Ministry of Agriculture, Livestock and Irrigation
Department of Agriculture
Horticulture and Plant Biotechnology Division

Exploring Nutrition and Starch Paste Profiles of Myanmar's unique Indigenous Rice, Namathalay

မြန်မာ့အထင်ကရ ဒေသစပါးမျိုး(နမသလေး) ၏ အာဟာရတန်ဖိုးများနှင့် ကစီဓာတ်အရည်အသွေးများအား ဖော်ထုတ်ခြင်း

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Introduction

Indigenous Rice in Myanmar

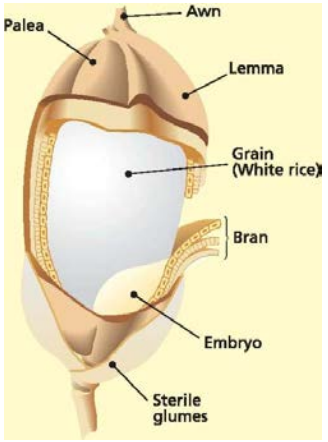
- **Indigenous rice** -traditionally grown for centuries, native to a certain area

- **Namathalay** - specialty rice cultivated in Myanmar for a long time
  -small grain, aromatic, good cooked kernel elongation and excellent eating quality
  -offer for the **King's feast**, in ancient time

- grow in some area of upper Sagaing region

(Min San Thein, 2017)

Nutritional values of Rice(Oryza sativa)



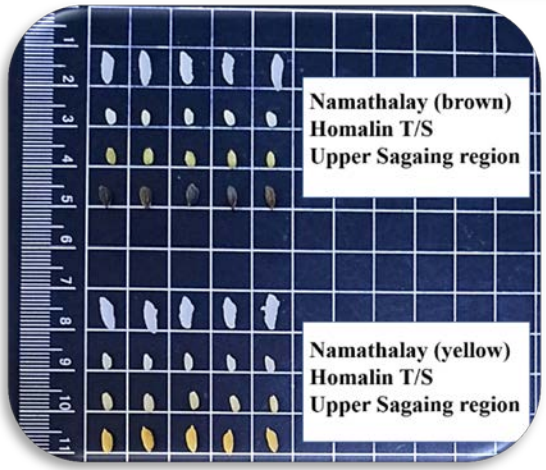
- chief food in Asia with plenty of nutrients
- readily available source of starch

- Brown rice(whole grain rice)
  - 3 layers: bran, embryo and endosperm
  - plentiful of fiber, minerals and micronutrients in bran layer
- White rice(milled rice)
  -some nutrients reduce because bran and embryo are eliminated during milling

- **Carbohydrate** - major component of rice, provide energy
- **Rice proteins** - help to reduce blood pressure and blood fats.
- **Fiber** - enhance gut health, manage weight
- **Iron** -major component of hemoglobin, a type of protein in red blood cells
- **Zinc** - enhance immune systems and maintaining good health

Significance of the Study

- Indigenous rice with quality variation can provide an opportunity to research area for rice varietal improvement
- Brown rice(whole grain rice), has attracted a lot of interest because of its possible health advantage
- Scientific report on their nutritional values and starch pasting properties still limited



Objectives

To examine the nutritional profiles of indigenous rice, Namathalay, both in the brown rice and white rice forms

