Comparison of extraction and derivatization methods for fatty acid methyl esters (FAMEs) analysis in composting matrixes

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Composting and Vermicomposting are accelerated processes of biooxidation and stabilization of organic wastes but, in contrast to composting, vermicomposting depends on the joint action of earthworms and microorganisms and does not involve a thermophilic stage. Both of them involve complex interactions between organic waste and microbial communities and, as microorganisms are the main drivers of the biological mechanisms that govern them, characterization of microorganisms would clearly improve the understanding and development of these processes

Fatty acid methyl ester (FAME) analysis has become an important tool for characterising microbial communities, thereby eliminating the bias inherent in culture-based methods. Most procedures of lipid analysis for the study of microbial communities have been developed for soil. Modifications to the method Bligh and Dyer and the alkaline methanolysis have been considered the standard procedures for profiling fatty acids

In this study a comparison of different extraction and derivatization methods for determining FAMEs was done in four composting matrixes

MATRIXES
Cattle manure
Pig slurry
Compost
Vermicompost

EXTRACTION OF FATTY ACIDS

Two modifications of the ***Bligh & Dyer (B & D)*** method:
B & D$_{c:m}$: chloroform:methanol (2:1, v/v)
B & D$_{c:m:phos}$: chloroform:methanol:phosphate buffer (1:2:0.8, v/v/v)

Microwave assisted extraction (MAE)
n-hexane:acetone (1:1, v/v)

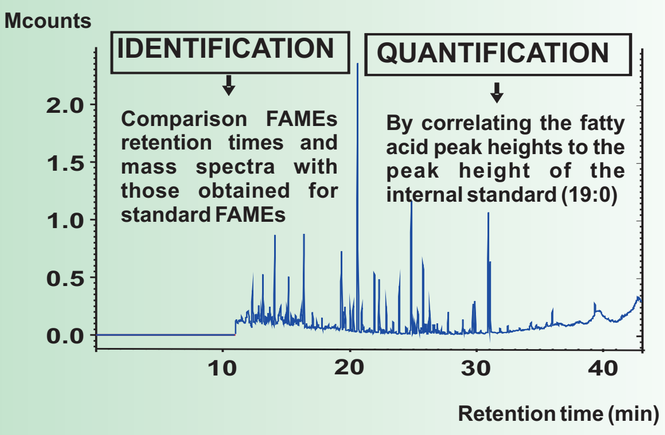
DERIVATIZATION
Fatty acids ⟶ FAMEs

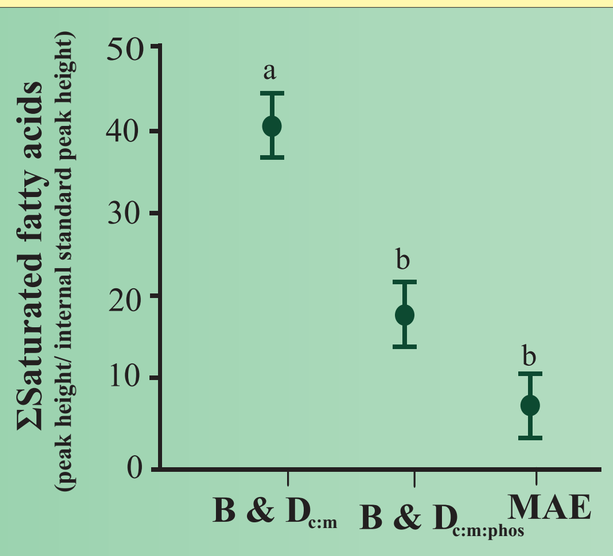
Alkaline methanolysis

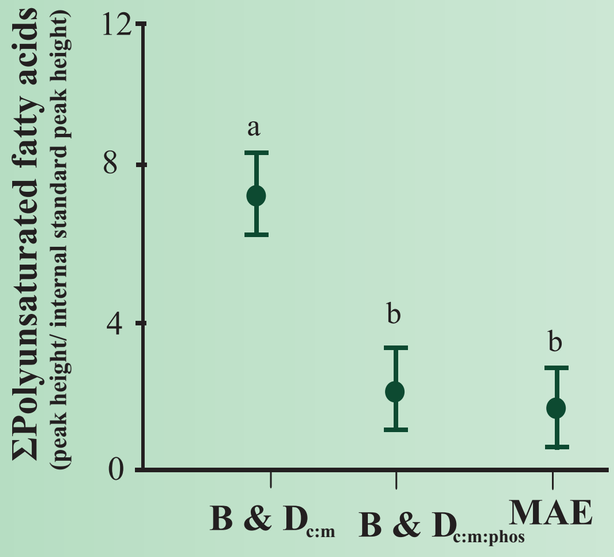
Trimethylsulfonium hydroxide (TMSH)

