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<u>Session 3 – Poster</u>

INVESTIGATING FUNCTIONNAL TRAITS ON OIL PALM CARBON ALLOCATION STRATEGY USING $\delta^{13}C$ ON SUGARS AND ORGANIC MATTER - I. LEAVES: PASSAGE FROM HETEROTROPHY TO AUTOTROPHY

Emmanuelle LAMADE (1) Indra Eko SETYIO (2), Max HILL (3), Gabriel CORNIC (3), Jaleh GHASHGHAIE (3)

(1) CIRAD-PERSYST, Montpellier, France (emmanuelle.lamade@cirad.fr)
(2) Indonesian Oil Palm Research Institute (IOPRI), Medan, Indonesia
(3) Laboratoire d'Ecologie, Systématique et Evolution, CNRS/UMR 8079, Université Paris-Sud, Orsay, France

This work was conducted on *Elaeis guineensis* Jacq. (oil palm) in North Sumatra (Indonesia) and carbon isotope discrimination was used to get a better understanding of the major ecophysiological traits involved in the growth and development of this tropical tree and more particularly on the carbon allocation to the bunches and the use of reserves. Carbon isotope signature ($^{13}C/^{12}C$) was measured on bulk organic matter which is supposed to integrate metabolic pathways during the elaboration of the organs. Similar analyses were done on soluble sugars (sucrose, fructose and glucose), starch and lipids, to study the plant metabolism during ontogenesis. The first part of the work deals with the development and the growth of the leaves. Emphasis was beard on the passage from heterotrophy to autotrophy. For the leaves, different growing stages were sampled from rank -6 to rank 45. Carbon isotope analyses were done at the technical platform of IFR 87 in IBP. The mean value for $\delta^{13}C$ of bulk organic matter for all the samples taken from all the organs was -27.46 ‰ ±0.93, which is normally expected for a C_3 plant like oil palm. Differences within trees and organs (for the same tree) and developmental stages (for the same organ) revealed a nice gradient along the leaf ranks. An expected gradient within leaves was also obtained; from leaflets (mean $\delta^{13}C$ = -28.22 ‰ ±1.01) to rachis ($\delta^{13}C$ = -27.04 ‰ ±0.38) and to petioles ($\delta^{13}C$ = -26.91‰ ±0.56), with photosynthetic tissues being ^{13}C-depleted (more than 1 ‰) compared to others. Leaves are ^{13}C-enriched at ranks below zero (around -27‰). At these stages, the leaves being completely heterotrophic, reserves from source organs are mobilised for the growth of these young emerging leaves. ^{13}C-depletion is observed when the leaf is expanding at rank 1, and continues to decrease during progressive passage from heterotrophy to autotrophy and until reaching the fully autotrophy at rank 8. Thereafter, $\delta^{13}C$ remains more or less constant around -29.5 ‰. The $\delta^{13}C$ gradient along the leaf ranks could reflect not only an increase in stomatal conductance and thus an increase in photosynthetic carbon isotope discrimination during leaf maturation but also changes in carbon metabolism. Carbon isotope discrimination is already a pertinent tool to follow photosynthetic metabolites for oil palm in leaves (heterotrophic and autotrophic) and for the understanding of the filling of the mature inflorescences from sugars reserves.

Investigating functional traits on oil palm carbon allocation strategy using $^{13}C/^{12}C$ on sugars and organic matter.

