

## DECLARATION

I, Asem Ibemhal Devi, bearing Ph.D Registration No. Ph.D/2167/12 Dated 26/09/2012, hereby declare that the thesis entitled “**IDENTIFICATION AND CHARACTERIZATION OF THE GENES RESPONSIBLE FOR SCENT AND PERICARP COLOR OF THE BLACK SCENTED RICE (*Oryza sativa* L.) OF MANIPUR**” submitted to Assam University, Silchar for the degree of Doctor of Philosophy (Ph. D) is the findings of my own research work carried out under the joint supervision of Prof. J. M. Laishram and Prof. P. B. Mazumder. The contents of the thesis presented here have not been previously submitted to any University/ Institute for any degree, diploma and associate fellowship whatsoever.

Date

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Place

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A. Ibemhal

(ASEM IBEMHAL DEVI)

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**Asem Ibemhal Devi**

*Dedicated to*  
*Prof. J. M. Laishram*  
*Grandmother*  
*Parents*  
*Brother*  
*Sister*

## LIST OF ABBREVIATIONS

%	Percentage
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	Ammonium sulfate
€	Extinction coefficient
1P	1-pyrroline
2AP	2-acetyl 1-pyrroline
A	Absorbance
AB-ald	4-aminobutyraldehyde
ANR	Anthocyanidin reductase
ANS	Anthocyanidin synthase
BAC	Bacterial artificial chromosome
BAD/ BADH	Betaine aldehyde dehydrogenase
BHA	Butylated hydroxyanisole
bHLH	Basic helix-loop-helix
BHT	Butylated hydroxytoluene
bp	Base pair
C3G/ Cy-3-glc	Cyanidin-3-glucoside
cDNA	Complementary DNA
cl	Chloride
CPU	Central processing unit
Ct	Cycle threshold
CTAB	Cetyltrimethylammonium
Cy	Cynidin
Cy-3-gal/C3G	Cyanidin 3-galactoside
DAD-ESI/MS	Diode array detection and electrospray ionization/mass spectrometry
DFR	Dihydroflavonol-4-reductase
DNA	Deoxyribonucleic acid
dNTP	Deoxynucleotide

Dp 3-ara	Delphinidin 3-arabinoside
Dp	Delphinidin
Dp-3-gal	Delphinidin 3-galactoside
DPPH	1,1-Diphenyl-2-picryl hydrazyl
DTT	Dithiothreitol
EST	Expressed sequence tag
F3H	Flavanone-3-hydroxylase
Fe	Iron
g	Gram
GABA	4-aminobutyric acid
GABald	$\gamma$ -aminobutyraldehyde
GAE	Gallic acid equivalent
GAPDH	Glyceraldehyde-3- phosphate dehydrogenase
GC-MS	Gas chromatography–mass spectrometry
GC-O	GC-olfactometry
GST	Glutathione-S-transferase
GT	Anthocyanidin glucosyltransferase
h	Hour
HCl	Hydrochloric acid
HDL	High-density lipoprotein
HPLC	High-performance liquid chromatography
kg	Kilogram
KCl	Potassium chloride
L	Litre
LAR	Leucoanthocyanidin reductase
LC-MS	Liquid chromatography mass spectrophotometry
LDL	Low density lipoprotein
NMR	Nuclear magnetic resonance
M	Molar

MeLo	Methyl linoleate
MeOH	Methanol
mg	Milligram
MgCl <sub>2</sub>	Magnesium chloride
ml	Milliliter
Min	Minute
MITE	Miniature interspersed transposable element
M	Molar
Mn	Manganese
mRNA	Messenger RNA
Mv	Malvidin
MW	Molecular weight
Na <sub>2</sub> CO <sub>3</sub>	Sodium carbonate
ng	Nanogram
nm	Nanometer
NMR	Nuclear magnetic resonance
OAVs	Odor activity values
°C	Degree Celsius
P	Phosphorous
PCR	Polymerase chain reaction
Pg	Pelargonidin
PGK	Phosphoglycerate kinase
pm	Picomol
Pn	Peonidin
Pn-3-glc	Peonidin 3- glucoside
Pt	Petunidin
PVP	Polyvinyl pyrrolidone
qRT-PCR	Real-time quantitative PCR
QTL	Quantitative trait loci

RAPD	Random amplified polymorphic DNA
RFLP	Restriction fragment length polymorphism
RNA	Ribonucleic acid
ROS	Reactive oxygen species
RPL	Ribosomal protein
rRNA	Ribosomal RNA
RT-PCR	Real-time PCR
rut	Rutinoside
sec	Second
SNP	Single nucleotide polymorphism
SOD	Superoxide dismutase
SSR	Short sequence repeat
STS	Sequence tagged site
TBA	Thiobarbituric acid
TPC	Total phenol content
Trolox	6-hydroxy 2,5,7,8-tetramethylchromane-2-carboxylic acid
UBQ	Ubiquitin
UV-Vis spectrophotometer	Ultra violet, visible spectrophotometer
v/v	Volume per volume
w/v	Weight per volume
Zn	Zinc
µg	Microgram
µl	Microlitre
µM	Micromolar

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