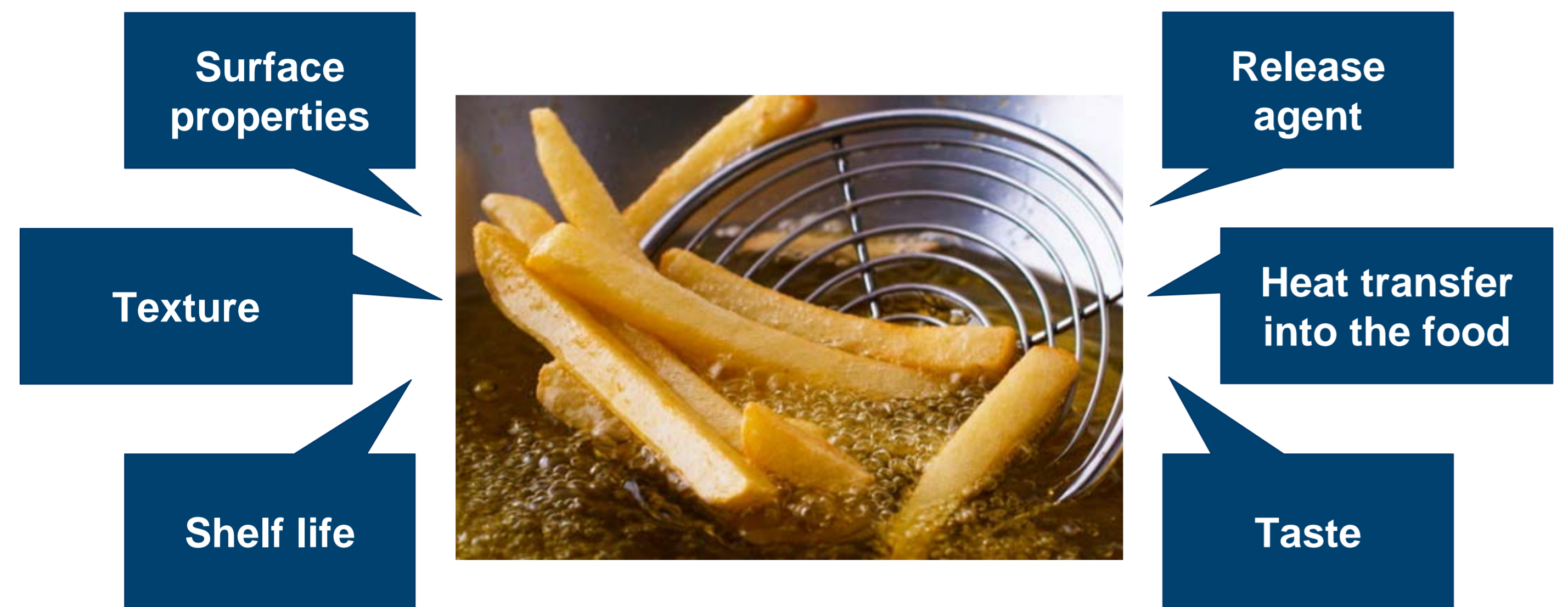


Rapeseed oil based oleogels as promising alternative as deep-frying medium

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Influence of deep-frying media on deep-fried food



During deep-frying water present in the food is replaced by the frying medium. Therefore, the texture and rheology of the frying medium correlate with the surface properties of the fried goods and can be modified via variation of the frying medium.

Characteristics of classic deep-frying media

Rapeseed oil	Palm oil	Hydrogenated oil
<ul style="list-style-type: none"> + Low amount of saturated fatty acids + High amount of unsaturated fatty acids - Oil leakage of the deep-fried product - Greasy surface 	<ul style="list-style-type: none"> + No oil leakage of the deep-fried product + Less greasy surface - High amount of saturated fatty acids - Environmental and ethical concerns 	<ul style="list-style-type: none"> + No oil leakage of the deep-fried product + Less greasy surface - High amount of saturated fatty acids - High amount of trans-fatty acids

<https://eatsmarter.de/ernaehrung/ernaehrungsmythen/rapeseel-gut-fuer-kinder>; <https://alpe-cos.com/alpe-cos/sunflower-oil-high-oleic-helianthus-annuus-hybrid-oil-refined-500ml>; <https://www.gesundheit.de/ernaehrung/lebensmittel/saucen-und-oele/palmoel>; <https://www.euroimmunblog.de/neuer-test-zur-unterscheidung-echter-erdnuss-allergien-und-unbedenklicher-kreuzreaktionen/>

Conventional deep-frying media display a lot of nutritional, environmental and technological disadvantages, resulting in a high demand for solid fats without hydrogenated fats, low amount of saturated fatty acids and palm oil free.

