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The use of analytical techniques for qualitative differentiation of lipids extracted from cheese samples and lard (Article)

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Abstract

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A study was carried out to differentiate three different types of cheese lipids from lard using GC-MS, Fourier transform infrared (FTIR) spectrometry and Differential Scanning Calorimetry (DSC). Sample of the cheese lipids and lard were extracted and analyzed using these three instruments. Results showed that all three cheese types were found to possess short chain fatty acids (C4 to C12) while these were totally absent in lard. FTIR spectroscopy corresponds to the wavenumbers at 3007, 1140–1070, 756 and 720 cm⁻¹ in the spectrum were useful to differentiate between these cheese lipid types and lard. DSC cooling and heating curves displayed considerable differences in their profiles that can be helpful to distinguish the three cheese lipid types from lard. It could be concluded that GC-MS, FTIR spectroscopy and DSC are rapid and steadfast techniques for the detection of non-halal and/or non-kosher lipids in the cheese. © 2017, WFL Publisher Ltd. All rights reserved.

Author keywords

Cheese DSC Food adulteration FTIR spectroscopy GC-MS Halal Lard

Indexed keywords

EMTREE drug terms: lard linoleic acid oleic acid palmitic acid short chain fatty acid stearic acid

EMTREE medical terms: analytic method Article cheese differential scanning calorimetry fatty acid analysis fermented milk product infrared spectroscopy lipid composition lipid extraction liquid liquid extraction mass fragmentography nonhuman quality control reflectometry thermal analysis

Chemicals and CAS Registry Numbers:

lard, 61789-99-9; linoleic acid, 1509-85-9, 2197-37-7, 60-33-3, 822-17-3; oleic acid, 112-80-1, 115-06-0; palmitic acid, 57-10-3; stearic acid, 57-11-4, 646-29-7

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-
- 1 Baeten, V., Aparicio, R.
Edible oils and fats authentication by fourier transform raman spectrometry
(2000) *Biotechnology, Agronomy and Society and Environment*, 4 (4), pp. 196-203. Cited 52 times.
<http://www.pressesagro.be/base/text/v4n4/196.pdf>
-
- 2 Hurley, I.P., Coleman, R.C., Ireland, H.E., Williams, J.H.H.
Use of sandwich IgG ELISA for the detection and quantification of adulteration of milk and soft cheese
(2006) *International Dairy Journal*, 16 (7), pp. 805-812. Cited 42 times.
doi: 10.1016/j.idairyj.2005.07.009
[View at Publisher](#)
-
- 3 Arvanitoyannis, I.S., Katsota, M.N., Psarra, E.P., Soufleros, E.H., Kallithraka, S.
Application of quality control methods for assessing wine authenticity: Use of multivariate analysis (chemometrics)
(1999) *Trends in Food Science and Technology*, 10 (10), pp. 321-336. Cited 142 times.
doi: 10.1016/S0924-2244(99)00053-9
[View at Publisher](#)
-
- 4 Fernandez, C., Astier, C., Rock, E., Coulon, J.-B., Berdagué, J.-L.
Characterization of milk by analysis of its terpene fractions
(2003) *International Journal of Food Science and Technology*, 38 (4), pp. 445-451. Cited 56 times.
doi: 10.1046/j.1365-2621.2003.00708.x
[View at Publisher](#)
-
- 5 Yang, H., Irudayaraj, J., Paradkar, M.M.
Discriminant analysis of edible oils and fats by FTIR, FT-NIR and FT-Raman spectroscopy
(2005) *Food Chemistry*, 93 (1), pp. 25-32. Cited 227 times.
www.elsevier.com/locate/foodchem
doi: 10.1016/j.foodchem.2004.08.039
[View at Publisher](#)
-
- 6 Karoui, R., De Baerdemaeker, J.
A review of the analytical methods coupled with chemometric tools for the determination of the quality and identity of dairy products
(2007) *Food Chemistry*, 102 (3), pp. 621-640. Cited 207 times.
doi: 10.1016/j.foodchem.2006.05.042
[View at Publisher](#)
-

