Dedication

This thesis is dedicated to my parents and family.

For their endless love, support and encouragement

DECLARATION

I hereby declare that the thesis entitled "**Studies on the isolation, modification, and application of starch from underutilized *Dioscorea* cultivars of Assam**" submitted to the **School of Engineering, Tezpur University** in partial fulfilment for the award of the degree of **Doctor of Philosophy** in the **Department of Food Engineering and Technology** is a record of research carried out by me under the guidance of **Prof. Charu Lata Mahanta, Professor in the Department of Food Engineering and Technology, Tezpur University**.

All assistance received from various sources and people have been duly acknowledged. No part of this thesis has been submitted elsewhere for the award of any other degree.

Date: 01-12-2023

Place: Tezpur

Jinku Bora

Reg. No. TZ133530 of 2013

DEPARTMENT OF FOOD ENGINEERING & TECHNOLOGY
TEZPUR UNIVERSITY
NAPAAM, TEZPUR- 784 028
Ph:(03712) 267007-09, Extn. 5702
Fax:(03712)-267005/06 Cell: 09435092658
E-mail: charu@tezu.ernet.in

Dr. Charu Lata Mahanta
Professor

CERTIFICATE OF THE SUPERVISOR

This is to certify that the thesis entitled "**Studies on the isolation, modification, and application of starch from underutilized *Dioscorea* cultivars of Assam**" submitted to the **School of Engineering, Tezpur University, Assam** in partial fulfilment for the award of the degree of **Doctor of Philosophy** in the **Department of Food Engineering and Technology** is a record of research work carried out by **Mr. Jinku Bora (Reg. No. TZ133530 of 2013** under my supervision and guidance.

All assistance received by him from various sources have been duly acknowledged. No part of this thesis has been submitted elsewhere for the award of any other degree.

Charu Lata Mahanta

Date: 01-12-2023
Place: Tezpur

(Prof. Charu Lata Mahanta)
Professor
Department of Food Engineering and Technology
School of Engineering, Tezpur University
Napaam: 784028, Tezpur, Assam, India

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I dedicate this thesis to all of you.

List of Tables

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List of Abbreviations

1ANN-12	*D. esculenta* starch after ANN (1:2, starch: mositure)
1ANN-14	*D. esculenta* starch after ANN (1:4, starch: mositure)
1HMT-20	*D. esculenta* starch after HMT with 20 % moisture
1HMT-30	*D. esculenta* starch after HMT with 30 % moisture
1YCL-02	Cross-linked *D. esculenta* starch (STMP, 2 g)
1YHP-05	Hydroxypropylated *D. esculenta* starch (propylene oxide, 5 ml)
1YHP-10	Hydroxypropylated *D. esculenta* starch (propylene oxide, 10 ml)
1YNS	*Dioscorea esculenta* native starch
2ANN-12	*D. alata* (purple yam) starch after ANN (1:2, starch: mositure)
2ANN-14	*D. alata* (purple yam) starch after ANN (1:4, starch: mositure)
2HMT-20	*D. alata* (purple yam) starch after HMT with 20 % moisture
2HMT-30	*D. alata* (purple yam) starch after HMT with 30 % moisture
2YCL-02	Cross-linked *D. alata* (purple yam) starch (STMP, 2 g)
2YHP-05	Hydroxypropylated *D. alata* (purple yam) starch (propylene oxide, 5 ml)
2YHP-10	Hydroxypropylated *D. alata* (purple yam) starch (propylene oxide, 10 ml)
2YNS	*Dioscorea alata* (purple yam) native starch
3ANN-12	*D. alata* (yellow yam) starch after ANN (1:2, starch: mositure)
3ANN-14	*D. alata* (yellow yam) starch after ANN (1:4, starch: mositure)
3HMT-20	*D. alata* (yellow yam) starch after HMT with 20 % moisture
3HMT-30	*D. alata* (yellow yam) starch after HMT with 30 % moisture
3YCL-02	Cross-linked *D. alata* (yellow yam) starch (STMP, 2 g)
3YHP-05	Hydroxypropylated *D. alata* (yellow yam) starch (propylene oxide, 5 ml)
3YHP-10	Hydroxypropylated *D. alata* (yellow yam) starch (propylene oxide, 10 ml)
3YNS	*Dioscorea alata* (yellow yam) native starch
A1WF	Films prepared from annealed starch with 1:2 starch to moisture ratio
A2WF	Films prepared from annealed starch with 1:4 starch to moisture

