EXTRACTION, OPTIMIZATION AND CHARACTERIZATION OF INCA INCHI OIL AND ITS OIL MEAL FOR CHEWABLE OIL TABLETS AND COOKIES FORMULATION

By

CHRISTOPHER JEFFI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

July 2024

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EXTRACTION, OPTIMIZATION AND CHARACTERIZATION OF INCA INCHI OIL AND ITS OIL MEAL FOR CHEWABLE OIL TABLETS AND COOKIES FORMULATION

By

CHRISTOPHER JEFFI

July 2024

Chairman : Professor Lai Oi Ming, PhD
Faculty : Bioscience

Inca Inchi Oil (*Plukenetia volubilis* L.), rich in essential fatty acid faces challenges that limit its practical applications. These include susceptibility to oxidation, low extraction yields and quality from conventional methods. This study aims to enhance oil yield, antioxidant properties, and quality through heat pretreatment (microwave and hot air oven) and enzyme-assisted extraction, develop chewable oil tablets, and evaluate the acceptability of its press cake in cookies. The study showed that microwave pretreatment of inca inchi seeds for 4 min resulted in the highest oil yield (43.39%), compared to control (37.76%). Pre-treated oil samples had better quality in terms of free fatty acids (<1%) and peroxide values (<8 meqO2/kg). The 2,2-diphenyl-1- 1picrylhydrazyl (DPPH) and 2,2´-azino-bis 3-ethylbenzothiazoline-6-sulfonic acid (ABTS) study, showed that pretreated oil had good radical scavenging activity (70% and 90%). The extraction efficiency of the enzymes Neutrase 0.8L and Viscozyme L were evaluated. The study showed that, among the enzymes, Neutrase 0.8L was more efficient in extracting the oil (46.77%) when compared to Viscozyme L (14.7%). The

oil extracted had low free fatty acid (<1%) and peroxide value (<8 meqO2/kg). The oil showed high scavenging activity (73% and 82%) as analyzed by DPPH and ABTS assays. Spray drying was used to develop microcapsules of blends of inca inchi oil-virgin coconut oil and inca inchi oil-red palm oil. Evaluation of the microcapsules showed that the microcapsules exhibited good flowability and low moisture content (<3%). The microcapsules showed reduction in fatty acids and the retention of β carotene was about 60%. Through the process of optimization, high encapsulation efficiency (>90%) was achieved at 40% and 160°C for total solids and inlet air temperature, respectively for both the samples. Chewable oil tablets were developed from spray dried encapsulates by direct compression technique. Analyses of the tablets in terms of attributes such as hardness, disintegration time and friability showed that the tablets were within the standard value as recommended by United States Pharmacopoeia. The invitro release of oil showed that the % of oil release was higher in gastrointestinal condition (8.5-18.67%) than in gastric condition (6.2-7.78%). Storage studies on the attributes of the chewable tablets indicated significant differences ($p<0.05$) in the attributes, but they remained within the acceptable limits over two months at 4°C and 25°C. Additionally inca inchi oil press cake at various proportions (5%, 10%, 20% and 30%) were used to develop cookies. The study observed that cookies containing 10% oil meal had high protein content (13.03%) against control (4.89%). The hardness of the cookies formulated with press cake were low (2.52-3.22 N) compared to control (3.30 N). Moisture stability of the cookies stored for a month showed that water activity remained below 0.6. Sensory analysis favored cookies with 10% formulation, suggesting its potential for developing healthier cookies. Overall, the study shows that by using innovative extraction techniques, developing dietary supplements, and incorporating press cake into food products, the study paves the way for its application benefiting both consumers and the industry.

Keywords: Chewable oil tablets, cookies, enzymes; inca inchi oil; spray drying

SDG: GOAL 3: Good Health and Well-Being, GOAL 12: Responsible Consumption and Production

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PENGEKSTRAKAN, PENGOPTIMUMAN DAN PENCIRIAN MINYAK INCA INCHI DAN BUNGKILNYA DALAM PEMBENTUKAN TABLET MINYAK KUNYAH DAN FORMULASI BISKUT

Oleh

CHRISTOPHER JEFFI

Julai 2024

Pengerusi : Profesor Lai Oi Ming, PhD
Fakulti : Biosains

Minyak Inca Inci (*Plukenetia volubilis*. L), kaya dengan asid lemak penting, mempunyai aplikasi yang berpotensi dalam bidang terapeutik, makanan dan farmaseutikal. Walau bagaimanapun, kerintangannya terhadap pengoksidaan menghalang aplikasinya. Kajian ini meneroka kaedah pengekstrakan dan pengkapsulan melalui pengeringan semburan untuk membangunkan tablet minyak kunyah. Kajian juga melihat kebolehterimaa tepung inca inchi dalam biskut untuk mempelbagaikan penggunaannya dalam produk makanan. Pengekstrakan minyak menggunakan teknik konvensional mempunyai had dalam memaksimumkan hasil minyak. Kajian dijalankan untuk menentukan kesan prarawatan haba dalam bentuk ketuhar gelombang mikro dan udara panas ke atas hasil, kualiti minyak, antioksidan, dan komposisi asid lemak. Keputusan menunjukkan rawatan gelombang mikro selama 4 minit menghasilkan hasil minyak tertinggi (43.39%) berbanding kawalan (37.76%). Sampel minyak pra-rawatan menunjukkan asid lemak bebas dan nilai peroksida yang lebih rendah daripada kawalan. Kajian 2,2-diphenyl-1-1picrylhydrazyl (DPPH) dan

2,2'-azino-bis 3-ethylbenzothiazoline-6-sulfonik acid (ABTS), menunjukkan minyak mempunyai aktiviti penghapusan radikal yang baik (70% dan 90%, masing-masing). Tambahan pula, pengekstrakan bebas pelarut menggunakan hidrolisis enzimatik dengan Neutrase 0.8 L dan Viscozyme L telah diterokai. Metodologi Permukaan Tindak Balas (RSM) digunakan untuk mengoptimumkan dos enzim (2-3.5%), masa (1-5 jam), dan suhu pengeraman (40-50°C). Kajian mendapati Neutrase 0.8 L lebih cekap daripada Viscozyme L dalam mengekstrak minyak. Kecekapan pengekstrakan tertinggi (47%) dicapai dalam masa optimum (5 jam), suhu pengeraman (40 °C), dan dos enzim (3.5%). Profil asid lemak dan kualiti minyak tidak terjejas dan berada dalam julat (ω-3:48.0-50.8%; ω-6:33.0-41%; ω9: 6.8% -11%; Palmitik acid:4.0-4.9%; Stearic acid: 2.0-3.68%). Nilai peroksida dan asid lemak bebas adalah <10 meq O_2/kg; dan 5%, masing-masing. Pengeringan semburan meningkatkan kestabilan minyak dengan melindungi komponen teras. Kajian ini membangunkan mikrokapsul kering semburan campuran minyak inca inchi -minyak kelapa dara, dan minyak inca inchi -minyak sawit merah. Proses ini dioptimumkan dengan memilih jumlah pepejal (20-40%) dan suhu udara masuk (160-180°C) sebagai pembolehubah dan kecekapan pengkapsulan sebagai faktor tindak balas. Keputusan menunjukkanhasil serbuk sederhana (56.05-77.06%) dengan pengurangan ketara dalam asid lemak dan karotenoid. Kecekapan pengkapsulan tinggi (> 90%) dicapai pada 40% dan 160°C untuk jumlah pepejal dan suhu udara masuk untuk kedua-dua sampel. Tablet minyak kunyah diperkaya asid lemak penting dan karotenoid dihasilkan daripada pembungkusan kering semburan dengan teknik pemampatan terus. Pelepasan in vitro minyak menunjukkan % pelepasan minyak lebih tinggi dalam gastrousus (sehingga 18%) berbanding dalam gastrik (sehingga 10%). Kajian penyimpanan sifat-sifat tablet kunyah menunjukkan perbezaan ketara ($p<0.05$) dalam tablet minyak kunyah, tetapi

ia kekal dalam had yang boleh diterima selama dua bulan pada 4°C dan 25°C. Akhir sekali, kandungan protein tinggi dalam tepung minyak membawa kepada penerokaannya dalam pembangunan biskut. Kajian menunjukkan biskut yang diformulasikan dengan tepung minyak menunjukkan kandungan protein yang tinggi berbanding kawalan (13.03% vs 4.89%) dan kekerasan berkurangan (2.52-3.22N) berbanding kawalan (3.30N). Analisis deria mengutamakan biskut berformulasi 10%, mencadangkan potensinya dalam pembangunan biskut yang lebih sihat. Kesimpulannya, kajian menunjukkan kepelbagaian minyak inca inchi dalam pelbagai aplikasi. Teknik pengekstrakan, pengkapsulan dan formulasi yang dibangunkan menunjukkan potensinya menangani keperluan pemakanan seperti pengurusan disfagia dan peningkatan profil pemakanan biskut. Penemuan ini membuka ruang untuk penggunaan minyak inca inchi dan produk sampingannya dalam makanan fungsian, memenuhi keperluan terapeutik dan pemakanan.

Kata Kunci: Biskut, enzim, minyak inca inci, pengeringan semburan, tablet minyak kunyah

SDG: MATLAMAT 3: Kesihatan yang Baik dan Kesejahteraan, MATLAMAT 12: Penggunaan dan Pengeluaran Bertanggungjawab

ACKNOWLEDGEMENTS

First and foremost, I praise and thank God Almighty for being with me throughout my research work and enabled me to successfully complete my thesis.

I avail this opportunity to acknowledge my sincere, humble and wholehearted sense of gratitude to my supervisor Prof Dr. Lai Oi Ming, for her meticulous guidance, valuable suggestions and incessant encouragement throughout my period of dissertation. I am thankful to my co- supervisors, Dr. Tan Chin Ping and Dr. Helmi Wasoh from Faculty of Food Science and Technology, UPM and Faculty of Biotechnology and Biomolecular Sciences, UPM for providing access to their research facilities. I am grateful to them for their insightful feedback and constructive criticism that significantly enhanced the quality of this work. It has been a real pleasure to work under their guidance.

Special thanks to Dr. Chan Yong Lin, Dr. Tang Teck Kim, Dr. Yeo Bee Hui, Gan Yee Lin, Nurul Aini binti Jamalullail, Chong Wai Ting and Dr. Khor Yih Phing for their encouragement, support and guidance during my tenure of study. I would like to extend my heartfelt thanks to the staff at Faculty of Biotechnology and Biomolecular Sciences, Faculty of Food Science and Technology, Malaysian Research Institute on Ageing, Institute of Bioscience UPM and Malaysia Palm Oil Board for providing necessary facilities and resources which have been crucial to my research.

I would like to thank my beloved parents, Dr. Moses Christopher and Kala Christopher, my sister, Steffi Christopher and my brother-in-law, Santhosh Saminathan. Their patience and support during the challenging phase of the academic

journey have been my source of strength. I would like to extend my sincere appreciation to all those who have played a role, no matter how big or small. Your support has been invaluable, and I am truly grateful.