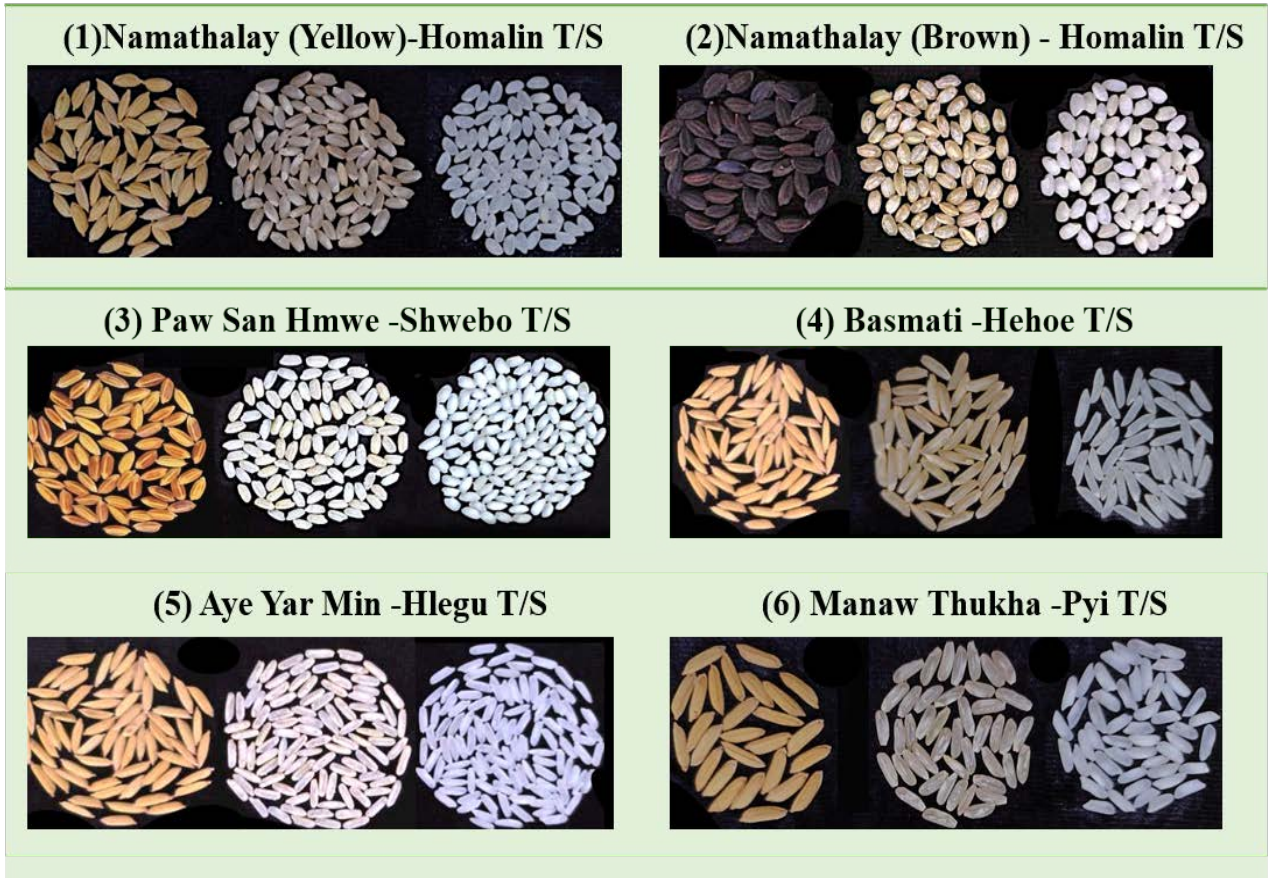
To characterize the quality and starch paste properties of Namathalay rice

To encourage health-conscious persons to consume the high-quality indigenous rice

Materials and Methods

Sample Collection

- **The (12) samples of Brown rice and White rice**



- Namathalay (Yellow)- Yellow husk, Translucent grain
- Namathalay (Brown)- Brown husk, opaque grain

➢ **Nutrition Parameters Analysis**

- Carbohydrate
- Protein
- Fiber (AOAC-2000) method(Association of Official Analytical Chemist)

- Iron and Zinc (Atomic Absorption Spectroscopy, AAS)

➢ **Determination of Amylose content(%)**-colorimetric method(Juliano et.al)

