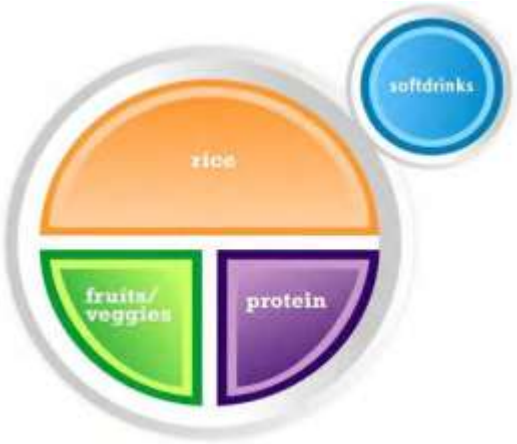
IR10M300: The First High Zn- Rice Recommended for Commercial Release in the Philippines

B. P. Mallikarjuna Swamy

29th National Rice R&D Conference
Sept 7-8, 2016
PhilRice, Munoz

Rice Science for a Better World

Importance of rice in the Filipino diet



Sl No	Food Item	Frequency per day	% Households	Av. Wt(g)
1	Rice	2.7	94.7	307
2	Sugar	1.3	81.1	12
3	Coconut oil	1.5	70.5	10
4	Coarse salt	1.0	64.9	3
5	Instant coffee	1.1	62.5	1

(Household level; NNS 2008)

On average, Filipinos eat around 4 ½ cups of rice a day

Saying in Philippines: ***If Filipinos have not taken rice means they have not taken food***

2013 National Year of RICE
SAPAT na BIGAS, KAYA na PINAS.

GOAL

- Help achieve rice self-sufficiency
- **Promote better health among rice consumers; and**
- Improve the income of farmers

July month was designated as Nutrition month for the purpose of creating greater awareness among Filipino people on the importance of Nutrition

IRRI

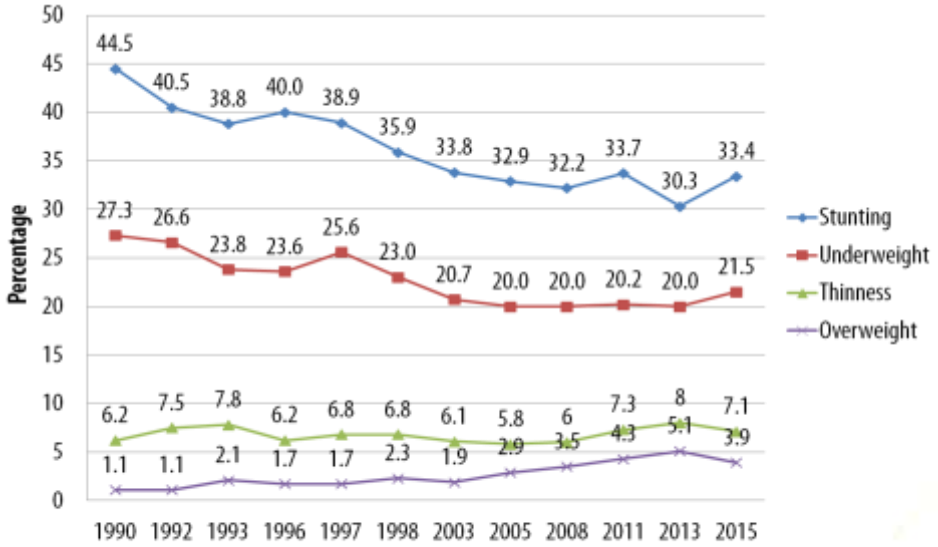
Serum Zinc levels of selected Filipino population

Zinc Status of Filipinos by Serum Zinc Level: 7th National Nutrition Survey, Philippine 2008

Conclusions: Zinc deficiency was considered of high magnitude (>20%) in all Filipino population groups, both in the national level (30%) and in different age/physiologic groups. The highest prevalence was noted among lactating women and those in the 1st six months of lactation. Males has higher deificency rates than females, except adults, 20-29 and 30-39 years

Zn status of Filipino population 8th NNS

- Infants and preschool children 21.6%
- Female adolescents 20.6%
- Elderly (60 years and older) 28.4%
  - » males 33.6%
  - » females 24.5%
- **Pregnant women 21 .5%**
- **Average among groups >20%**



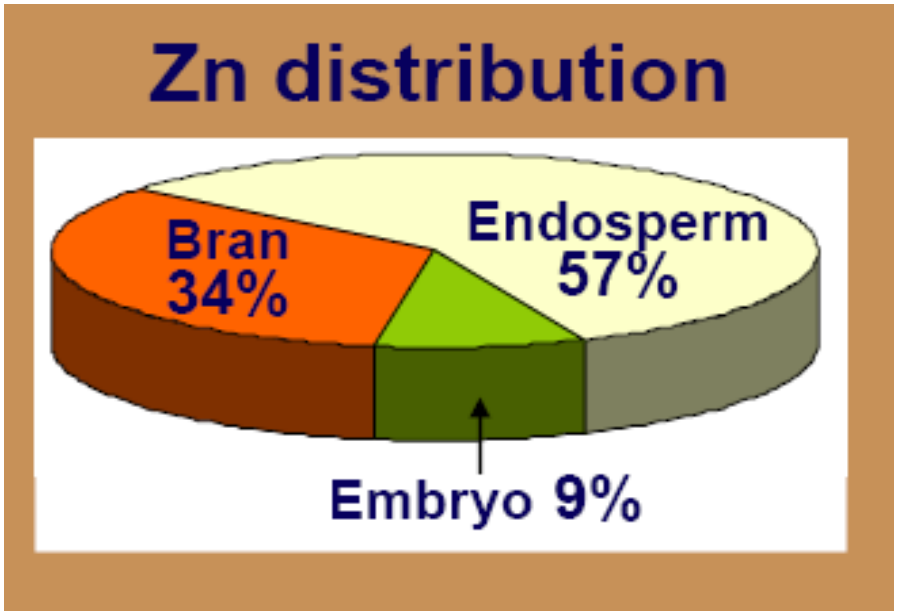
Prevalence of underweight, stunting, thinness & overweight: 0-59 months, based on WHO-CGS (Source: FNRI-NNS)

"Prevalence of Zinc Deficiency was generally of high…"

IRRI

Importance of rice biofortification

- Rice is the major staple food in the Philippines
- Supplies 30-50% of the daily caloric intake
- Polished rice is low in essential micronutrients
- So micronutrients enrichment is essential for the nutritional security



Distribution of Zinc in the rice grain

Zn Breeding Target

Basal level of Zinc: 12-16 ppm

Zinc target : + 6 to 12 ppm

Entries tested in NCT

Genotype
IR10M300
IR10M210
IR84749-R1L 47-1-1-1-1
IR84842-87-3-1-2-2
MS 13 (MC)
IR83317-54-1-2-3
IR84841-17-3-1-2
PR38732-B-B-1
PR38963 (Fe)-B-7-1
PSB Rc82 (YC)

