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Dear GERLI members,

I am writing to you to inquire about the possibility of a Postdoctoral position. I have recently obtained my PhD in Biotechnology at the University of Compiègne (France) under supervision of Dr Brigitte Thomasset.

During my thesis, I focused my work on improving our understanding of lipid synthesis and storage in oilseed plants. Particularly, my work consisted in the identification of enzymes involved in the synthesis and the storage of branched chain fatty acids into triacylglycerols of producing plants. In parallel we studied the bottlenecks in the incorporation of these branched chain fatty acids into oilseed plant triacylglycerols. This study was part of a regional research program (METALIPID) for the production of high value oilseed crops.

Following my PhD, I am interested in working on developing plant based renewable resources. Specifically, I am interested in conducting research projects that develop novel lipids for industrial uses. Working amount GERLI members will allow me to pursue research in lipid metabolism and to widen my knowledge and experience in this domain.

My studies allowed me to gain valuable experience in molecular and cellular biology, plant physiology and biochemistry. My studies at the University of Plymouth in England and my different work experiences in France have developed my ability to work independently and as part of a team in addition to adapting to different research cultures.

Please find enclosed my Curriculum Vitae, and I remain at your disposal for any further information you may require.

Yours faithfully,

Madeleine Nlandu Mputu

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Civil status: single

Age: 29 years old

**PhD in Biotechnology****Education-Qualification****2006-2009**

Ph.D., Speciality: Biotechnology. University of Technology, Compiègne, France

Degree obtained on December 9, 2009. Grant provided by the "Region de Picardie"

**2005-2006**

Master II, Speciality: Plant Biology. University of Sciences, Nantes, France

**2004-2005**

Master I, Speciality: Biotechnology from genes to molecules. International University of Plymouth, England (ERASMUS exchange during 10 months)

**2001-2004**

Bachelor of Science, Speciality: Cellular and Molecular Biology and Physiology. University of Sciences, Nantes, France

**1999-2001**

Bachelor of Medicine. University of Medicine, Nantes, France

**Professional Experience****RESEARCH****December 2006 – December 2009**

Identification of enzymes involved in the fatty acid transfer to triglycerides in plants: Specificity of the enzymes for the incorporation of unusual fatty acids. Ph.D. Supervisors: Dr B. Thomasset and Pr E. Gontier. Laboratoire UMR-CNRS 6022 « Génie Biologique » (Université de Technologie de Compiègne (UTC)), Compiègne, France.

Jury members: R. Lessire, Dr CNRS, UMR 5200, Université Paul Segalen, Bordeaux ; J.M. Nicaud, Dr CNRS, UMR 1238, INRA Grignon; D. Marion, Dr INRA, INRA- Nantes; J. Wilmer, Directeur du Centre BIOGEMMA, Mondonville; D. Thomas, Pr Université de Technologie de Compiègne, UMR 6022.

**January 2006 - June 2006**

Analysis of cuticular proteins involved in the wax formation in tomato (*Lycopersicon esculentum*): Identification of enzymes involved in the cutin monomers transfer and assembly. Master 2 training work. Supervisors : Dr B. Bakan and Pr D. Marion. Laboratoire INRA « Unité Biopolymères, Interactions, Assemblage (BIA)», Nantes, France

**Juillet 2004 – Août 2004**

Culture and purification of mouse CD 28 antibodies: Implication in griffon rejection. Training work. Supervisor: Pr JP. Soulillou. Laboratoire INSERM UMR 643 « Immuno-intervention dans les Allo- et les Xéno- transplantation », Nantes, France

## SUPERVISION

### December 2006 - December 2009

Supervision of bachelor and master students training on the FAME preparation and their analysis with GC-MS and on the use of radiolabelled substrates to test enzyme activities.

## **Publications – Scientific communications**

### PUBLICATIONS

**Nlandu Mputu M.**, Rhazi L., Vasseur G., Vu T.-D., Gontier E. and Thomasset B. (2009) Identification of a potential bottleneck in branched chain fatty acid incorporation into triacylglycerol for lipid biosynthesis in agronomic plants. *Biochimie*. 91, 703-710.