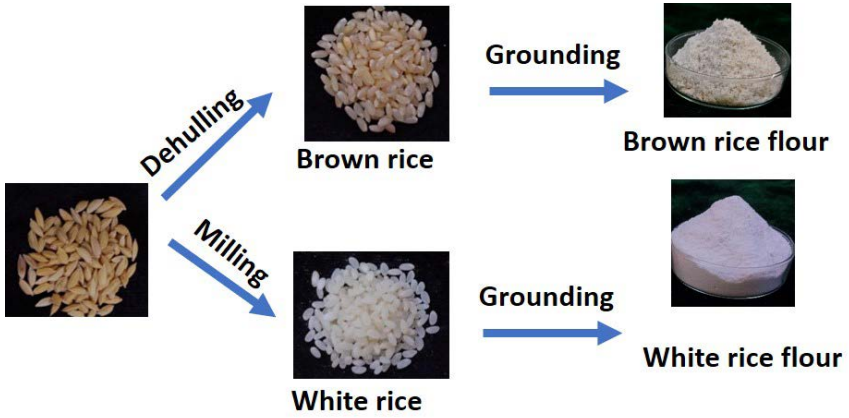
➢ **Starch pasting properties and viscosity**-Rapid visco analyzer(RVA) (Brabender ViscoQuick)

Statistical Analysis : SPSS version 25.0

❑ Experimental Site : Grain Quality and Nutrition Analysis Laboratory, Plant Biotechnology Centre, Yangon
: Department of Research and Innovation, Yangon

❑ Experimental Duration : August 2023 to December 2023

Sample Preparation and Determination



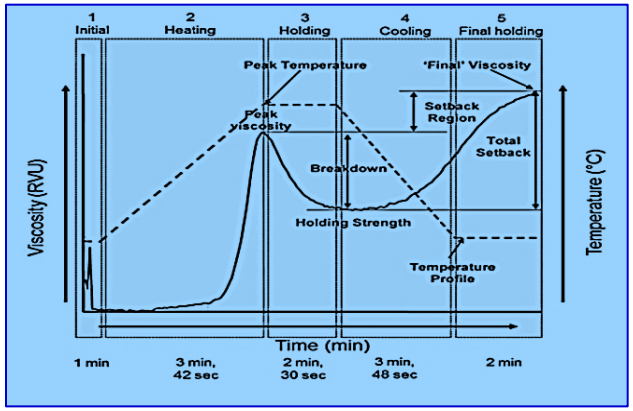
Determination of Amylose content(%)

-measured by UH 5300 UV-Vis spectrophotometer

Starch pasting properties and viscosity

Rapid visco analyzer(RVA) (Brabender ViscoQuick)

RVA analysis: Heating-Holding-Cooling Cycle



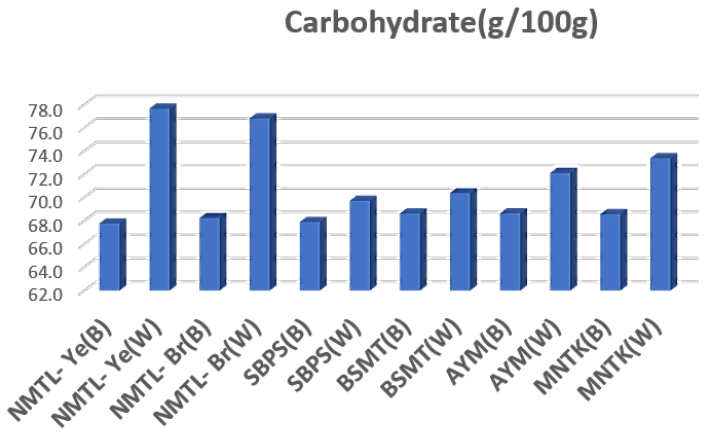
- Pasting temperature
- Peak temperature
- Peak viscosity (A)
- Hold viscosity (B)
- Breakdown viscosity (A-B)
- Final viscosity (C)
- Setback viscosity (C-B)