Expt Details

Design – **RCBD**
No of entries – 18
Checks – 3
No. of Reps – 3
Spacing – 20cm x 20cm
No of rows per rep – 10
Plot Size – 2m x 5m
Number of Locations - 4/5

Performance of high Zn lines in NCT 2014WS

Genotype	PRRI		Negros		Batac		SCRC	
	YLD	Zn	YLD	Zn	YLD	Zn	YLD	Zn
IR10M210	4895.7	20.0	3542	-	4438.3	13.7	3399.3	16.7
IR10M300	4976.3	21.7	3869	-	4542.7	12.7	2706.7	18.7
IR84749-R1L 47-1-1-1-1	3315.3	19.7	3656	-	4286.3	12.0	3302.7	17.0
IR84842-87-3-1-2-2	2150.0	27.0	3092	-	2048.0	10.6	3074.7	16.7
MS 13	3502.3	20.0	4105	-	4065.7	12.9	2340.0	18.7
IR83317-54-1-2-3	2230.3	26.3	3598	-	587.3	12.3	3368.0	16.3
IR84841-17-3-1-2	4034.3	22.3	3436	-	3650.0	11.3	3102.3	17.0
PR38732-B-B-1	2840.7	18.0	4136	-	4317.7	8.9	2876.0	17.7
PR38963 (Fe)-B-7-1	5225.0	15.0	3021	-	4850.0	9.7	3650.7	13.0
PSB Rc82	5550.7	15.3	4161	-	4587.0	9.9	3431.0	13.0
Mean	3872.1	20.5	3661.7	-	3737.3	11.4	3125.1	16.5
CV	9.9	5.1	16.8	-	9.4	11.2	11.9	4.9
LSD 1%	899.1	2.7	1444.2	-	829.3	3.0	872.2	1.9
LSD 5%	656.2	1.8	1054.1	-	605.3	2.2	636.6	1.4
Pr (> F)	0.0001	0.0001	0.2843	-	0.0001	0.003	0.0136	0.0001

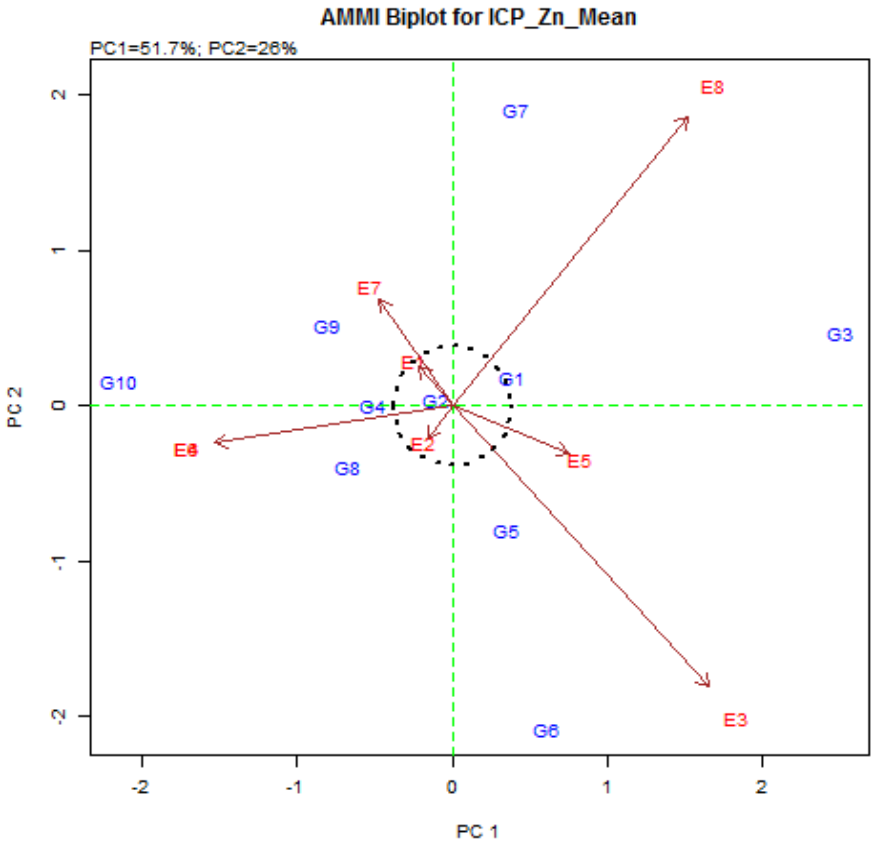
Performance of high Zn lines in NCT 2015DS

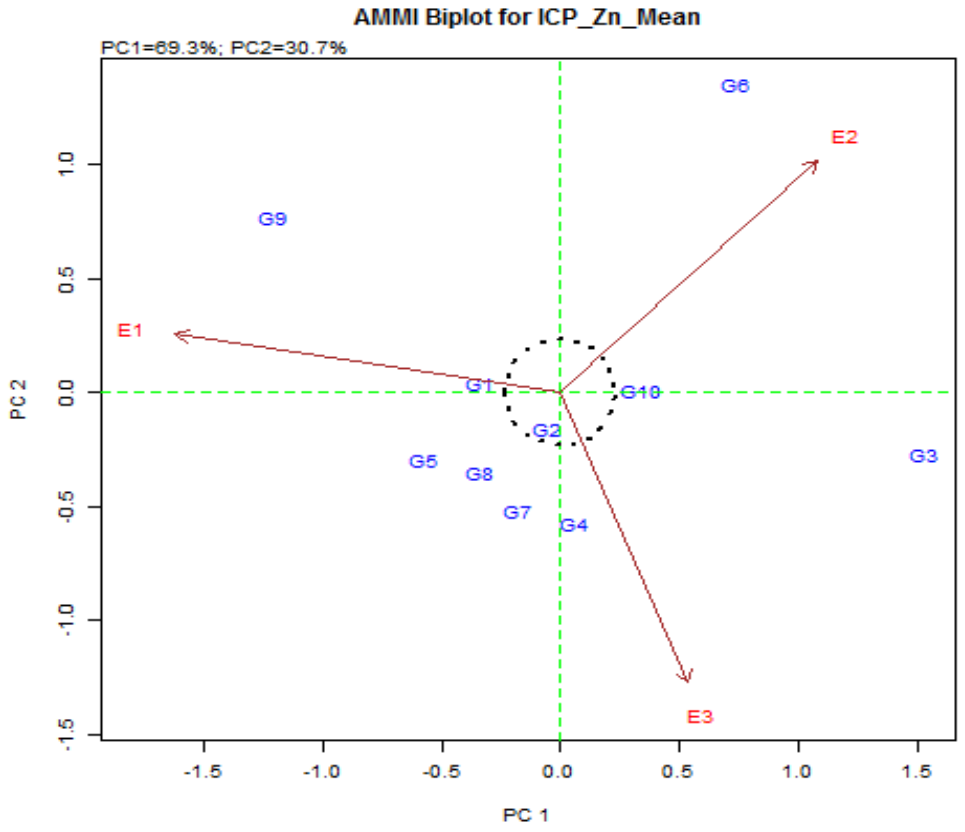
Genotype	PRRI		Negros		UPLB*		SCRC		Batac	
	YLD	Zn	YLD	Zn	YLD	Zn	YLD	Zn	YLD	Zn
IR10M210	5265.1	19.7	1861.0	21.5	2135.7	24.6	4715.7	21.5	4130.3	22.2
IR10M300	5758.4	20.8	2448.7	26.6	1409.7	22.8	5482.7	21.2	4182.3	21.3
IR84749-R1L 47-1-1-1-1	5344.9	20.3	2149.0	24.3	2821.7	23.9	3954.3	22.9	4183.3	18.8
IR84842-87-3-1-2-2	3456.8	19.1	1411.7	23.2	693.3	21.8	4082.7	24.0	2490.7	19.3
MS 13	4650.9	22.9	2325.0	32.7	2670.0	27.4	2930.3	22.8	3949.3	19.6
IR83317-54-1-2-3	2766.7	20.7	1434.0	34.5	1468.3	25.0	2774.7	29.3	1443.7	15.8
IR84841-17-3-1-2	4325.5	21.8	2430.3	25.0	2019.3	23.8	5460.3	21.3	4031.7	19.7
PR38732-B-B-1	4007.2	18.4	929.3	25.2	1109.7	21.7	3983.0	20.1	4213.3	16.1
PR38963 (Fe)-B-7-1	6055.2	16.3	1745.7	22.8	2949.0	18.3	6757.0	16.6	4744.0	16.1
PSB Rc82	6205.1	15.9	1460.3	21.2	2971.3	18.4	7192.0	16.3	4354.0	18.5
Mean	4783.6	19.6	1819.5	26.0	2024.8	22.8	4733.3	21.6	3772.3	18.7
CV	18.8	6.2	19.3	10.9	40.1	5.4	13.2	5.8	16.1	6.2
LSD 1%	2112.0	2.8	823.5	6.9	1906.3	2.9	1466.6	3.0	1430.9	2.7
LSD 5%	1541.5	2.1	601.1	5.0	1391.4	2.1	1070.5	2.2	1044.4	2.0
Pr (> F)	0.0021	0.0001	0.0004	0.0007	0.019	0.0001	0.0001	0.0001	0.0001	0.0001

