Automated Fatty Acid Methyl Ester and Cis/Trans Methyl Ester Analysis of Fats and Oils

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INTRODUCTION

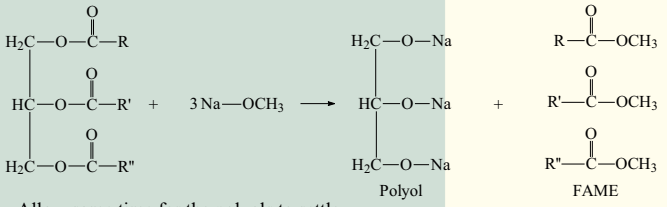
The preparation of fatty acid methyl esters (FAMEs) from fats and oils is one of the most frequently performed chemical reactions in food industry. This reaction is the first step in the analysis of the overall FAME composition of fats and oils. FAME generation is also part of the cis/trans distribution analysis, an analysis that is important due to health aspects of trans fatty acids. The FAME and Cis/Trans Methyl Ester (CTME) analysis requires a manual, time consuming sample preparation step. Mainly because of the large numbers of samples that have to be analysed there is a clear advantage to be gained from the automation of this procedure.
In this presentation a fully automated procedure based on the ATAS FOCUS XYZ Sample Preparation Robot is described and compared to the classical method. The target of the research is:
- Reduced sample throughput time
- Reduced manual operator time
- Improve the quality of the data
- Reduce the cost per analysis

CLASSICAL PROCEDURE

- Manual preparation of FAMEs using Borontrifluoride/Methanol
- Manual transfer of FAMEs into a GC vial
- Analysis + interpretation of the data

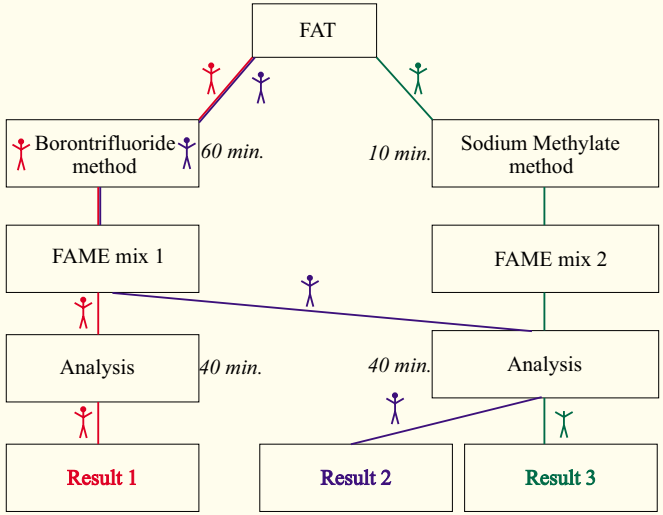
AUTOMATED PROCEDURE

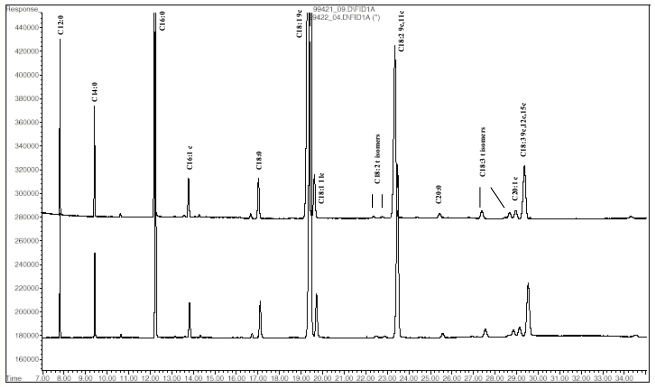
- Introduce lipid sample into a 2 mL autosampler vial and add hexane
- Shake to disolve the lipids
- Add an excess of satureted Sodium Methylate/Methanol reagent



- Allow some time for the polyols to settle
- Inject the clear top layer into the GC
- Analysis + interpretation of the data

RESEARCH SET-UP





Overlaid GC-FID chromatogram of mixed vegetable/animal oil. Upper: $NaOCH_3$ method. Lower: BF_3 method.
Column: CP-Sil 88 FAME 100m x 0.25mm x 0.2 µm

ANALYSIS DATA

Sunflower 1	C18:0	C18:2 9c,12c	C18:2 tr (sum)
result 1	3.58	57.33	1.80
result 2	3.46	58.33	1.69
result 3	3.46	57.45	1.69
Sunflower 2	C18:0	C18:2 9c,12c	C18:2 tr (sum)
result 1	3.39	61.06	0.30
result 2	3.14	61.27	0.28
result 3	3.20	61.30	0.26
Oil mix 1	C18:0	C18:2 9c,12c	C18:2 tr (sum)
result 1	2.41	15.78	0.31
result 2	2.33	16.21	0.30
result 3	2.41	14.88	0.26
Oil mix 1	C18:0	C18:2 9c,12c	C18:2 tr (sum)
result 1	2.72	14.10	0.21
result 2	2.72	14.62	0.00
result 3	2.69	13.29	0.00

CONCLUSION

Depending on the nature of the oil,the two methods can give identical results but there can also be differences. The explanation could be that Borontrifluoride also reacts with the free fatty acids whereas Sodium Methylate does not.
It can be concluded that the automated method is a good and cost saving (reduced manual operator time, reduced sample throughtput time) alternative for the current method.

LITERATURE

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ACKNOWLEDGEMENTS

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