

GENERAL INFORMATION

author(s)	Agrianto G
year	1974
English title	Microbial-ecological study of forest soils under different tree species
original title	Mikrobieel-ecologische studie van bosgronden onder verschillend boombestand
reference	PhD thesis, Ghent University, Ghent
pages	102
type	dissertation (d1)
ecosystem service	supporting – nutrient cycling
keywords	C, N, species effect, micro-organisms, enzyme activity, soil, pH, seasonality
taxa	
project	PhD
supervisor	Voets JP
institution	Faculteit van de Landbouwwetenschappen, Laboratorium voor Algemene en Industriële Microbiologie
document	hardcopy
data	

MATERIALS & METHODS

study area	5
time period	July 1970–August 1972
goal	Investigate the relationships between the density and composition of the community of micro-organisms and environmental variables such as stand characteristics (tree species, basal area), soil (pH, moisture content, organic matter), and climate (season).
set-up	18 study plots on points of the 70 m x 70 m grid (map p 12)
data collection	Soil samples at 9 sample dates (July, October–November 1970, January/February, March, April/May, July, August, September, October 1971): 2-3 kg mineral soil from 0-10 cm depth <ul style="list-style-type: none">- Microbial analysis (technique of Pochon & Tardieux with cell culture dishes): total number of micro-organisms, fungi, cellulolytic micro-organisms and fungi- Enzymatic activity of the soil: sucrase, glycoside hydrolase, phosphatase, urease, cellulase- moisture content, pH, C content, N content, base content, texture, temperature- Nitrification measurements: identification of <i>Nitrosomonas/Nitrobacter</i> (different methods tested) Litter samples for 2 plots (poplar and oak) at 3 dates (December 1971, February 1972, April 1972) <ul style="list-style-type: none">- number of leaves and dry mass per species- enzymatic activity: idem
remarks	Map of sample points. Summary of 1967 forest inventory.

RESULTS

Significant differences in micro-organism communities and enzyme activity. High activity seems to be correlated with a high diversity in tree species, a high pH + clay content + base content, low basal area. Low activity might be correlated with low moisture content and low N&C content.

Oak causes high cellulolytic and urease activity, red oak promotes fungi, poplar/ash/sycamore stimulate glycoside hydrolase activity, birch promotes phosphatase, beech hinders glycoside hydrolase, cherry&larch show no impact on micro-organisms.

Enzym activity shows seasonal variation, except for urease. Dry conditions seem to induce a decrease in micro-organism numbers and an increase in enzymatic activity.

Micro-organisms seem to be the N transformers, fungi are responsible for the phosphatase. Together, they do the C transformations. Glycoside hydrolase and urease are microbial, phosphatase is fungal, and sucrose is partly microbial, partly fungal.

Sucrase and urease activity in the litter were lower for the oak-hazel litter than for the oak-hazel-poplar litter. Cellulase activity is higher in litter whereas urease and phosphatase mainly act in the soil layer below. Carbohydrates are mainly decomposed in the litter layer while mineralisation of N and P occurs also in the soil.

Nitrification occurs at a rate of 20 mg NO₃-N / kg soil /month. *Nitromonas* and *Nitrobacter* could not be identified. Other micro-organisms are probably responsible for the nitrification.