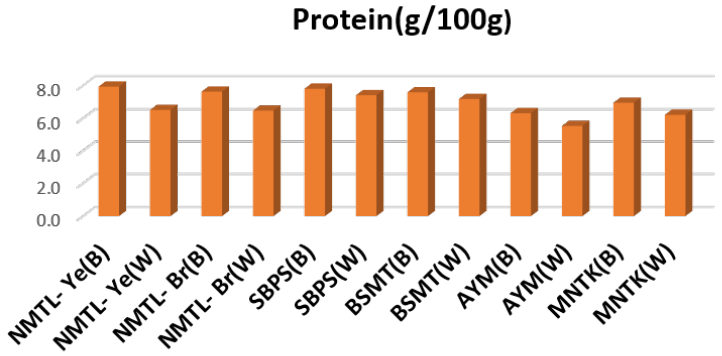
Method -ICC Standard No.169

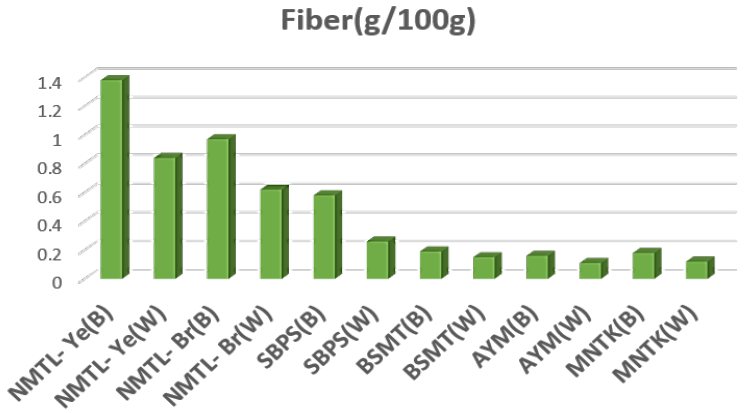
- **a cooking, stirring viscometer with ramped temperature and variable shear capability optimized for testing the viscous properties of starch**

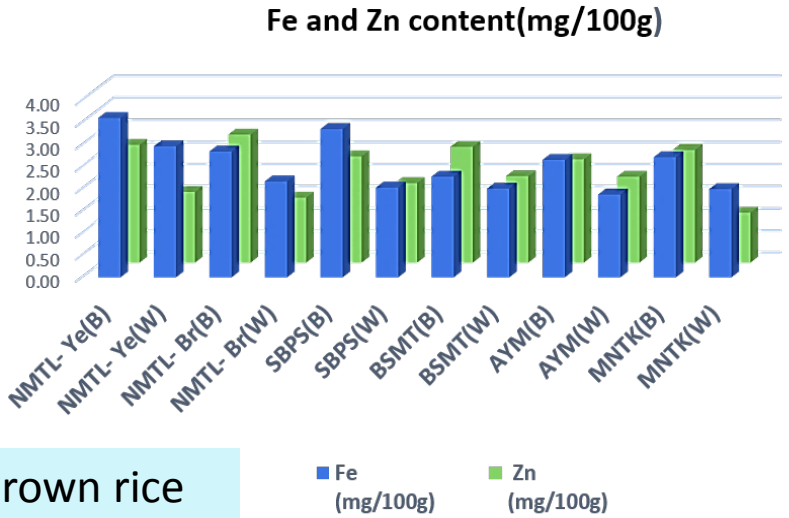
Results and Discussion

Nutritional Composition in brown and white forms of different rice varieties









- **Carbohydrate -** white rice >brown rice
- **Protein, Fiber -** brown rice > white rice
- **Iron, Zinc** - brown rice > white rice

Results and Discussion

Table-Nutritional profiles of different rice varieties (Brown rice)