	ratio
ACE	Anti-angiotensin i-converting enzyme
AChE	Anti-acetylcholinesterase
AHMT	Autoclave heat-moisture treatment
AM	Amylose
AML	Amylose leaching
AMP	Amylopectin
ANN	Annealing
AOAC	Association of official analytical chemists
API	Almond protein isolate
ATR-FTIR	Attenuated total reflectance - Fourier transform infrared spectroscopy
BD	Break-down viscosity
CA	Citric acid treatment
CMCS	Carboxy methy cellulose starch
D	Diameter
DPPH	2,2-diphenylpicrylhydrazyl
DS	Degree of substitution
DSC	Differential scanning calorimeter
FC	Folin–Ciocalteu
FC	Foaming capacity
FS	Foaming stability
FTC	Freeze-thaw cycles
FV	Final viscosity
G′	Storage modulus
G′′	Loss modulus
GCWS	Granular cold water soluble
H1WF	Films prepared from HMT starch with 20% moisture level
H2WF	Films prepared from HMT starch with 30% moisture level
HMT	Heat moisture treatment
HP	Hydroxypropyl groups
LLD	Laser light diffraction
LM	Light microscopy

MS	Molar substitution
NS	Native starch
NS0F	Native starch film without walnut oil
NSWF	Native starch film with walnut oil
OAC	Oil absorption capacity
OHMT	Oven heat-moisture treatment
OSA	Octenyl succinic anhydride
P	Phosphorus
PT	Peak temperature
PV	Peak viscosity
PY1	Blend of YF1 and API
PY2	Blend of YF2 and API
PY3	Blend of YF3 and API
RDS	Rapidly digestible starch
RS	Resistent starch
RVA	Rapid Visco Analyzer
S	Solubility
SB	Set back viscosity
SDS	Slowly digestible starch
SEM	Scanning electron microscopy
SP	Swelling power
STMP	Sodium trimetaphosphate
STPP	Sodium tripolyphosphate
T	Thickness
TA	Titratable acidity
TAC	Total monomeric anthocyanin content
tan δ	Loss tangent
TPC	Total phenolic content
TPC	Total phenolic content
TS	Tensile strength
TSS	Total soluble solids
UATR	Universal Attenuator Total Reflectance
UC	Uncoated grapes

UHP	Ultra-high pressure treatment
US	Ultrasonication
WAC	Water absorption capacity
WL	Weight loss
WO	Walnut oil
WVP	Water vapor permeability
XRD	X-ray diffraction
YF1	*Dioscorea esculenta* flour
YF2	*Dioscorea alata* (purple yam) flour
YF3	*Dioscorea alata* (yellow yam) flour

List of Symbol and Units

%	percentage
°C	degree Celsius
µl	micro litres
µm	micrometer
cm	centimetres
cm^{-1}	per centimetre
cP	centipoises
db	dry basis
g	gram
g/g	gram per gram
g/ml	grams per millilitres
g/mol	gram per mol
h	hour
J/g	Joule per gram
kg	kilogram
kV	kilo volts
L/mol cm	litres per mole per centimetres
M	molar
mg/g	milligram per gram
mg/ml	milligram per millilitres
min	minutes
ml	millilitres
mm	millilitres
mm^{-1}	per millimetres
mol/l	moles per litre
n	flow behaviour index (dimensionless)
N/mm^2	Newton per millimetres square
nm	nanometre
rad/s	radian per second
rpm	rotation per minute
s	seconds

s^{-1}	per seconds
U/ml	units per millilitre
w/v	weight per volume
w/w	weight per weight
Δm	mass difference
Δp	pressure difference
Δt	time difference
ϵ	molar absorptivity
θ	theta
ω	angular frequency
k	consistency coefficient ($Pa.s^n$)
γ	shear rate (1/s)
σ	shear stress