norway maple comparing to the value of the useful matter accumulation between 8 and 12 o'clock.

MATERIALS AND METHODS

The experiments were conducted in 2009 and 2010 in the arboretum of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca and in the Făget IV production unit which is located southwest of Cluj-Napoca.

The canopy of trees chosen randomly, was divided into four parts following the cardinal points, and was taken four shots in each canopy, after it was settled the exhibition of 25 Norway maple (*Acer platanoides*) trees.

Experiences took place at the beginning of the growing season from March to the reach of the maximum size of leaves in August, aiming the development of canopy separately for each experimental variant. Photographs were taken with the same optical parameters in each month and for each sample under study, to avoid the appearance of errors.

After data collection, the photo drawings were processed through the Motic Images Plus 2.0 digital microscopy software, by which it was calculated the degree of penetration of solar radiation inside the canopy. The experimental results obtained were statistically processed by analysis of variance with ANOVA software.

Since in forestry it is entrenched the height of 1.3 m above the ground, the photos were made at this height. From this height, the effect of light reflection from the surface litter is insignificant.

RESULTS AND DISCUSSION

After processing the photo drawings, the obtained data of light penetration in the canopy of trees subjected to study it is presented in percentage values. After statistical accountings, the results are presented in the following tables.

Tab. 1

The influence of exhibition on light penetration in the canopy of Norway maple species (*Acer platanoides*)

Variant	Penetration of solar radiation in the canopy (%)	%	Difference compared to the control variant	Significance	Duncan Test
Control	52.85	100.0	0.00	Mt.	
North	51.28	97.0	-1.57	000	A
South	52.59	99.5	-0.26	0	B
East	52.64	99.6	-0.21	-	B
West	54.90	103.9	2.05	***	C
DL (p 5%)		0.23			
DL (p 1%)		0.32			
DL (p 0.1%)		0.44			

It is surprising that the significance of the Western variant it is very distinct significantly positive. The explanation is given by the amount of solar energy in this area.

Tab. 2

The influence of the month on light penetration in the canopy of Norway maple (*Acer platanoides*)

Variant	Penetration of solar radiation in the canopy (%)	%	Difference compared to the control variant	Significance	Duncan Test
Control	52.85	100.0	0.00	Mt.	
March	65.79	124.5	12.94	***	F
April	61.88	117.1	9.03	***	E
May	58.44	110.6	5.59	***	D
June	53.75	101.7	0.90	***	C
Julie	47.55	90.0	-5.30	000	B
August	29.68	56.2	-23.17	000	A
DL (p 5%)		0.29			
DL (p 1%)		0.39			
DL (p 0.1%)		0.50			

Analyzing the significance for the first four months, they are very distinct significantly positive compared with the mean, and the last two months significance it is very distinct significantly negative, we can explain the results with the progressive growth of the deciduous broad leafs, from budding to achieving the maximum development.

Tab. 3

Interaction between the exhibition and year

Variant	Penetration of solar radiation in the canopy (%)	%	Difference compared to the control variant	Significance	Duncan Test
Control	53.74	100.0	0.00	Mt.	
N Y1	51.69	96.2	-2.06	000	BC
S Y1	53.63	99.8	-0.11	-	F
E Y1	53.72	100.0	-0.02	-	F
W Y1	55.93	104.1	2.19	***	H
Control	52.61	100.0	0.00	Mt.	
N Y2	51.02	97.0	-1.59	000	A
S Y2	52.79	100.4	0.19	-	E
E Y2	52.36	99.5	-0.24	-	D
W Y2	54.25	103.1	1.65	***	G
DL (p 5%)		0.41			
DL (p 1%)		0.56			
DL (p 0.1%)		0.76			

Repeatability of the significance of the variants in Table 3 suggests that, regardless of differences in climatic conditions during the study years, the position of the main branches within the canopy and distinct distribution of foliage in the direction of the cardinal points remains unchanged. Results in these three tables present basic information on the expression and distribution of solar energy.

The results on the dynamics of solar radiation inside the canopy of Norway maple, interactions of the factors month and exhibition it is presented in Figure 1:

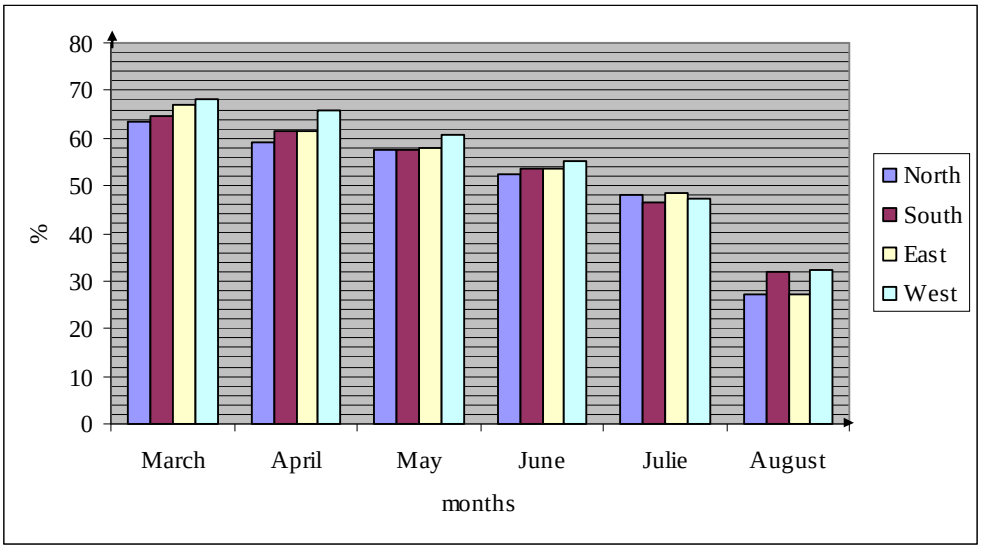

Fig.1. Interaction of the factors month and exhibition

In July and August for all exhibitions, the meaning of variants it is very distinct significantly negative, this is due to the progressive development of foliage during the growing season.

CONCLUSIONS

1. Distribution of solar energy in the canopy of Norway maple varies in every month of vegetation due to morphological development of the tree organs.

2. Distribution of solar energy in solitary trees canopy is variable in the cardinal points. It is clearly seen that the greatest penetration it is in the Western part of the crowns. In the northern part it is a lower penetration, because the higher leaf growth due to longitude and latitude of the place.

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