Dedicated to

My Parents

(Late) Mr. Maibam Kameshor Singh
&
Mrs. Maibam Thambalngoubi Devi

DECLARATION BY THE CANDIDATE

The hereby declared that the thesis entitled "Development and Characterization of starch-polyphenol complex from gorgon nut (*Euryale ferox*) and its application" submitted to the School of Engineering, Tezpur University in partial fulfillment 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 Professor S.C. Deka.

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.

Maibam Baby Devi

Date: (Maibam Baby Devi)

Place: Tezpur Reg. No. TZ189839 of 2018

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CERTIFICATE OF THE SUPERVISOR

This is to certify that the thesis entitled "**Development and characterization of starch-polyphenol complex from gorgon nut (*Euryale ferox*) and its application"** submitted to the Department of Food Engineering and Technology, School of Engineering, Tezpur University in partial fulfillment for the award of the degree of Doctor of Philosophy in Tezpur University is a record of research carried out by Ms. Maibam Baby Devi under my supervision and guidance.

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

Date: (**Prof. Sankar Chandra Deka**)

Place:

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Tezpur

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List of abbreviations

2-NBDG	2-[N-(7-nitrobenz-2-oxa-1,3-diazol-4-yl) amino]-2-deoxy-D-glucose
AUC	Area under the hydrolysis curve
ABTS	2,2'-azino-bis 3-ethylbenzothiazoline-6-sulphonic acid
ANN	Artificial Neural Network
AOAC	Association of Official Analytical Chemists
ATCC	American type culture collection
AUC	Area under curve
DC	Decoction
DMSO	Dimethyl sulfoxide
DPPH	2,2-diphenyl-1-picrylhydrazyl
DPPIV	Dipeptidyl Peptidase-IV
EFKS	*Euryale ferox* kernel starch
EFSSE	*Euryale ferox* seed shell extract
FBS	Fetal Bovine Serum
FCR	Folin-Ciocalteau reagent
FRAP	Ferric reducing antioxidant power assay
FTIR	Fourier transform infrared spectroscopy
GAE	Gallic acid equivalent
HI	Hydrolysis index
HRLCMS	Higher Resolution Liquid Chromatography
IR	Infrared
k	Kinetic constant
MAE	Microwave assisted extraction
MC	Maceration
MFI	Mean fluorescence intensity
MS	Mass spectroscopy
MSE	Mean square error
MTT	3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium bromide)
NCCS	National Centre for Cell Science
NMR	Nuclear magnetic resonance

PCA	Principal component analysis
pGI	Predicted glycemic index
POM	Proportional Odd Modelling
PS	Pregelatinized *Euryale ferox* kernel starch
PSO	Particle Swarm Optimization
QE	Quercetin equivalent
RDS	Rapidly digestible starch
RMSE	Root means square error
RP-HPLC	Reverse Phase High Performance Liquid Chromatography
rpm	Rotation per minute
RS	Resistant starch
RPMI	Roswell Park Memorial Institute
RT	Retention time
RVA	Rapid Visco Analyzer
SD	Standard Deviation
SDS	Slowly digestible starch
SEM	Scanning Electron Microscopy
SISNN	Swarm Intelligence Supervised Neural Network
SSE	Sum of Square Error
t	Time
T2-DM	Type 2 Diabetes Mellitus
TFC	Total flavonoid content
TOF	TOF Time of flight
TPC	Total Phenolic Content
TPTZ	2,4,6-Tripyridyl-S-triazine
TS	Total starch
UAE	Ultrasound assisted extraction
UHPLC-PDA	UHPLC-PDA- Ultra-performance liquid chromatography coupled to photodiode array detection
UV-VIS	Ultraviolet-visible
XRD	X-ray diffraction

List of symbols

%	Percentage
/	Per
<	Lesser than
>	Greater than
℃	Degree celcius
µg	Microgram
µL	Microlitre
µm	Micrometre
µmol	Micromolar
A_B	Absorbance of the blank sample
$AlCl_3$	Aluminum chloride
a*	Redness
A_E	Absorbance of the plant extract
b*	Yellowness
cm	Centimetre
FeCl	Ferric chloride
FeSO4	Ferrous sulfate
g	Gram
h	Hour
H	Hydrogen atom
IC_{50}	Half maximal inhibitory concentration
L*	Lightness
m	Minute
m/z	Mass by charge
mAU	Milli absorbance unit
mg	Milligram
mm	Millimeter
mM	Millimolar
Nm	Nanometer
p	p-value
R^2	Correlation coefficient
s	Second

U	Unit
v	Volume
W	Watt
w	Weight
w/v	Weight by volume
w/w	Weight by weight
α	α Alpha
β	Beta
∞	Infinity
λ	Lambda
Δ	Delta
π	pi
δ	Delta
∑	Sigma
θ	Theta
H_2O	Water
HCOOH	Formic acid
Na_2CO_3	Sodium carbonate