This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Lai Oi Ming, PhD
Professor
Faculty of Biotechnology and Biomolecular Sciences
Universiti Putra Malaysia
(Chairman)

Tan Chin Ping, PhD
Professor
Faculty of Food Science and Technology
Universiti Putra Malaysia
(Member)

Helmi binWasoh @ Mohamad Isa, PhD
Associate Professor
Faculty of Biotechnology and Biomolecular Sciences
Universiti Putra Malaysia
(Member)

ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 13 January 2025

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABTS	2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid))
AI	Active Ingredient
ALA	Alpha-Linolenic acid
ANOVA	Analysis of Variance
AOAC	Association of Official Analytical Chemists
AOCS	American Oil Chemist Society
CI	Carr's Index
DPA	Docosapentaenoic Acid
DPPH	2,2-diphenyl-1-picryl-hydrazyl-hydrate
DSC	Differential Scanning Calorimetry
EMC	Equilibrium Moisture Content
EP	European Pharmacopeia
EPA	Eicosapentaenoic Acid
FCCD	Face Centered Central Composite Design
FFA	Free Fatty Acid
FID	Flame Ionization Detector
GA	Gum Arabic
GC	Gas Chromatography
HDL-C	High-Density Lipoprotein Cholesterol
HPLC	High Performance Liquid Chromatography
HR	Hausner Ratio
II	Inca Inchi
IIO	Inca Inchi Oil
IIOPC	Inca Inchi Oil Press Cake
IV	Iodine Value
LCT	Long-Chain Triglycerides

LDL-C	Low-Density Lipoprotein Cholesterol
MAE	Microwave Assisted Extraction
MD	Maltodextrin
MEE	Micro Encapsulation Efficiency
MUFAs	Mono Unsaturated Fatty Acids
OAC	Oil Absorption Capacity
PUFAs	Poly Unsaturated Fatty Acids
PV	Peroxide Value
PVA	Provitamin A
QE	Quercetin Equivalent
RPO	Red Palm Oil
RSM	Response Surface Methodology
SEM	Scanning Electron Microscopy
SFAs	Saturated Fatty Acids
SGC	Simulated Gastric Condition
SGF	Simulated Gastric Fluid
SO	Surface Oil
TAG	Tri Acyl Glycerol
TG	Triglycerides
TLE	Total Life Expectancy
TO	Total Oil
USFDA	United States Food and Drug Administration
USP	US Pharmacopeia
VCO	Virgin Coconut Oil
WAC	Water Absorption Capacity
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Fatty acids, the fat-soluble components found in both animals and plants, are the primary building blocks of lipids and are classified as either saturated or unsaturated based on the presence of double bones in their structure. Saturated fatty acids (SFAs) have no double bonds, while unsaturated fatty acids can be further divided into monounsaturated (MUFAs), containing one double bond, and polyunsaturated fatty acids (PUFAs), which have two or more double bonds (Sokoła-Wysoczańska et al., 2018; Islam et al., 2023). PUFAs are crucial for maintaining cell membrane integrity and are important in treating various conditions, including chronic illness, non-alcoholic fatty liver disease, and autoimmune disorders. Among PUFAs, essential fatty acids (EFAs) are a vital subclass that the human body cannot synthesize and must be obtained through the diet. EFAs are characterized by multiple double bonds and are classified into omega-3 and omega-6 fatty acids based on the position of the first double bond relative to the terminal methyl group in the aliphatic chain (Rizzo et al., 2023; Kapoor et al., 2021). Omega-3 fatty acids, such as alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), have their first double bond between the third and fourth carbon atoms from the methyl end, while omega-6 fatty acids, like linoleic acid (LA) and arachidonic acid (AA), have their first double bond between the sixth and seventh carbon atoms (Mariamenatu & Abdu, 2021).Omega-3 and omega-6 fatty acids provide significant health benefits, particularly for cardiovascular, inflammatory, and neurological health. EPA and DHA, lower triglyceride levels, improve blood flow, and support heart function, reducing the risk of cardiovascular diseases. Their1 anti-inflammatory effects help manage conditions like arthritis and support mental health by reducing depressive symptoms and enhancing cognitive function. DHA is crucial for brain development, especially during pregnancy and early childhood. Meanwhile, omega-6 fatty acids, such as arachidonic acid, contribute to brain development and help lower LDL cholesterol, further promoting cardiovascular health (Djuricic & Calder, 2021).

The omega-6 to omega-3 ratio is a key indicator of the balance between these fatty acids, that is critical for overall health. However, modern Western diets often display a much higher ratio, sometimes exceeding 16:1, largely due to the prevalent consumption of foods rich in omega-6 fatty acids. The ideal ratio should range between 1:1 and 4:1. This imbalance in the ratio has significant health implications, as omega-6 fatty acids tend to promote inflammation, while omega-3s are known for their anti-inflammatory effects. Research highlights that excessive omega-6 intake, can exacerbate oxidative stress and inflammation, adversely affecting heart health and increasing the risk of chronic conditions such as diabetes, cardiovascular disease, and metabolic syndrome. Therefore, maintaining an appropriate balance by reducing the intake of omega 6 fatty acid and increasing the intake of omega 3 fatty acids can mitigate associated health risk (Brown et al., 2019; Djuricic & Calder, 2021; Jang & Park, 2020).

Seafood is often the best source of omega-3 fatty acids. Fishes known for their high omega-3 content include mackerel, herring, sardines, salmon, pollock, anchovies, and tuna (Oliver et al., 2020). Other sources of plant-based omega 3 fatty acids include nuts such as walnuts, seed oils such as garden cress, chia seed, inca inchi and flax seed, seaweeds and microalgae (Saini et al., 2021; Kodahl et al., 2022; Rizzo et al., 2023). Fish oil is well known as the primary source of PUFAs. However, due to ecological, ethical, and taste-related factors, they are not consumed by everyone. However, PUFAs obtained from plant sources are beneficial over fish oil due to their neutral odour thus making it easier to develop omega fatty acid supplements in the form of chewable tablets as a better choice for consumers seeking alternatives to fish based products. Hence there is a need to identify plant-based sources that are globally acceptable and sustainable (Rizzo et al., 2023; Supriyanto et al., 2022).

1.2 Problem Statement

Inca Inchi Oil obtained from the seeds of inca inchi has been known to improve health due to the presence of PUFAs. However, the nutritional composition, antioxidant properties and quality of the oil depends on the extraction techniques such as Soxhlet extraction, supercritical CO_2 extraction, screw press extraction, aqueous enzyme assisted extraction etc. Moreover, inca inchi oil pressed cake, a byproduct obtained after extracting the inca inchi oil is known to contain functional ingredients such as protein, fiber, and minerals. However, the application of inca inchi oil press cake in bakery products is limited and the potential of developing oil into chewable oil tablets for delivering its health benefits has not been fully explored. Thus, this study aims to evaluate different extraction methods (microwave assisted extraction, dry roasting and aqueous enzyme assisted extraction) on the fatty acid composition, quality and antioxidant properties of inca inchi oil and to assess the feasibility of incorporating inca inchi oil and inca inchi oil press cake in chewable tablets and cookies.

1.3 Research Hypotheses

The study aims to address the following hypotheses

1. Microwave and dry roasting pre-treatments will significantly affect the yield, fatty acid composition, antioxidant properties, and overall quality of inca inchi oil.

2. Enzyme-assisted extraction of oil from inca inchi seeds can be optimized using response surface methodology, and the extracted oil will exhibit desirable characteristics.

3. Spray-dried microcapsules of oil blends (inca inchi oil-virgin coconut oil and inca inchi oil-red palm oil) will have high encapsulation efficiency, and the wall material will significantly influence the encapsulation efficiency.

4. Chewable tablets enriched with oil blend encapsulates can be successfully developed and characterized.

5. Partial replacement of whole wheat flour with inca inchi oil press cake in cookies will improve the physico-chemical and organoleptic properties of the cookies.

1.4 Research Objectives

The study aims to utilize inca inchi oil and its byproduct, press cake to develop chewable oil tablets from oil encapsulates and cookies from press cake. The following five objectives outlines the overall view of the research. The initial step involves investigating the effect of microwave and dry roasting pre-treatment on the oil yield, quality, antioxidant property and fatty acid composition. In the second part the study aims to optimize the extraction of inca inchi oil using enzymes such as Neutrase 0.8L and Viscozyme L by varying enzyme dose, hydrolysis time and incubation temperature to determine the extraction efficiency of the enzymes. These enzymes were chosen based on their ability to break down the key components (proteins and cell wall components). Enzyme Neutrase 0.8 L is a protease enzyme that helps to break down the protein molecules surrounding the oil, facilitating the release of oil. Enzyme Viscozyme L is a multi-enzyme complex with various activities such as cellulase, hemicellulose, xylanase and beta-glucanase activities. They help to release the oil by breaking down the cell wall components such as cellulose, hemicellulose, pectin and β-glucans. Further the oil obtained were characterized for their quality, antioxidant property and fatty acid composition. In the third part of the study, two spray dried microcapsules of oil blend were developed by combining inca inchi oil with virgin coconut oil and red palm oil to assess the influence of total solids and inlet air temperature on the encapsulation efficiency. The oil encapsulates developed were used to develop chewable oil tablets as a convenient way of delivering the nutritional benefits of the oil blends. Finally, the research will investigate the incorporation of inca inchi oil press cake into cookie formulations by partially replacing whole wheat flour, and to assess the effect of partial replacement on the nutritional, physical and overall acceptability of the cookies.

Thus, the five objectives of the study were:

1. To determine the effect of microwave and dry roasting pre-treatments on the yield, fatty acid composition, antioxidant and quality of inca inchi seed oil.
2. To optimize the enzyme assisted extraction of oil from inca inchi seeds using response surface methodology and its characterization.
3. To evaluate the effect of process conditions and wall materials on the encapsulation efficiency of spray-dried microcapsules containing blends of inca inchi oil with virgin coconut oil or red palm oil.

4. To develop and characterize chewable tablets enriched with oil blend encapsulates

5. To evaluate the effect of partial replacement of whole wheat flour with inca inchi oil press cake in the formulation of cookies and to determine the physico chemical and organoleptic parameters of the cookies.

REFERENCES

AACC. (2000). *Approved method of the American Assosciation of Cereal Chemists.* (10th ed.). American Association of Cereal Chemists.

Ahmed, I. A. M., Al-Juhaimi, F. Y., Özcan, M. M., Osman, M. A., Gassem, M. A., & Salih, H. A. A. (2019). Effects of cold-Press and soxhlet extraction systems on antioxidant activity, total phenol contents, fatty acids, and tocopherol contents of walnut kernel oils. *Journal of Oleo Science*, *68*(2), 167–173. https://doi.org/10.5650/jos.ess18141

Aksoz, E., Korkut, O., Aksit, D., & Gokbulut, C. (2020). Vitamin E (α-, β + γ- and δ-tocopherol) levels in plant oils. *Flavour and Fragrance Journal*, *35*(5), 504–510. https://doi.org/10.1002/ffj.3585

Alayón, A. N., Ortega Ávila, J. G., & Echeverri Jiménez, I. (2019). Metabolic status is related to the effects of adding of sacha inchi (*Plukenetia volubilis* L.) oil on postprandial inflammation and lipid profile: Randomized, crossover clinical trial. *Journal of Food Biochemistry*, *43*(2), e12703. https://doi.org/10.1111/jfbc.12703

Alemu, B., Pu, Z., Debele, G., Goshu, A., Jida, M., Abdikadir, A., Ahmed, A., Dadi, H., Tesfaye, K., Tessema, A., & Chunhong, M. (2022). Proximate analysis of endangered evergreen leguminous shrub Yeheb-nut (*Cordeauxia edulis* Hemsl.) reveals high content of carbohydrate than protein. *Measurement: Food*, *7*, 100051. https://doi.org/10.1016/j.meafoo.2022.100051

Allay, A., Benkirane, C., Rbah, Y., Moumen, A. B., Taaifi, Y., Belhaj, K., Melhaoui, R., Elamrani, A., Serghini-Caid, H., & Mansouri, F. (2024). Combined effect of protease, hemicellulase and pectinase on the quality of hemp seed oil (*Cannabis sativa* L.) obtained by aqueous enzymatic extraction as an eco-friendly method. *Journal of Oleo Science*, *73*(7), 963–976. https://doi.org/10.5650/jos.ess24031

Alvarez-Sala, A., Attanzio, A., Tesoriere, L., Garcia-Llatas, G., Barberá, R., & Cilla, A. (2019). Apoptotic effect of a phytosterol-ingredient and its main phytosterol (β-sitosterol) in human cancer cell lines. *International Journal of Food Sciences and Nutrition*, *70*(3), 323–334. https://doi.org/10.1080/09637486.2018.1511689

Ambulay, J. P., Rojas, P. A., Timoteo, O. S., Barreto, T. V., & Colarossi, A. (2020). Effect of the emulsion of sacha inchi (*Plukenetia huayalabambana*) oil on oxidative stress and inflammation in rats induced to obesity. *Journal of Functional Foods*, *64*, 103631. https://doi.org/10.1016/j.jff.2019.103631

Ancuța, P., & Sonia, A. (2020). Oil press-cakes and meals valorization through circular economy approaches: A Review. *Applied Sciences*, *10*(21), 7432. https://doi.org/10.3390/app10217432

Anusha, V., Palanichamy, S, Sugumar, M, Rajesh,M, Parasakthi, N, Godwin Raja Das, T, Ramasubramaniyan, P, & Thirupathi,A, T. (2012). Formulation and characterization of albendazole chewable tablets. *Der Pharmacia Sinica*, *3*(2), 211–216.

