

DECLARATION

I, hereby declare that this thesis entitled “REFRACTANCE WINDOW DRYING AND INSTANTANEOUS CONTROLLED PRESSURE DROP ASSISTED EXTRACTION OF ESSENTIAL OIL FROM NUTMEG MACE” is a bonafide record of research work done by me during the course of research. The thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Tavanur

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CERTIFICATE

Certified that this thesis entitled “REFRACTANCE WINDOW DRYING AND INSTANTANEOUS CONTROLLED PRESSURE DROP ASSISTED EXTRACTION OF ESSENTIAL OIL FROM NUTMEG MACE” is a record of research work done independently by Ann Annie Shaju (2022-28-001) under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

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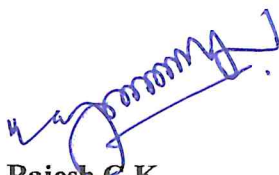
We, the undersigned members of the advisory committee of **Er. Ann Annie Shaju (2022-28-001)**, a candidate for the degree of **Doctor of Philosophy in Agricultural Engineering** with major in Processing and Food Engineering, agree that the thesis entitled **“REFRACTANCE WINDOW DRYING AND INSTANTANEOUS CONTROLLED PRESSURE DROP ASSISTED EXTRACTION OF ESSENTIAL OIL FROM NUTMEG MACE”** may be submitted by **Er. Ann Annie Shaju (2022-28-001)**, in partial fulfillment of the requirement for the degree.



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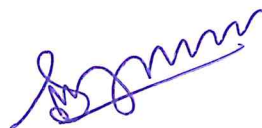
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DEDICATION

To my family, whose unwavering love, sacrifices, and support have been the foundation of my achievements. Thank you for being my greatest strength and inspiration throughout this journey.

CONTENTS

Chapter No.	Title	Page No.
	LIST OF TABLES	i-ii
	LIST OF FIGURES	iii-v
	LIST OF PLATES	vi
	LIST OF APPENDICES	vii
	SYMBOLS AND ABBREVIATIONS	viii-x
I	INTRODUCTION	1-5
II	REVIEW OF LITERATURE	6-60
III	MATERIALS AND METHODS	61-129
IV	RESULTS AND DISCUSSION	129-233
V	SUMMARY AND CONCLUSION	234-243
	REFERENCES	244-281
	APPENDICES	282-287
	ABSTRACT	

LIST OF TABLES

Table No.	Title	Page No.
3.1	Design assumptions for Refractance Window dryer	65
3.2	Technical specifications of Refractance Window dryer	72
3.3	Engineering Properties of mylar membrane	77
3.4	Experimental Design for the performance evaluation of the developed RW dryer	82
3.5	RSM design for Refractance window drying of nutmeg mace	84
3.6	Thin-layer drying models used for mathematical modelling of nutmeg mace	91
3.7	Design assumptions adopted for the fabrication of the ICPD system	99
3.8	Technical specifications of all components	101
3.9	Vacuum chamber wall thickness verification for implosion safety	117
3.10	Pump-down time for evacuating the 30 L vacuum chamber to target vacuum levels using the VE115N vacuum pump	118
3.11	Independent variables, coded levels, and actual values for the rotatable Central Composite Design	121
3.12	Central Composite Design matrix for optimization of ICPD pretreatment parameters	123
4.1	Engineering Properties of Nutmeg Mace	132
4.2	Box-Behnken design matrix and observed responses for Refractance Window drying of Nutmeg mace	135
4.3	ANOVA for the quadratic models fitted to responses of Refractance Window drying of Nutmeg mace	136
4.4	Comparison of predicted and experimental values at optimised RWD process conditions	155
4.5	Thin layer drying kinetic models for RWD of Nutmeg mace	160
4.6	Statistical parameters for drying models of nutmeg mace dried by RWD, HAD, and SD	170
4.7	Quality characteristics of nutmeg mace dried by RWD, HAD, and SD	173

4.8	CCD Design matrix and observed responses for RSM optimisation of ICPD-assisted essential oil extraction from nutmeg mace	194
4.9	ANOVA results and model fit statistics for energy consumption and essential oil yield of ICPD-assisted extraction of nutmeg mace essential oil	196
4.10	Comparison of predicted and experimental values at optimised ICPD process conditions	207
4.11	Comparative Analysis of GC-MS Characterisation of essential oil from Nutmeg Mace (ICPD pretreated MAHD vs MAHD vs Conventional Extraction (CE)	220
4.12	Quality characteristics of nutmeg mace essential oil extracted by conventional HD, MAHD, and ICPD pretreated MAHD	222
4.13	CIE L*a*b* colorimetric parameters of nutmeg mace (<i>Myristica fragrans</i> Houtt.) essential oils obtained by three extraction treatments	228

