Department of Safety and Quality of Cereals



Oleogels as alternative deep-frying media to optimize the surface properties of fried products

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Influence of deep-frying media on deep-fried food		Quality parameters of oleogels after stress test	
Surface	Release	A - Total polar materials	B - Total polymerized triglycerides



https://www.t-online.de/leben/essen-und-trinken/id 69224366/frittieren-im-oelbad-knusprige-speisen-zubereiten.html

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





- + Low amount of saturated fatty acids
- + High amount of unsaturated fatty acids - High amount of saturated fatty acids Oil leakage of the Environmental and deep-fried product ethical concerns Greasy surface

Palm oil



- + No oil leakage of the deep-fried product
- + Less greasy surface

Hydrogenated oil



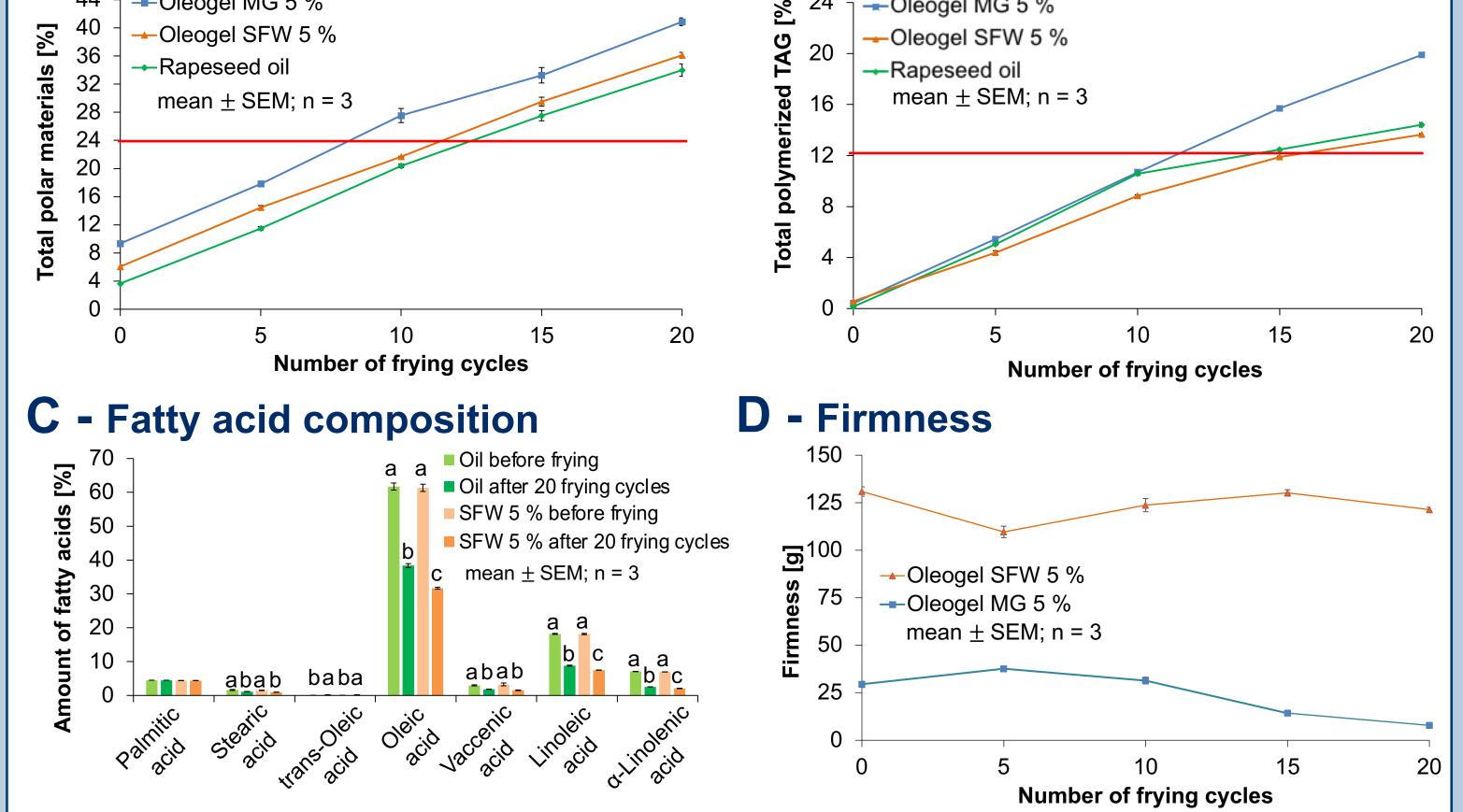
- + No oil leakage of the deep-fried product
- + Less greasy surface

saturated fatty acids

- High amount of

- High amount of

trans-fatty acids



Within a stress test performed at 175°C several quality parameters, like total polar materials (A), total polymerized triacylglycerides (B), fatty acid composition (C) and the firmness (D) of oleogels were analyzed. Whereas the 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 triglycerides more quickly and were less firm.

Analysis of French fries deep-fried in oleogels **B** - Colour **A** - Firmness mean \pm SEM; n = 24 mean + SEM; n = 45 80 a, b a, b b, c b, c 4000 ***_** 60 **5** 3000 2000 40 2340 2505 3060 2759 2527 3115 3419 Light Firm 1000 20 66 70 66 70 67 67 67 -oelstw 50% 200EING5010 reedoil el MG 50% reseedoil Oleogel SFN 5° MCS OleogelSFNSOL 20gel SFW 5°1 200elstn 5°10 Self-made French Commercial French Self-made French Self-made French Self-made French Commercial French fries, par-fried in oleogel SFW 5 % oleogel SFW 5 % rapeseed oil palm oil rapeseed oil palm oil С - Total fat content **D** - Sensory properties Rapeseed oil mean \pm SEM; n = 3 Б 16,0 Oleogel SFW 5 % [g/100 14,0 12,0 Oleogel MG 5 % 10,0 suoinido n = 24 14,0 14,3 12,3 S 11,3 $\overline{}$ 8,4 12, 12, 13, 2,0 Jg 0,0 eogetstw 50% , seed oil otal SENSI 01 **ag** of The mouthfeel Which sample The crust of The surface

arter.de/ernaehrung/ernaehrungsmythen/rapsoel-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 triglycerides (TAG)	Schematic structure		Product
Conventional solid fats	Glycerol with saturated fatty acids (SFA)	Compact structure of SFA		
ctured oils - leogels	Glycerol with mono-/poly unsaturated fatty acids	Lipidic continuous phase and 3D- network of		

Self-made French Self-made French Commercial French fries, par-fried in fries, par-fried in fries, par-fried in oleogel SFW 5 % palm oil rapeseed oil

Self-made and commercial par-fried French fries were deep-fried in rapeseed oil, which was set as standard frying medium, and in 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. In contrast, par-frying in oleogels seems to reduce the total fat content (C). Moreover, a 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.

of which

less oily?

appears more sample appears

crispy?

tastes more

aromatic?

of which sample which sample

is less oily by

the finger test?



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 % sunflower wax or 5 % monoglycerides displayed the same colour and texture compared to the standard, while the organoleptic properties were significantly improved by the application of oleogels. Moreover, parfrying in oleogels seems to reduce the total fat uptake. Since the amount of polar compounds in monoglyceride based oleogels was very high even before frying, especially the application of 5 % SFW based oleogels represents a promising new alternative for deep-frying.

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