Performance of high Zn lines in NCT 2015WS

Genotype	PRRI		Negros		UPLB		SCRC	
	YLD	Zn	YLD	Zn	YLD	Zn	YLD	Zn
IR10M210	4895.7	20.0	3542	-	4438.3	13.7	3399.3	16.7
IR10M300	8735.0	19.0	3287.0	20.8	4276.3	19.7	6018.3	18.0
IR84749-R1L 47-1-1-1-1	9084.3	17.7	3842.0	23.6	3908.7	19.3	4147.7	16.7
IR84842-87-3-1-2-2	3828.7	27.0	2381.0	22.7	2770.3	23.3	5336.7	22.3
MS 13	6758.7	17.7	4072.7	20.4	2699.7	19.3	4692.3	17.3
IR83317-54-1-2-3	4655.7	24.7	2945.7	23.9	3050.3	24.7	5504.3	19.0
IR84841-17-3-1-2	10557.0	13.7	3710.0	17.5	4161.0	15.0	1831.3	14.3
PR38732-B-B-1	7222.7	14.7	2511.7	18.4	2735.3	16.0	4348.7	14.7
PR38963 (Fe)-B-7-1	10206.7	13.3	4906.3	17.5	4211.7	12.3	4940.7	15.0
PSB Rc82	8688.3	15.3	3592.3	18.4	3968.0	15.3	7284.7	13.0
Mean	7765.3	18.2	3403.1	20.2	3497.5	18.5	4793.4	16.9
CV	7.7	6.2	20.0	5.8	13.4	8.0	11.4	9.2
LSD 1%	1413.9	2.7	1597.1	2.8	1103.2	3.5	1288.0	3.7
LSD 5%	1032.0	1.9	1165.7	2.0	805.2	2.5	940.1	2.7
Pr (> F)	0.0001	0.0001	0.0063	0.0001	0.0006	0.0001	0.0001	0.0001

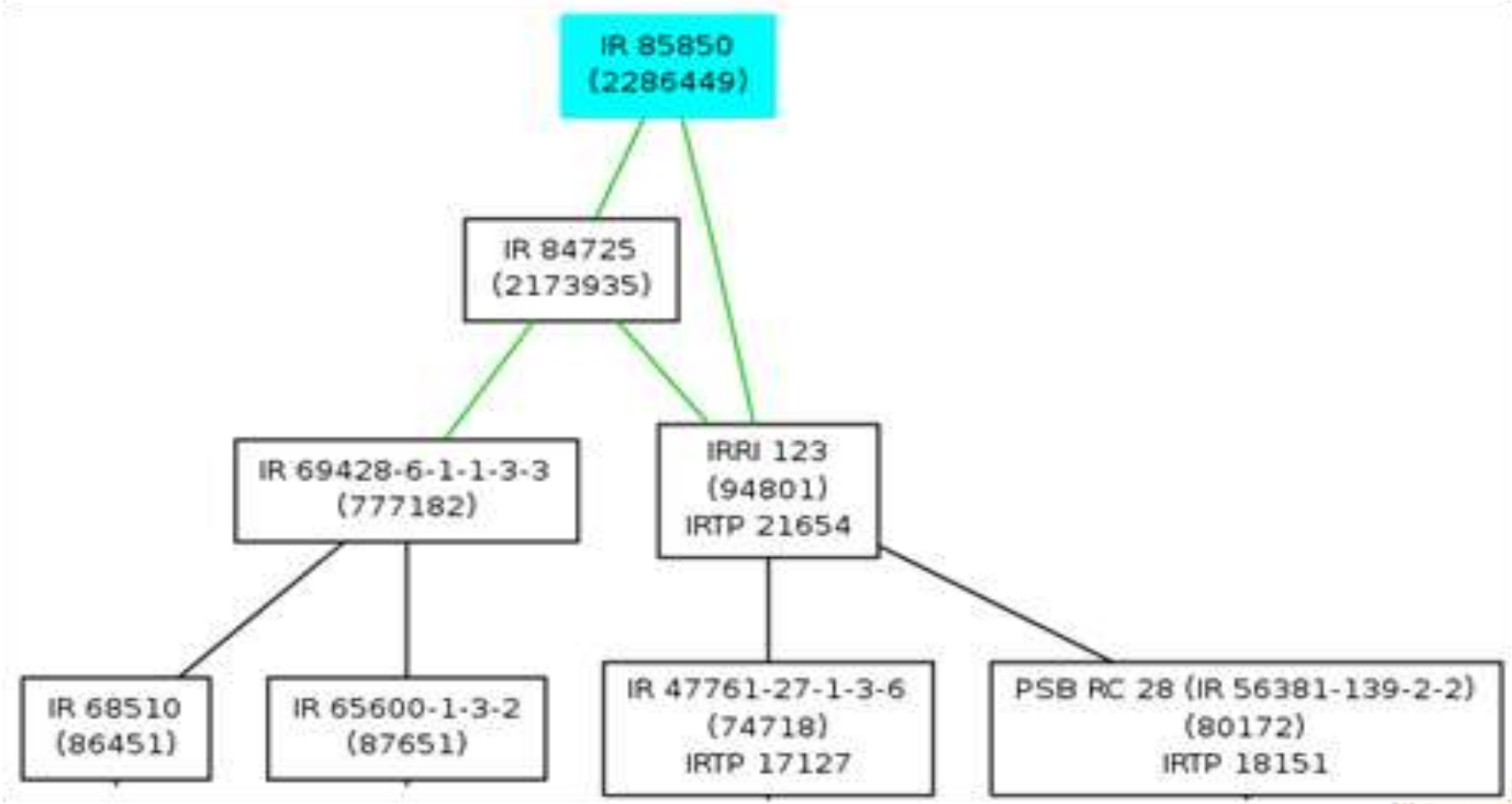
AMMI Biplot for grain Zn in 2014WS and 2015DS