Arun, K. B., Persia, F., Aswathy, P. S., Chandran, J., Sajeev, M. S., Jayamurthy, P., & Nisha, P. (2015). Plantain peel—A potential source of antioxidant dietary fibre for developing functional cookies. *Journal of Food Science and Technology*, *52*(10), 6355–6364. https://doi.org/10.1007/s13197-015-1727-1

Baba, S. A., & Malik, S. A. (2015). Determination of total phenolic and flavonoid content, antimicrobial and antioxidant activity of a root extract of Arisaema jacquemontii Blume. *Journal of Taibah University for Science*, *9*(4), 449–454. https://doi.org/10.1016/j.jtusci.2014.11.001

Backes, J., Anzalone, D., Hilleman, D., & Catini, J. (2016). The clinical relevance of omega-3 fatty acids in the management of hypertriglyceridemia. *Lipids in Health and Disease*, *15*(1), 118. https://doi.org/10.1186/s12944-016-0286-4

Bakare, A. H., Adeola, A. A., Otesile, I., Obadina, A. O., Afolabi, W. A., Adegunwa, M. O., Akerele, R. A., Bamgbose, O. O., & Alamu, E. O. (2020). Nutritional, texture, and sensory properties of composite biscuits produced from breadfruit and wheat flours enriched with edible fish meal. *Food Science & Nutrition*, *8*(11), 6226–6246. https://doi.org/10.1002/fsn3.1919

Belghith Fendri, L., Chaari, F., Maaloul, M., Kallel, F., Abdelkafi, L., Ellouz Chaabouni, S., & Ghribi-Aydi, D. (2016). Wheat bread enrichment by pea and broad bean pods fibers: Effect on dough rheology and bread quality. *LWT*, *73*, 584–591. https://doi.org/10.1016/j.lwt.2016.06.070

Berardi, A., Bisharat, L., Quodbach, J., Abdel Rahim, S., Perinelli, D. R., & Cespi, M. (2021). Advancing the understanding of the tablet disintegration phenomenon – An update on recent studies. *International Journal of Pharmaceutics*, *598*, 120390. https://doi.org/10.1016/j.ijpharm.2021.120390

Berk, E., Hamzalıoğlu, A., & Gökmen, V. (2019). Investigations on the maillard reaction in sesame (*Sesamum indicum* L.) seeds induced by roasting. *Journal of Agricultural and Food Chemistry*, *67*(17), 4923–4930. https://doi.org/10.1021/acs.jafc.9b01413

Bhatt, S. K., M, K., & Sharma, M. (2021). The role of chewable tablets: An Overview. *Asian Journal of Pharmaceutical Research and Development*, *9*(4), 141–146. https://doi.org/10.22270/ajprd.v9i4.1005

Bhuyan, D. J., & Basu, A. (2017). Phenolic compounds: Potential health benefits and toxicity. In *Utilisation of bioactive compounds from agricultural and food waste* (1st Edition, p. 414). CRC Press.

Bochkarev, M. S., Egorova, E. Yu., & Altai, P. (2016). Reasons for the ways of using oilcakes in food industry. *Foods and Raw Materials*, *4*(1), 4–12. https://doi.org/10.21179/2308-4057-2016-1-4-12

Boujemaa, I., Bernoussi, S. E., Harhar, H., & Tabyaoui, M. (2020). The influence of the species on the quality, chemical composition and antioxidant activity of pumpkin seed oil. *OCL*, *27*, 40. https://doi.org/10.1051/ocl/2020031

Brock, J. R., Scott, T., Lee, A. Y., Mosyakin, S. L., & Olsen, K. M. (2020). Interactions between genetics and environment shape camelina seed oil composition. *BMC Plant Biology*, *20*(1), 423. https://doi.org/10.1186/s12870-020-02641-8

Brown, T. J., Brainard, J., Song, F., Wang, X., Abdelhamid, A., & Hooper, L. (2019). Omega-3, omega-6, and total dietary polyunsaturated fat for prevention and treatment of type 2 diabetes mellitus: Systematic review and meta-analysis of randomised controlled trials. *BMJ*, *366*, l4697. https://doi.org/10.1136/bmj.l4697

Bueno-Borges, L. B., Sartim, M. A., Gil, C. C., Sampaio, S. V., Rodrigues, P. H. V., & Regitano-d'Arce, M. A. B. (2018). Sacha inchi seeds from sub-tropical cultivation: Effects of roasting on antinutrients, antioxidant capacity and oxidative stability. *Journal of Food Science and Technology*, *55*(10), 4159–4166. https://doi.org/10.1007/s13197-018-3345-1

Burbank, A. J., Duran, C. G., Almond, M., Wells, H., Jenkins, S., Jiang, Q., Yang, C., Wang, T., Zhou, H., Hernandez, M. L., & Peden, D. B. (2017). A short course of gamma-tocopherol mitigates LPS-induced inflammatory responses in humans ex vivo. *Journal of Allergy and Clinical Immunology*, *140*(4), 1179-1181.e4. https://doi.org/10.1016/j.jaci.2017.04.030

Bustani, S., & Soni, S. (2023). Review on the impact of peroxide value from edible oil: Indian perspective. *Journal of Survey in Fisheries Science*, *10*(2), 26-33.

Cai, Z., Li, K., Lee, W. J., Reaney, M. T. J., Zhang, N., & Wang, Y. (2021). Recent progress in the thermal treatment of oilseeds and oil oxidative stability: A review. *Fundamental Research*, *1*(6), 767–784. https://doi.org/10.1016/j.fmre.2021.06.022

Callahan, J. C., Cleary, G. W., Elefant, M., Kaplan, G., Kensler, T., & Nash, R. A. (1982). Equilibrium moisture content of pharmaceutical excipients. *Drug Development and Industrial Pharmacy*, *8*(3), 355–369. https://doi.org/10.3109/03639048209022105

Cardinal-McTeague, W. M., Wurdack, K. J., Sigel, E. M., & Gillespie, L. J. (2019). Seed size evolution and biogeography of Plukenetia (Euphorbiaceae), a pantropical genus with traditionally cultivated oilseed species. *BMC Evolutionary Biology*, *19*(1), 29. https://doi.org/10.1186/s12862-018-1308-9

Carneiro, H. C. F., Tonon, R. V., Grosso, C. R. F., & Hubinger, M. D. (2013). Encapsulation efficiency and oxidative stability of flaxseed oil microencapsulated by spray drying using different combinations of wall materials. *Journal of Food Engineering*, *115*(4), 443–451. https://doi.org/10.1016/j.jfoodeng.2012.03.033

Carrillo, D. M., & López, Carlos. (2022). Development of a formulation of macarela sausage (Scomber Japonicus, Linnaeus 1758), using neem oil (*Azadirachta indica*) and sacha inchi oil (*Plukenetia volubilis*) as natural preservatives. *Journal of Agricultural Sciences Research*, *3*(15), 2–10.

Castro, J. P., Vaca, C. F., Soto, E. J., Vargas, J. R., García, G., Bañon, J., Neira, E. F., & Tuesta, T. (2020). Sacha inchi oil (*Plukenetia volubilis*) stabilized with antioxidants for addition in fresh cheese. *African Journal of Food, Agriculture, Nutrition and Development*, *20*(6), 16638-16651.

Cedó, L., Farràs, M., Lee-Rueckert, M., & Escolà-Gil, J. C. (2019). Molecular insights into the mechanisms underlying the cholesterol-lowering effects of phytosterols. *Current Medicinal Chemistry*, *26*(37), 6704–6723. https://doi.org/10.2174/0929867326666190822154701

Čepková, P. H., Jágr, M., Viehmannová, I., Dvořáček, V., Huansi, D. C., & Mikšík, I. (2019). Diversity in seed storage protein profile of oilseed crop *Plukenetia volubilis* from Peruvian Amazon. *International Journal of Agriculture and Biology*, *21*(3), 679–688. https://doi.org/10.17957/IJAB/15.0945

Chaari, M., Akermi, S., Elhadef, K., Said-Al Ahl, H. A. H., Hikal, W. M., Mellouli, L., & Smaoui, S. (2024). Microwave-assisted extraction of bioactive and nutraceuticals. In T. Sarkar & S. Pati (Eds.), *Bioactive Extraction and Application in Food and Nutraceutical Industries* (pp. 79–102). Springer US. https://doi.org/10.1007/978-1-0716-3601-5_4

Chan, Y.-J., Chiu, C.-S., Li, P.-H., & Lu, W.-C. (2024). Evaluation of different roasting condition on yield, physico-chemical characteristics, and antioxidant activity of cold-pressed sacha inchi (*Plukenetia volubilis*) oil. *LWT*, *203*, 116343. https://doi.org/10.1016/j.lwt.2024.116343

Chansuvarn, W., & Panich, S. (2024). Nutritional and sensory properties of plant-based milk produced from sacha inchi seeds (*Plukenetia volubilis* L.). *Food Science and Applied Biotechnology*, *7*(1), 14-23. https://doi.org/10.30721/fsab2024.v7.i1.303

Cheong, A. M., Tan, C. P., & Nyam, K. L. (2018). Stability of bioactive compounds and antioxidant activities of kenaf seed oil-in-water nanoemulsions under different storage temperatures. *Journal of Food Science*, *83*(10), 2457–2465. https://doi.org/10.1111/1750-3841.14332

Chew, S. C., Tan, C. P., & Nyam, K. L. (2018). Microencapsulation of refined kenaf (*Hibiscus cannabinus* L.) seed oil by spray drying using β-cyclodextrin/gum arabic/sodium caseinate. *Journal of Food Engineering*, *237*, 78–85. https://doi.org/10.1016/j.jfoodeng.2018.05.016

Chiang, E. (2013). Measuring tablet hardness: A primer. *Pharmaceutical Technology*, *37*(1), 1–3.

Chirinos, R., Aquino, M., Pedreschi, R., & Campos, D. (2017). Optimized methodology for alkaline and enzyme-assisted extraction of protein from sacha inchi (*Plukenetia volubilis*) kernel cake. *Journal of Food Process Engineering*, *40*(2), e12412. https://doi.org/10.1111/jfpe.12412

Chirinos, R., Necochea, O., Pedreschi, R., & Campos, D. (2016). Sacha inchi (*Plukenetia volubilis* L.) shell: An alternative source of phenolic compounds and antioxidants. *International Journal of Food Science & Technology*, *51*(4), 986–993. https://doi.org/10.1111/ijfs.13049

Chirinos, R., Zuloeta, G., Pedreschi, R., Mignolet, E., Larondelle, Y., & Campos, D. (2013). Sacha inchi (*Plukenetia volubilis*): A seed source of polyunsaturated fatty acids, tocopherols, phytosterols, phenolic compounds and antioxidant capacity. *Food Chemistry*, *141*(3), 1732–1739. https://doi.org/10.1016/j.foodchem.2013.04.078

Chowhan, Z. (2008). Moisture, hardness, disintegration and dissolution interrelationships in compressed tablets prepared by the wet granulation process. *Drug Development and Industrial Pharmacy*, *5*, 41–62. https://doi.org/10.3109/03639047909055661

Christopher, J., Tan, C. P., Wasoh, H., & Lai, O. M. (2023). Comparative study of thermal pre-treatment on the extraction, antioxidant, fatty acid profile, and physicochemical properties of inca inchi seed oil. *Pertanika Journal of Tropical Agricultural Science*, *46*(3), 909–930. https://doi.org/10.47836/pjtas.46.3.11

Chung, H.-J., Cho, A., & Lim, S.-T. (2014). Utilization of germinated and heat-moisture treated brown rices in sugar-snap cookies. *LWT - Food Science and Technology*, *57*(1), 260–266. https://doi.org/10.1016/j.lwt.2014.01.018

Comunian, T. A., da Silva Anthero, A. G., Bezerra, E. O., Moraes, I. C. F., & Hubinger, M. D. (2020). Encapsulation of pomegranate seed oil by emulsification followed by spray drying: Evaluation of different biopolymers and their effect on particle properties. *Food and Bioprocess Technology*, *13*(1), 53–66. https://doi.org/10.1007/s11947-019-02380-1

Cornelio-Santiago, H. P., Bodini, R. B., Mazalli, M. R., Gonçalves, C. B., Rodrigues, C. E. C., & Lopes de Oliveira, A. (2022). Oil extraction from pequi (*Caryocar brasiliensis* Camb.) and sacha inchi (*Plukenetia huayllabambana* sp. Nov.) almonds by pressurized liquid with intermittent purge: The effects of variables on oil yield and composition. *The Journal of Supercritical Fluids*, *182*, 105527. https://doi.org/10.1016/j.supflu.2022.105527

David, O., Arthur, E., Kwadwo, S. O., Badu, E., & Sakyi, P. (2015). Proximate composition and some functional properties of soft wheat flour. *International Journal of Innovative Research in Science, Engineering and Technology*, *4*(2), 753–758. https://doi.org/10.15680/IJIRSET.2015.0402097

Deen, A., Visvanathan, R., Wickramarachi, D., Marikkar, N., Nammi, S., Jayawardana, B. C., & Liyanage, R. (2021). Chemical composition and health benefits of coconut oil: An overview. *Journal of the Science of Food and Agriculture*, *101*(6), 2182–2193. https://doi.org/10.1002/jsfa.10870

del-Castillo, Á. M. R., Gonzalez-Aspajo, G., de Fátima Sánchez-Márquez, M., & Kodahl, N. (2019). Ethnobotanical knowledge in the Peruvian Amazon of the neglected and underutilized crop sacha inchi (*Plukenetia volubilis* L.). *Economic Botany*, *73*(2), 281–287. https://doi.org/10.1007/s12231-019-09459-y

Dhyani, A., Chopra, R., & Garg, M. (2018). A review on blending of oils and their functional and nutritional benefits. *Chemical Science Review and Letters*, *7*(27), 840–847.