Replacement of solid fats via oleogels

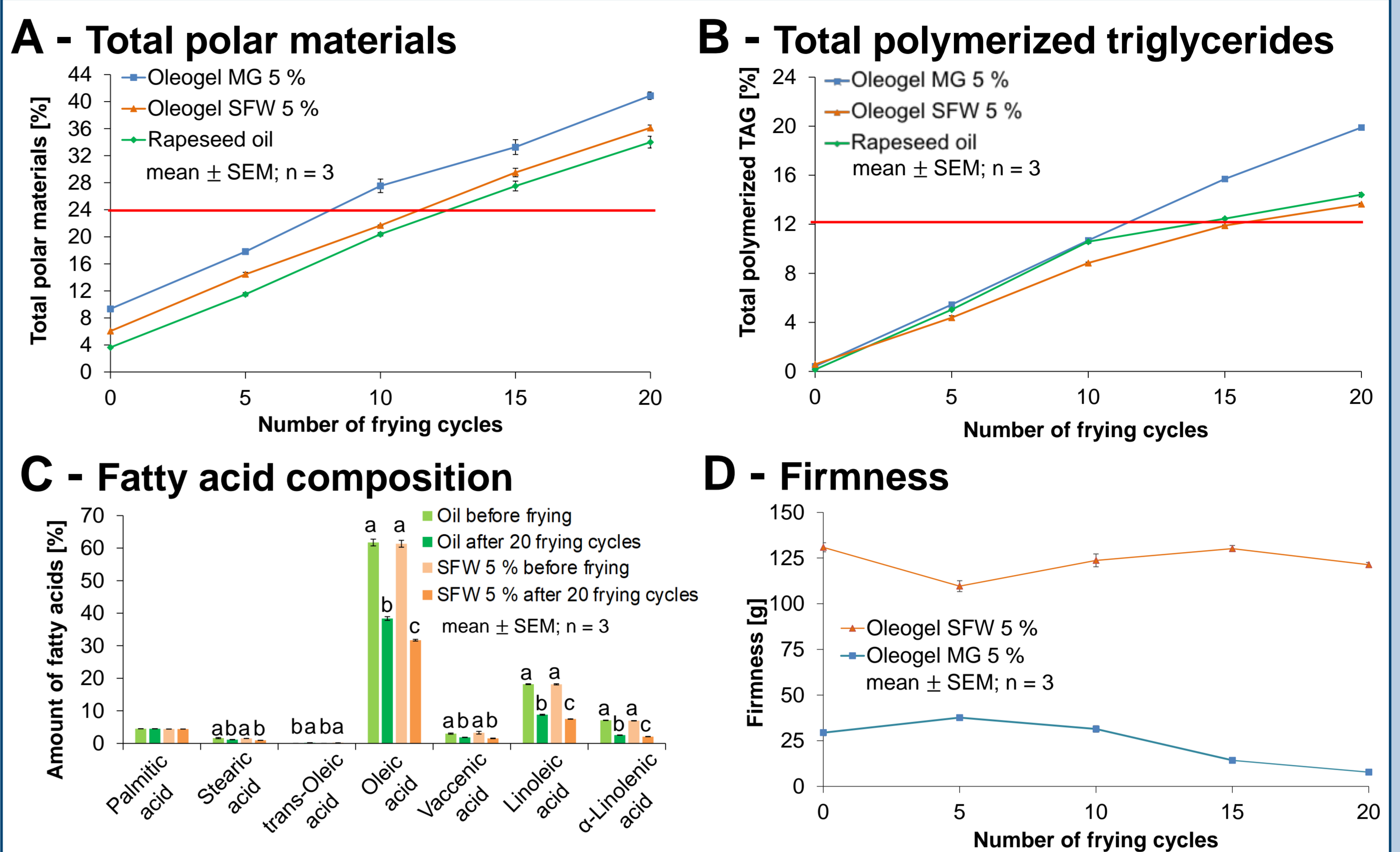
	Structure of triacylglycerides (TAG)	Schematic structure	Product
A Conventional solid fats	Glycerol with saturated fatty acids (SFA)	Compact structure of SFA	
B Structured oils - oleogels	Glycerol with mono-/poly unsaturated fatty acids (UFA)	Lipidic continuous phase (rapeseed oil) and 3D-network of building blocks (sunflower wax, ethyl cellulose or monoglycerides)	

Instead of conventional TAG oil structuring, rapeseed oil is used as lipidic continuous phase because of its nutritionally favourable fatty acid composition. To stabilize the rapeseed oil in a gel-like structure, sunflower wax (SFW) or monoglycerides (MG) can be used as structurants, which form a 3D-network of building blocks.