G2: IR10M300

Pedigree of IR10M300



Agronomic performance of IR10M300 at IRRI

Genotype	2012WS		2013DS		2013WS		2014DS		2015DS		2015WS		2016DS		Av	Av
	DTF	YLD	DTF	YLD	DTF	YLD	DTF	YLD	DTF	YLD	DTF	YLD	DTF	YLD	DTF	YLD
IR 68144-2B-2-2-3-1-166	87	3396	87	3243	82	3355	84	4068	88	4630	85	2474	85	3794	85	3566
IR 68144-2B-2-2-3-1-127	87	4137	92	4058	80	4255	77	2304	89	6397	79	4141	84	5357	84	4378
IR 68144-2B-2-2-3-1-120	85	3509	93	3699	81	3986	85	6159	-	-	-	-	-	-	86	4388
IR 69428-6-1-1-3-3	92	878	103	5968	92	1085	-	-	-	-	-	-	-	-	96	2644
IR10M300	95	5278	95	4889	86	3910	91	6981	101	6520	107	4445	87	5774	95	5400
NSICRc 238	94	5760	96	6142	92	4232	91	7009	97	6820	90	3932	85	5256	92	5593
PSBRc 82	97	5543	95	5034	93	4653	85	7807	92	6913	107	3105	80	5965	93	5574

Grain quality traits of IR10M300

Entry	Milling Potential			Physical Attributes				Physicochemical Properties			
	BR(%)	MR(%)	HR(%)	Chalk (%)	IM (%)	GL	GS	CP(%)	AC (%)	GT	HD
IR10M300	78.6	72.0	58.1	14.6	4.9	7.2	3.2	7.6	18.3	3.0	1.6
MS13	78.0	72.4	56.9	21.2	3.5	5.6	2.51	8.6	17.3	3.1	1.6
Rc82	78.9	73.7	59.4	18.0	3.9	6.9	3.1	8.0	17.7	3.5	1.6

Cooking quality and sensory traits of IR10M300

Entries	Rating		Sensory Description	
	Raw	Cooked	Raw	Cooked
IR10M300	93.3	90	no aroma, no off-odor, slightly grayish, dull, 41-60% white belly, hard	no aroma, no off-odor, slightly grayish, glossy, cohesive, tender, smooth, bland, no off-taste
MS13	87.5	98.3	no aroma, no off-odor, white, dull, 41-60% chalky, slightly hard	no aroma, no off-odor, white, glossy, cohesive, tender, smooth, bland, no off-taste
Rc82	96.7	96.7	no aroma, no off-odor, slightly white, slightly glossy, 81-100% white belly, hard	no aroma, no off-odor, white, glossy, cohesive, tender, smooth, bland, no off-taste

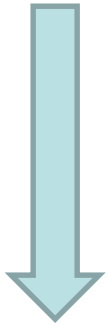
Disease reaction of IR10M300

Entry	Diseases	Locations							
		CES	MS	ISB	UPLB	VSU	VIARC	BIARC	Mean
IR10M300	BL	I	R	I	I			I	I
	BLB	S	I		I	I	S		I
	SB	S	S		I	I	I		I-S
	T(I)	S			S				S
	T(M)	S		S					S
MS13	BL	S	I	I	I		I		I
	BLB	S	S		I	S	I		I-S
	SB	S	S		S	I	I		S
	T(I)	S			S				S
	T(M)		S					I	S
Rc82	BL	S	I	I	I			S	I
	BLB	I	R		I	I	I		I
	SB	S	S		S	S	I		I-S
	T(I)	S			S				S
	T(M)		S					I	S

High Zn rice line IR10M300

IRRI

“ Food is the moral right of all who are born into this world.” - Norman Borlaug



“Nutritious food is the moral right of all who are born into this world.”

Acknowledgement

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IRRI Zinc Breeding Team

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Physicochemical Properties, Proximate Composition, & Antioxidant Activities of Popular Traditional Rice Varieties in the Philippines

Gerome A. Corpuz, Henry F. Mamucod, Henry M. Corpuz, Allen Jun P. Anies, and Marissa V. Romero
Rice Chemistry and Food Science Division
Philippine Rice Research Institute

29th National Rice R&D Conference
September 7, 2016

Traditional Varieties

- Broad genetic base
- Includes pigmented and aromatic rices
- Possess excellent cooking and eating quality
- High health-promoting properties such as antioxidant activity
- High market value and potential for export

REPUBLIC OF THE PHILIPPINES

Department of Agriculture

(KAGAWARAN NG PAGSASAKA)

PHL exports 400 MT premium rice

Created on Tuesday, 12 August 2014

The Department of Agriculture said today that for the first time in 30 years, the Philippines has been able to export high quality rice.

Agriculture Secretary Proceso Alcala said that the country has already exceeded earlier projections on the volume of premium rice the country can export.

"Ang amin pong naunang projection ay ang maka-export ng 100 metric tons of premium rice, but we have already exported 400 metric tons of premium rice—red rice, black rice and organic rice—and the year is not yet over," Alcala said.

The secretary said that in the event we hit rice self-sufficiency and there is already adequate buffer stock, rice farmers will be encouraged to cultivate more premium rice for export.

According to Alcala, Hong Kong and Singapore have large requirements for premium rice but they don't have any production.

The Manila Times

PH exports 400 MT of high-quality rice

August 8, 2014 9:28 pm
by JAMES KONSTANTIN GALVEZ REPORTER

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The Philippines has exported more than 400 metric tons of high-quality rice to date, the Department of Agriculture (DA) reported on Friday.

Agriculture Secretary Proceso Alcala said that Manila's premium rice exports—including red, black and organic rice – have already exceeded the 100 MT target for this year, with additional shipments now underway.

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DA to export Iloilo's aromatic white rice

June 2, 2013 | Filed under: Agriculture | Posted by: Montesa Grifio Casyonan

Iloilo is now producing an aromatic white rice variety to export market this year.

Department of Agriculture 6 (DA-6) director Larry Nacionales said Iloilo and other provinces in Western Visayas are now producing this variety from 20 hectares rice land.

Nacionales said this rice variety was taken originally from India but later developed by the Philippine Rice Research Institute (PhilRice) and Region 6 is one of the beneficiaries of this research.