Díaz-Suárez, P., Rosales-Quintero, A., Fernandez-Lafuente, R., Pola-Sánchez, E., Hernández-Cruz, M. C., Ovando-Chacón, S. L., Rodrigues, R. C., & Tacias-Pascacio, V. G. (2021). Aqueous enzymatic extraction of *Ricinus communis* seeds oil using Viscozyme L. *Industrial Crops and Products*, *170*, 113811. https://doi.org/10.1016/j.indcrop.2021.113811

Djeridane, A., Yousfi, M., Nadjemi, B., Boutassouna, D., Stocker, P., & Vidal, N. (2006). Antioxidant activity of some algerian medicinal plants extracts containing phenolic compounds. *Food Chemistry*, *97*(4), 654–660. https://doi.org/10.1016/j.foodchem.2005.04.028

Djuricic, I., & Calder, P. C. (2021). Beneficial outcomes of omega-6 and omega-3 polyunsaturated fatty acids on human health: An update for 2021. *Nutrients*, *13*(7), 2421. https://doi.org/10.3390/nu13072421

European Pharmacopoeia. (2010). *Characters Section in Monographs.* (6; Version 6.8). European Directorate for the Quality of Medicines & Healthcare (EQDM).

Fanali, C., Dugo, L., Cacciola, F., Beccaria, M., Grasso, S., Dachà, M., Dugo, P., & Mondello, L. (2011). Chemical characterization of sacha inchi (*Plukenetia volubilis* L.) Oil. *Journal of Agricultural and Food Chemistry*, *59*(24), 13043–13049. https://doi.org/10.1021/jf203184y

Fantino, V. M., Bodoira, R. M., Penci, M. C., Ribotta, P. D., & Martínez, M. L. (2020). Effect of screw-press extraction process parameters on the recovery and quality of pistachio oil. *Grasas y Aceites*, *71*(2), e360. https://doi.org/10.3989/gya.0107191

Fathi-Achachlouei, B., Azadmard-Damirchi, S., Zahedi, Y., & Shaddel, R. (2019). Microwave pretreatment as a promising strategy for increment of nutraceutical content and extraction yield of oil from milk thistle seed. *Industrial Crops and Products*, *128*, 527–533. https://doi.org/10.1016/j.indcrop.2018.11.034

Fernandes, R. V. de B., Borges, S. V., & Botrel, D. A. (2013). Influence of spray drying operating conditions on microencapsulated rosemary essential oil properties. *Food Science and Technology*, *33*, 171–178. https://doi.org/10.1590/S0101-20612013000500025

Ferrari, C., Angiuli, M., Tombari, E., Righetti, M. C., Matteoli, E., & Salvetti, G. (2007). Promoting calorimetry for olive oil authentication. *Thermochimica Acta*, *459*(1), 58–63. https://doi.org/10.1016/j.tca.2007.04.002

Ferreira, C. D., da Conceição, E. J. L., Machado, B. A. S., Hermes, V. S., de Oliveira Rios, A., Druzian, J. I., & Nunes, I. L. (2016). Physicochemical characterization and oxidative stability of microencapsulated crude palm oil by spray drying. *Food and Bioprocess Technology*, *9*(1), 124–136. https://doi.org/10.1007/s11947-015-1603-z

Ferreira, D. M., Nunes, M. A., Santo, L. E., Machado, S., Costa, A. S. G., Álvarez-Ortí, M., Pardo, J. E., Oliveira, M. B. P. P., & Alves, R. C. (2023). Characterization of chia seeds, cold-pressed oil, and defatted cake: An ancient grain for modern food production. *Molecules*, *28*(2), 723. https://doi.org/10.3390/molecules28020723

Firestone, D. (2009). *Official methods and recommended practices of the AOCS* (6th ed.). AOCS.

Fitzpatrick-Wong, S. C., Tappia, P. S., & Dhalla, N. S. (2024). Vitamin E for the Prevention and Treatment of Cardiovascular Disease. In P. S. Tappia, A. K. Shah, & N. S. Dhalla (Eds.), *Lipophilic Vitamins in Health and Disease* (pp. 221–232). Springer International Publishing. https://doi.org/10.1007/978-3-031-55489-6_11

Fong, Y. K., Muhamad, N., Salleh, L. M., & Zaidel, D. N. A. (2023). Microwave drying of sacha inchi (*Plukenetia volubilis* L.) seed for improving oil yield extract. *Journal of Bioprocessing and Biomass Technology*, *2*(2), 7-11. https://doi.org/10.11113/bioprocessing.v2n2.29

Franc, A., Kurhajec, S., Pavloková, S., Sabadková, D., & Muselík, J. (2017). Influence of concentration and type of microcrystalline cellulose on the physical properties of tablets containing cornelian cherry fruits. *Acta Pharmaceutica*, *67*(2), 187–202. https://doi.org/10.1515/acph-2017-0019

Gabbott, I. P., Al Husban, F., & Reynolds, G. K. (2016). The combined effect of wet granulation process parameters and dried granule moisture content on tablet quality attributes. *European Journal of Pharmaceutics and Biopharmaceutics*, *106*, 70–78. https://doi.org/10.1016/j.ejpb.2016.03.022

Gai, Q.-Y., Jiao, J., Mu, P.-S., Wang, W., Luo, M., Li, C.-Y., Zu, Y.-G., Wei, F.-Y., & Fu, Y.-J. (2013). Microwave-assisted aqueous enzymatic extraction of oil from *Isatis indigotica* seeds and its evaluation of physicochemical properties, fatty acid compositions and antioxidant activities. *Industrial Crops and Products*, *45*, 303–311. https://doi.org/10.1016/j.indcrop.2012.12.050

Gajendran, B., Durai, P., Madhu Varier, K., & Chinnasamy, A. (2020). A novel phytosterol isolated from Datura inoxia, RinoxiaB is a potential cure colon cancer agent by targeting BAX/Bcl2 pathway. *Bioorganic & Medicinal Chemistry*, *28*(2), 115242. https://doi.org/10.1016/j.bmc.2019.115242

Gallardo, G., Guida, L., Martinez, V., López, M. C., Bernhardt, D., Blasco, R., Pedroza-Islas, R., & Hermida, L. G. (2013). Microencapsulation of linseed oil by spray drying for functional food application. *Food Research International*, *52*(2), 473–482. https://doi.org/10.1016/j.foodres.2013.01.020

Gao, P., Ding, Y., Chen, Z., Zhou, Z., Zhong, W., Hu, C., He, D., & Wang, X. (2022). Characteristics and antioxidant activity of walnut oil using various pretreatment and processing technologies. *Foods*, *11*(12), 1698. https://doi.org/10.3390/foods11121698

Gao, P., Liu, R., Jin, Q., & Wang, X. (2019). Comparison of solvents for extraction of walnut oils: Lipid yield, lipid compositions, minor-component content, and antioxidant capacity. *LWT*, *110*, 346–352. https://doi.org/10.1016/j.lwt.2019.04.100

GBIF Secretariat. (2023). *Plukenetia volubilis L.* GBIF Backbone Taxonomy. https://doi.org/10.15468/39omei

Ghoshal, G., & Kaushik, P. (2020). Development of soymeal fortified cookies to combat malnutrition. *Legume Science*, *2*(3), e43. https://doi.org/10.1002/leg3.43

Gong, H.-D., Geng, Y.-J., Yang, C., Jiao, D.-Y., Chen, L., & Cai, Z.-Q. (2018). Yield and resource use efficiency of *Plukenetia volubilis* plants at two distinct growth stages as affected by irrigation and fertilization. *Scientific Reports*, *8*(80). https://doi.org/10.1038/s41598-017-18342-6

Gonzalez-Aspajo, G., Belkhelfa, H., Haddioui-Hbabi, L., Bourdy, G., & Deharo, E. (2015). Sacha inchi oil (*Plukenetia volubilis* L.), effect on adherence of *Staphylococus aureus* to human skin explant and keratinocytes in vitro. *Journal of Ethnopharmacology*, *171*, 330–334. https://doi.org/10.1016/j.jep.2015.06.009

Górniak, I., Bartoszewski, R., & Króliczewski, J. (2019). Comprehensive review of antimicrobial activities of plant flavonoids. *Phytochemistry Reviews*, *18*(1), 241–272. https://doi.org/10.1007/s11101-018-9591-z

Goyal, A., Sharma, V., Sihag, M. K., Tomar, S. K., Arora, S., Sabikhi, L., & Singh, A. K. (2015). Development and physico-chemical characterization of microencapsulated flaxseed oil powder: A functional ingredient for omega-3 fortification. *Powder Technology*, *286*, 527–537. https://doi.org/10.1016/j.powtec.2015.08.050

Goyal, A., Tanwar, B., Kumar Sihag, M., & Sharma, V. (2022). Sacha inchi (*Plukenetia volubilis* L.): An emerging source of nutrients, omega-3 fatty acid and phytochemicals. *Food Chemistry*, *373*, 131459. https://doi.org/10.1016/j.foodchem.2021.131459

Gu, L.-B., Zhang, G.-J., Du, L., Du, J., Qi, K., Zhu, X.-L., Zhang, X.-Y., & Jiang, Z.-H. (2019). Comparative study on the extraction of *Xanthoceras sorbifolia* Bunge (yellow horn) seed oil using subcritical n-butane, supercritical CO_2, and the soxhlet method. *LWT*, *111*, 548–554. https://doi.org/10.1016/j.lwt.2019.05.078

Gulcin, Ii., & Alwasel, S. H. (2023). DPPH radical scavenging activity. *Processes*, *11*(8), 2248. https://doi.org/10.3390/pr11082248

Gutiérrez, L. F., Rosada, L. M., & Jiménez, Á. (2011). Chemical composition of Sacha inchi (*Plukenetia volubilis* L.) seeds and characteristics of their lipid fraction. *Grasas y Aceites*, *62*(1), 76-83. https://doi.org/10.3989/gya044510

Gutiérrez, L.-F., Quiñones-Segura, Y., Sanchez-Reinoso, Z., Díaz, D. L., & Abril, J. I. (2017). Physicochemical properties of oils extracted from γ-irradiated sacha inchi (*Plukenetia volubilis* L.) seeds. *Food Chemistry*, *237*, 581–587. https://doi.org/10.1016/j.foodchem.2017.05.148

Gutiérrez, L.-F., Sanchez-Reinoso, Z., & Quiñones-Segura, Y. (2019). Effects of dehulling sacha inchi (*Plukenetia volubilis* L.) seeds on the physicochemical and sensory properties of oils extracted by means of cold pressing. *Journal of the American Oil Chemists' Society*, *96*(11), 1187–1195. https://doi.org/10.1002/aocs.12270

Gutiérrez-Luna, K., Ansorena, D., & Astiasarán, I. (2022). Fatty acid profile, sterols, and squalene content comparison between two conventional (olive oil and linseed oil) and three non-conventional vegetable oils (echium oil, hempseed oil, and moringa oil). *Journal of Food Science*, *87*(4), 1489–1499. https://doi.org/10.1111/1750-3841.16111

Haile, M., Duguma, H. T., Chameno, G., & Kuyu, C. G. (2019). Effects of location and extraction solvent on physico chemical properties of *Moringa stenopetala* seed oil. *Heliyon*, *5*(11), e02781. https://doi.org/10.1016/j.heliyon.2019.e02781

Hee, Y. Y., Tan, C. P., Rahman, R. A., Adzahan, N. M., Lai, W. T., & Chong, G. H. (2015). Influence of different wall materials on the microencapsulation of virgin coconut oil by spray drying. *International Journal of Food Engineering*, *11*(1), 61–69. https://doi.org/10.1515/ijfe-2014-0215

Hidalgo, R., Rogel, C. J. V., & Bermeo, S. M. B. (2019). Characterization of sacha inchi seed oil (*Plukenetia volubilis*) from " Canton San Vicente, Manabí, Ecuador", obtained by non-thermal extrusion processes. *LA GRANJA. Revista de Ciencias de La Vida*, *30*(2), 77–87. https://doi.org/10.17163/lgr.n30.2019.07

Hilden, J., Polizzi, M., & Zettler, A. (2017). Note on the use of diametrical compression to determine tablet tensile strength. *Journal of Pharmaceutical Sciences*, *106*(1), 418–421. https://doi.org/10.1016/j.xphs.2016.08.004

Horwitz, W., & Latimer, G. W. (2005). *Official methods of analysis of AOAC International* (18th ed). AOAC International.

