17th Euro Fed Lipid Congress, 20-23 October 2019, Sevilla

Influence of triacylglycerol composition on the baking performance of palm-based puff pastry margarines

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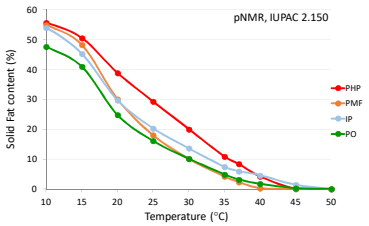
Introduction and approach

- *Trans*-free palm-based model puff pastry margarines were produced at pilot scale under the same processing conditions.
- Palm oil (PO), palm stearin, palm mid fraction (PMF), interesterified palm oil (IP) and rapeseed oil were combined to produce 3 margarines with identical fatty acid but different triacylglycerol (TAG) compositions (PO-M, PMF-M and IP-M) [48% SAFA].
- Melting profile, polymorphism, solid fat content (SFC) and hardness of margarines were measured and confronted to their ability to provide high puff pastries during a storage period of 6 months (20°C).
- Behaviors of the *trans*-free products were compared with a margarine containing partially hydrogenated palm oil (PHP-M) (7,5% *trans*-FA).

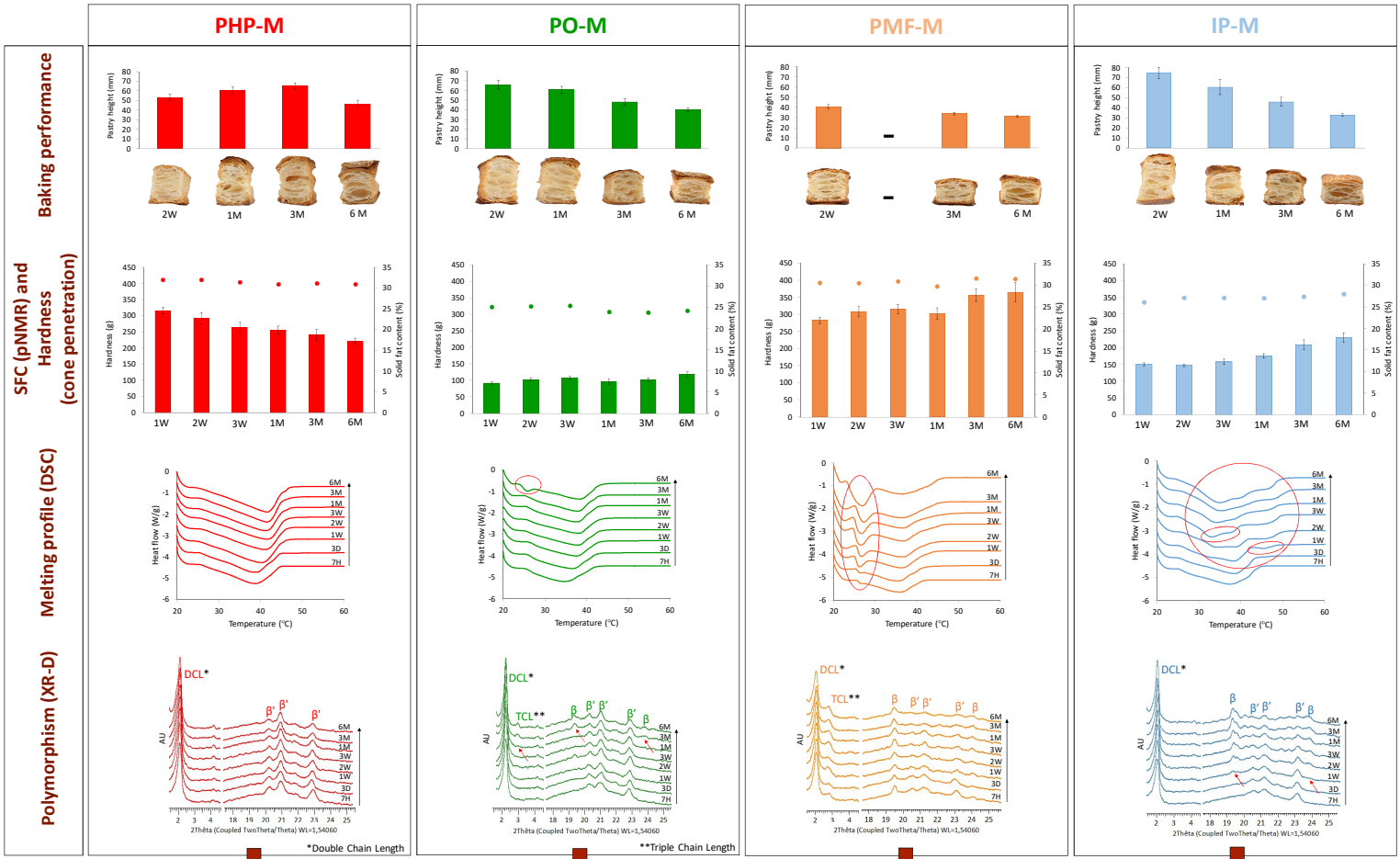
Fat phases: TAG composition and SFC profile

Main TAGs (%)	PO-M	PMF-M	IP-M
PPP	**5**	**5,5**	**8**
POP+PPO	**29**	**36,5**	**28**
PLP	12	9	9
POS	4	4,5	3,5
POO+OPO	23	17,5	21
POL	10	7	9,5
SatSatO/SatOSat	**0,13**	**0,07**	**0,55**



The 3 *trans*-free fat phases **possess different PPP and SatSatO/SatOSat contents** and **close SFC profiles**. The *trans*-FA containing fat phase possesses higher SFC values between 15 and 35°C.

Margarines: Evolution of macro and microscopic properties from day of production up to 6 months storage



Stable melting and polymorphic behavior (β', DCL) enabled PHP margarine to provide highly developed puff pastries up to long storage period.

Performance reduction at 6 months storage is probably linked to hardness decrease as margarine is ageing.

The high POP content of PO margarine induced triacylglycerol demixion and polymorphic transformation of β' (DCL) into β (TCL) crystals at 3 months storage. As a consequence, margarine functionality was reduced from mid-term storage.

The very high POP content of PMF margarine lead to a mixture of β and β' crystals (DCL and TCL) providing poor pastry lift in the first weeks.

During storage, TAG demixion lead to β (TCL), leading to a harder product, unsuitable to make puff pastry.

The low POP and relatively high PPP contents of IP margarine lead to TAG demixion and polymorphic transition of PPP from β' (DCL) to β (DCL), dramatically impacting margarine hardness. Margarine functionality was considerably reduced after 1 month storage.

Conclusions

- Solid fat content was stable while hardness varied during the whole storage period at 20°C for all margarines produced.
- The *trans*-FA containing margarine possessed stable behavior and acceptable performance up to up to 6 months.
- The 3 *trans*-free products all suffered from TAG demixion and polymorphic transformation during storage, dramatically affecting their baking performance.
- Origin and timing of the transformation are determined by the fat phase TAG composition and mainly influenced by POP and PPP contents and SatSatO/SatOSat ratio.
- This study demonstrates that TAG composition of palm-based puff pastry margarine should be carefully selected in order to form adequate fat crystal network properties that can be maintained over long term storage periods.

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