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Application Data Sheet

No.62

GC-MS
Gas Chromatograph Mass Spectrometer

Analysis of Aroma Compounds in Cheese

Volatile compounds, including aroma compounds, in Parmesan and Blue cheese were analyzed using adsorption and thermal desorption GC/MS (TD-GC/MS). MonoTrap was used as adsorbant. It is a state-of-the-art silica monolithic and hybrid adsorbent having a large surface area and properties based on silica, activated carbon (graphite carbon for Mono Trap TD) and the octadecyl functional group. GC-MS equipped with the OPTIC-4 multi-purpose injector was used for thermal desorption. The OPTIC-4 allows direct introduction of desorbed gas into a capillary column without re-adsorption.

Experimental

Sample Preparation

MonoTrap RGC18 TD is conditioned and packed into an ampoule (Fig. 1) before shipment and therefore showed an extremely low blank. It was used without conditioning.
Ten grams of each cheese sample were weighed and placed into a vial (40mL). MonoTrap was placed over the sample in the vial using the MonoTrap holder. The vials were capped and agitated for 3 hours at 600 °C.

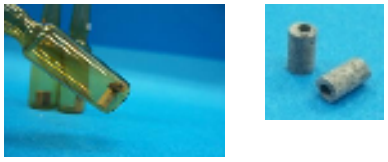

Fig. 1: MonoTrap Packed into an Ampoule for TD (left) MonoTrap RGC18 TD (right)

TD-GC/MS Analysis

MonoTrap RGC18 TD was removed and placed into the OPTIC-4 liner. Analytical conditions are shown in Table 1.

Fig. 2: OPTIC-4 (left) and GCMS-QP2010 Ultra equipped with OPTIC-4 and AOC-5000 Plus (right). Liner can be automatically exchanged using the AOC-5000 Plus.

Table 1: Analytical Conditions

Instruments			
Injection Unit	:OPTIC-4		
GC-MS	:GCMS-QP2010 Ultra		
Auto-Sampler	:AOC-5000 Plus LINEX system		
Column	:InertCap Pure-WAX (60m x 0.25 mm I.D. , df=0.25 µm (GL Sciences, Inc.)		
[OPTIC-4]		[MS]	
Desorb Temp.	:200 °C	Interface Temp.	:230 °C
Desorb Time	:5 min	Ion Source Temp.	:200 °C
Carrier Gas	:Helium	Acquisition Mode	:Scan
Column Flow	:1.0 mL/min	Mass Range	:*m/z* 29-600
Injection Mode	:Splitless		
Cryo Trapping	:-150 °C		
Injection Temp.	:250 °C		
[GC]			
Column Oven Temp.	:40 °C (5 min)→(6 °C /min)→250 °C		

Results and Discussion

Fig. 3 and 4 show total ion current chromatograms of Parmesan and Blue cheese, respectively. The detected compounds were identified using a mass spectral library search. Sulfur compounds, such as dimethyl disulfide and dimethyl sulfone, were extracted and detected. It is known to be difficult to detect sulfur compounds using conventional TD system.

