

## Melting profile, polymorphic behaviour and chemical composition of some selected fractions issued from the multi-step dry fractionation of palm oil

Sabine Danthine<sup>a</sup>, Claude Deroanne<sup>a</sup>, Bernadette Norberg<sup>c</sup>, Johan Wouters<sup>c</sup> and Véronique Gibon<sup>b</sup> (danthine.s@fsagx.ac.be)

a. Food Technology Department, Gembloux Agricultural University, Gembloux, Belgium.

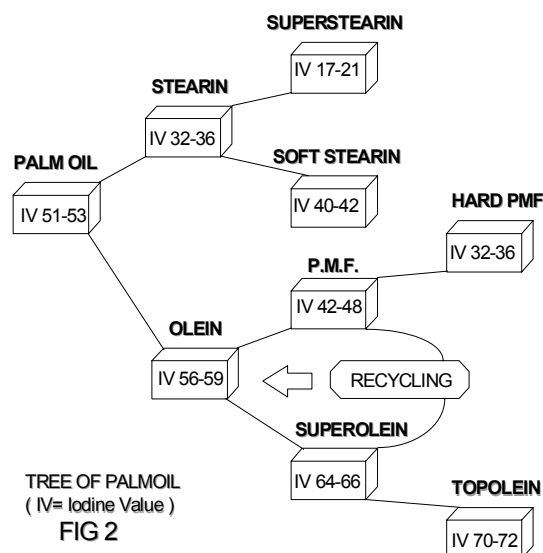
b. Fractionnement Tirtiaux SA, Fleurus, Belgium.

c. Biological Structural Chemistry Laboratory, University of Namur, Namur, Belgium.

Palm oil is without doubt the most widely fractionated oil. It is principally made up of trisaturated triacylglycerols SSS (8-10%), disaturated triacylglycerols SUS (44-48%), monosaturated triacylglycerols SUU (38-42%) and unsaturated triacylglycerols UUU (6-8%).

Multi-step dry fractionation gives rise to soft fractions (oleins, superoleins and topoleins) that are used as cooking and salad oils, and to harder fractions (stearins and mid-fractions) finding applications in frying fats, margarines, shortenings and speciality fats, as shown in the figure.

The dry fractionation process is based on differences in melting points of the triacylglycerol components that will crystallize separately during a cooling process. Unfortunately, limitations due to intersolubility (closely linked to polymorphism) make the separation difficult as co-crystals are formed at each crystallization step. For this reason, only restricted enrichments in triacylglycerol components are observed.



Several liquid and solid fractions have been selected in the dry fractionation “tree” of palm oil. They are examined in terms of differential scanning calorimetry melting profile (DSC), variable temperature powder X-ray diffraction pattern (XRD), fatty acid methyl ester (GC), and triacylglycerol compositions (HPLC).

The DSC melting curve of palm oil consists in two major endotherm regions: the low temperature peak is associated to the olein fraction and the high temperature peak consists of a plateau with a pair of shoulder peaks corresponding to the stearin. One exothermic peak is observed in between and is assigned to polymorphic transformation within the fat. Strong modifications of this melting profile and polymorphic behaviour are observed within the selected fractions.

The goal of this paper is to establish relationships between melting/polymorphic properties (DSC/XRD) and chemical composition (GC/HPLC) of the different fractions, in order to highlight the intersolubility phenomenon involved in the dry fractionation process of palm oil.