**Nlandu Mputu M.**, Gongeon S., Wilmer J. Gontier E. and Thomasset B. Isolation of gene encoding lysophosphatidic acid acyltransferase from developing seeds of *Litchi sinensis* that accepts various branched chain fatty acids as substrate. To be submitted to *Biochemical Journal*.

### POSTERS

**Nlandu Mputu M.**, Rhazi L., El Kassis E., Vasseur G., Vu T.-D., Gontier E. and Thomasset B. Selectivity of enzymes involved in the incorporation of unusual fatty acids into triacylglycerol for lipid biosynthesis in oilseed plants. 4<sup>th</sup> European Symposium on Plant Lipids 2009, Göttingen, Germany.

**NlanduMputu M.**, Rhazi L., Gontier E. and Thomasset B. Incorporation of unusual fatty acids into triacylglycerols of agronomic plants and identification of bottleneck in lipid biosynthesis reactions. 18<sup>th</sup> International Symposium on Plant Lipids 2008, Bordeaux, France.

### INVITED CONFERENCE

**NlanduMputu M.**, Gontier E. and Thomasset B. Identification of bottleneck in branched chain fatty acid incorporation into triacylglycerol for lipid biosynthesis in agronomic plants. 5<sup>th</sup> Lipidomics Congress GERLI 2008, Compiègne, France.

### DIFFUSION OF THE SCIENTIFIC INFORMATION

#### June 2008

Participation to the « Doctoriales 2008 » of Picardie region in France

#### October - November 2008

Participation to the « Science Festival 2008 » in Compiègne and scientific presentations about « Production and uses of vegetal oil for industry » in Schools and Colleges of Senlis, Mortefontaine and Abbeville in France

#### 14 - 15 November 2008

Participation to the « La ville Européenne des Sciences » event in Grand Palais of Paris; UTC Stand about the Biorefinery.

## **Professional skills**

### MOLECULAR BIOLOGY

*Nucleic acids analysis*: extraction and purification of DNA and RNA, PCR, RT-PCR, cloning and vector construction, electrophoresis, Southern Blot, Northern Blot.

*Bacteria* : culture, transformation, extraction and purification of plasmids, heterologous gene expression studies.

### PLANT PHYSIOLOGY

*Linum usitatissimum*: greenhouse culture, *in vitro* culture.

*Brassica napus*: greenhouse culture

*Seed growth analysis*: seed lyophilisation, extraction of seed lipids, proteins and starch

*Enzymatic activity analysis*: acyltransferase activity measurements in seed during development and use of radiolabeled substrates

### PLANT CHEMISTRY

*Metabolites measurements techniques*: TLC, Gaz Chromatography, HPLC, Photospectrometry, Mass spectrometry (LC-MS, LC-MS/MS (Maldi-TOF and Q-TOF), GC-MS and GC-MS/MS)

### MICROSCOPY

Tissue sections, confocal and fluorescence microscopy, electronic transmission microscopy, *in situ* hybridization

### COMPUTER SCIENCE

*Bioinformatics*: GCK software, Vector NTI suite

*Operating systems*: Windows, Vista

*Text editing*: Word, Java Script for informatics programming

*Statistical data analysis*: Excel, Excalibur, Masslynx

*Picture analysis and treatment*: Power Point, Paint, Adobe Photoshop

### LANGUAGES

*French*: read, written, spoken

*English*: read, written, spoken

*Spanish*: basics

## **Referees**

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## SUMMARY OF RESEARCH ACTIVITIES

**January 2006 - June 2006**

**Laboratory INRA « Unité Biopolymères, Interactions, Assemblage », Nantes, France**

**Master 2 training work**

**Supervisors: Dr B. Bakan and Pr D. Marion.**

**“Analysis of cuticular proteins involved in the cutin and wax formation in tomato (*Lycopersicon esculentum*): Identification of enzymes involved in the cuticular monomers transfer and assembly”**

The cuticular layers constitute a vital hydrophobic barrier that covers aerial plant organ surfaces. Those lipophilic layers are essential for the protection of plants against stress conditions and for the proper development of aerial plant organ. Those layers mainly consist of cutin matrix embedded in and covered with a mixture of ubiquitous aliphatic compounds (mainly C24-C34 alkanes, alcohols, and ketones) called cuticular waxes. Cutin matrix is a polymer of C16 and C18 hydroxy and epoxy fatty acid derivatives and some aromatic compounds also. Following their biosynthesis in epidermal cells, cutin and waxes monomers were suggested to be exported across the plasma membrane to the cell wall and further to extracellular matrix. However, plant cuticle structure and mechanisms involved in those lipid monomer transport and assembly in cuticular layers still uncertain.