- 7 Mafra, I., Ferreira, I.M.P.L.V.O., Oliveira, M.B.P.P.
Food authentication by PCR-based methods
(2008) *European Food Research and Technology*, 227 (3), pp. 649-665. Cited 203 times.
doi: 10.1007/s00217-007-0782-x
[View at Publisher](#)
-
- 8 Lai, Y.W., Kemsley, E.K., Wilson, R.H.
Quantitative analysis of potential adulterants of extra virgin olive oil using infrared spectroscopy
(1995) *Food Chemistry*, 53 (1), pp. 95-98. Cited 106 times.
doi: 10.1016/0308-8146(95)95793-6
[View at Publisher](#)
-
- 9 Al-Jowder, O., Kemsley, E.K., Wilson, R.H.
Mid-infrared spectroscopy and authenticity problems in selected meats: A feasibility study
(1997) *Food Chemistry*, 59 (2), pp. 195-201. Cited 74 times.
doi: 10.1016/S0308-8146(96)00289-0
[View at Publisher](#)
-
- 10 Poulli, K.I., Mousdis, G.A., Georgiou, C.A.
Rapid synchronous fluorescence method for virgin olive oil adulteration assessment
(2007) *Food Chemistry*, 105 (1), pp. 369-375. Cited 87 times.
doi: 10.1016/j.foodchem.2006.12.021
[View at Publisher](#)
-
- 11 Aida, A.A., Man, Y.B.C., Wong, C.M.V.L., Raha, A.R., Son, R.
Analysis of raw meats and fats of pigs using polymerase chain reaction for Halal authentication
(2005) *Meat Science*, 69 (1), pp. 47-52. Cited 98 times.
doi: 10.1016/j.meatsci.2004.06.020
[View at Publisher](#)
-
- 12 Syahariza, Z.A., Che Man, Y.B., Selamat, J., Bakar, J.
Detection of lard adulteration in cake formulation by Fourier transform infrared (FTIR) spectroscopy
(2005) *Food Chemistry*, 92 (2), pp. 365-371. Cited 51 times.
www.elsevier.com/locate/foodchem
doi: 10.1016/j.foodchem.2004.10.039
[View at Publisher](#)
-
- 13 Al-Rashood, K.A., Abou-Shaab, R.R.A., Abdel-Moety, E.M., Rauf, A.
Compositional and thermal characterization of genuine and randomized lard: A comparative study
(1996) *JAOCs, Journal of the American Oil Chemists' Society*, 73 (3), pp. 303-309. Cited 37 times.
<http://www.aocs.org/press>
doi: 10.1007/BF02523423
[View at Publisher](#)
-

- 14 Mansor, T.S.T., Man, Y.B.C., Shuhaimi, M.
Employment of differential scanning calorimetry in detecting lard adulteration in virgin coconut oil

(2012) *JAOCs, Journal of the American Oil Chemists' Society*, 89 (3), pp. 485-496. Cited 13 times.
doi: 10.1007/s11746-011-1936-3

[View at Publisher](#)

- 15 Eliasi, J.R., Dwyer, J.T.
Kosher and Halal: Religious observances affecting dietary intakes

(2002) *Journal of the American Dietetic Association*, 102 (7), pp. 911-913. Cited 26 times.
<http://www.elsevier.com/inca/publications/store/6/6/2/1/7/3/index.htm>
doi: 10.1016/S0002-8223(02)90203-8

[View at Publisher](#)

- 16 Regenstein, J., Chaudry, M., Regenstein, C.
The kosher and halal food laws
(2003) *Comprehensive Reviews in Food Science and Food Safety*, 2, pp. 111-127. Cited 137 times.