The director added the one sack of rice which was given to them was planted in three-hectare land owned by Western Visayas Integrated Agricultural Research Center (Westviarch) in Sitio Hamungaya, Brgy. Buntatala, Jaro, Iloilo City.

Nacionales stressed the variety was later distributed to other farmer beneficiaries particularly in town of Calinog, Iloilo for reproduction purposes.

EMIRATES 24|7 News

Philippines to export fancy rice to Dubai, HK

Next shipment is 50 metric tonnes to US by Q3

By Correspondent
Published Wednesday, April 10, 2013

The Philippines is exporting 50 metric tonnes (mt) of fancy rice to Dubai and Hong Kong within this month, and another 50 mt to the US between July and August, with a total value of $100,000.

This is part of the government's strategic plan to use fancy rice as one of the tools for global trading, as it is in fancy rice that the Philippines can compete with the world's biggest rice producers, Thailand and Vietnam.

"It will be a progressive programme to export fancy rice where we can be competitive," Department of Agriculture (DA) Secretary Proceso Alcala said in a 'Manila Bulletin' article recently.

Profiling and Seed Multiplication/Purification of Selected Traditional Rice Varieties

Component Projects

1. DNA Fingerprinting, Agro-Morphological Characterization, and Disease and Pest Reaction Profiling *(LM Perez/TL Mananghaya)*
2. DNA Sequencing of Grain Quality Genes *(DA Tabanao/RA Millas)*
3. **Grain Quality Profiling, and Evaluation of Nutritional Value and Health-Promoting Properties *(MV Romero)***
4. Seed Multiplication/Production *(RB Miranda)*

Objectives

- To characterize selected popular traditional rice varieties in the Philippines
  - Physicochemical Properties
  - Proximate Composition
  - Antioxidant Activities
- To evaluate the effect of polishing in physicochemical properties, proximate composition and antioxidant activity of traditional rice varieties.

Methodology

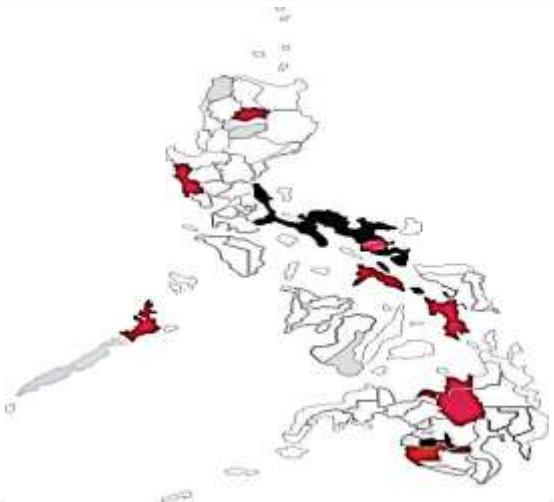
Popular Traditional Rice Varieties in the Philippines

Collection of TRV in Different Provinces of the Philippines

Variety	Source
Kutibos	Negros Oriental
Azucena	Negros Oriental
3 Buwan	Negros Oriental
Milagrosa	Palawan
Tipak	Palawan
Mating	Palawan
Gobyerno	Mountain Province
Pinili	Mountain Province
75 days	Ilocos Norte
Tomindog	Negros Oriental
Dinorado White	Maguindanao

Variety	Source
Monos	Leyte
Makarato	Leyte
Baysilanon L	Leyte
Bulawanon	Leyte
Red Blondie (M)	Masbate
Inumay 1	Maguindanao
Denorado	Negros Oriental
Duryat	Palawan
Kanting	Kalinga
Binundok	Zambales
Kalibo	Zambales
Dumudao	Bukidnon
Dinorado	Palawan
Maria Gakit	Misamis Oriental
Bulaw	Albay

Variety	Source
Pirurutong	Quezon
Black Rice A	Albay
Black Rice M	Masbate
Kanukot	Leyte
Pilit	Maguindanao
Ismagol	Maguindanao
Black Rice	Bukidnon
Tapol	Bukidnon
Rautong	Camarines Norte



Processing of Rice Samples

Unpolished

Polished

Physicochemical Properties

Proximate Properties

Phytochemical Analysis

Popular Traditional Rice Varieties in the Philippines

Physicochemical Properties

Amylose content

-the key determinant of rice eating quality

Gelatinization Temperature

-predicts the cooking time of rice

High Gelatinization
No Dispersion
(alkali value=2)

Intermediate Gelatinization
Moderate Dispersion
(alkali value=4)

Low Gelatinization
Almost Complete Dispersion
(alkali value=6)

Proximate Composition

Crude Protein

Crude Fiber

Crude Fat

Popular Traditional Rice Varieties in the Philippines

Phytochemical Analysis

Total Anthocyanin Content

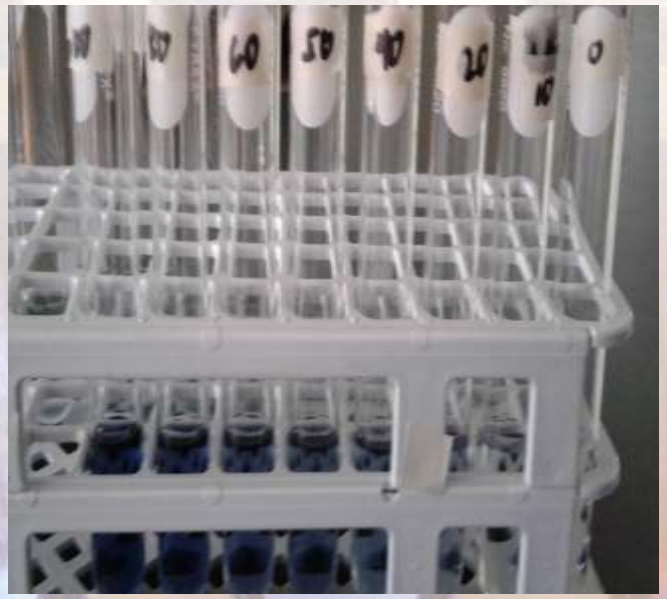
-spectrophotometric method

Total Phenolic Content

-Folin-ciocalteu method

Antioxidant Activity

-DPPH scavenging assay



Results

Physicochemical Properties

Amylose content

Variety	Amylose (%) (Classification)
Kutibos	21.16(I)
Azucena	21.19(I)
3 Buwan	20.85(I)
Milagrosa	20.07(I)
Tipak	19.39(I)
Mating	19.26(I)
Gobyerno	21.24(I)
Pinili	21.67(I)
75 days	20.77(I)
Tomindog	19.72(I)
Dinorado White	5.79(VL)

Variety	Amylose (%) (Classification)
Denorado	18.62(I)
Duryat	19.42(I)
Kanting	20.04(I)
Binundok	23.34(I)
Kalibo	21.13(I)
Dumudao	19.90(I)
Dinorado	19.46(I)
Maria Gakit	22.03(I)
Bulaw	20.49(I)
Monos	21.54(I)
Makarato	22.99(I)
Baysilanon L	20.67(I)
Bulawanon	22.59(I)
Red Blondie	19.65(I)
Inumay 1	22.00(I)