The aim of my work was the identification of cuticular proteins that may be involved in those cutin monomers transport and assembly. The tomato fruit *Lycopersicon esculentum* was chosen as a model plant for our study because of the high amount of cutin matrix in its surface.

The presence of proteins on the cuticular layers was highlighted by UV spectrometry. Their extraction and purification were established. First, the cuticular layers of *Lycopersicon esculentum* were purified by oxalate solutions (pH4), EDTA solutions (pH5) and a very concentrated enzyme solutions with cellulase, pectinase, hemicellulase and  $\alpha$  - amylase, able to degrade the cell wall. Secondly, the cuticular proteins were extracted in a sodium chloride solution then in a chloroform/methanol solution, by sonification and by crushing the isolated layers. Lastly, they were separated on electrophoresis gel (2D), and identified by mass spectrometry (MALDI-TOF and Q-TOF). Analysis show the presence of proteins taking part in the metabolism of the lipids (like the MD2-related lipid recognition domain-containing protein, the GDSL-lipase, the lipid-associated family protein and the non-specific LTP) and the presence of proteins involved in pathogen or environmental stress protection (like the protein NP24 and the wound- induced proteinase inhibitor I precursor). In spite of the prolonged enzymatic treatment, the isolated cuticle tends to adsorb a significant proportion of hemicellulose and other parietal carbohydrates. These highly hydrophobic carbohydrates could be implicated with cuticular proteins in the formation of the cuticular layers.

**December 2006 – December 2009**

**Laboratory UMR-CNRS 6022 « Génie Biologique » (Université de Technologie de Compiègne (UTC)), Compiègne, France**

**PhD**

**.Supervisors: Dr B. Thomasset and Pr E. Gontier.**

“Identification of enzymes involved in the fatty acid transfer to triglycerides in plants:

Specificity of the enzymes for the incorporation of unusual fatty acids”

**Branched chain fatty acids are of particular interest for the oleo-chemical industry. The cloning of genes involved in their biosynthesis has led scientists toward the design of new high value oilseed crops. However, their research resulted in very modest accumulation in seeds (less than 15 %) due to a limited knowledge of the lipid metabolism and fatty acids transfer in plants.**

**In this context, the aim was to better understand the lipid synthesis and storage in oilseed plants and particularly, the substrate specificity and selectivity of Kennedy pathway acyltransferases (G3PAT, LPAAT and DAGAT) which are required for the incorporation of these fatty acids into storage triacylglycerols.**

**Our assays demonstrated that the G3PAT of the three studied species (flaxseed, rapeseed and castor bean seed) show no specificity toward usual and unusual substrates incorporation at the *sn*-1 position of the triacylglycerol. But, our study shows that LPAAT and DAGAT have a limited ability to incorporate branched chain fatty acids at the *sn*-2 and *sn*-3 positions of the triacylglycerol due to their low specific and selective activities for unusual substrates. However, the flaxseed LPAAT present a cyclopropane acyl-CoA incorporation rate similar to that observed for the isolated and studied litchi LPAAT in this study. In addition, our results show that other alternative pathways (PDAT, CPT, PLA) exist in unusual fatty acid producing plants for their efficient accumulation into triacylglycerides such as must be the case of the castor bean to explain the high level hydroxy fatty acid in its seed oil.**

**Successful production of high value oilseed crops depends on: i) the optimization of unusual fatty acid precursor production, ii) the identification of high selectivity enzymes and iii) a better knowledge of branched chain fatty acid transfer mechanisms into triacylglycerols.**