Hu, X., Wang, J., Zhang, W., Zhang, F., Tian, S., Zhou, Z., & Ren, Z. (2023). Aqueous enzymatic extraction and quality evaluation of *Acer truncatum* Bunge seed oil. *The Canadian Journal of Chemical Engineering*, *101*(4), 2230–2239. https://doi.org/10.1002/cjce.24623

Ibáñez, M. A., de Blas, C., Cámara, L., & Mateos, G. G. (2020). Chemical composition, protein quality and nutritive value of commercial soybean meals produced from beans from different countries: A meta-analytical study. *Animal Feed Science and Technology*, *267*, 114531. https://doi.org/10.1016/j.anifeedsci.2020.114531

Islam, F., Imran, A., Nosheen, F., Fatima, M., Arshad, M. U., Afzaal, M., Ijaz, N., Noreen, R., Mehta, S., Biswas, S., Rasool, I. F. U., Aslam, M. A., Usman, I., Zahra, S. M., Segueni, N., & Amer Ali, Y. (2023). Functional roles and novel tools for improving-oxidative stability of polyunsaturated fatty acids: A comprehensive review. *Food Science & Nutrition*, *11*(6), 2471–2482. https://doi.org/10.1002/fsn3.3272

Iyenagbe, D. O., Malomo, S. A., Idowu, A. O., Badejo, A. A., & Fagbemi, T. N. (2017). Effects of thermal processing on the nutritional and functional properties of defatted conophor nut (*Tetracarpidium conophorum*) flour and protein isolates. *Food Science & Nutrition*, *5*(6), 1170–1178. https://doi.org/10.1002/fsn3.508

Jang, H., & Park, K. (2020). Omega-3 and omega-6 polyunsaturated fatty acids and metabolic syndrome: A systematic review and meta-analysis. *Clinical Nutrition*, *39*(3), 765–773. https://doi.org/10.1016/j.clnu.2019.03.032

Javed, A., Imran, M., Ahmad, N., & Hussain, A. I. (2018). Fatty acids characterization and oxidative stability of spray dried designer egg powder. *Lipids in Health and Disease*, *17*(1), 282. https://doi.org/10.1186/s12944-018-0931-1

Jeddou, K. B., Bouaziz, F., Zouari-Ellouzi, S., Chaari, F., Ellouz-Chaabouni, S., Ellouz-Ghorbel, R., & Nouri-Ellouz, O. (2017). Improvement of texture and sensory properties of cakes by addition of potato peel powder with high level of dietary fiber and protein. *Food Chemistry*, *217*, 668–677. https://doi.org/10.1016/j.foodchem.2016.08.081

Ji, J., Liu, Y., Shi, L., Wang, N., & Wang, X. (2019). Effect of roasting treatment on the chemical composition of sesame oil. *LWT*, *101*, 191–200. https://doi.org/10.1016/j.lwt.2018.11.008

Jiang, Q., Christen, S., Shigenaga, M. K., & Ames, B. N. (2001). γ-Tocopherol, the major form of vitamin E in the US diet, deserves more attention. *The American Journal of Clinical Nutrition*, *74*(6), 714–722. https://doi.org/10.1093/ajcn/74.6.714

Jiapong, S., & Ruttarattanamongkolkol, K. (2021). Development of direct expanded high protein snack products fortified with sacha inchi seed meal. *Journal of Microbiology, Biotechnology and Food Sciences*, *10*(4), 680–684. https://doi.org/10.15414/jmbfs.2021.10.4.680-684

Jirarattanarangsri, W., & Muangrat, R. (2022). Comparison of supercritical CO2 and screw press extraction methods for producing oil from *Camellia sinensis* var. *assamica* seeds: Physicochemical properties and antioxidant activity. *Journal of Applied Research on Medicinal and Aromatic Plants*, *31*, 100413. https://doi.org/10.1016/j.jarmap.2022.100413

Jitpinit, S., Siraworakun, C., Sookklay, Y., & Nuithitikul, K. (2022). Enhancement of omega-3 content in sacha inchi seed oil extracted with supercritical carbon dioxide in semi-continuous process. *Heliyon*, *8*(1), e08780. https://doi.org/10.1016/j.heliyon.2022.e08780

Jones-Salkey, O., Chu, Z., Ingram, A., & Windows-Yule, C. R. K. (2023). Reviewing the impact of powder cohesion on continuous direct compression (CDC) performance. *Pharmaceutics*, *15*(6), 1587. https://doi.org/10.3390/pharmaceutics15061587

Kandi, M., Sivasai, G., Rathnanand, M., & Reddy, S. M. (2013). Formulation and evaluation of chewable tablet of metformin HCl using Stevia by different technique. *International Journal of Pharm Tech Research*, *5*(3), 1364–1372.

Kang, J.-B., Park, D.-J., Shah, M.-A., Kim, M.-O., & Koh, P.-O. (2019). Lipopolysaccharide induces neuroglia activation and NF-κB activation in cerebral cortex of adult mice. *Laboratory Animal Research*, *35*(1), 19. https://doi.org/10.1186/s42826-019-0018-9

Kapoor, B., Kapoor, D., Gautam, S., Singh, R., & Bhardwaj, S. (2021). Dietary polyunsaturated fatty acids (PUFAs): Uses and potential health benefits. *Current Nutrition Reports*, *10*(3), 232–242. https://doi.org/10.1007/s13668-021-00363-3

Karthik, P., & Anandharamakrishnan, C. (2016). Enhancing omega-3 fatty acids nanoemulsion stability and in-vitro digestibility through emulsifiers. *Journal of Food Engineering*, *187*, 92–105. https://doi.org/10.1016/j.jfoodeng.2016.05.003

Kaseke, T., Opara, U. L., & Fawole, O. A. (2021). Novel seeds pretreatment techniques: Effect on oil quality and antioxidant properties: a review. *Journal of Food Science and Technology*, *58*(12), 4451–4464. https://doi.org/10.1007/s13197-021-04981-1

Kaur, P., Sharma, P., Kumar, V., Panghal, A., Kaur, J., & Gat, Y. (2019). Effect of addition of flaxseed flour on phytochemical, physicochemical, nutritional, and textural properties of cookies. *Journal of the Saudi Society of Agricultural Sciences*, *18*(4), 372–377. https://doi.org/10.1016/j.jssas.2017.12.004

Kha, T. C., Nguyen, M. H., Roach, P. D., & Stathopoulos, C. E. (2014). Microencapsulation of gac oil by spray drying: Optimization of wall material concentration and oil load using response surface methodology. *Drying Technology*, *32*(4), 385–397. https://doi.org/10.1080/07373937.2013.829854

Khieokhajonkhet, A., Aeksiri, N., Rojtinnakorn, J., Van Doan, H., & Kaneko, G. (2022). Sacha inchi meal as a fish-meal replacer in red hybrid tilapia (*Oreochromis niloticus* × *O. mossambicus*) feeds: Effects on dietary digestibility, growth metrics, hematology, and liver and intestinal histology. *Aquaculture International*, *30*(2), 677–698. https://doi.org/10.1007/s10499-022-00833-7

Khokra, S. L., Parashar, B., Dhamija, H. K., Purohit, R., & Chandel, A. (2012). Formulation development and evaluation of chewable tablet of albendazole by different techniques. *International Journal of Pharmacy and Pharmaceutical Sciences*, *4*(1), 461–464.

Kikuchi, H., Yuan, B., Hu, X., & Okazaki, M. (2019). Chemopreventive and anticancer activity of flavonoids and its possibility for clinical use by combining with conventional chemotherapeutic agents. *American Journal of Cancer Research*, *9*(8), 1517–1535.

Kim, D.-S., & Joo, N. (2019). Nutritional composition of sacha inchi (*Plukenetia Volubilis* L.) as affected by different cooking methods. *International Journal of Food Properties*, *22*(1), 1235–1241. https://doi.org/10.1080/10942912.2019.1640247

Kim, D.-S., & Joo, N. (2021). Feasibility of elder-friendly food applications of sacha inchi according to cooking method: Focusing on analysis of antioxidative activity and brain neuron cell viability. *Foods*, *10*(12), 2948. https://doi.org/10.3390/foods10122948

Kodahl, N. (2020). Sacha inchi (*Plukenetia volubilis* L.)—From lost crop of the Incas to part of the solution to global challenges? *Planta*, *251*(4), 80. https://doi.org/10.1007/s00425-020-03377-3

Kodahl, N., Frandsen, H. B., Lütken, H., Petersen, I. L., Paredes Andrade, N. J., García-Davila, C., & Sørensen, M. (2022). Lipid composition of the Amazonian 'Mountain Sacha Inchis' including *Plukenetia carolis*-vegae Bussmann, Paniagua & C.Téllez. *Scientific Reports*, *12*(6452). https://doi.org/10.1038/s41598-022-10404-8

Kodahl, N., & Sørensen, M. (2021). Sacha inchi (*Plukenetia volubilis* L.) is an underutilized crop with a great potential. *Agronomy*, *11*(6), 1066. https://doi.org/10.3390/agronomy11061066

Kong, S., Keang, T., Bunthan, M., Say, M., Nat, Y., Tan, C. P., & Tan, R. (2023). Hydraulic cold-pressed extraction of sacha inchi seeds: Oil yield and its physicochemical properties. *ChemEngineering*, *7*(4), 69. https://doi.org/10.3390/chemengineering7040069

Kori, A. H., Mahesar, S. A., Khaskheli, A. R., Sherazi, S. T. H., Laghari, Z. H., Panhwar, T., & Otho, A. A. (2022). Effect of wall material and inlet drying temperature on microencapsulation and oxidative stability of pomegranate seed oil using spray drying. *Journal of Oleo Science*, *71*(1), 31–41. https://doi.org/10.5650/jos.ess21105

Kotecka-Majchrzak, K., Sumara, A., Fornal, E., & Montowska, M. (2020). Oilseed proteins – properties and application as a food ingredient. *Trends in Food Science & Technology*, *106*, 160–170. https://doi.org/10.1016/j.tifs.2020.10.004

Kulczyński, B., Kobus-Cisowska, J., Taczanowski, M., Kmiecik, D., & Gramza-Michałowska, A. (2019). The chemical composition and nutritional value of chia seeds—Current State of Knowledge. *Nutrients*, *11*(6), 1242. https://doi.org/10.3390/nu11061242

Lavanya, M. N., Kathiravan, T., Moses, J. A., & Anandharamakrishnan, C. (2020). Influence of spray-drying conditions on microencapsulation of fish oil and chia oil. *Drying Technology*, *38*(3), 279–292. https://doi.org/10.1080/07373937.2018.1553181

Lee, Y.-Y., Tang, T.-K., Phuah, E.-T., Karim, N. A. A., Alwi, S. M. M., & Lai, O.-M. (2015). Palm-based medium-and-long-chain triacylglycerol (P-MLCT): Production via enzymatic interesterification and optimization using response surface methodology (RSM). *Journal of Food Science and Technology*, *52*(2), 685–696. https://doi.org/10.1007/s13197-013-1065-0

Lemus-Conejo, A., -Lazo, A. V., Martin, M. E., Millan, F., & Millan-Linares, M. C. (2024). Sacha inchi (*Plukenetia volubilis* L.) protein hydrolysate as a new ingredient of functional foods. *Foods*, *13*(13), 2045. https://doi.org/10.3390/foods13132045

Li, P., Huang, J., Xiao, N., Cai, X., Yang, Y., Deng, J., Zhang, L.-H., & Du, B. (2020). Sacha inchi oil alleviates gut microbiota dysbiosis and improves hepatic lipid dysmetabolism in high-fat diet-fed rats. *Food & Function*, *11*(7), 5827–5841. https://doi.org/10.1039/D0FO01178A

Liersch, A., Bocianowski, J., Nowosad, K., Mikołajczyk, K., Spasibionek, S., Wielebski, F., Matuszczak, M., Szała, L., Cegielska-Taras, T., Sosnowska, K., & Bartkowiak-Broda, I. (2020). Effect of genotype × environment interaction for seed traits in winter oilseed rape (*Brassica napus* L.). *Agriculture*, *10*(12), 607. https://doi.org/10.3390/agriculture10120607

Lin, S., Zhang, G., Liao, Y., Pan, J., & Gong, D. (2015). Dietary flavonoids as xanthine oxidase inhibitors: Structure–affinity and structure–activity relationships. *Journal of Agricultural and Food Chemistry*, *63*(35), 7784–7794. https://doi.org/10.1021/acs.jafc.5b03386

Liu, G., Wu, Z., Peng, Y., Shang, X., Xie, Y., & Arnold, R. J. (2020). Transcriptome analyses reveals the dynamic nature of oil accumulation during seed development of *Plukenetia volubilis* L. *Scientific Reports*, *10*(1), 20467. https://doi.org/10.1038/s41598-020-77177-w

Liu, L., Sun, Y., Laura, T., Liang, X., Ye, H., & Zeng, X. (2009). Determination of polyphenolic content and antioxidant activity of kudingcha made from *Ilex kudingcha* C.J. Tseng. *Food Chemistry*, *112*(1), 35–41. https://doi.org/10.1016/j.foodchem.2008.05.038

Liu, Q., Xu, Y. K., Zhang, P., Na, Z., Tang, T., & Shi, Y. X. (2014). Chemical composition and oxidative evolution of sacha inchi (*Plukentia volubilis* L.) oil from Xishuangbanna (China). *Grasas y Aceites*, *65*(1), e012. https://doi.org/10.3989/gya.075713

Liu, Z., Gui, M., Xu, T., Zhang, L., Kong, L., Qin, L., & Zou, Z. (2019). Efficient aqueous enzymatic-ultrasonication extraction of oil from *Sapindus mukorossi* seed kernels. *Industrial Crops and Products*, *134*, 124–133. https://doi.org/10.1016/j.indcrop.2019.03.065

Lopez-Garcia, G., Alegria, A., Barbera, R., & Cilla, A. (2018). Antiproliferative effect and mechanism of action of phytosterols derived from bioactive plant extracts. In *Nutraceuticals and Natural Product Derivatives: Disease Prevention & Drug Discovery*. John Wiley & Sons.