Variety	Amylose (%) (Classification)
Pirurutong	8.43(VL)
Black Rice A	19.64(I)
Black Rice M	20.70(I)
Kanukot	3.92(VL)
Pilit	13.86(L)
Ismagol	20.80(I)
Black Rice	21.02(I)
Tapol	3.42(VL)
Rautong	19.98(I)

Physicochemical Properties

Gelatinization Temperature

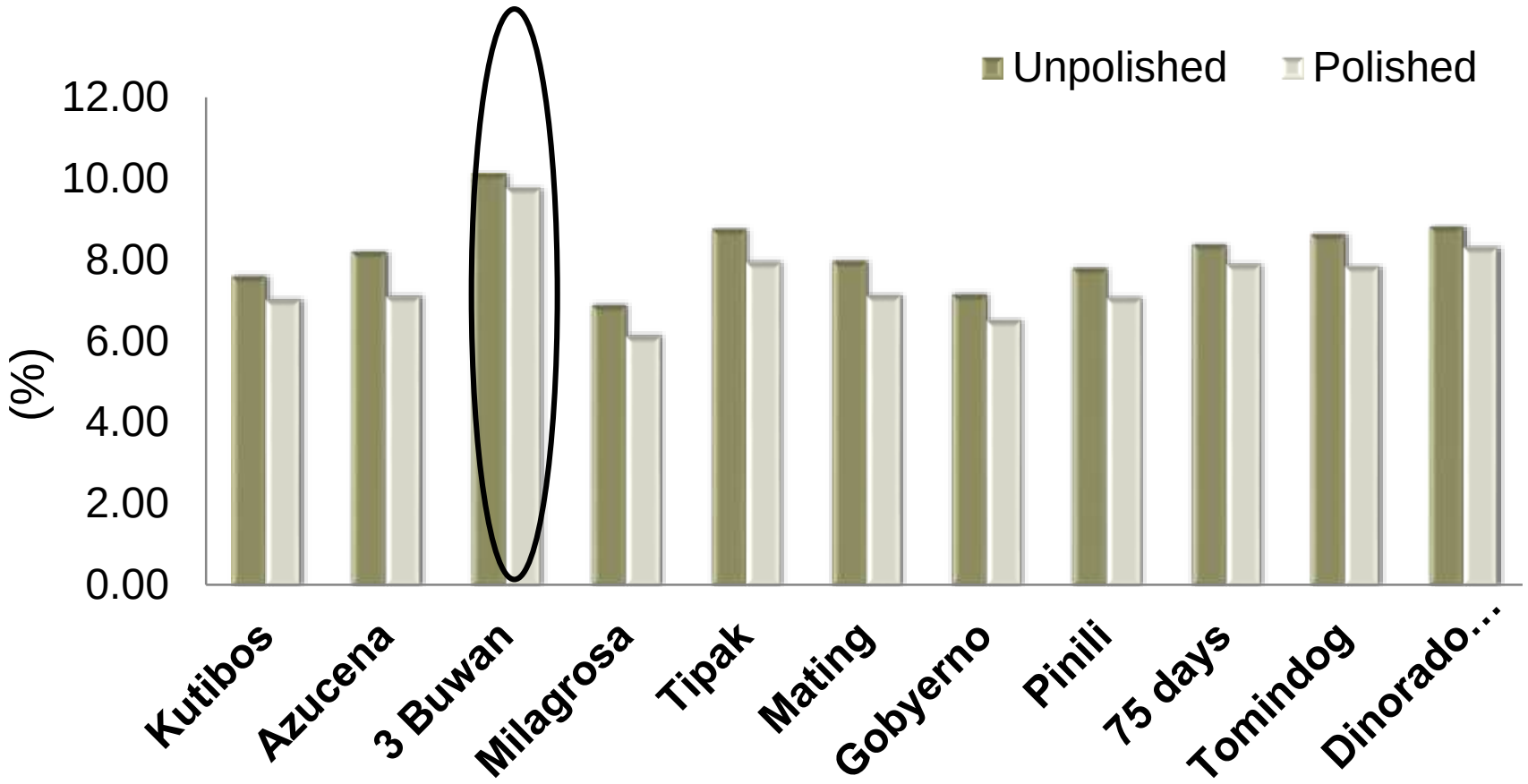
Variety	GT (ASV)	
Kutibos	2.22	HI/I/H
Azucena	4.56	I/HI
3 Buwan	5.00	I
Milagrosa	4.00	I/HI
Tipak	4.78	I/HI
Mating	4.61	I/HI
Gobyerno	4.00	HI/I
Pinili	3.89	HI/I
75 days	4.06	I/HI
Tomindog	4.50	I/HI
Dinorado White	5.11	I/L

Variety	GT (ASV)	
Monos	3.78	I/HI
Makarato	4.06	I/HI/H
Baysilanon L	3.44	HI/I/H
Bulawanon	4.17	I/HI
Red Blondie (M)	5.00	I
Inumay 1	4.94	I
Denorado	4.56	I/HI
Duryat	4.83	I/HI
Kanting	4.89	I/HI
Binundok	4.00	I/HI
Kalibo	3.33	HI/I
Dumudao	4.44	I/HI
Dinorado	3.17	HI/I
Maria Gakit	5.33	I/L
Bulaw	3.50	I/HI/H

Variety	GT (ASV)	
Pirurutong	3.39	HI/I
Black Rice A	4.11	I/HI
Black Rice M	3.67	HI/I
Kanukot	3.78	I/HI
Pilit	3.89	HI/I
Ismagol	4.78	I
Black Rice	3.33	HI/I
Tapol	3.00	HI
Rautong	3.06	I/HI/H