I. Leaves: passage from heterotrophy to autotrophy.

Lamade Emmanuelle (1), Setiyo I. Eko (2), Max Hill (3) Ghashghaie Jaleh (3)

(1) CIRAD-PERSYST, UPR 80, Montpellier, France, emmanuelle.lamade@cirad.fr, http://www.cirad.fr
(2) IOPRI (Indonesian Oil Palm Research Institute), Medan, Indonesia, iopri@idola.net.id, http://www.iopri.co.id
(3) Laboratoire d'Ecologie, Systématique et Evolution, UMR 8079, Bâtiment 362, F 91405 Orsay Cedex, France

Key words: carbon isotope discriminaion, oil palm, leaf, heterotrophy, autotrophy, carbon allocation,

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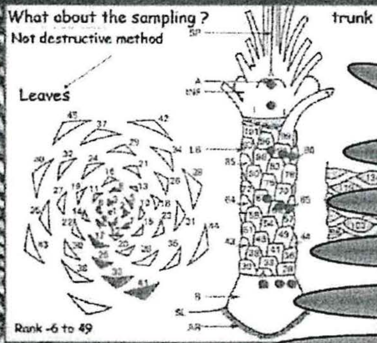

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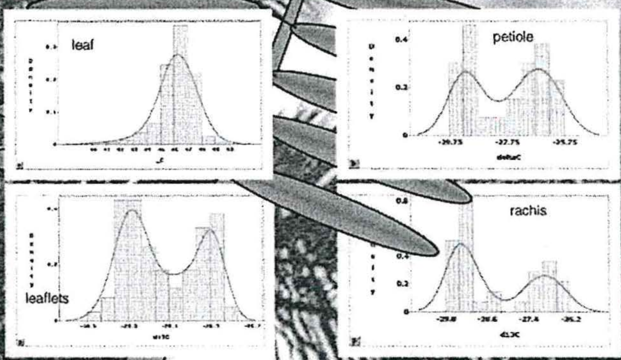
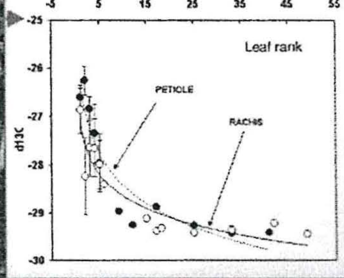
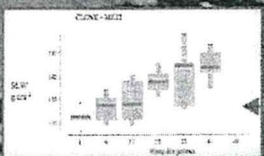
C% and d13C



At these stages, the leaves being completely heterotrophic, reserves from source organs are mobilised for the growth of these young emerging leaves. 13C-depletion is observed when the leaf is expanding at rank 1, and continues to decrease during progressive passage from heterotrophy to autotrophy and until reaching the fully autotrophy at rank 8. Thereafter, Δ13C remains more or less constant around -29.5 ‰.

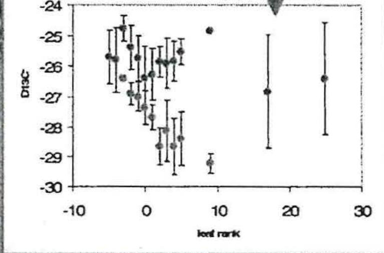
OM

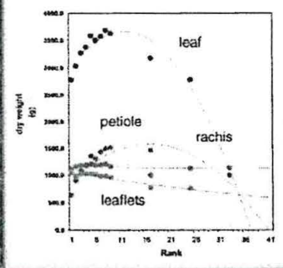


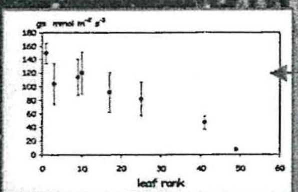


SLW

starch

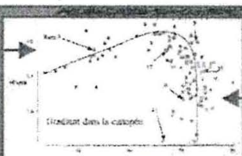






Gs

Nleaf%



SPAD

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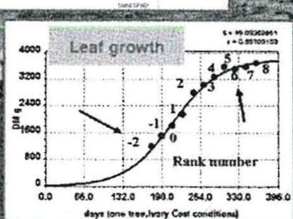