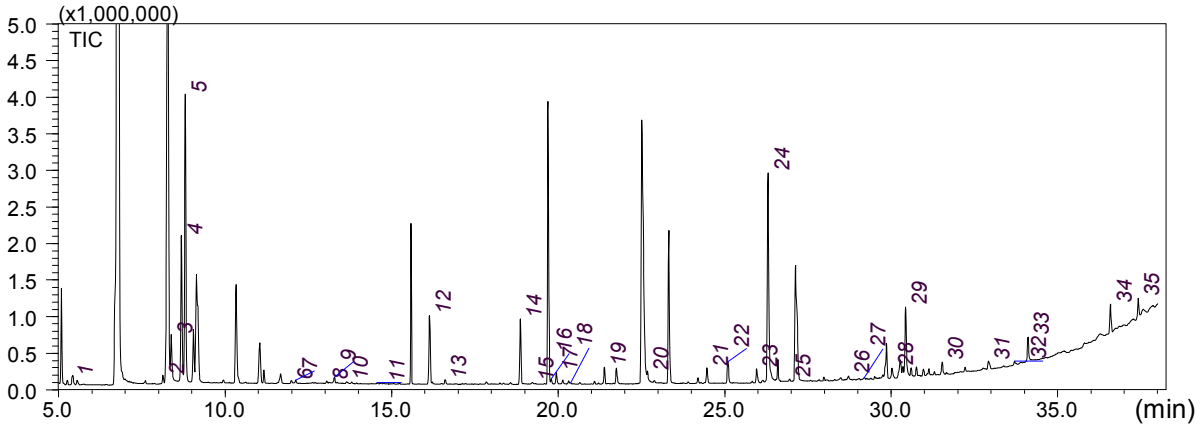

Fig. 3: Total Ion Current Chromatogram of Parmesan Cheese

1. Methanethiol, 2. Ethyl Acetate, 3. 2-Butanone, 4. 2-methylbutanal, 5. 3-methylbutanal, 6. 1-Propanol, 7. Toluene,
8. Dimethyl disulfide, 9. Hexanal, 10. 2-Pentenal, 11. 3-Penten-2-one 12. 2-Heptanone, 13. D-Limonene, 14. Acetoin,
15. Acetol, 16. Dimethylpyrazine, 17. Dimethylpyrazine, 18. Dimethylpyrazine, 19. 2-Nonanone, 20. 2,5-Dimethyl-3-ethylpyrazine,
21. Benzaldehyde, 22. Isobutyric acid, 23. 2-Undecanone, 24. Butanoic acid, 25. 2-Furanmethanol, 26. Acetamide,
27. 2-Tetradecanol, 28. 2-Tridecanone, 29. Hexanoic acid, 30. Dimethyl sulfone, 31. δ-Octalactone, 32. 2-Pentadecanone,
33. Octanoic acid, 34. δ-Decalactone, 35 .Decanoic acid

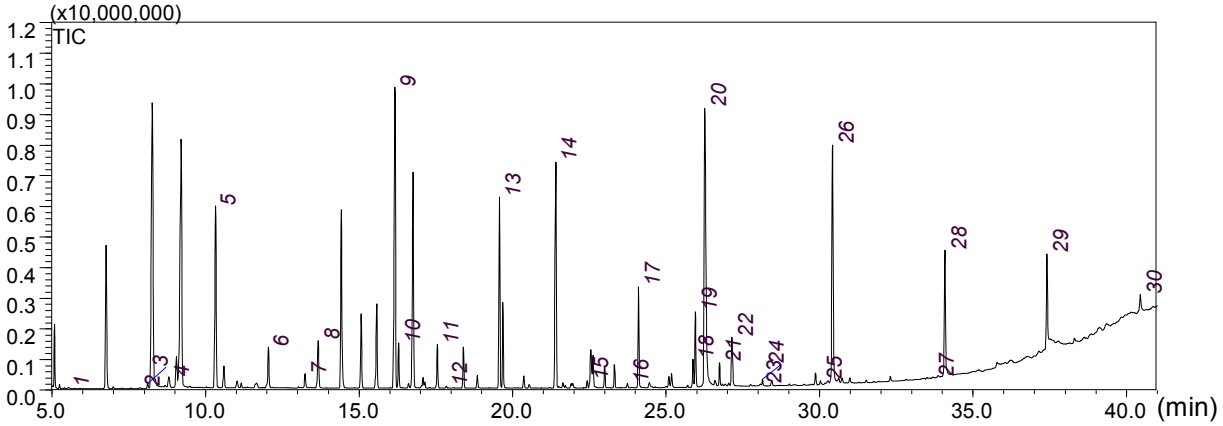

Fig. 4: Total Ion Current Chromatogram of Blue Cheese

1. Acetaldehyde, 2. Butanal, 3. Ethyl Acetate, 4. Isovaleraldehyde, 5. 2-Pentanone, 6. Ethyl butyrate, 7. 2-Hexanone,
8. Isobutyl alcohol, 9. 2-Heptanone, 10. Methylhexanoate, 11. Ethylhexanoate, 12. 1-Pentanol, 13. 2-Heptanol, 14. 2-Nonanone,
15. Ethyloctanoate, 16. 2-Decanone, 17. 2-Nonanol, 18. Methyldecanoate, 19. 2-Undecanone, 20. Butanoic acid,
21. Ethyldecanoate, 22. 3-Methylbutanote, 23. γ-Caprolactone, 24. 2-Undecanol, 25. 2-Tridecanone, 26. Hexanoic acid,
27. 2-Pentadecanone, 28. Octanoic acid, 29. Decanoic acid, 30. Dodecanoic acid

Summary

Sulfur compounds in the cheese were easily and simply detected using MonoTrap and TD-GC/MS (OPTIC-4 and GC-MS).

This application data sheet was created in the corroboration with GL Sciences, Inc.

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