

Formulated lipids vs shortenings. Short communication

Rinovetz A.^{1,2}, Riviş A.^{1,2}, Mişcă Corina^{1,2}, Velciov Ariana^{1,2}, Stoin Daniela^{1,2}, Hegheduş-Mîndru G.^{1,2}, Rădoi P.B.^{1,2}, Megyesi Corina^{1,2}, Fraiu Mihaela-Gianina^{1,2}, Marcu Oana-Alina^{1,2}, Coste S.^{1,2}, Vaipan B.^{1,2}, Traşcă T.I.^{1,2}, Hădărugă Nicoleta^{1,2}

¹University of Life Sciences "King Mihai I" from Timisoara, Faculty of Food Engineering,

²Research Institute for Biosecurity and Bioengineering, 300645-Timisoara, Romania, Calea Aradului 119, Romania, Phone: +40-256-277327; Fax: +40-256-277261

*Corresponding author: Rădoi P.B., e-mail: bogdanradoi@usab-tm.ro

Abstract: Currently, processing techniques (physical, chemical, biotechnological or combinations thereof) allow formulation of the structure and properties of natural lipids, without equivalents in nature, but adapted to the technological, nutritional or prophylactic-therapeutic needs. Techniques (e.g.: simple mixing, hydrogenation, interesterification, fractionation), continuously optimized, through scientific understanding of physico-chemical processes and development of new equipment. Resulting "new" products are known in literature as substitutes, lipid equivalents, shortenings, with significant economic implications.

• Introduction

Formulated food industry is dynamic, upward, with accelerated development in recent years, supported both by technological development and innovation, as well as by need to cover a diverse range of problems of food raw material sources. The main characteristic of oils and fats is their ability to form different type-dimensional crystals (=polymorphism), generated by the wide melting/solidification temperature characteristic of each structural component. Fractional crystallization of lipid individuals in a mixture is subordinated to degree of non-saturation (iodine number (NI)), respectively size of hydrocarbon chain. Generic fractional crystallization refers to the processes of fractional crystallization of triglycerides in a lipid mixture. Depending on accessed fractionation technique, crystals can be obtained as follows: 1. with surfactants (detergents), solvents (=wet fractionation); 2. winterization, deceration, pressing, filtering, centrifugation (=dry fractionation).

• Material and method

Natural or hydrogenated animal/vegetable lipid mixtures. Fractionation technique.