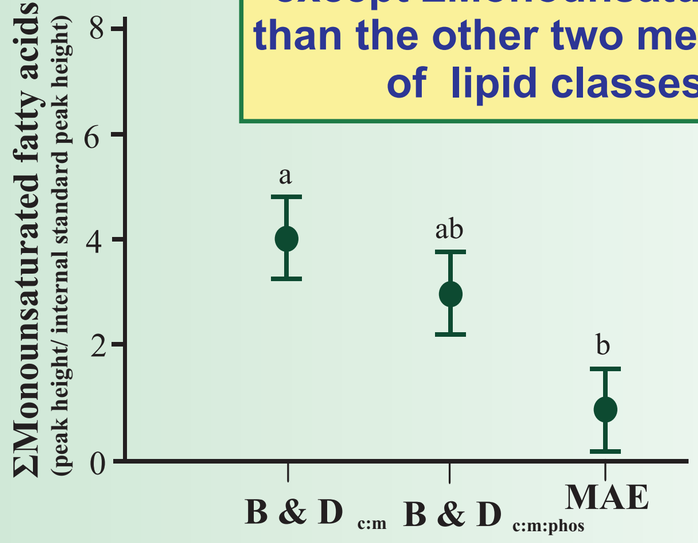
GAS CHROMATOGRAPHY/ MASS SPECTROMETRY ANALYSIS

CHROMATOGRAMS INTERPRETATION

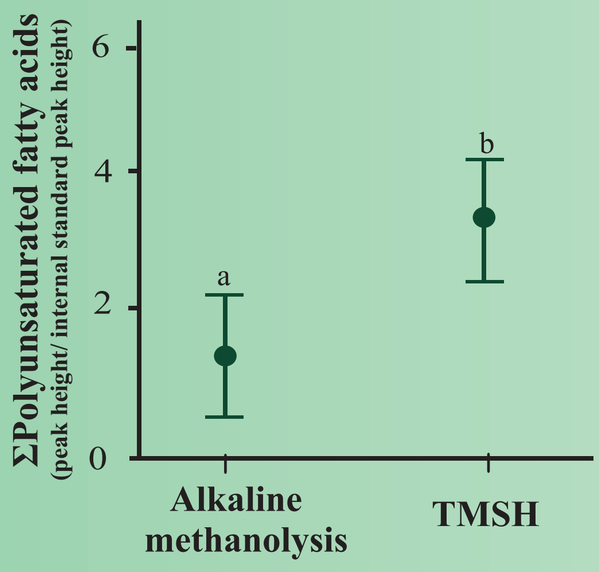


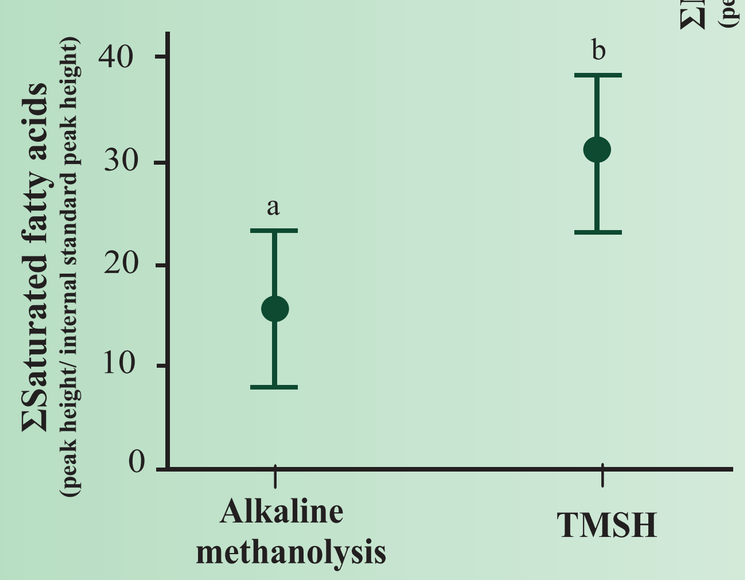






The modified B & D$_{c:m}$ method provided much higher yields of all variables, except ΣMonounsaturated fatty acids, than the other two methods. Mean plots of lipid classes are shown





TWhen TMSH was used as derivatization agent, the yields of FAMEs were significantly higher than those obtained by alkaline methanolysis. Mean plots of lipid classes are shown

CONCLUSION

The modified B & Dc:m method and the derivatization with TMSH rendered higher yields of most of the lipid classes; thus, they are considered as the best options for the analysis of FAMEs in the present study