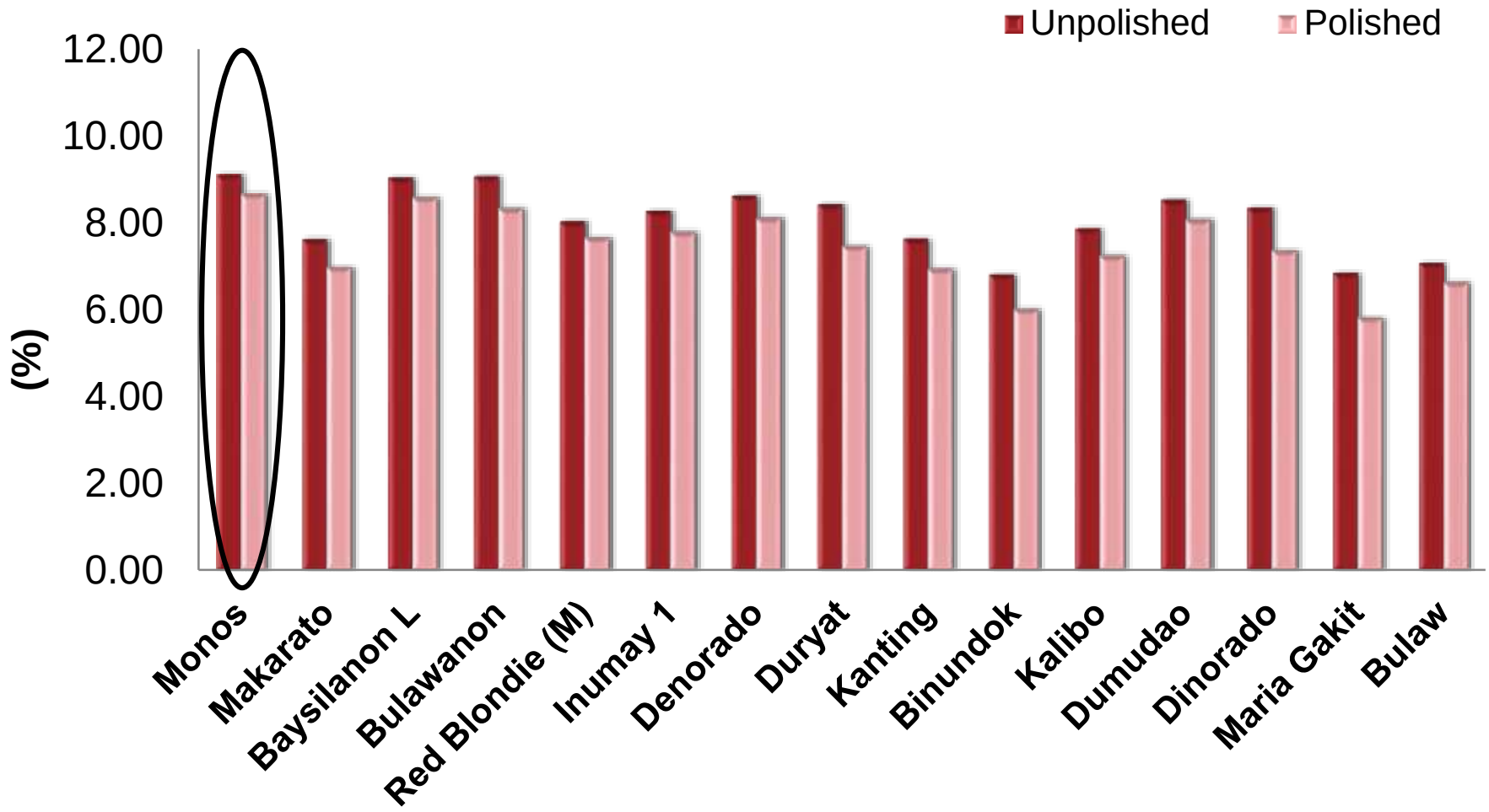
Proximate Composition

Crude Protein



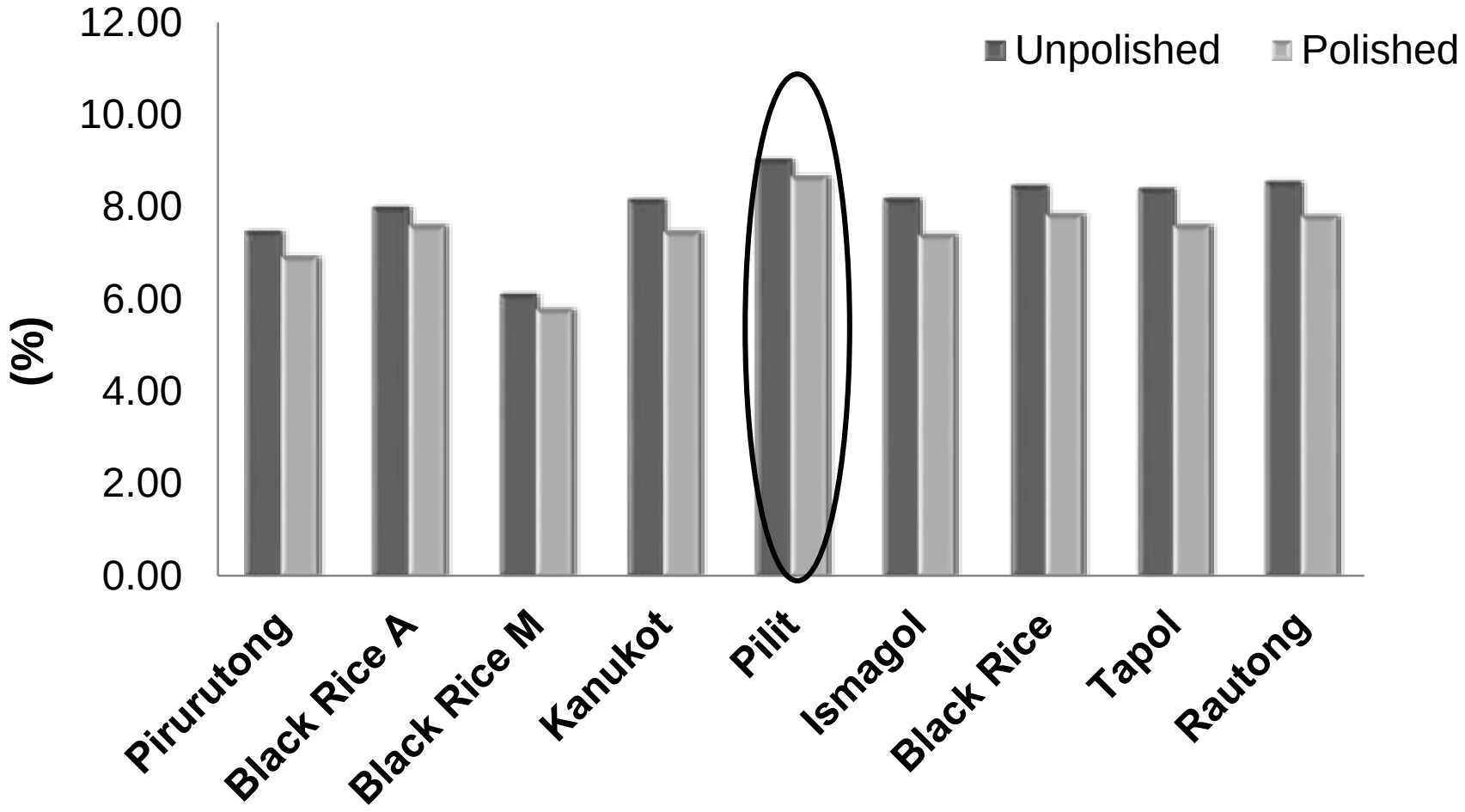
Proximate Composition

Crude Protein