Brown rice	Parameters				
	Carbohydrate (g/100g)	Protein (g/100g)	Fiber (g/100g)	Iron(Fe) (mg/100g)	Zinc(Zn) (mg/100g)
NMTL- Ye	67.77 d	7.94 a	1.38 a	3.60 a	2.66 b*
NMTL- Br	68.23 c	7.64 ab	0.97 b	2.84 c	2.90 a
SBPS	67.89 d	7.81 ab	0.58 c	3.35 b	2.40 d
BSMT	68.63 a	7.59 b	0.19 d	2.28 e	2.62 bc
AYM	68.64 a	6.32 c	0.16 d	2.66 d	2.34 d
MNTK	68.57 b	6.95 bc	0.18 d	2.72 d	2.55 c
P value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

* a-e: data bearing identical letter within each column are not significantly different (P < 0.05) by Tukey HSD Test

Namathalay(Yellow) and Namathalay(Brown) -Brown rice form

- high content in Protein, Fibre, Iron and Zinc

Results and Discussion

Table-Nutritional profiles of different rice varieties (White rice)

White rice	Parameters				
	Carbohydrate (g/100g)	Protein (g/100g)	Fiber (g/100g)	Iron(Fe) (mg/100g)	Zinc(Zn) (mg/100g)
NMTL- Ye	77.65 a	6.51 b	0.84 a	2.96 a	1.60 c*
NMTL- Br	76.81 b	6.47 b	0.62 b	2.17 b	1.47 d
SBPS	69.72 e	7.41 a	0.26 c	2.03 c	1.80 b
BSMT	70.38 e	7.18 a	0.15 d	2.01 c	1.96 a
AYM	72.11 d	5.54 c	0.11 d	1.87 d	1.94 a
MNTK	73.38 c	6.21 b	0.12 d	2.00 c	1.13 e
P value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

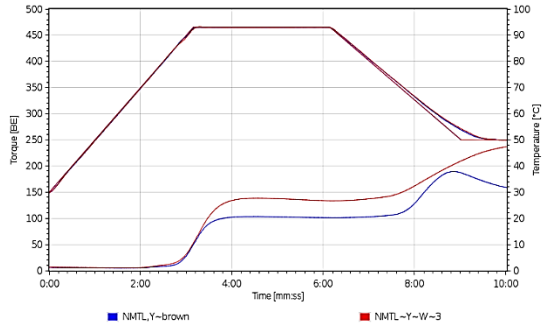
* a-e: data bearing identical letter within each column are not significantly different ($P < 0.05$) by Tukey HSD Test

Namathalay(Yellow) and Namathalay(Brown) -White rice form

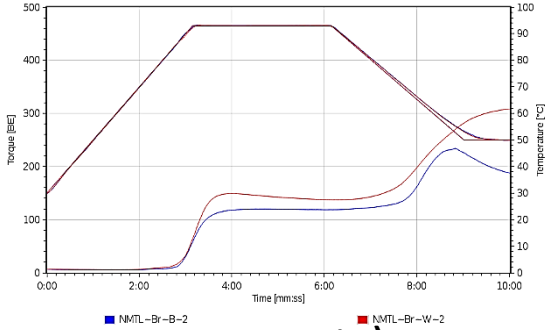
- high content in Carbohydrate, Protein, Fibre, Iron and Zinc

Results and Discussion

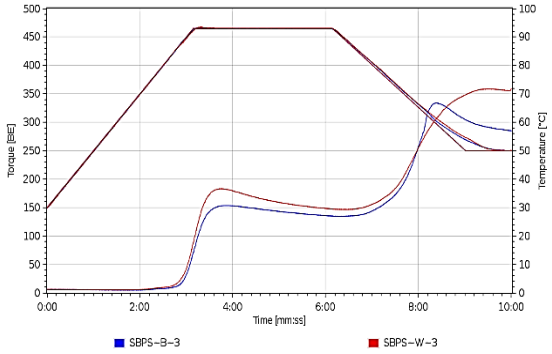
Characterization of Starch paste viscosity and properties by Rapid Visco Analyzer