Łubek-Nguyen, A., Ziemichód, W., & Olech, M. (2022). Application of enzyme-assisted extraction for the recovery of natural bioactive compounds for nutraceutical and pharmaceutical applications. *Applied Sciences*, *12*(7), 3232. https://doi.org/10.3390/app12073232

Mancebo, C. M., Picón, J., & Gómez, M. (2015). Effect of flour properties on the quality characteristics of gluten free sugar-snap cookies. *LWT - Food Science and Technology*, *64*(1), 264–269. https://doi.org/10.1016/j.lwt.2015.05.057

Mancera-Rodriguez, L., Muñoz-Ramirez, A. P., Lopez-Vargas, J. H., & Simal-Gandara, J. (2022). Development, characterization and stability of a white cachama pâté-type product (*Piaractus brachypomus)*. *Food Chemistry*, *375*, 131660. https://doi.org/10.1016/j.foodchem.2021.131660

Marak, N. R., Malemnganbi, C. C., Marak, C. R., & Mishra, L. K. (2019). Functional and antioxidant properties of cookies incorporated with foxtail millet and ginger powder. *Journal of Food Science and Technology*, *56*(11), 5087–5096. https://doi.org/10.1007/s13197-019-03981-6

Mariamenatu, A. H., & Abdu, E. M. (2021). Overconsumption of omega-6 polyunsaturated fatty acids (PUFAs) versus deficiency of omega-3 pufas in modern-day diets: The disturbing factor for their “balanced antagonistic metabolic functions” in the human body. *Journal of Lipids*, *2021*(1), 8848161. https://doi.org/10.1155/2021/8848161

Mason, R. P. (2019). New insights into mechanisms of action for omega-3 fatty acids in atherothrombotic cardiovascular disease. *Current Atherosclerosis Reports*, *21*(1), 2. https://doi.org/10.1007/s11883-019-0762-1

Mazaheri, Y., Torbati, M., Azadmard-Damirchi, S., & Savage, G. P. (2019). Effect of roasting and microwave pre-treatments of *Nigella sativa* L. seeds on lipase activity and the quality of the oil. *Food Chemistry*, *274*, 480–486. https://doi.org/10.1016/j.foodchem.2018.09.001

Mba, O. I., Dumont, M.-J., & Ngadi, M. (2015). Palm oil: Processing, characterization and utilization in the food industry – A review. *Food Bioscience*, *10*, 26–41. https://doi.org/10.1016/j.fbio.2015.01.003

Medina-Mendoza, M., Rodriguez-Pérez, R. J., Rojas-Ocampo, E., Torrejón-Valqui, L., Fernández-Jeri, A. B., Idrogo-Vásquez, G., Cayo-Colca, I. S., & Castro-Alayo, E. M. (2021). Rheological, bioactive properties and sensory preferences of dark chocolates with partial incorporation of sacha inchi (*Plukenetia volubilis* L.) oil. *Heliyon*, *7*(2), e06154. https://doi.org/10.1016/j.heliyon.2021.e06154

Memon, H. D., Mahesar, S. A., Sirajuddin, Kara, H., Sherazi, S. T. H., & Talpur, M. Y. (2024). A review: Health benefits and physicochemical characteristics of blended vegetable oils. *Grain and Oil Science Technology*, *7*(2), 113–123. https://doi.org/10.1016/j.gaost.2024.05.001

Micanquer-Carlosama, A., Cortés-Rodríguez, M., & Serna-Cock, L. (2020). Formulation of a fermentation substrate from pineapple and sacha inchi wastes to grow *Weissella cibaria. Heliyon*, *6*(4), e03790https://doi.org/10.1016/j.heliyon.2020.e03790

Mohammed, N. K., Meor Hussin, A. S., Tan, C. P., Abdul Manap, M. Y., & Alhelli, A. M. (2017). Quality changes of microencapsulated *Nigella sativa* oil upon accelerated storage. *International Journal of Food Properties*, *20*(sup3), S2395–S2408. https://doi.org/10.1080/10942912.2017.1371189

Mohammed, N. K., Tan, C. P., Manap, Y. A., Muhialdin, B. J., & Hussin, A. S. M. (2020). Spray drying for the encapsulation of oils—A review. *Molecules*, *25*(17), 3873. https://doi.org/10.3390/molecules25173873

Morales, N. B., & Garcia, P. G. (2023). Chemical composition, fatty acid profile, and Optimization of the sacha inchi (*Plukenetia volubilis* L.) seed-roasting process using response surface methodology: Assessment of oxidative stability and antioxidant activity. *Foods*, *12*(18), 3405. https://doi.org/10.3390/foods12183405

Mosquera, J. A. N., Viteri, O. F. M., Arcia, J. A. U., & Llaguno, S. N. S. (2022). Study of vegetable oils of sacha inchi (*Plukenetia huayllabambana)*, *Sesamum indicum* and peanuts (*Arachis hypogaea*) and their influence on making vegetable sausages type “frankfurt” considering bromatological and organoleptic characteristics. *Journal of Pharmaceutical Negative Results*, *13*(3), 623–627. https://doi.org/10.47750/pnr.2022.13.03.091

Muangrat, R., Veeraphong, P., & Chantee, N. (2018). Screw press extraction of sacha inchi seeds: Oil yield and its chemical composition and antioxidant properties. *Journal of Food Processing and Preservation*, *42*(6), e13635. https://doi.org/10.1111/jfpp.13635

Munshi, M., Arya, P., & Kumar, P. (2020). Physico-chemical analysis and fatty acid profiling of fenugreek (*Trigonella foenum-graecum*) seed oil using different solvents. *Journal of Oleo Science*, *69*(11), 1349–1358. https://doi.org/10.5650/jos.ess20137

Munteanu, I. G., & Apetrei, C. (2021). Analytical methods used in determining antioxidant activity: A review. *International Journal of Molecular Sciences*, *22*(7), 3380. https://doi.org/10.3390/ijms22073380.

Mwaurah, P. W., Kumar, S., Kumar, N., Attkan, A. K., Panghal, A., Singh, V. K., & Garg, M. K. (2020). Novel oil extraction technologies: Process conditions, quality parameters, and optimization. *Comprehensive Reviews in Food Science and Food Safety*, *19*(1), 3–20. https://doi.org/10.1111/1541-4337.12507

Nainggolan, M., & Sinaga, A. G. S. (2021). Characteristics of fatty acid composition and minor constituents of red palm olein and palm kernel oil combination. *Journal of Advanced Pharmaceutical Technology & Research*, *12*(1), 22–26. https://doi.org/10.4103/japtr.JAPTR_91_20

Nayana, N., Mary Abraham, L., Padma Ishwarya, S., & Nisha, P. (2021). Spray-dried microcapsules of red palm olein-flaxseed oil blend: Development, physicochemical characterization, and evaluation of its potential applications as a fat replacer and β-carotene fortificant in cupcakes. *Journal of Food Processing and Preservation*, *45*(9), e15663. https://doi.org/10.1111/jfpp.15663

Nguyen, H. C., Vuong, D. P., Nguyen, N. T. T., Nguyen, N. P., Su, C.-H., Wang, F.-M., & Juan, H.-Y. (2020). Aqueous enzymatic extraction of polyunsaturated fatty acid–rich sacha inchi (*Plukenetia volubilis* L.) seed oil: An eco-friendly approach. *LWT*, *133*, 109992. https://doi.org/10.1016/j.lwt.2020.109992

Nguyen, P. T. N., Nguyen, H. T. A., Hoang, Q. B., Nguyen, T. D. P., Nguyen, T. V., & Mai, H. C. (2022). Influence of spray drying parameters on the physicochemical characteristics of microencapsulated orange (*Citrus sinensis* L.) essential oil. *Materials Today: Proceedings*, *60*, 2026–2033. https://doi.org/10.1016/j.matpr.2022.01.269

Nikitha, M., & Natarajan, V. (2020). Properties of south-indian rice cultivars: Physicochemical, functional, thermal and cooking characterisation. *Journal of Food Science and Technology*, *57*(11), 4065–4075. https://doi.org/10.1007/s13197-020-04440-3

Nordgreen, J., Munsterhjelm, C., Aae, F., Popova, A., Boysen, P., Ranheim, B., Heinonen, M., Raszplewicz, J., Piepponen, P., Lervik, A., Valros, A., & Janczak, A. M. (2018). The effect of lipopolysaccharide (LPS) on inflammatory markers in blood and brain and on behavior in individually-housed pigs. *Physiology & Behavior*, *195*, 98–111. https://doi.org/10.1016/j.physbeh.2018.07.013

Norhazlindah, M. F., Jahurul, M. H. A., Norliza, M., Shihabul, A., Islam, S., Nyam, K. L., & Zaidul, I. S. M. (2023). Techniques for extraction, characterization, and application of oil from sacha inchi (*Plukenetia volubilis* L.) seed: A review. *Journal of Food Measurement and Characterization*, *17*(1), 904–915. https://doi.org/10.1007/s11694-022-01663-0

Nounah, I., Gharby, S., Hajib, A., Harhar, H., Matthäus, B., & Charrouf, Z. (2021). Effect of seeds roasting time on physicochemical properties, oxidative stability, and antioxidant activity of cactus *(Opuntia ficus-indica* L.) seed oil. *Journal of Food Processing and Preservation*, *45*(9), e15747. https://doi.org/10.1111/jfpp.15747

Nyamweya, N. N., & Kimani, S. N. (2020). Chewable tablets: A review of formulation considerations. *Pharmaceutical Technology*, *44*(11), 38–44.

O’Fallon, J. V., Busboom, J. R., Nelson, M. L., & Gaskins, C. T. (2007). A direct method for fatty acid methyl ester synthesis: Application to wet meat tissues, oils, and feedstuffs. *Journal of Animal Science*, *85*(6), 1511–1521. https://doi.org/10.2527/jas.2006-491

Okuno, Y., Marumoto, S., & Miyazawa, M. (2019). Antimutagenic activity of flavonoids from Sozuku. *Natural Product Research*, *33*(6), 862–865. https://doi.org/10.1080/14786419.2017.1408104

Oliver, L., Dietrich, T., Marañón, I., Villarán, M. C., & Barrio, R. J. (2020). Producing omega-3 polyunsaturated fatty acids: a review of sustainable sources and future trends for the EPA and DHA market. *Resources*, *9*(12), 148. https://doi.org/10.3390/resources9120148

Ordonez, G. M., Pereyra, G. S., Gallardo, Z. L., & Cortez, B. L. (2019). Effect of dietary sacha inchi pressed cake as a protein source on guinea pig carcass yield and meat quality. *Pakistan Journal of Nutrition*, *18*(11), 1021–1027. https://doi.org/10.3923/pjn.2019.1021.1027

Panche, A. N., Diwan, A. D., & Chandra, S. R. (2016). Flavonoids: An overview. *Journal of Nutritional Science*, *5*, e47. https://doi.org/10.1017/jns.2016.41

Pareyt, B., Talhaoui, F., Kerckhofs, G., Brijs, K., Goesaert, H., Wevers, M., & Delcour, J. A. (2009). The role of sugar and fat in sugar-snap cookies: Structural and textural properties. *Journal of Food Engineering*, *90*(3), 400–408. https://doi.org/10.1016/j.jfoodeng.2008.07.010

Park, J., Choi, I., & Kim, Y. (2015). Cookies formulated from fresh okara using starch, soy flour and hydroxypropyl methylcellulose have high quality and nutritional value. *LWT - Food Science and Technology*, *63*(1), 660–666. https://doi.org/10.1016/j.lwt.2015.03.110

Patel, B. P., Patel, J. K., Rajput, G. C., & Thakor, R. S. (2010). Formulation and evaluation of mouth dissolving tablets of cinnarizine. *Indian Journal of Pharmaceutical Sciences*, *72*(4), 522–525. https://doi.org/10.4103/0250-474X.73930

Pawde, S., Talib, M. I., & Parate, V. R. (2020). Development of fiber-rich biscuit by incorporating dragon fruit powder. *International Journal of Fruit Science*, *20*(S3), S1620–S1628. https://doi.org/10.1080/15538362.2020.1822267