- 17 KOWALSKI, B.
Sub-ambient differential scanning calorimetry of lard and lard contaminated by tallow

(1989) *International Journal of Food Science & Technology*, 24 (4), pp. 415-420. Cited 12 times.
doi: 10.1111/j.1365-2621.1989.tb00661.x

[View at Publisher](#)

- 18 Che Man, Y.B., Syahariza, Z.A., Mirghani, M.E.S., Jinap, S., Bakar, J.
Analysis of potential lard adulteration in chocolate and chocolate products using Fourier transform infrared spectroscopy

(2005) *Food Chemistry*, 90 (4), pp. 815-819. Cited 81 times.
doi: 10.1016/j.foodchem.2004.05.029

[View at Publisher](#)

- 19 Kurniawati, E., Rohman, A., Triyana, K.
Analysis of lard in meatball broth using Fourier transform infrared spectroscopy and chemometrics

(2014) *Meat Science*, 96 (1), pp. 94-98. Cited 26 times.
doi: 10.1016/j.meatsci.2013.07.003

[View at Publisher](#)

- 20 Nurjuliana, M., Che Man, Y.B., Mat Hashim, D.
Analysis of lard's aroma by an electronic nose for rapid Halal authentication

(2011) *JAOCs, Journal of the American Oil Chemists' Society*, 88 (1), pp. 75-82. Cited 25 times.
doi: 10.1007/s11746-010-1655-1

[View at Publisher](#)

- 21 Mansor, T.S.T., Man, Y.B.C., Rohman, A.
Application of Fast Gas Chromatography and Fourier Transform Infrared Spectroscopy for Analysis of Lard Adulteration in Virgin Coconut Oil

(2011) *Food Analytical Methods*, 4 (3), pp. 365-372. Cited 21 times.
doi: 10.1007/s12161-010-9176-y

[View at Publisher](#)

- 22 Indrasti, D., Che Man, Y.B., Mustafa, S., Hashim, D.M.
Lard detection based on fatty acids profile using comprehensive gas chromatography hyphenated with time-of-flight mass spectrometry
(2010) *Food Chemistry*, 122 (4), pp. 1273-1277. Cited 21 times.
doi: 10.1016/j.foodchem.2010.03.082
[View at Publisher](#)
-
- 23 Nizar, N.N.A., Marikkar, J.M.N., Hashim, D.M.
Differentiation of lard, chicken fat, beef fat and mutton fat by GCMS and EA-IRMS techniques
(2013) *Journal of Oleo Science*, 62 (7), pp. 459-464. Cited 17 times.
https://www.jstage.jst.go.jp/article/jos/62/7/62_459/_pdf
doi: 10.5650/jos.62.459
[View at Publisher](#)
-
- 24 Marikkar, J.M.N., Ghazali, H.M., Che Man, Y.B., Peiris, T.S.G., Lai, O.M.
Distinguishing lard from other animal fats in admixtures of some vegetable oils using liquid chromatographic data coupled with multivariate data analysis
(2005) *Food Chemistry*, 91 (1), pp. 5-14. Cited 42 times.
doi: 10.1016/j.foodchem.2004.01.080
[View at Publisher](#)
-
- 25 Fang, G., Goh, J.Y., Tay, M., Lau, H.F., Li, S.F.Y.
Characterization of oils and fats by 1H NMR and GC/MS fingerprinting: Classification, prediction and detection of adulteration
(2013) *Food Chemistry*, 138 (2-3), pp. 1461-1469. Cited 36 times.
doi: 10.1016/j.foodchem.2012.09.136
[View at Publisher](#)
-
- 26 Cebula, D.J., Smith, K.W.
Differential scanning calorimetry of confectionery fats: Part II-Effects of blends and minor components
(1992) *Journal of the American Oil Chemists' Society*, 69 (10), pp. 992-998. Cited 52 times.
doi: 10.1007/BF02541064
[View at Publisher](#)
-
- 27 Biliaderis, C.G.
Differential scanning calorimetry in food research-A review
(1983) *Food Chemistry*, 10 (4), pp. 239-265. Cited 156 times.
doi: 10.1016/0308-8146(83)90081-X
[View at Publisher](#)
-
- 28 Coni, E., Di Pasquale, M., Coppolelli, P., Bocca, A.
Detection of animal fats in butter by differential scanning calorimetry: A pilot study
(1994) *Journal of the American Oil Chemists' Society*, 71 (8), pp. 807-810. Cited 47 times.
doi: 10.1007/BF02540453
[View at Publisher](#)
-