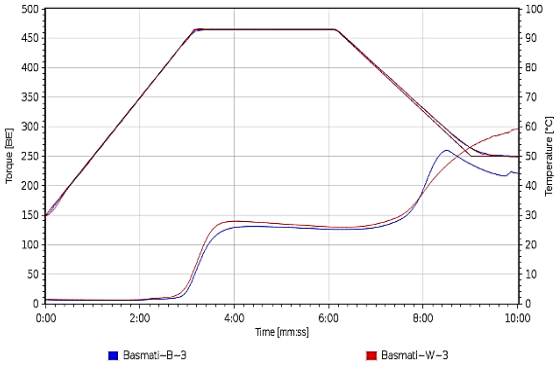
Namathalay(Ye)



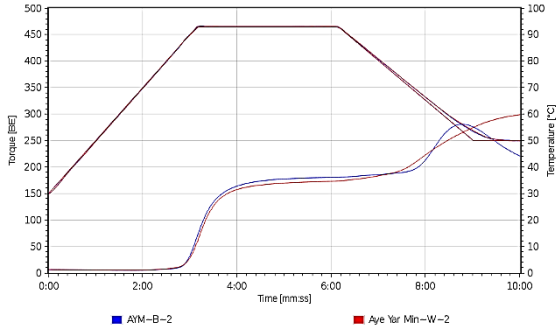
Namathalay(Br)



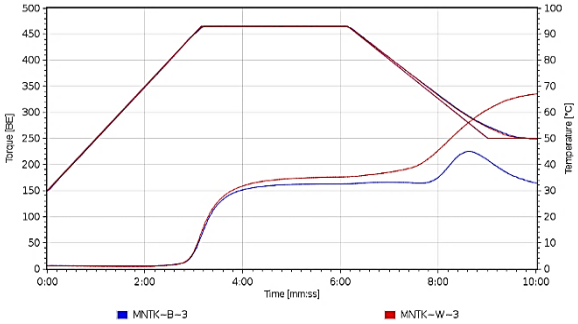
Paw San Hmwe



Basmati



Aye Yar Min



Manaw Thukha

Figure. Diverse RVA Profiles of different rice samples in Brown and white forms

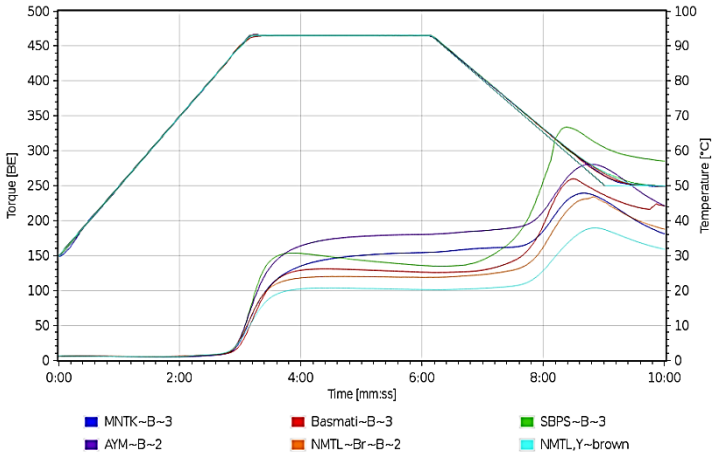
Brown rice

White rice

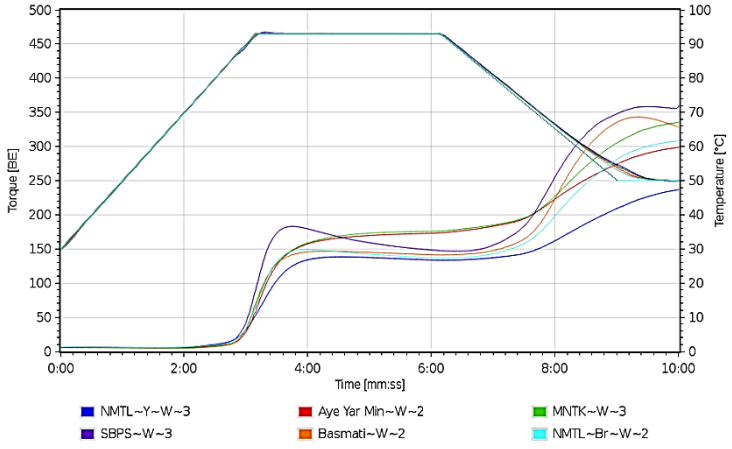
Results and Discussion

Characterization of Starch paste viscosity and properties by Rapid Visco Analyzer

