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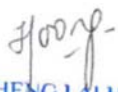
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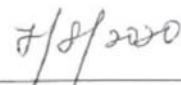
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2. Saya ingin mengesahkan bahawa saya berpuas hati dengan pembetulan/pindaan yang dilaksanakan oleh calon.

Sekian, terima kasih.

  
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# PLANT-BASED MILK AS AN ALTERNATIVE TO DAIRY MILK - THE CHALLENGES AND WAY FORWARD

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Technology (B. Tech) in the field of Food Technology  
School of Industrial Technology  
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## **DECLARATION BY AUTHOR**

This dissertation is composed of my original work and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.



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Nor Syahirah binti Abd Rashid

July 2020

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## **LIST OF ABBREVIATIONS**

LCA	= Life cycle assessment
MUFA	= Mono-unsaturated fatty acid
MCFA	= Medium chain fatty acid
FAO	= Food and Agriculture Organization of the United Nations

# **SUSU BERASASKAN TUMBUHAN SEBAGAI ALTERNATIF KEPADA SUSU TENUSU- CABARAN DAN LANGKAH KE HADAPAN**

## **ABSTRAK**

Tinjauan ilmiah ini bertujuan untuk membincangkan kegunaan teknologi rawatan haba yang dihadapi semasa pemprosesan susu berasaskan tumbuhan dan mengulas cabaran berkaitan sifat pemakanan, penerimaan deria, kestabilan, fungsional dan penggunaan susu berasaskan tumbuhan. Susu berasaskan tumbuhan boleh didefinisikan sebagai cecair yang mempunyai saiz partikel iaitu 5 hingga 10 $\mu$ m hasil daripada pemecahan bahan tumbuhan dan proses homogenisasi. Susu berasaskan tumbuhan boleh diperbuat daripada sumber, bijirin, kacang, bijian, kacang dan bijirin pseudo. Contoh-contoh susu berasaskan tumbuhan adalah susu oat, susu soya, susu kacang badam, susu beras, susu kelapa, susu kacang dan susu bijan. Walaupun susu tenusu telah diterima dengan baik oleh pengguna, susu berasaskan tumbuhan masih menghadapi cabaran untuk berkembang dalam pasaran. Susu berasaskan tumbuhan mempunyai masalah berkaitan dengan penghapusan bahan anti-nutrien dan had rawatan pemanasan yang diaplikasikan dalam pemprosesan. Pemanasan konvensional tidak dapat menghilangkan semua sebatian yang tidak diinginkan. Nutrisi susu berasaskan tumbuhan tidak dapat dibandingkan dengan susu tenusu tanpa fortifikasi dan kualiti protein berasaskan tumbuhan lebih rendah daripada susu tenusu dari segi susunan asid amino. Isu sensori pada susu berasaskan tumbuhan pada dasarnya adalah rasa kacang berikutan kandungan yang tidak diinginkan seperti lipoxigenase, hexanal dan isoflavones. Selain daripada itu, susu berasaskan tumbuhan biasanya terdiri daripada zarah besar seperti protein dan karbohidrat yang menyebabkan pemisahan fasa sewaktu penyimpanan. Ini dapat diselesaikan dengan penambahan gum

tetapi jenis dan jumlah gum yang betul harus diputuskan dengan teliti untuk mengelakkan interaksi yang tidak perlu dengan sebatian yang terdapat secara semula jadi dalam produk. Nutrisi susu berasaskan tumbuhan tidak semestinya sesuai untuk konsumsi bayi dan kanak-kanak disebabkan oleh kehadiran sebatian berbahaya yang tidak diingini seperti arsenik dan bahan allergik. Susu berasaskan tumbuhan mengalami cabaran dari segi kekangan teknologi rawatan haba, sifat pemakanan, penerimaan deria, jangka hayat dan kestabilan, serta sifat dan aplikasi berfungsi. Melihat prospek masa depan, kita dapat menyimpulkan bahawa susu berasaskan tumbuhan memerlukan kajian dan penambahbaikan dari segi pemprosesan, komposisi pemakanan, deria, ciri-ciri kestabilan and sifat berfungsi.

# **PLANT-BASED MILK AS AN ALTERNATIVE TO DAIRY MILK - THE CHALLENGES AND WAY FORWARD**

## **ABSTRACT**

This literature review aims to discuss the technological constraint faced during the processing of plant-based milk and to review the nutritional properties, sensory acceptability, stability, functional and application challenges of plant-based milk. Plant-based milk can be defined as a liquid that has a particle size distribution of 5-10 $\mu$ m resulted from the breakdown of plant material and homogenization process. Plant-based milk can be made from cereal, legume, seed, nut and pseudo-cereal. The examples of plant-based milk are oats milk, soymilk, almond milk, rice milk, coconut milk, peanut milk and sesame milk. While dairy milk has already well accepted by consumer, plant-based milk still faces challenges to grow in the market. Plant-based milk has problem related to elimination of anti-nutrient factors and limitations of heat treatment applied in the processing. The conventional heating is unable to eliminate all the undesirable compounds. The nutritional properties of plant-based milk are not comparable to dairy milk without fortification and quality of protein of plant-based is lower than dairy milk in terms of amino acids array. The issue of sensory properties for plant-based milk is basically caused by beany flavour due to the presence of some undesirable compounds such as lipoxygenase, hexanal and isoflavones. Besides, plant-based milk normally made up of big particles such as protein and carbohydrate that leads to phase separation on storage. This can be solved by the addition of gums but the right type and amount of gums should be carefully decided to prevent unnecessary interaction with compounds naturally present in the product. The nutritional value in plant-based milk are not necessarily suitable for the consumption of infants and children as it contains undesirable harmful

compound such as arsenic and allergen. Plant based milk are undergoing challenges in terms of technological constraints of heat treatment, nutritional properties, sensory acceptability, shelf life and stability, and functional properties and application. Looking on future prospect, it is concluded that plant-based milk needs great effort in research and improvements in terms of processing, nutritional composition, sensory, stability properties and functional properties.