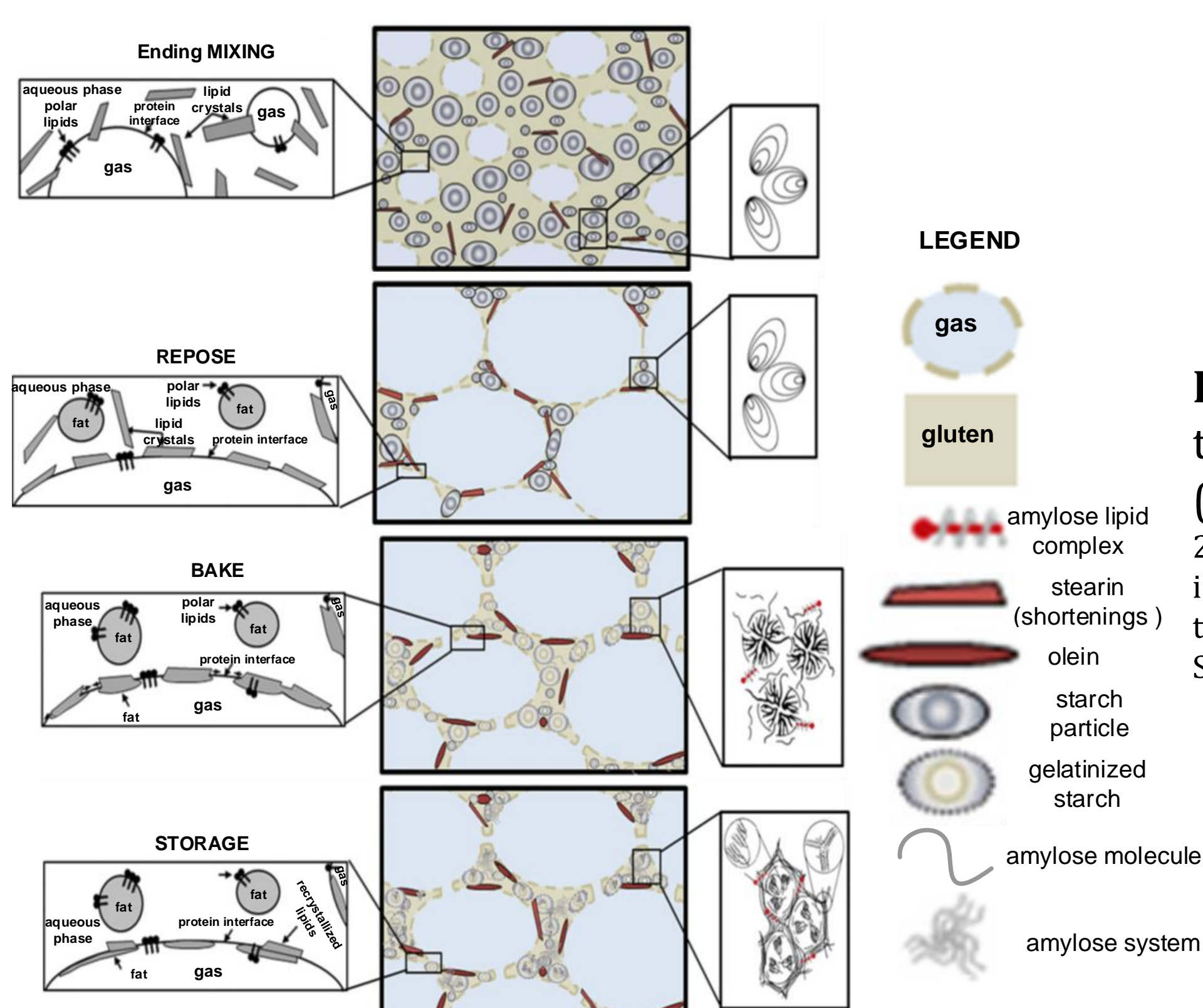


Fig. 1. Role of shortenings in the structure of food matrix (e.g. bread) [from Goesaert, H. et al., 2005, Wheat flour constituents: how they impact bread quality, and how to impact their functionality. Trends in Food Science & Technology 16, p. 12-30.]

• Results and discussions

Dry fractionation is of interest, known as a thermo-mechanical process, "green", characterized by the absence of chemical transformations. It involves the selective crystallization from the melt, under controlled conditions (= "memory destruction" of the initial crystallization), followed by the selective-physical separation (decantation (winterization), filtration, centrifugal filtration)), from initial natural lipid mixture (oil or fat), in distinct liquid and solid phases (oleines/stearines), with distinct physico-chemical, rheological and functional properties, compared to the chemical fractionation processes (hydrogenation, interesterification). A structurally/behaviorally modified lipid mixture through which new functional, technological competences and adaptability to "stressors" are generated, can be classified as a formulated lipid, a class to which shortening. Generally, the term shortening define lipid products with a fat content of more than 80%, rich in monoglycerides, compared to butter and/or margarine, a characteristic that allows mixing with hydrophilic components (sugar, starch). The role (Fig. 1) of shortenings is a diverse one: a) it imprints tenderness (plasticizing/lubricating) and gloss; b) potentiates aeration; c) porosity and aroma promoters; d) changes the architecture of gluten; e) act as emulsifiers. Degree of incorporation in food is dependent on three parameters: **1.** olein/stearin ratio in direct relation to melting-solidification interval; **2.** polymorphic geometry of stearine (β' (the most thermally steady)); **3.** oxidation stability, is directly proportional to fatty acid species and degree of unsaturation. Nature of behavioral characters recommends 5% of all raw and/or auxiliary materials. The presence of cis-trans forms induces negative effects on melting/solidification range.

• Conclusions

Thus formulated, shortenings are result of fractionation techniques on various principles (physical/chemical/enzymatic), of natural or hydrogenated animal/vegetable lipid mixtures resulting in 100% lipid products, but characters differentiated from the starting base. Therefore, it can be stated that the effect/role of shortenings is beneficial through their attribute of "mediation" in relation to the structure of the food matrix.