LIST OF FIGURES

Sl No.	Title	Page No.
2.1	Typical pressure/temperature-time profile for a ICPD processing cycle: (1) starting phase (2) initial vacuum phase (3) steam application phase (4) abrupt pressure drop phase (5) atmospheric pressure releasing phase	46
2.2	Multi-cycle ICPD. (a) Treatment vessel at atmospheric pressure; (b) initial vacuum (c) injection of saturated steam (d) maintaining the pressure for a specific time (e) abrupt pressure drop (f) vacuum period followed by restoration of atmospheric pressure	48
3.1	Three-dimensional diagram of RW dryer	71
3.2	Design drawing of RW dryer	71
3.3	Three-dimensional diagram of the water bath assembly of the RW dryer	74
3.4	Design drawing of water bath assembly of RW dryer	75
3.5	Three-dimensional diagram of the supporting frame	76
3.6	Design drawing of the supporting frame	76
3.7	Three-dimensional diagram of pyramidal exhaust hood	78
3.8	Design drawing of the pyramidal exhaust hood	79
3.9	Operating procedure of Refractance Window dryer	81
3.10	Schematic diagram of the developed ICPD system	100
3.11	Instantaneous controlled pressure drop system	101
3.12	Operating procedure of ICPD pretreated MAHD for essential oil extraction	119
4.1	Diagnostic plots for energy consumption	139
4.2	Diagnostic plots for drying time	140
4.3	Diagnostic plots for essential oil yield	141
4.4	Effect of process variables on energy consumption	148

4.5	Effect of process variables on drying time	149
4.6	Effect of process variables on essential oil yield	150
4.7	Desirability ramps for the optimized conditions of Refractance Window drying of Nutmeg mace	152
4.8	Predicted Vs Actual values of response: Energy consumption	153
4.9	Predicted Vs Actual values of response: Drying time	153
4.10	Predicted Vs actual values of Response: Essential oil Yield	154
4.11	Observed Vs. Predicted moisture ratio of best fit model	159
4.12	Moisture content verses Drying time for RWD, HAD and SD	166
4.13	Drying rate verses Drying time for RWD, HAD and SD	168
4.14	ln MR versus drying time plots for RWD, HAD, and SD of nutmeg mace	169
4.15	Best fit model for Sun drying	171
4.16	Best fit model for hot air drying	171
4.17	Energy consumption of RWD and HAD	174
4.18	Essential oil yield of RWD, HAD and SD	175
4.19	Rehydration ratio of RWD, HAD and SD	181
4.20	Total Phenolic content of RWD, HAD and SD	182
4.21	SEM images of RW dried Nutmeg mace	184
4.22	SEM images of hot air-dried Nutmeg mace	184
4.23	SEM images of the sun-dried Nutmeg mace	185
4.24	FTIR Spectra of Refractance Window dried Nutmeg mace	189
4.25	FTIR Spectra of Hot air-dried Nutmeg mace	189
4.26	FTIR Spectra of Sun-Dried Nutmeg mace	189

4.27	Diagnostic plots for energy consumption	198
4.28	Diagnostic plots for essential oil yield	199
4.29	Effect of process variables on energy consumption	203
4.30	Effect of process variables on essential oil yield	204
4.31	Predicted Vs. Actual values of response: Energy consumption	206
4.32	Predicted Vs. Actual values of response: Essential oil yield	206
4.33	Desirability ramps for the optimized conditions of ICPD-assisted extraction of Nutmeg mace essential oil	207
4.34	SEM micrograph of RW dried Nutmeg mace	209
4.35	SEM micrographs of RW dried ICPD treated Nutmeg mace	209
4.36	Refractive Index values of ICPD-treated MAHD, MAHD, and CE essential oils	223
4.37	Specific gravity values of ICPD assisted MAHD, MAHD and CE essential oil	224
4.38	Solubility values of ICPD pretreated MAHD, MAHD and CE essential oil	227
4.39	Radical Scavenging activity values of ICPD treated MAHD, MAHD and CE essential oil	230
4.40	Total Flavanoid content of ICPD assisted MAHD, MAHD and CE essential oil	232

