Fatty Acid Evaluation and Antimicrobial Activity of Virgin Coconut Oil and Activated Virgin Coconut Oil on Streptococcus mutans

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Abstract

For decades, coconut oil was reported to possess a broad spectrum of antimicrobial activity due to its abundant fatty acid contents. Streptococcus mutans (S. mutans) has been strongly implicated as the main etiological factor in dental caries. Regardless of the ongoing medical advances, the therapeutic resources for dental caries remain insufficient, and this has led to renewed interest in using virgin coconut oil (VCO) as a possible choice for dental caries control. In this study, the ability of VCO and activated virgin coconut oil (AVCO) combating S. mutans ATCC 25175 has been evaluated. Fatty acids contents were compared through gas chromatography–mass spectrometry (GC–MS) analysis, and their antimicrobial activity was determined using disc diffusion and minimum inhibitory concentration (MIC) test. From the GC–MS analysis, AVCO (89%) was found to have a slightly higher medium–chain fatty acids (MCFA) as compared to VCO (84.1%), and the long–chain fatty acids (LCFA) contents in VCO (45.9%) was found to be higher than AVCO (41%). Interestingly, S. mutans ATCC 25175 was found to be susceptible towards AVCO (MIC: 6.24 mg/ml) and resistant towards VCO in vitro. The excellent antimicrobial activity of AVCO is a result from (i) the release of individuals fatty acids after activation of VCO by lipase digestion and (ii) the presence of MCFA and LCFA that are significant in antimicrobial activity. Further study can be designed to specifically examine the activity of individuals fatty acids present in oils against S. mutans virulence genes/protein using molecular dynamic assessment.

Keywords

Author Keywords: Activated virgin coconut oil; antimicrobial activity; fatty acids; GC–MS analysis; virgin coconut oil
Key Words Plus: ANTICANCER DRUG METHOTREXATE; LACTOACID; PROPRIONIBACTERIUM ACNES; ANTIBACTERIAL ACTIVITY; ANTIOXIDANT; SURVIVAL; EFFICACY; DISEASE

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   Publisher: Malaysia Palm Oil Board, Kuala Lumpur

2. Comparative study of the fatty acid composition of virgin coconut oil (VCO) at different stages of coconut growth using supercritical carbon dioxide (SC-CO2) extraction compared with other conventional methods

3. Title: [not available]
   By: [Anonymous]
   Wiley Registry of Mass Spectral Data. Published: 2016
   Publisher: Wiley Inc, New Jersey

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   FOOD CHEMISTRY Volume: 172 Pages: 288-304 Published: APR 1 2015

7. In vitro antibacterial activity and major bioactive components of Cinnamomum verum essential oils against cariogenic bacteria, Streptococcus mutans and Streptococcus sobrinus
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   ASIAN PACIFIC JOURNAL OF TROPICAL BIOMEDICINE Volume: 6 Issue: 4 Pages: 308-314 Published: APR 2016

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   NATURE Volume: 172 Issue: 4389 Pages: 1100-1202 Published: 1953

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   JOURNAL OF THE AMERICAN DENTAL ASSOCIATION Volume: 148 Issue: 5 Pages: 308-318 Published: MAY 2017

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12. Prevention Strategies for Periodontal Diseases
    By: Eden, B.D.
    Prevention in Clinical Oral Health Care Pages: 213-223 Published: 2008
    Chapter 16 Crossref
    Publisher: Mosby, St. Louis, MO, USA

13. Coconut oil consumption and cardiovascular risk factors in humans
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    NUTRITION REVIEWS Volume: 74 Issue: 4 Pages: 267-280 Published: APR 2016

14. Effects of feeding lauric acid or coconut oil on ruminal protozoa numbers, fermentation pattern, digestion, omasal nutrient flow, and milk production in dairy cows
    By: Facella, A.P.; Brederie, G.A.
    JOURNAL OF DAIRY SCIENCE Volume: 97 Issue: 8 Pages: 5088-5100 Published: AUG 2014

15. Antioxidant and anti-inflammatory effects of virgin coconut oil supplementation abrogate acute chemotherapy oxidative nephrotoxicity induced by anticancer drug methotrexate in rats
    By: Famurewa, Adebowale C.; Aja, Patrick M.; Madugasuna, Ekechukwu K.; et al.
    BIOMEDICINE & PHARMACOTHERAPY Volume: 96 Pages: 905-911 Published: DEC 2017
16. Virgin coconut oil supplementation attenuates acute chemotherapy hepatotoxicity induced by anticancer drug methotrexate via inhibition of oxidative stress in rats
By: Famurewa, Ademola C.; Udibe, Odemere G.; Egdigigie, Chima A.; et al.
BIOMEDICINE & PHARMACOTHERAPY Volume: 87 Pages: 437-442 Published: MAR 2017
Times Cited: 24