Pérez, M., Dominguez-López, I., & Lamuela-Raventós, R. M. (2023). The chemistry behind the folin–ciocalteu method for the estimation of (poly)phenol content in food: Total phenolic intake in a mediterranean dietary pattern. *Journal of Agricultural and Food Chemistry*, *71*(46), 17543–17553. https://doi.org/10.1021/acs.jafc.3c04022

Pino, J. A., Sosa-Moguel, O., Sauri-Duch, E., & Cuevas-Glory, L. (2019). Microencapsulation of winter squash (*Cucurbita moschata* Duchesne) seed oil by spray drying. *Journal of Food Processing and Preservation*, *43*(10), e14136. https://doi.org/10.1111/jfpp.14136

Pitt, K. G., & Heasley, M. G. (2013). Determination of the tensile strength of elongated tablets. *Powder Technology*, *238*, 169–175. https://doi.org/10.1016/j.powtec.2011.12.060

Pojić, M., Mišan, A., & Tiwari, B. (2018). Eco-innovative technologies for extraction of proteins for human consumption from renewable protein sources of plant origin. *Trends in Food Science & Technology*, *75*, 93–104. https://doi.org/10.1016/j.tifs.2018.03.010

Poli, A., Marangoni, F., Corsini, A., Manzato, E., Marrocco, W., Martini, D., Medea, G., & Visioli, F. (2021). Phytosterols, cholesterol control, and cardiovascular disease. *Nutrients*, *13*(8), 2810. https://doi.org/10.3390/nu13082810

Porter, S., Sackett, G., & Liu, L. (2017). Chapter 34 - Development, optimization, and scale-up of process parameters: Pan coating. In Y. Qiu, Y. Chen, G. G. Z. Zhang, L. Yu, & R. V. Mantri (Eds.), *Developing Solid Oral Dosage Forms (Second Edition)* (pp. 953–996). Academic Press. https://doi.org/10.1016/B978-0-12-802447-8.00034-0

Prasert, W., Pantoa, T., Chitisankul, W. T., & Pengpinij, W. (2022). Effects of sacha inchi (*Plukenetia volubilis* L.) oil and extrusion process conditions on physicochemical properties of fortified omega-3 fibrous high moisture meat analogs. *Journal of Food Processing and Preservation*, *46*(12), e17227. https://doi.org/10.1111/jfpp.17227

Prommaban, A., Kuanchoom, R., Seepuan, N., & Chaiyana, W. (2021). Evaluation of fatty acid compositions, antioxidant, and pharmacological activities of pumpkin (*Cucurbita moschata*) seed oil from aqueous enzymatic extraction. *Plants*, *10*(8), 1582. https://doi.org/10.3390/plants10081582

Quispe-Chambilla, L., Pumacahua-Ramos, A., Choque-Quispe, D., Curro-Pérez, F., Carrión-Sánchez, H. M., Peralta-Guevara, D. E., Masco-Arriola, M. L., Palomino-Rincón, H., & Ligarda-Samanez, C. A. (2022). Rheological and functional properties of dark chocolate with partial substitution of peanuts and sacha inchi. *Foods*, *11*(8), 1142. https://doi.org/10.3390/foods11081142

Raihan, M., & Saini, C. S. (2017). Evaluation of various properties of composite flour from oats, sorghum, amaranth and wheat flour and production of cookies thereof. *International Food Research Journal*, *24*(6), 2278–2284.

Rajani, C., Kumar, D. D., Jaya, D., & Kumar, J. A. (2018). Effects of granule particle size and lubricant concentration on tablet hardness containing large concentration of polymers. *Brazilian Journal of Pharmaceutical Sciences*, *53*. https://doi.org/10.1590/s2175-97902017000300149

Rajavel, T., Mohankumar, R., Archunan, G., Ruckmani, K., & Devi, K. P. (2017). Beta sitosterol and daucosterol (phytosterols identified in *Grewia tiliaefolia*) perturbs cell cycle and induces apoptotic cell death in a549 cells. *Scientific Reports*, *7*, 3418. https://doi.org/10.1038/s41598-017-03511-4

Ramos-Escudero, F., Morales, M. T., Ramos Escudero, M., Muñoz, A. M., Cancino Chavez, K., & Asuero, A. G. (2021). Assessment of phenolic and volatile compounds of commercial sacha inchi oils and sensory evaluation. *Food Research International*, *140*, 110022. https://doi.org/10.1016/j.foodres.2020.110022

Rao, S., Kumar, K. A., & Indrani, D. (2022). Low carbohydrate high fat flour: Its rheology, bread making, physico-sensory and staling characteristics. *Journal of Food Science and Technology*, *59*(6), 2220–2230. https://doi.org/10.1007/s13197-021-05235-w

Rawdkuen, S., D'Amico, S., & Schoenlechner, R. (2022). Physicochemical, functional, and in vitro digestibility of protein isolates from thai and peru sacha inchi (*Plukenetia volubilis* L.) oil press-cakes. *Foods*, *11*(13), 1869. https://doi.org/10.3390/foods11131869

Rawdkuen, S., Rodzi, N., & Pinijsuwan, S. (2018). Characterization of sacha inchi protein hydrolysates produced by crude papain and calotropis proteases. *LWT*, *98*, 18–24. https://doi.org/10.1016/j.lwt.2018.08.008

Rękas, A., Ścibisz, I., Siger, A., & Wroniak, M. (2017). The effect of microwave pretreatment of seeds on the stability and degradation kinetics of phenolic compounds in rapeseed oil during long-term storage. *Food Chemistry*, *222*, 43–52. https://doi.org/10.1016/j.foodchem.2016.12.003

Rengifo, E., Rios-Mera, J. D., Huamaní, P., Vela-Paredes, R., Vásquez, J., Saldaña, E., Siche, R., & Tello, F. (2024). Fish burgers fortified with microencapsulated sacha inchi oil: Effects on technological and sensory properties. *Foods*, *13*(7), 1004. https://doi.org/10.3390/foods13071004

Renu, Dahiya, J., Jalwal, P., & Singh, B. (2015). Chewable Tablets: A Comprehensive Review. *The Pharma Innovation Journal*, *4*(5), 100–105.

Ribeiro, A. P. L., Haddad, F. F., Tavares, T. de S., Magalhães, K. T., Pimenta, C. J., & Nunes, C. A. (2020). Characterization of macadamia oil (*Macadamia integrifolia*) obtained under different extraction conditions. *Emirates Journal of Food and Agriculture*, 295–302. https://doi.org/10.9755/ejfa.2020.v32.i4.2095

Rincón-Cervera, M. Á., Valenzuela, R., Hernandez-Rodas, M. C., Barrera, C., Espinosa, A., Marambio, M., & Valenzuela, A. (2016). Vegetable oils rich in alpha linolenic acid increment hepatic n-3 LCPUFA, modulating the fatty acid metabolism and antioxidant response in rats. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, *111*, 25–35. https://doi.org/10.1016/j.plefa.2016.02.002

Rizzo, G., Baroni, L., & Lombardo, M. (2023). Promising sources of plant-derived polyunsaturated fatty acids: A narrative review. *International Journal of Environmental Research and Public Health*, *20*(3), 1683. https://doi.org/10.3390/ijerph20031683

Roccia, P., Martínez, M. L., Llabot, J. M., & Ribotta, P. D. (2014). Influence of spray-drying operating conditions on sunflower oil powder qualities. *Powder Technology*, *254*, 307–313. https://doi.org/10.1016/j.powtec.2014.01.044

Rodrigues, H. S., Borém, A., Valente, M. S. F., Lopes, M. T. G., Cruz, C. D., Chaves, F. C. M., & Bezerra, C. D. S. (2018). Genetic diversity among accessions of sacha inchi (*Plukenetia volubilis*) by phenotypic characteristics analysis. *Acta Amazonica*, *48*(2), 93–97. https://doi.org/10.1590/1809-4392201702591

Rodzi, N. A. R. M., & Lee, L. K. (2022). Sacha inchi (*Plukenetia volubilis* L.): Recent insight on phytochemistry, pharmacology, organoleptic, safety and toxicity perspectives. *Heliyon*, *8*(9). https://doi.org/10.1016/j.heliyon.2022.e10572

Rohman, A., Irnawati, Erwanto, Y., Lukitaningsih, E., Rafi, M., Fadzilah, N. A., Windarsih, A., Sulaiman, A., & Zakaria, Z. (2021). Virgin coconut oil: Extraction, physicochemical properties, biological activities and its authentication analysis. *Food Reviews International*, *37*(1), 46–66. https://doi.org/10.1080/87559129.2019.1687515

Rudakov, O. B., Saranov, I. A., Van, A. N., Rudakova, L. V., & Polyanskiy, K. K. (2021). Differential scanning calorimetry as a method for the control of vegetable oils. *Journal of Analytical Chemistry*, *76*(2), 258–266. https://doi.org/10.1134/S1061934821020118

Ruiz, C., Díaz, C., Anaya, J., & Rojas, R. (2013). Análisis proximal, antinutrientes, perfil de ácidos grasos y de aminoácidos de semillas y tortas de 2 especies de Sacha inchi (*Plukenetia volubilis* y *Plukenetia huayllabambana*) [Proximate analysis, antinutrients, fatty acids and amino acids profiles of seeds and cakes from 2 species of sacha inchi: *Plukenetia volubilis* and *Plukenetia huayllabambana*]. *Revista de La Sociedad Química Del Perú*, *79*(1), 29–36.

Rungrot, K., Hudthagosol, C., & Sanporkha, P. (2021). Effect of Sacha Inchi pressed-cake (*Plukenetia volubilis* L.) on the physical, chemical and sensory properties of tuiles. *Chiang Mai University Journal of Natural Sciences*, *20*(2), e2021044.

Rutz, J. K., Borges, C. D., Zambiazi, R. C., Crizel-Cardozo, M. M., Kuck, L. S., & Noreña, C. P. Z. (2017). Microencapsulation of palm oil by complex coacervation for application in food systems. *Food Chemistry*, *220*, 59–66. https://doi.org/10.1016/j.foodchem.2016.09.194

Said, N. S., & Sarbon, N. M. (2022). Physical and mechanical characteristics of gelatin-based films as a potential food packaging material: A review. *Membranes*, *12*(5), 442. https://doi.org/10.3390/membranes12050442

Saini, R. K., Prasad, P., Sreedhar, R. V., Akhilender Naidu, K., Shang, X., & Keum, Y.-S. (2021). Omega−3 polyunsaturated fatty acids (PUFAs): Emerging plant and microbial sources, oxidative stability, bioavailability, and health benefits—A review. *Antioxidants*, *10*(10), 1627. https://doi.org/10.3390/antiox10101627

Samimi, M., Jamilian, M., Asemi, Z., & Esmaillzadeh, A. (2015). Effects of omega-3 fatty acid supplementation on insulin metabolism and lipid profiles in gestational diabetes: Randomized, double-blind, placebo-controlled trial. *Clinical Nutrition*, *34*(3), 388–393. https://doi.org/10.1016/j.clnu.2014.06.005

San, S. M., Jaturanpinyo, M., & Limwikrant, W. (2022). Effects of wall material on medium-chain triglyceride (MCT) Oil microcapsules prepared by spray drying. *Pharmaceutics*, *14*(6), 1281. https://doi.org/10.3390/pharmaceutics14061281

Sánchez, E. G. T., Hernández-Ledesma, B., & Gutiérrez, L.-F. (2021). Sacha Inchi oil press-cake: Physicochemical Characteristics, food-related applications and biological Activity. *Food Reviews International*, *0*(0), 1–12. https://doi.org/10.1080/87559129.2021.1900231

Sánchez, E. G. T., Hernández-Ledesma, B., & Gutiérrez, L.-F. (2023). Sacha inchi oil press-cake: Physicochemical characteristics, food-related applications and biological activity. *Food Reviews International*, *39*(1), 148–159. https://doi.org/10.1080/87559129.2021.1900231

Sanchez-Reinoso, Z., & Gutiérrez, L.-F. (2017). Effects of the emulsion composition on the physical properties and oxidative stability of sacha inchi (*Plukenetia volubilis* L.) oil microcapsules produced by spray drying. *Food and Bioprocess Technology*, *10*(7), 1354–1366. https://doi.org/10.1007/s11947-017-1906-3

Santos, H. O., Price, J. C., & Bueno, A. A. (2020). Beyond fish oil supplementation: the effects of alternative plant sources of omega-3 polyunsaturated fatty acids upon lipid indexes and cardiometabolic biomarkers—An overview. *Nutrients*, *12*(10), 3159. https://doi.org/10.3390/nu12103159

Sarabhai, S., & Prabhasankar, P. (2015). Influence of whey protein concentrate and potato starch on rheological properties and baking performance of Indian water chestnut flour based gluten free cookie dough. *LWT - Food Science and Technology*, *63*(2), 1301–1308. https://doi.org/10.1016/j.lwt.2015.03.111

Sathe, S. K., Kshirsagar, H. H., & Sharma, G. M. (2012). Solubilization, fractionation, and electrophoretic characterization of inca peanut (*Plukenetia volubilis* L.) proteins. *Plant Foods for Human Nutrition*, *67*, 247–255. https://doi.org/10.1007/s11130-012-0301-5

Saw, H. Y., Davies, C. E., Paterson, A. H. J., & Jones, J. R. (2013). The influence of particle size distribution and tapping on the bulk density of milled lactose powders. *Chemeca: Challenging Tomorrow*, *299*.

