

This thesis is dedicated

.....to my beloved Maa and Papa,

.....to my beloved, husband Muktedir,

.....to my beloved sister Miliyara

Declaration

The thesis entitled “**Evaluation of defatted coconut milk and pineapple juice-based beverage with curcumin-enriched Pickering nanoemulsion developed from oil and nanocellulose obtained from coconut**” is being submitted to the Tezpur University in partial fulfilment for the award of the degree of Doctor of Philosophy in **Food Engineering and Technology** is a record of bonafide research work accomplished by me under the supervision of Prof. Charu Lata Mahanta. All assistance received from various sources have been appropriately acknowledged. No part of this thesis has been submitted elsewhere for award of any other degree



(Fogila Begum)

Date: 19-12-2024

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तेजपुर विश्वविद्यालय/ **TEZPUR UNIVERSITY**
(संसद के अधिनियम द्वारा स्थापित केंद्रीय विश्वविद्यालय)
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(सर्वोत्तम विश्वविद्यालय के लिए कुलाध्यक्ष पुरस्कार, 2016 और भारत के 100 श्रेष्ठ उच्च शिक्षण संस्थानों में पंचम स्थान प्राप्त विश्वविद्यालय)
(Awardee of Visitor's Best University Award, 2016 and 5th among India's Top 100 Universities, MHRD-NIRF Ranking, 2016)

Charu Lata Mahanta
Professor
Department of Food Engineering and Technology
School of Engineering

Email: charu@tezu.ernet.in
Mob: 91-9435092658

Certificate from the Supervisor

This is to certify that the thesis entitled “Evaluation of defatted coconut milk and pineapple juice-based beverage with curcumin-enriched Pickering nanoemulsion developed from oil and nanocellulose obtained from coconut” submitted to the School of Engineering, Tezpur University in partial fulfilment for the award of the degree of Doctor of Philosophy in Food Engineering and Technology, is a record of research work carried out by Fogila Begum under my supervision and guidance.

All assistance received by her from various sources have been duly acknowledged.

No part of this thesis has been submitted elsewhere for award of any other degree.

Date: 19-12-2024

Place: Tezpur

Charu Lata Mahanta
(Prof. Charu Lata Mahanta)

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List of Abbreviation

ABTS	2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)
VCO	Virgin coconut oil
CMR	Coconut milk waste residue
Cur	Curcumin
ANOVA	Analysis of variance
DCP	2,6-dichloroindophenol
TPC	Total phenolic content
CM	Coconut milk
GAE	Gallic acid
TFC	Total flavonoid content
DPPH	2,2-diphenyl-1-picrylhydrazyl
QE	Quercetin
FRAP	Ferric reducing antioxidant power assay
MCC	Metal chelation capacity
FDA	Food and Drug Administration
HACCP	Hazard Analysis and Critical Control Point
HPH	High Pressure Homogenization
HPLC	High performance Liquid Chromatography
FCCD	Face centred central composite design
CFU	Colony forming units
POD	Peroxidase
NE	Nanoemulsions
PDI	Polydispersity Index
C50:P50	Blended beverage
1GGCP	Blended beverage (C50:P50) treated with guar gum 0.1%
2GGCP	Blended beverage (C50:P50) treated with guar gum 0.2%
3GGCP	Blended beverage (C50:P50) treated with guar gum 0.3%
3GGHPH	Guar gum 0.3% and high-pressure homogenization

3GGPAS	Guar gum 0.3% and pasteurization
RSM	Response Surface Methodology
PAS	Pasteurized blended beverage
SS%	Serum separation
FE-SEM	Field Emission Scanning Electron Microscopy
RA	Relative activity
TAC	Total aerobic count
YMC	Yeast and mould count
CNF	Cellulose nanofibers
CNC	Cellulose nanocrystals
ACMR	Alkaline treated coconut milk waste residue
MCP	Microcrystalline cellulose powder
TMAC	Total Monomeric Anthocyanin Content
TMC	Total Microbial Count
TPC	Total Phenolic content
TSS	Total Soluble Solids
GC-HPMS	Gas chromatography-high resolution mass spectrometry
FAME	Fatty acid methyl esters
UV-Vis	Ultraviolet Visible
BF ₃ -MeOH	Boron trifluoride-methanol
NaCl	Sodium chloride
NaOH	Sodium hydroxide
NCC	Nanocrystalline cellulose
AC3	CMR hydrolysed with 42% acid
AC2	CMR hydrolysed with 40% acid
AC1	CMR hydrolysed with 38% acid
ACU-5	CMR hydrolysed with 42% acid and ultrasonicated for 5 min
ACU-10	CMR hydrolysed with 42% acid and ultrasonicated for 10 min
UL-5	MCP sample was ultrasonicated for 5 min
UL-10	MCP sample was ultrasonicated for 10 min
PN	Pickering nanoemulsion
%CMI	Creaming index

CP-Cur	Curcumin-enriched Pickering nanoemulsion added blended beverage
UNCP-Cur	Unpasteurized curcumin-enriched nanoemulsified blended beverages
PNCP-cur	Curcumin-enriched Pickering nanoemulsified blended beverage
VA	Vancomycin
P	Penicillin
S	Streptomycin
LZ	Linezolid
GEN	Gentamycin
CIP	Ciprofloxacin
TE	Tetracycline

List of Symbols and Units

%	percentage
RT	room temperature
°C	degree Celsius
μl	micro litres
μm	micrometre
L*	Lightness
a*	redness
b*	yellowness
A _o	absorbance of blank
A _s	absorbance of sample
CFU/ml	colony forming unit per millilitres
cm	centimetre
cm ⁻¹	per centimetre
eq	equation
g	gram
g/ml	grams per millilitres
h	hour
kg	kilogram
M	molar
min	minutes
ml	millilitres
mm	millimetres
nm	nanometre
R ²	coefficient of determination
rpm	rotation per minute
s	seconds
U/ml	units per millilitre
v/v	volume by volume

w/v	weight per volume
w/w	weight by weight
λ	wavelength
mg/ml	milligram per millilitre
$\mu\text{g/ml}$	microgram per milliliter