Summary

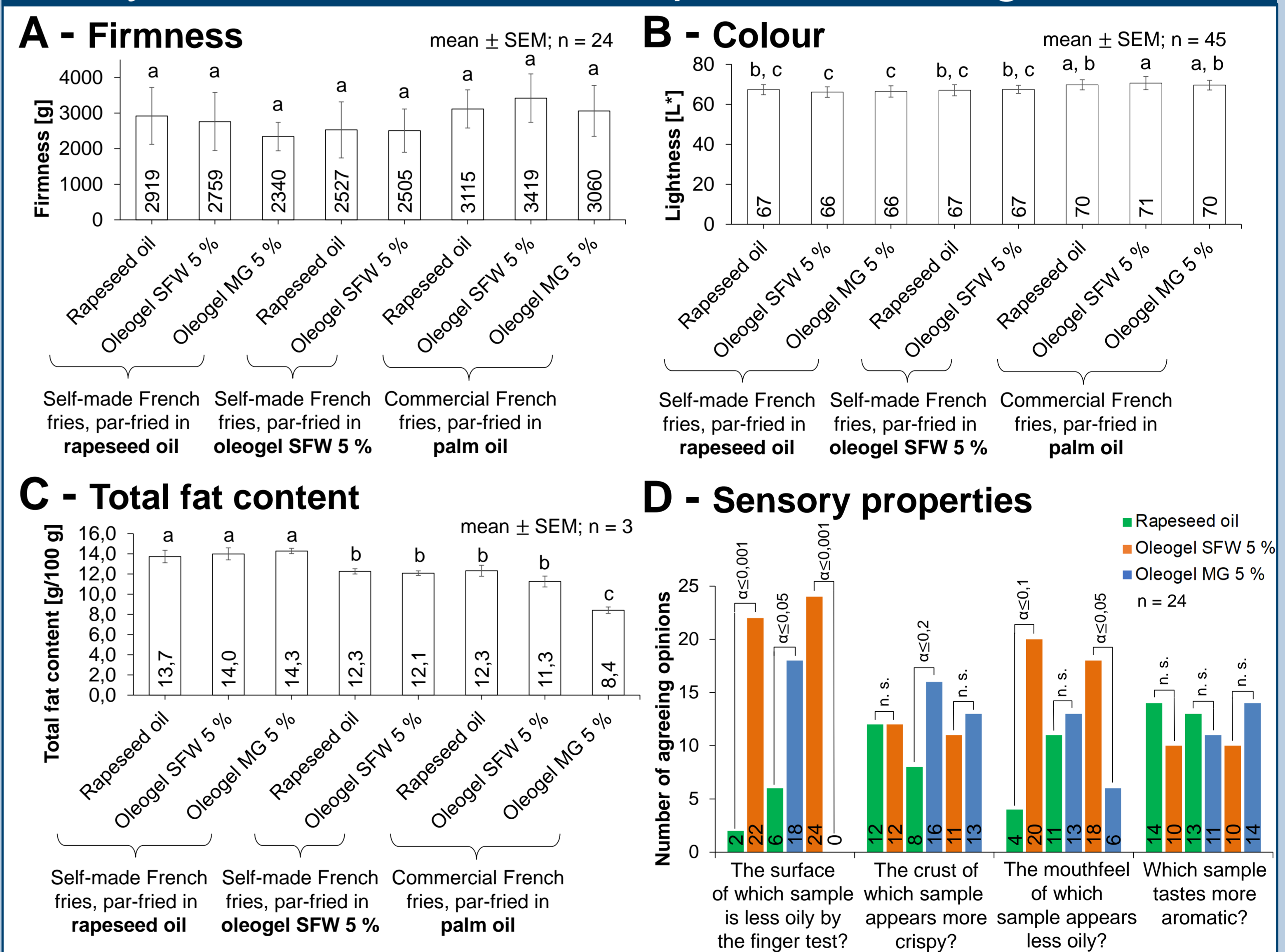
- French fries deep-fried in oleogels based on rapeseed oil and 5 % SFW or 5 % MG displayed the same colour and texture compared to the standard.
- Organoleptic properties were significantly improved by the application of oleogels.
- No oil leakage was observed for French fries deep-fried in oleogels based on rapeseed oil and 5 % SFW or 5 % MG, with advantages for SFW oleogels.
- Par-frying in oleogels slightly reduce the total fat uptake.
- Oleogels based on 5 % SFW showed better frying performance (polar compounds and polymerized triacylglycerols) than oleogels based on 5 % MG.

Quality parameters of oleogels after frying



- Frying experiment at 175°C.
- Quality parameters: total polar materials (A), total polymerized triacylglycerols (B), fatty acid composition (C) of frying media and firmness (D) of oleogels.
- Quality parameters of oleogels with 5 % SFW were comparable with rapeseed oil.
- Oleogels with 5 % MG reached the limit values of polar compounds and polymerized triacylglycerols more quickly and were less firm.

Analysis of French fries deep-fried in oleogels



- Self-made and commercial par-fried French fries were deep-fried in rapeseed oil (reference) and oleogels based on rapeseed oil with 5 % SFW or 5 % MG.
- French fries produced in oleogels displayed a similar colour (A) and texture (B) compared to the standard product.
- Par-frying in oleogels slightly reduce the total fat content (C).
- Two-sided pairwise comparison (D) confirmed, that oleogel based French fries displayed optimized organoleptic properties, since the surface of the fries was less greasy and almost no oil leakage was observed.

5 % SFW based oleogels represents a promising new alternative as medium for deep-frying