LIST OF PLATES

Plate No.	Title	Page No.
3.1	Nutmeg Mace (<i>Myristica Fragrans Houtt.</i>) used for study	62
3.2	Mylar membrane	77
3.3	Refractance window drying of nutmeg mace	82
3.4	Hot air drying of Nutmeg mace	85
3.5	Sun drying of nutmeg mace	86
3.6	Water activity meter	93
3.7	Lovibond tintometer	95
3.8	Sputter coater and scanning electron microscope	96
3.9	FTIR spectrophotometer	97
3.10	Steam generator	103
3.11	Processing vessel	104
3.12	Vacuum chamber	105
3.13	Vacuum Pump	105
3.14	Control valves and safety valves: (A). Valve 1, (B). Valve 2, (C). Valve 3, (D). Valve 4, (E) Safety valve	107
3.15	Gauges: (A). Pressure gauge 1, (B). Pressure gauge 2, (C). Vacuum gauge 1, (D). Vacuum Gauge 2	108
4.1	Fabricated RW dryer: (A). Top view, (B). Pyramidal exhaust hood and exhaust fan, (C). Membrane supporting frame, (D), Waterbath, (E). Refractance window dryer	134
4.2	Dried samples of Nutmeg mace using (A) RWD, (B) HAD, and (C) SD	172
4.3	Front view of the developed ICPD system	191
4.4	Top view of the developed ICPD system	191
4.5	ICPD pretreated MAHD essential oil	212

LIST OF APPENDICES

Appendix No.	Title	Page No.
A 1.	Equilibrium pressure attained in the processing vessel after instantaneous valve opening for all ICPD treatment combinations	282
B 1.	FTIR absorption bands and corresponding functional group assignments of RWD, HAD, and SD dried nutmeg mace	283
C 1.	Drying characteristic data during Refractance window drying of Nutmeg mace	284
C 2.	Drying characteristic data during hot air drying of Nutmeg mace	284
C 3.	Drying characteristic data during sun drying of Nutmeg mace	285
D 1.	Economic analysis of the Refractance Window Dryer and ICPD system for nutmeg mace processing	286

SYMBOLS AND ABBREVIATIONS

A	: Area
a	: Constant used in drying equation
a_w	: Water activity
C _p	: Specific heat capacity
D _{eff}	: Effective moisture diffusivity
K	: Thermal conductivity / drying rate constant
M	: Moisture content
M ₀	: Initial moisture content
M _e	: Equilibrium moisture content
M _t	: Moisture content at time t
MR	: Moisture ratio
P	: Pressure
Q	: Heat energy transferred
R	: Universal gas constant
R ²	: Coefficient of determination
RH	: Relative humidity
r	: Radius
T	: Temperature
t	: Time
U	: Overall heat transfer coefficient
v	: Velocity
V	: Volume
W	: Weight / Mass
X	: Independent variable
Y	: Response variable
μ	: Mean / Dynamic viscosity

ρ	: Density
λ	: Wavelength / Latent heat
Σ	: Standard deviation
Δ	: Difference / Change in value
∇	: Gradient
$^{\circ}\text{C}$	: Degree Celsius
K	: Kelvin
rpm	: Revolutions per minute
min	: Minute
h	: Hour
s	: Second
kg	: Kilogram
g	: Gram
mg	: Milligram
μg	: Microgram
L	: Litre
mL	: Millilitre
μL	: Microlitre
Pa	: Pascal
kPa	: Kilopascal
MPa	: Megapascal
N	: Newton
W	: Watt
kW	: Kilowatt
J	: Joule
kJ	: Kilojoule
mol	: Mole
%	: Percent
ppm	: Parts per million
ppb	: Parts per billion
DR	: Drying rate
DE	: Drying efficiency

SEC	: Specific energy consumption
TPC	: Total phenolic content
TFC	: Total flavonoid content
AA	: Antioxidant activity
RWD	: Refractance Window Drying
HAD	: Hot Air Drying
SD	: Sun Drying
CE	: Conventional Hydrodistillation
MAHD	: Microwave assisted Hydrodistillation
ICPD	: Instantaneous Controlled Pressure Drop
SEM	: Scanning Electron Microscopy
DSC	: Differential Scanning Calorimetry
FTIR	: Fourier Transform Infrared Spectroscopy
GCMS	: Gas Chromatography–Mass Spectrometry