Shafi, M., Baba, W. N., Masoodi, F. A., & Bazaz, R. (2016). Wheat-water chestnut flour blends: Effect of baking on antioxidant properties of cookies. *Journal of Food Science and Technology*, *53*(12), 4278–4288. https://doi.org/10.1007/s13197-016-2423-5

Shahidi, F., & Ambigaipalan, P. (2015). Phenolics and polyphenolics in foods, beverages and spices: Antioxidant activity and health effects – A review. *Journal of Functional Foods*, *18*, 820–897. https://doi.org/10.1016/j.jff.2015.06.018

Shang, C., Sinka, I. C., & Pan, J. (2013). Modelling of the break force of tablets under diametrical compression. *International Journal of Pharmaceutics*, *445*(1), 99–107. https://doi.org/10.1016/j.ijpharm.2013.01.032

Silva, E. V. C. da, Lourenço, L. de F. H., & Pena, R. S. (2017). Optimization and characterization of gelatin from kumakuma (*Brachyplatystoma filamentosum*) skin. *CyTA - Journal of Food*, *15*(3), 361–368. https://doi.org/10.1080/19476337.2016.1266391

Singanusong, R., & Jiamyangyuen, S. (2020). Effects of maturity on chemical composition and antioxidant activity of sacha inchi (*Plukenetia volubilis* L.) cultivated in NorthernThailand. *Walailak Journal of Science and Technology (WJST)*, *17*(9), 998-1009. https://doi.org/10.48048/wjst.2020.5028

Siregar, A. N., Ghani, J. A., Haron, C. H. C., Rizal, M., Yaakob, Z., & Kamarudin, S. K. (2016). Comparison of oil press for jatropha oil - A review. *Research in Agricultural Engineering*, *61*(1), 1–13. https://doi.org/10.17221/22/2013-RAE

Soimee, W., Nakyai, W., Charoensit, P., Grandmottet, F., Worasakwutiphong, S., Phimnuan, P., & Viyoch, J. (2020). Evaluation of moisturizing and irritation potential of sacha inchi oil. *Journal of Cosmetic Dermatology*, *19*(4), 915–924. https://doi.org/10.1111/jocd.13099

Sokoła-Wysoczańska, E., Wysoczański, T., Wagner, J., Czyż, K., Bodkowski, R., Lochyński, S., & Patkowska-Sokoła, B. (2018). Polyunsaturated fatty acids and their potential therapeutic role in cardiovascular system disorders—A review. *Nutrients*, *10*(10), 1561. https://doi.org/10.3390/nu10101561

Soulairol, I., Chaheen, M., Tarlier, N., Aubert, A., Bataille, B., & Sharkawi, T. (2017). Evaluation of disintegrants functionality for orodispersible mini tablets. *Drug Development and Industrial Pharmacy*, *43*(11), 1770–1779. https://doi.org/10.1080/03639045.2017.1339081

Sruthi, N. U., Premjit, Y., Pandiselvam, R., Kothakota, A., & Ramesh, S. V. (2021). An overview of conventional and emerging techniques of roasting: Effect on food bioactive signatures. *Food Chemistry*, *348*, 129088. https://doi.org/10.1016/j.foodchem.2021.129088

Su, C.-H., Nguyen, H. C., Bui, T. L., & Huang, D.-L. (2019). Enzyme-assisted extraction of insect fat for biodiesel production. *Journal of Cleaner Production*, *223*, 436–444. https://doi.org/10.1016/j.jclepro.2019.03.150

Sundar, S., Singh, B., Kaur, A., & Yadav, M. P. (2022). Impact of infrared and dry-air roasting on antioxidant potential, oxidative stability, chemical characteristics, and fatty acid profile of black and white sesame (*Sesamum indicum* L.) oil. *Journal of Food Processing and Preservation*, *46*(12). https://doi.org/10.1111/jfpp.17252

Supriyanto, S., Imran, Z., Ardiansyah, R., Auliyai, B., Pratama, A., & Kadha, F. (2022). The effect of cultivation conditions on sacha inchi (*Plukenetia volubilis* L.) seed production and oil quality (omega 3, 6, 9). *Agronomy*, *12*(3), 636. https://doi.org/10.3390/agronomy12030636

Suwannasang, S., Zhong, Q., Thumthanaruk, B., Vatanyoopaisarn, S., Uttapap, D., Puttanlek, C., & Rungsardthong, V. (2022). Physicochemical properties of yogurt fortified with microencapsulated sacha inchi oil. *LWT*, *161*, 113375. https://doi.org/10.1016/j.lwt.2022.113375

Suzihaque, M. U. H., Irfan, M. H., & Ibrahim, U. K. (2017). A study on friability, hardness and fiber content analysis of fiber enriched milk tablet. *IOP Conference Series: Materials Science and Engineering*, *206*(1), 012038. https://doi.org/10.1088/1757-899X/206/1/012038

Swallah, M. S., Fan, H., Wang, S., Yu, H., & Piao, C. (2021). Prebiotic impacts of soybean residue (okara) on eubiosis/dysbiosis condition of the gut and the possible effects on liver and kidney functions. *Molecules*, *26*(2), 326. https://doi.org/10.3390/molecules26020326

Tall, A. R., & Yvan-Charvet, L. (2015). Cholesterol, inflammation and innate immunity. *Nature Reviews Immunology*, *15*(2), 104–116. https://doi.org/10.1038/nri3793

Tang, Y., Wang, X., Yu, J., Song, L., & Lin, S. (2020). Fish skin gelatin-based emulsion as a delivery system to protect lipophilic bioactive compounds during in vitro and in vivo digestion: The case of benzyl isothiocyanate. *LWT*, *134*, 110145. https://doi.org/10.1016/j.lwt.2020.110145

Terán, W. C., Quinteros, M. F., Carpió, C. L., G, Vá., Alvarez, M., M, S., & Alvarez, M. (2018). Identification of fatty acids in sacha inchi oil (*Plukenetia volubilis* L.) from Ecuador. *Asian Journal of Pharmaceutical and Clinical Research*, *11*(2), 389. https://doi.org/10.22159/ajpcr.2018.v11i2.15515

Tolve, R., Condelli, N., Can, A., & Tchuenbou-Magaia, F. L. (2018). Development and characterization of phytosterol-enriched oil microcapsules for foodstuff application. *Food and Bioprocess Technology*, *11*(1), 152–163. https://doi.org/10.1007/s11947-017-1990-4

Torres-Sánchez, E., Hernández-Ledesma, B., & Gutiérrez, L.-F. (2023). Isolation and characterization of protein fractions for valorization of sacha inchi oil press-cake. *Foods (Basel, Switzerland)*, *12*(12), 2401. https://doi.org/10.3390/foods12122401

US FDA. (2018b). Pharmaceutical quality chemistry, manufacturing, and controls (CMC). *Quality attribute considerations for chewable tablets guidance for industry.* Center for Drug Evaluation and Research (CDER).

USP 28. (2016b). *<701> Disintegration*. The United States Pharmacopeial Convention.

USP 35. (2012). *< 2091> Weight Variation of Dietary Supplements.* (pp. 978–979). The United States Pharmacopeial Convention.

USP 38. (2015). *The United States Pharmacopeia, The National Formulary, NF33: Vol. 4/a*. United Book Press.

USP29. (2016). *<1174> Powder Flow*. The United States Pharmacopeial Convention.

Vadukapuram, N., Hall, C., Tulbek, M., & Niehaus, M. (2014). Physicochemical properties of flaxseed fortified extruded bean snack. *International Journal of Food Science*, *2014*, e478018. https://doi.org/10.1155/2014/478018

Valencia, A., Muñoz, A. M., Ramos-Escudero, M., Chavez, K. C., & Ramos-Escudero, F. (2024). Carotenoid, Tocopherol, and volatile aroma compounds in eight sacha inchi seed (*Plukenetia volubilis* L.) oil accessions. *Journal of Oleo Science*, *73*(5), 665–674. https://doi.org/10.5650/jos.ess23158

Vasanthakumari, P., & Jaganmohan, R. (2018). Process development and formulation of multi-cereal and legume cookies. *Journal of Food Processing and Preservation*, *42*(12), e13824. https://doi.org/10.1111/jfpp.13824

Vašek, J., Čepková, P. H., Viehmannová, I., Ocelák, M., Huansi, D. C., & Vejl, P. (2017). Dealing with AFLP genotyping errors to reveal genetic structure in *Plukenetia volubilis* (Euphorbiaceae) in the Peruvian Amazon. *PLOS ONE*, *12*(9), e0184259. https://doi.org/10.1371/journal.pone.0184259

Vicente, J., de Carvalho, M. G., & Garcia-Rojas, E. E. (2015). Fatty acids profile of Sacha Inchi oil and blends by 1H NMR and GC–FID. *Food Chemistry*, *181*, 215–221. https://doi.org/10.1016/j.foodchem.2015.02.092

Villamil, R.-A., Cortés, L.-Y., & Gutiérrez, L.-F. (2023). Physicochemical and sensory properties of sacha inchi oil-functionalised stirred yogurt. *International Journal of Food Science & Technology*, *58*(7), 3681–3692. https://doi.org/10.1111/ijfs.16470

Volf, I., Ignat, I., Neamtu, M., & Popa, V. I. (2014). Thermal stability, antioxidant activity, and photo-oxidation of natural polyphenols. *Chemical Papers*, *68*(1), 121–129. https://doi.org/10.2478/s11696-013-0417-6

Wang, S., Zhu, F., & Kakuda, Y. (2018). Sacha inchi (*Plukenetia volubilis* L.): Nutritional composition, biological activity, and uses. *Food Chemistry*, *265*, 316–328. https://doi.org/10.1016/j.foodchem.2018.05.055

WHO. (2011). *Revision of monograph on tablets*. The International Pharmacopoeia.

Wongpattananukul, S., Nungarlee, U., Ruangprach, A., Sulong, S., Sanporkha, P., Adisakwattana, S., & Ngamukote, S. (2022). Effect of inca peanut oil on omega-3 polyunsaturated fatty acids, physicochemical, texture and sensory properties in chicken sausage. *LWT*, *163*, 113559. https://doi.org/10.1016/j.lwt.2022.113559

Xu, D., Hao, J., Wang, Z., Liang, D., Wang, J., Ma, Y., & Zhang, M. (2021). Physicochemical properties, fatty acid compositions, bioactive compounds, antioxidant activity and thermal behavior of rice bran oil obtained with aqueous enzymatic extraction. *LWT*, *149*, 111817. https://doi.org/10.1016/j.lwt.2021.111817

Xuan, T. D., Gangqiang, G., Minh, T. N., Quy, T. N., & Khanh, T. D. (2018). An overview of chemical profiles, antioxidant and antimicrobial activities of commercial vegetable edible oils marketed in Japan. *Foods*, *7*(2), 21. https://doi.org/10.3390/foods7020021

Xuehua, F., Ali, T., Zurong, S., & Panpan, G. (2021). Study on aqueous enzymatic extraction process of common pistache oil. *E3S Web of Conferences*, *251*, 02058. https://doi.org/10.1051/e3sconf/202125102058

Yashini, M., Sahana, S., Hemanth, S. D., & Sunil, C. K. (2021). Partially defatted tomato seed flour as a fat replacer: Effect on physicochemical and sensory characteristics of millet-based cookies. *Journal of Food Science and Technology*, *58*(12), 4530–4541. https://doi.org/10.1007/s13197-020-04936-y

Zanqui, A. B., da Silva, C. M., de Morais, D. R., Santos, J. M., Ribeiro, S. A. O., Eberlin, M. N., Cardozo-Filho, L., Visentainer, J. V., Gomes, S. T. M., & Matsushita, M. (2016). Sacha inchi (*Plukenetia volubilis* L.) oil composition varies with changes in temperature and pressure in subcritical extraction with n-propane. *Industrial Crops and Products*, *87*, 64–70. https://doi.org/10.1016/j.indcrop.2016.04.029

Zhang, Y., Li, X., Lu, X., Sun, H., & Wang, F. (2021). Effect of oilseed roasting on the quality, flavor and safety of oil: A comprehensive review. *Food Research International*, *150*, 110791. https://doi.org/10.1016/j.foodres.2021.110791

Zhou, Y., Zhao, W., Lai, Y., Zhang, B., & Zhang, D. (2020). Edible plant oil: Global status, health issues, and perspectives. *Frontiers in Plant Science*, *11*. https://doi.org/10.3389/fpls.2020.01315