GENERAL INFORMATION

author(s)	Van Linthout K
year	1996
English title	Evaluation of the impact of nutrient enrichment on the water balance in the experimental forest Aelmoeseneie (Gontrode)
original title	Evaluatie van de hydrologische balans in relatie tot de aanrijking van nutriënten in het proefbos Aelmoeseneie (Gontrode)
reference	MSc thesis, Ghent University, Ghent
pages	98
type	dissertation (d2)
ecosystem service	regulating – water cycle
keywords	deposition, LAI, stomata, S, Cl, transpiration
taxa	*Fagus sylvatica – Quercus robur – Fraxinus excelsior – Acer pseudoplatanus*
project	
supervisor	Lemeur R
institution	Faculty of Agricultural and Applied Biological Sciences, Laboratory of Plant Ecology
document	pdf_short, hardcopy at the Laboratory of Plant Ecology
data	

MATERIALS & METHODS

study area	5n (scientific zone)
time period	May-November 1995
goal	- determination of the transpiration of the Aelmoeseneie forest during the growing season - determination of the bulk and throughfall deposition of SO_4, S, and Cl
set-up	oak-beech forest (Aelmoeseneie) vs. free field (Munte) growing season = spring (May, June), summer (July, August), autumn (September, November)
data collection	bulk & throughfall deposition - bulk collectors = funnel at 1 m height, PVC tube, belowground 2 litre bottle - Cl, SO_4 - 21 April – 1 November, fortnightly sampling meteorological data - measuring tower - precipitation, air & soil temperature, relative humidity, incident radiation - no data between mid-July and the beginning of August 1995 climatological data - KMI station Munte - free field precipitation & amount of sunshine/day, relative humidity/hour - year 1995 leaf area index (beech, oak, sycamore) - 13 leaf litter traps with a mean surface area of 5.6 m² near the throughfall collectors - October–December: sample dates = 05/10, 23/10, 30/10, 16/11, 05/12 - fresh weight - 50 g subsample: sorted into different species, fresh and dry weight and leaf area per species plant-water relationships - a dry, sunny and a dry, cloudy day per month (11/05, 22/05, 13/06, 26/06, 16/07, 30/07, 10/08, 24/08, 14/09, 30/09, 06/10, 19/10, 06/11, 17/11) - hourly calculation of the stomatal resistance and the saturation deficit

	- stomatal characteristics (replica method) o beech and ash, adaxial side of the leaves o 14 September, 3 levels of the measuring tower o beech: 20 leaves at 7 m, 15 leaves at 14 m and at 21 m o ash: 10 leaves at 21 m o stomatal density, width and length of the stomata o calculation of relative stomatal surface (RSPO) and the stomatal resistance o (oak and stomatal depth: data from literature)
remarks	description collection meteorological data from Neirynck&DeKeersmaeker_1995_rep LAI for ash calculated during autumn 1995 by Neirynck&DeKeersmaeker_1995_rep

RESULTS

LAI

The contribution of sycamore to the overall LAI was < 8 %. The total LAI was 6.4 in September (3 oak, 3.3 beech, 0.1 sycamore). The LAI decreased between September and December and was 0 by 5 December; the LAI of beech dropped earlier than that of oak. The leaf dry biomass was 3.4 ton/ha in September (1.8 oak, 1.5 beech). The leaves of beech occur over the entire length of the crown, not only at the top of the tree.

Stomatal characteristics

Stomatal density and dimensions increase with height in the canopy. Ash has the largest stomatal density; RSPO is smallest for beech.

stomata	density (/mm^2)	length (microm)	width (microm)	RSPO (%)
beech 7 m	138 (SE 4)	14.6 (0.9)	8.7 (0.9)	1.4
beech 14 m	183 (SE 3)	15.4 (1.9)	9.4 (1.0)	2.1
beech 21 m	213 (SE 4)	16.3 (1.7)	9.4 (0.9)	2.6
ash 21 m	414 (SE 3)	19.8 (2.8)	9.9 (2.0)	6.4

Climatological and physiological parameters

The changes in net incident PAR radiation, leaf & air temperature, and relative humidity & saturation deficit are shown for a sunny (10/08) and cloudy day (13/06). Changes in stomatal resistance are shown for the 3 species at 21 m on 13/06.

stomatal dynamics	stomatal resistance (s/m)	cuticular resistance (s/m)
beech 7 m	43	18500
beech 14 m	29	18500
beech 21 m	24	18500
ash 21 m	10	18500
oak 21 m	6	38500

Monthly transpiration (mm)

month	oak stand	beech stand	ash stand	oak-beech stand
May	71	21	96	51
June	41	13	58	30
July	180	43	152	127
August	223	54	195	157
September	49	12	50	35
October	43	10	41	30
November	7	2	6	5
Total	614	155	598	435

The calculated transpiration was lower on cloudy days than on sunny days. Transpiration was highest in August. Maximum daily transpiration (l/m^2 leaf area) in August was 1.4 (oak), 1.1 (ash), 0.5 (beech) for a sunny day and 1.2 (oak), 0.8 (ash), and 0.3 (beech) on a cloudy day. In November, the daily transpiration was lower than 0.15 for the 3 species on a sunny day vs. 0.004 on a cloudy day.

deposition (kg/ha) for 18 weeks during the growing season

	bulk	throughfall
SO_4	8.83	14.93
Cl	20.29	11.75
S	2.94	4.98