- 29 Lambelet, P., Singhal, O.P., Ganguli, N.C.
Detection of goat body fat in ghee by differential thermal analysis¹
(1980) *Journal of the American Oil Chemists Society*, 57 (10), pp. 364-366. Cited 18 times.
doi: 10.1007/BF02662061
[View at Publisher](#)
-

- 30 Tan, C.P., Che Man, Y.B.
Recent developments in differential scanning calorimetry for assessing oxidative deterioration of vegetable oils
(2002) *Trends in Food Science and Technology*, 13 (9-10), pp. 312-318. Cited 54 times.
doi: 10.1016/S0924-2244(02)00165-6
[View at Publisher](#)
-

- 31 Yanty, N.A.M., Marikkar, J.M.N., Miskandar, M.S.
Comparing the thermo-physical characteristics of lard and selected plant fats
(2012) *Grasas y Aceites*, 63 (3), pp. 328-334. Cited 8 times.
<http://grasasyaceites.revistas.csic.es/index.php/grasasyaceites/article/view/1387/1383>
doi: 10.3989/gya.023712
[View at Publisher](#)
-

- 32 Tan, C.P., Che Man, Y.B.
Differential scanning calorimetric analysis of edible oils: Comparison of thermal properties and chemical composition
(2000) *JAOCS, Journal of the American Oil Chemists' Society*, 77 (2), pp. 143-155. Cited 187 times.
doi: 10.1007/s11746-000-0024-6
[View at Publisher](#)
-

- 33 Che Man, Y.B., Mirghani, M.E.S.
Detection of lard mixed with body fats of chicken, lamb, and cow by Fourier Transform Infrared Spectroscopy
(2001) *JAOCS, Journal of the American Oil Chemists' Society*, 78 (7), pp. 753-761. Cited 36 times.
<http://www.aocs.org/press>
doi: 10.1007/s11746-001-0338-4
[View at Publisher](#)
-

- 34 Rohman, A., Che Man, Y.B.
FTIR spectroscopy combined with chemometrics for analysis of lard in the mixtures with body fats of lamb, cow, and chicken
(2010) *International Food Research Journal*, 17 (3), pp. 519-526. Cited 26 times.
[http://www.ifrj.upm.edu.my/17%20\(03\)%202010/IFRJ-2010-519-526%20Che%20Man%20Malaysia%20ok.pdf](http://www.ifrj.upm.edu.my/17%20(03)%202010/IFRJ-2010-519-526%20Che%20Man%20Malaysia%20ok.pdf)
-

- 35 Marikkar, J.M.N., Lai, O.M., Ghazali, H.M., Che Man, Y.B.
Detection of lard and randomized lard as adulterants in refined-bleached-deodorized palm oil by differential scanning calorimetry
(2001) *JAOCS, Journal of the American Oil Chemists' Society*, 78 (11), pp. 1113-1119. Cited 48 times.
<http://www.aocs.org/press>
doi: 10.1007/s11746-001-0398-5
[View at Publisher](#)
-

- 36 Marikkar, J.M.N., Ghazali, H.M., Long, K., Lai, O.M.
Lard uptake and its detection in selected food products deep-fried in lard

(2003) *Food Research International*, 36 (9-10), pp. 1047-1060. Cited 25 times.
www.elsevier.com/inca/publications/store/4/2/2/9/7/0
doi: 10.1016/j.foodres.2003.08.003

[View at Publisher](#)

- 37 (1995) *PORIM Test Methods*. Cited 135 times.
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