17. The inhibitory effect of Plectranthus barbatus and Plectranthus ecklonii leaves on the viability, glucosyltransferase activity and biofilm formation of Streptococcus sobrinus and Streptococcus mutans
By: Figueiredo, Almeida M.; de Aguiar, Sara Raquel M.; Fale, Pedro Luis; et al.
FOOD CHEMISTRY Volume: 119 Issue: 2 Pages: 666-668 Published: MAR 15 2010
Times Cited: 13

18. The Impact of Virgin Coconut Oil and High-Oleic Safflower Oil on Body Composition, Lipids, and Inflammatory Markers in Postmenopausal Women
By: Harris, Margaret; Hutchins, Andrea; Fryda, Lisa
JOURNAL OF MEDICINAL FOOD Volume: 20 Issue: 4 Pages: 345-351 Published: APR 2017
Times Cited: 9

19. Short- and medium-chain fatty acids exhibit antimicrobial activity for oral microorganisms
By: Huang, Chufi B.; Almeida, Yelena; Myres, Taylor M.; et al.
ARCHIVES OF ORAL BIOLOGY Volume: 56 Issue: 7 Pages: 650-654 Published: JUL 2011
Times Cited: 126

20. Anti-bacterial and anti-inflammatory properties of capric acid against Propionibacterium acnes: A comparative study with lauric acid
By: Huang, Wen-Cheng; Tsai, Tsung-Hsien; Chuang, Lu-Ti; et al.
JOURNAL OF DERMATOLOGICAL SCIENCE Volume: 73 Issue: 3 Pages: 232-240 Published: MAR 2014
Times Cited: 42

21. Fatty acid composition, antioxidant and antibacterial properties of the microwave aqueous extract of three varieties of Labisia pumila Benth
By: Kamrav, Elhan; Jafar, Hawa Z.; Ghasemzadeh, Ali; et al.
BIORESEARCH Volume: 48 Article Number: 8 Published: JAN 23 2015
Times Cited: 14

22. Improvement of Medium Chain Fatty Acid Content and Antimicrobial Activity of Coconut Oil via Solid-State Fermentation Using a Malaysian Geotrichum candidum
By: Kheramnia, Anahita; Ebrahimian, Afshin; Ghanbari, Rana; et al.
BIOMED RESEARCH INTERNATIONAL Article Number: 354542 Published: 2013
Times Cited: 14

23. Coconut oil has less satiating properties than medium chain triglyceride oil
By: Kinsella, R.; Maher, T.; Clegh, M. E.
PHYSIOLOGY & BEHAVIOR Volume: 179 Pages: 422-426 Published: OCT 1 2017
Times Cited: 9

24. Enhanced virgin coconut oil (EVCO) as natural postmilking teat germicide to control environmental mastitis pathogens
By: Koh, S.P.; Hanun, D.; Mat, Amin, M.; et al.
Int J Biotechnol Wellness Ind Volume: 5 Issue: 4 Pages: 128-134 Published: 2016
[Show additional data]
Times Cited: 2

25. The antimicrobial activity of enhanced virgin coconut oil (EVCO) on the growth of mastitis pathogens
By: Koh, S.P.; Long, K.
Malays J Microbiol Volume: 20 Issue: 2 Pages: 112-118 Published: 2014
URL: https://doi.org/10.21836/MJMI.2014.4.8
Times Cited: 1

26. The role of coconut and coconut oil in coronary heart disease in Kerala, South India
By: Kumar, P.D.
TROPICAL DOCTOR Volume: 27 Issue: 4 Pages: 215-217 Published: OCT 1 1997
Times Cited: 24

27. Study on the enzyme’s 1,3-positional specificity during lipoloyse TL-mediated biodiesel production
By: Li, Renwang; Du, Wei; Lu, Dianlan; et al.
RSC ADVANCES Volume: 3 Issue: 77 Pages: 62460-62468 Published: 2015
Times Cited: 2

28. Hypolipemiament and antioxi dant effects of Eugenia brasiilensis in an animal model of coconut oil-induced hypertriglyceridemia
By: Lima, Alme Barbea; Delwein de Lima, Daniela; Vieira, Mariana Ramos; et al.
BIOMEDICINE & PHARMACOTHERAPY Volume: 96 Pages: 642-643 Published: DEC 2017
Times Cited: 4

29. Microbiology of dental decay and periodontal disease
By: Loesche, WJ.
Medical Microbiology Published: 1996 Chapter 99. Retrieved 30 April 2018, from Publisher: University of Texas Medical Branch at Galveston, Galveston (TX) URL: https://www.ncbi.nlm.nih.gov/books/NBK8253/
Times Cited: 22

30. ROLE OF STREPTOCOCCUS-MUTANS IN HUMAN DENTAL DECAY
By: LOESCHE, WJ
MICROBIOLOGICAL REVIEWS Volume: 50 Issue: 4 Pages: 353-380 Published: DEC 1986
Times Cited: 2,002