Starch paste profiles of Brown rice and White rice samples



Brown rice	Amylose content (%)	Pasting temperature (°C)	Breakdown viscosity (BU)	Setback viscosity (BU)
Namathalay(Ye)	21	87.4	1.2	85.8
Namathalay(Br)	20	87.7	2.3	107
Paw San Hmwe	20	86.2	10.3	130.1
Basmati	21	87.9	5.1	111.1
Aye Yar Min	23	87.7	0	95.7
Manaw Thukha	24	87.7	0	74.8



White rice	Amylose content (%)	Pasting temperature (°C)	Breakdown viscosity (BU)	Setback viscosity (BU)
Namathalay(Ye)	23	85.5	5.1	95.8
Namathalay(Br)	22	86.3	11.8	144
Paw San Hmwe	22	85.7	35.6	200.6
Basmati	23	86.5	11.5	132.6
Aye Yar Min	26	87.7	0.1	100.7
Manaw Thukha	28	87.3	0	128.8

BU = Brabender unit (Viscosity)

Results and Discussion

Table-Nutritional profiles and Starch paste properties of Namathalay rice varieties

Name	Carbohydrate (g/100g)		Protein (g/100g)		Fiber (g/100g)		Iron (Fe) (mg/100g)		Zinc (Zn) (mg/100g)		Amylose content(%)		Breakdown Viscosity(BU)	
	Brown rice	White rice	Brown rice	White rice	Brown rice	White rice	Brown rice	White rice	Brown rice	White rice	Brown rice	White rice	Brown rice	White rice
Namathalay(Ye)	67.8	77.7	7.9	6.5	1.38	0.84	3.60	2.96	2.66	1.60	21	23	1.2	5.1
Namathalay(Br)	68.2	76.8	7.6	6.5	0.97	0.62	2.84	2.17	2.90	1.47	20	22	2.3	11.8
Paw San Hmwe	67.9	69.7	7.8	7.4	0.58	0.26	3.35	2.03	2.40	1.80	20	22	10.3	35.6
Basmati	68.6	70.4	7.6	7.2	0.19	0.15	2.28	2.01	2.62	1.96	21	23	5.1	11.5
Aye Yar Min	68.6	72.1	6.3	5.5	0.16	0.11	2.66	1.87	2.34	1.94	23	26	0	0.1
Manaw Thukha	68.6	73.4	7.0	6.2	0.18	0.12	2.72	2.00	2.55	1.13	24	28	0	0

Namathalay(Yellow) and Namathalay(Brown) rice

- Higher amount of carbohydrate, protein, fiber and mineral content than commercial rice varieties
- More fiber content in brown rice -better choice on a high fiber diet
- Intermediate Amylose content -consumer preference
- Low breakdown viscosity –starch resist to high temperature, good cooking property

Conclusion and Suggestion

- Myanmar indigenous rice, Namathalay, offer high nutritional values and suitable to consume as iron and zinc rich rice, found to be good cooking and eating quality rice
- Brown rice(bran, embryo and endosperm) has higher amount of fiber, protein and minerals than white form, which helps for weight management, diabetes control and other health advantages
- The information of this study can provide in promoting local production and consumption, supporting small-scale farmers and also the breeders
- Encouraging for sustainable use and the conservation of genetic resources
- Further research work on other Myanmar indigenous rice varieties

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Thank You

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