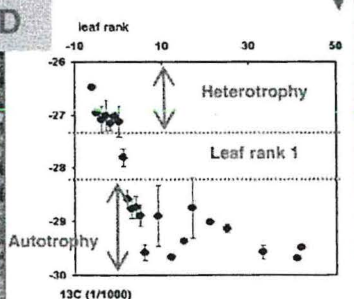

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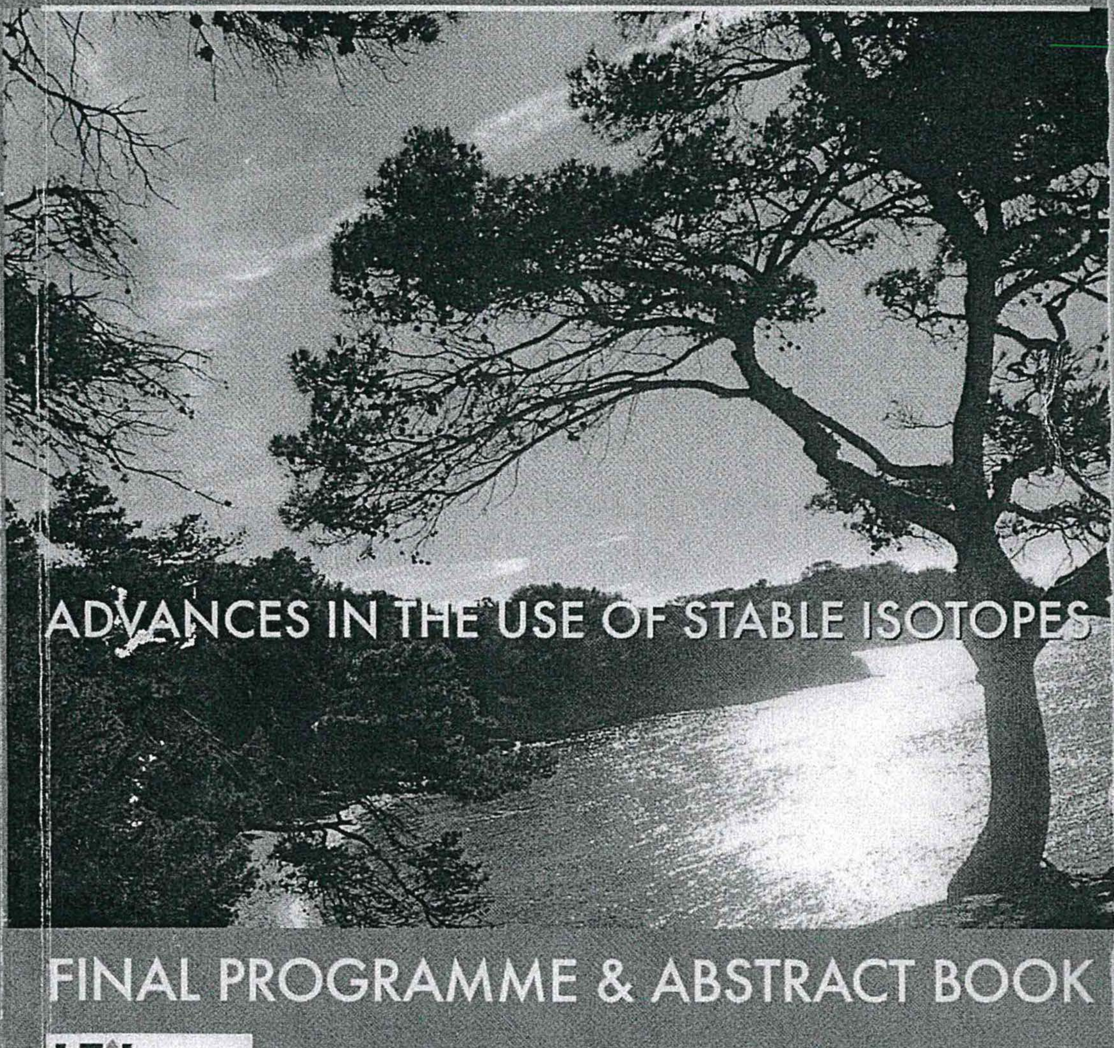

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