



INTRODUCTION

Expertise Center Sustainable Resources conducts research into the valorisation of waste streams. In collaboration with Vlaanderen Circulair, the RESOAP project was created, where circular soap is produced from waste streams. There is also a collaboration with the company 't Is Om Zeep, where ecological soap is produced in a traditional way with local vegetable oils.

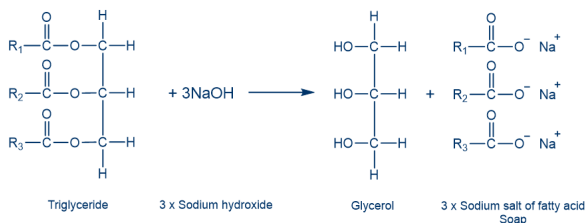


Research is being conducted into how used deep-frying fat can be purified to make soap. The difference between unused frying fat and used frying fat is also investigated, as well as its influence on the soap. The composition of the different locally grown vegetable oils such as hemp oil, camelina oil and linseed oil is compared. Various parameters such as temperature, time, and pH are investigated during the production to determine their influence on the quality of the soap.

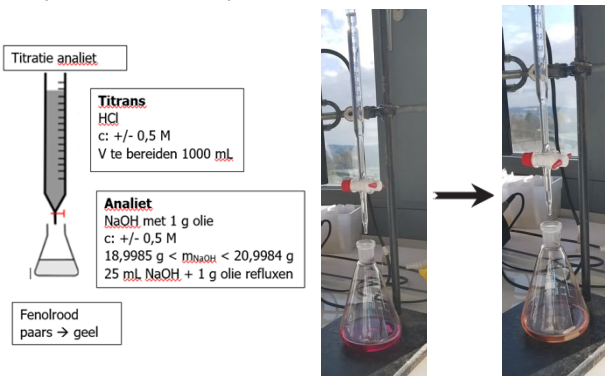
MATERIALS AND METHODS

Fats are triglycerides. These are esters formed from glycerol and three fatty acids. The fatty acids are transesterified to methyl esters to enable GC analyses. GC-MS is an analysis technique in which a mixture of unknown substances is separated (GC), detected and identified (MS). The GC-MS analysis was carried out with a Trace 1300 GC and a ISQ 7000 EI MS both from Thermo Scientific.

Basic hydrolysis:



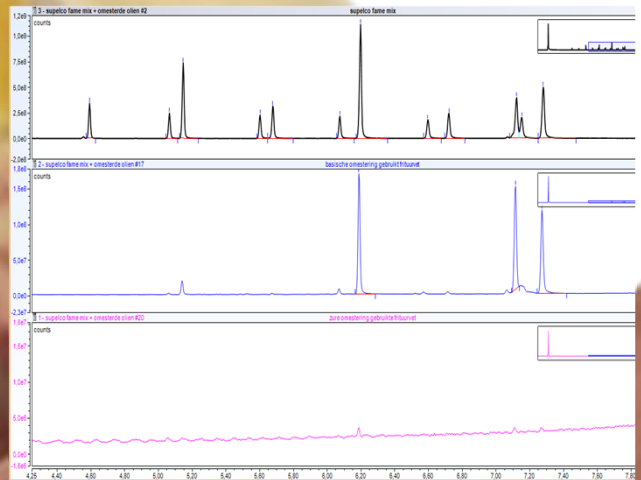
Basic hydrolysis, also called saponification, causes the reaction of a triglyceride with NaOH. The saponification number is determined with a back titration to know how much NaOH is needed to saponify the fat. The soap can be made with the cold process or the hot process. This is actually the same but in the hot process the last step is accelerated in the oven.



REFERENCES

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- Orsavova, Jana, et al. "Fatty Acids Composition of Vegetable Oils and Its Contribution to Dietary Energy Intake and Dependence of Cardiovascular Mortality on Dietary Intake of Fatty Acids." International Journal of Molecular Sciences, vol. 16, no. 6, 2015, pp. 12871-12890.

RESULTS AND DISCUSSION



The composition of the frying fat and vegetable oils is determined by comparison of the chromatograms with the supelco 37 component FAME standard mix and by the MS spectra analysis.

FATS AND OILS	SAPONIFICATION VALUE
Pure frying fat	144 mg NaOH/g fat
Used frying fat	146 mg NaOH/g fat
Hemp oil	137 mg NaOH/g fat
Camelina oil	138 mg NaOH/g fat
Linseed oil	137 mg NaOH/g fat

The saponification values found are indicated above.



Making soap has generally been successful, both with the frying fat and with the vegetable oils. The biggest pitfall was the pH, which was sometimes too high. There is often not much difference between the cold process and the hot process. The soaps from the cold process are smoother and the soaps made with the hot process are more pH stable.

CONCLUSION

The impurities have been successfully removed from the frying fat using vacuum filtration. The odors did not get neutralized, therefore we masked them by adding fragrances to the soap. The saponification values found by the back titration are very close to the theoretical saponification values.

The oils were successfully transesterified by both acidic and basic catalysis and the composition was correctly determined by the GC-MS. More fatty acids were analyzed for the used frying fat than for the pure frying fat. This is due to oxidation, hydrolysis and polymerization of the fat.

For optimal results, the soaps are best removed from the mold after hardening. This allows them to ripen in the air, so that no 2 layers are formed. The soaps produced from the used frying fat and the vegetable oils have a correct pH and a good structure using both hot and cold processes.