

# Phytochemical and biological studies of Vietnamese Herbal Medicine for the development of high-value healthcare products - BL/03/V09

## Context and objectives

Natural products are widely used in traditional medicine, and are nowadays also gaining interest in Western countries. Medicinal plants have a potential to be developed as high-value healthcare products. However, quality control is an important issue during development of such products to ensure the identity, safety and quality of the natural and synthesized products. In this project natural compounds of vegetable origin with interesting biological activities will be examined, in order to be utilised as new drugs or in the parapharmaceutical field, e.g. as non-nutritive and alternative sweeteners, nutraceuticals or ecological insecticides. Only a limited number of natural products will be focused on and considered as case studies. Therefore, the main aims of this project were:

- 1) To survey Vietnamese medicinal plants, folklore medicine and other bioresources,
- 2) To investigate the pharmacological efficacy of selected medicinal plants and folk medicines using chemical and molecular biological techniques,
- 3) To develop analytical aspects for quality control of herbal drugs: proper fingerprints of crude extracts for identification and quality control purposes, and quantitative determination of specific active compounds,
- 4) To develop healthcare products and/or lead molecules from the examined plants.

## Methodology

### - Survey medicinal plants, folklore medicine and other bioresources

The plants were selected by the Vietnamese partner.

### - Investigate the pharmacological efficacy of selected medicinal plants and folk medicines using chemical and molecular biological techniques

The antioxidant, the antimicrobial, and the cytotoxic activities of the selected samples were measured by the Walloon partner (UCL). From these results, interesting compounds for given activities are isolated and identified.

### - Develop analytical aspects for quality control of herbal drugs: proper fingerprints of crude extracts for identification and quality control purposes, and quantitative determination of specific active compounds

A methodology to develop HPLC fingerprints is defined by the Flemish partner (VUB). HPLC fingerprints were developed and peaks responsible for given activities determined. From these results, interesting compounds for given activities are examined by HPLC-MS.

- Develop healthcare products and/or lead molecules from Vietnamese plants (performed by Vietnamese partner in cooperation with a Vietnamese company)

## Results

### - Survey medicinal plants, folklore medicine and other bioresources

39 *Mallotus* samples from different species and plant parts were collected in different Vietnamese regions. The research focused on the extraction, purification and identification of bioactive compounds from *Mallotus* genus. Two articles are in preparation. Second, also compounds from *Polygonum hydropiper* and *Ficus religiosa* were isolated and identified. Two papers were written about *P. hydropiper*, of which one is published in Journal of Chemistry in Vietnam and one is in preparation. Another paper about *F. religiosa* is in preparation.

### - Investigate the pharmacological efficacy of selected medicinal plants and folk medicines using chemical and molecular biological techniques

The antioxidant, the antimicrobial, and the cytotoxic activities of the 39 *Mallotus* samples were measured. Afterwards it was tried to identify in the antioxidant compounds, responsible for the activity. Samples were purified and fractions were tested for given activities. It was found that mainly tannins and flavonoids are responsible for the antioxidant activity. One paper about the above results is in press in Phytochemistry, and one is submitted for publication.

### - Develop analytical aspects for quality control of herbal drugs: proper fingerprints of crude extracts for identification and quality control purposes, and quantitative determination of specific active compounds

A methodology to develop HPLC fingerprints was defined, and a paper is in preparation. Afterwards, this methodology was used to develop fingerprints of the 39 *Mallotus* samples. From the fingerprints, peaks responsible for antioxidant and cytotoxic activity were determined using different linear multivariate calibration techniques. Interesting peaks for antioxidant activity were then further examined with HPLC-MS at the UCL. Concerning the antioxidant activity, two papers were written, of which one is submitted for publication and one is in preparation.

### - Develop healthcare products and/or lead molecules from Vietnamese plants

For this purpose, the Vietnamese partner chose to use *Mallotus anisopodus* for further extraction, purification and identification of bioactive compounds.

## Products and services

### Published

\* Chau Van Minh et al., Study in the chemical constituents of *Polygonum hydropiper* L., Journal of Chemistry in Vietnam 45 (2007) 122-126.

\* C. Rivière, V. Nguyen Thi Hong, L. Pieters, B. Dejaegher, Y. Vander Heyden, C. Van Minh, J. Quetin-Leclercq, Polyphenols with antioxidant activities from *Mallotus metcalfeanus* Croizat, Phytochemistry xxx (2008) xxx-xxx.

### Submitted

\* N. Nguyen Hoai, B. Dejaegher, C. Tistaert, V. Nguyen Thi Hong, C. Rivière, C. van Minh, J. Leclercq-Quetin, Y. Vander Heyden, Development of HPLC fingerprints for *Mallotus* species extracts and evaluation of the peaks responsible for their antioxidant activity (submitted).

\* Van Nguyen Thi Hong, Céline Rivière, Nam Nguyen Hoai, Thanh Nguyen Thi Kim, Bieke Dejaegher, Yvan Vander Heyden, Chau Van Minh, Joëlle Quetin-Leclercq, Antimicrobial, cytotoxic and antioxidant properties of *Mallotus* species from Vietnam (submitted).

### In preparation

\* B. Dejaegher, N. Matthijs, G. Alaerts and Y. Vander Heyden, Methodology for the development of herbal fingerprint chromatograms.

\* C. Tistaert, B. Dejaegher, N. Nguyen Hoai, V. Nguyen Thi Hong, C. Rivière, C. van Minh, J. Leclercq-Quetin, Y. Vander Heyden, Determination of antioxidative compounds in *Mallotus* species using linear multivariate calibration techniques.

\* Chau Van Minh, Tran Hong Quang, Nguyen Xuan Cuong, Yvan Vander Heyden, Joëlle Quetin-Leclercq and Phan Van Kiem, Chemical Constituents of *Mallotus anisopodus*.

\* Phan Van Kiem, Nguyen Xuan Nhiem, Nguyen Xuan Cuong, Chau Van Minh, Yvan Vander Heyden and Joëlle Quetin-Leclercq, New Phenylpropanoid Esters of Sucrose from *Polygonum hydropiper*.

\* Chau Van Minh, Nguyen Hai Dang, Phan Van Kiem, Nguyen Phuong Thao, Nguyen Xuan Cuong, Yvan Vander Heyden and Joëlle Quetin-Leclercq, Two New C-Glucosyl Benzoic Acids and Flavonoids from *Mallotus nanus*.

\* Chau Van Minh et al., Chemical investigation of *F. religiosa* in Vietnam.

## Execution

**Period:** 01/11/2006-30/04/2009

**Laboratory/network (promotor names, institutes, mail-adresses, web-site) :**

### Flemish partner:

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## Discipline

Medicine /Drugs (pharmacopy)