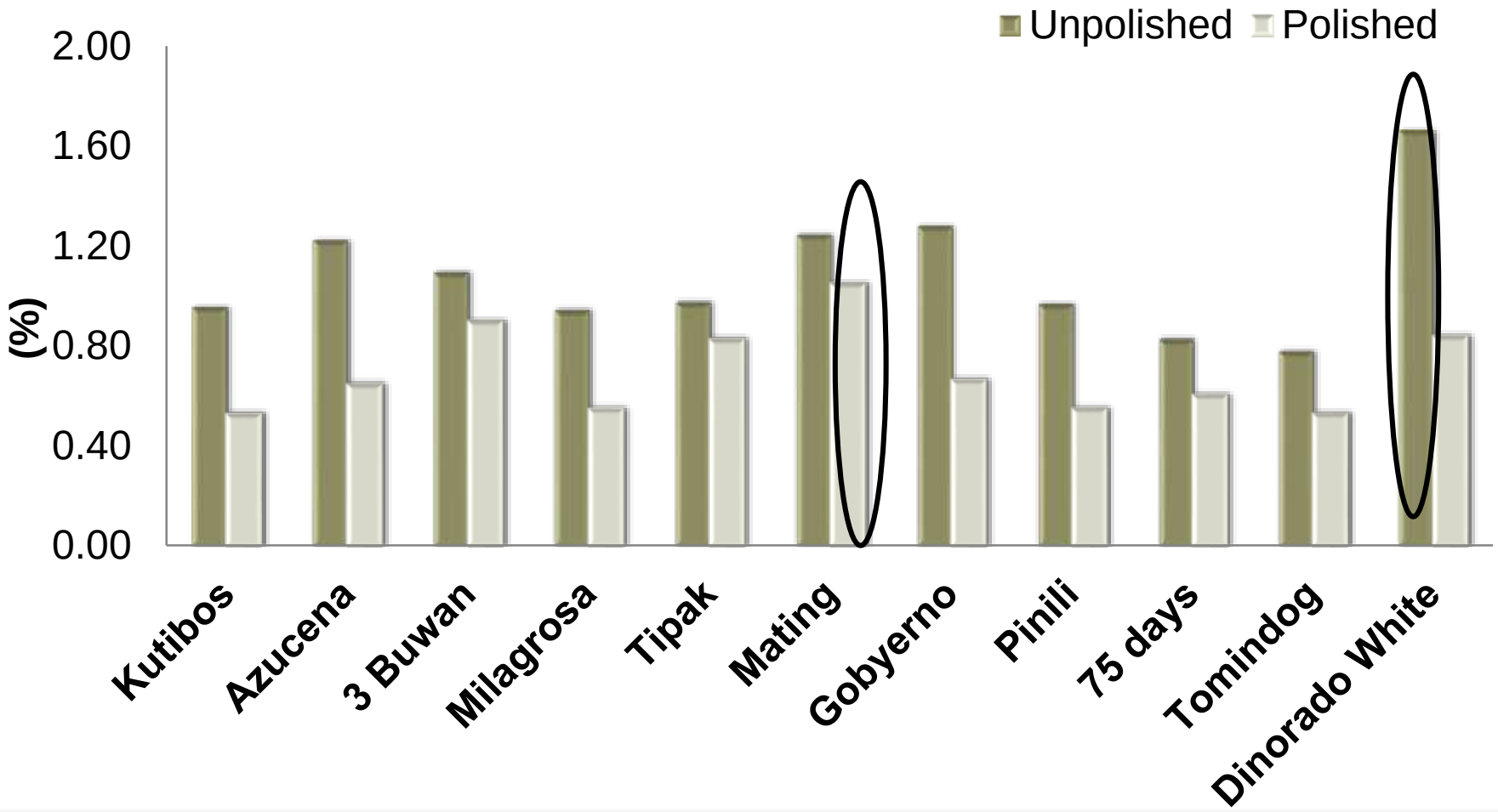
Proximate Composition

Crude Protein



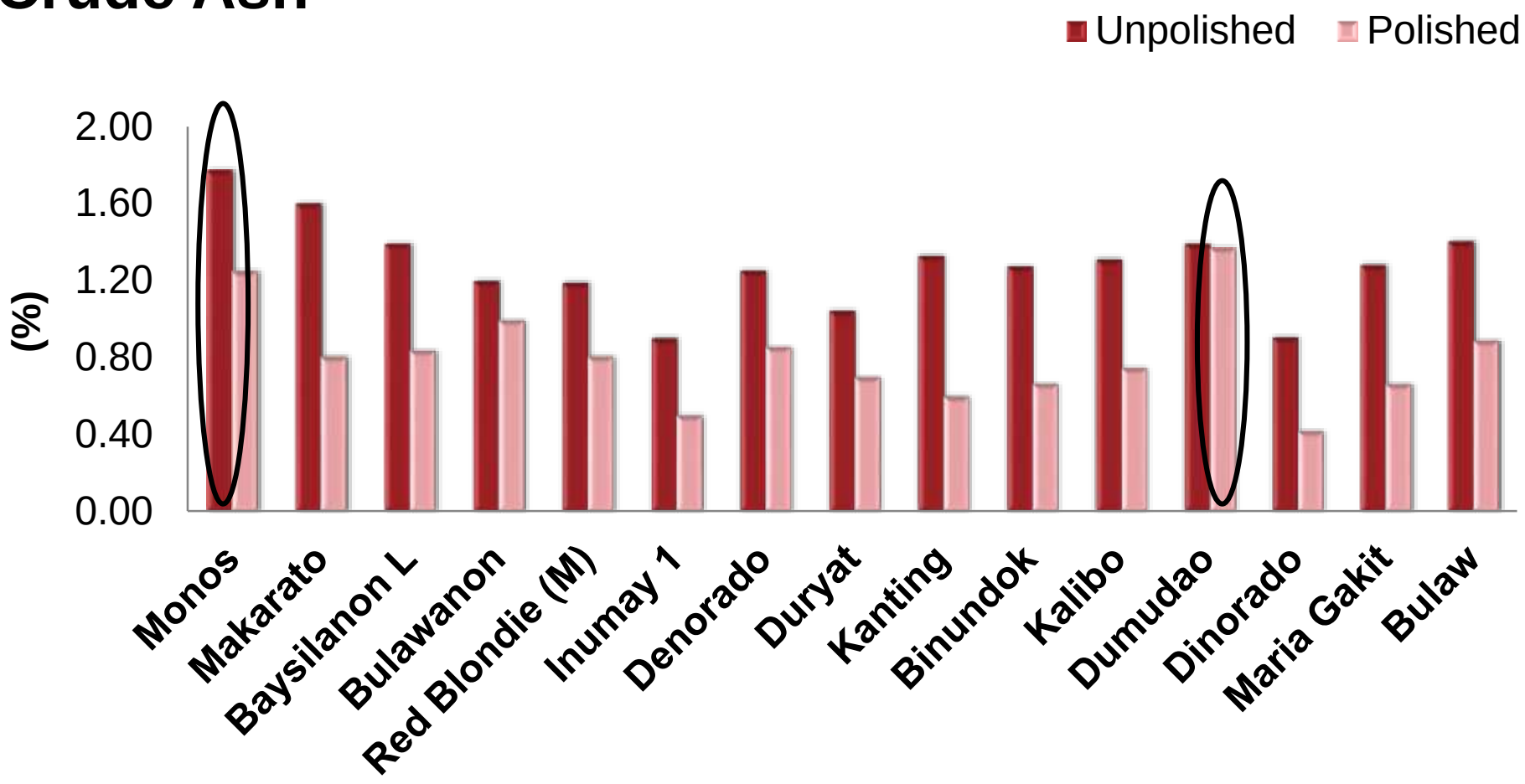
Proximate Composition

Crude Ash



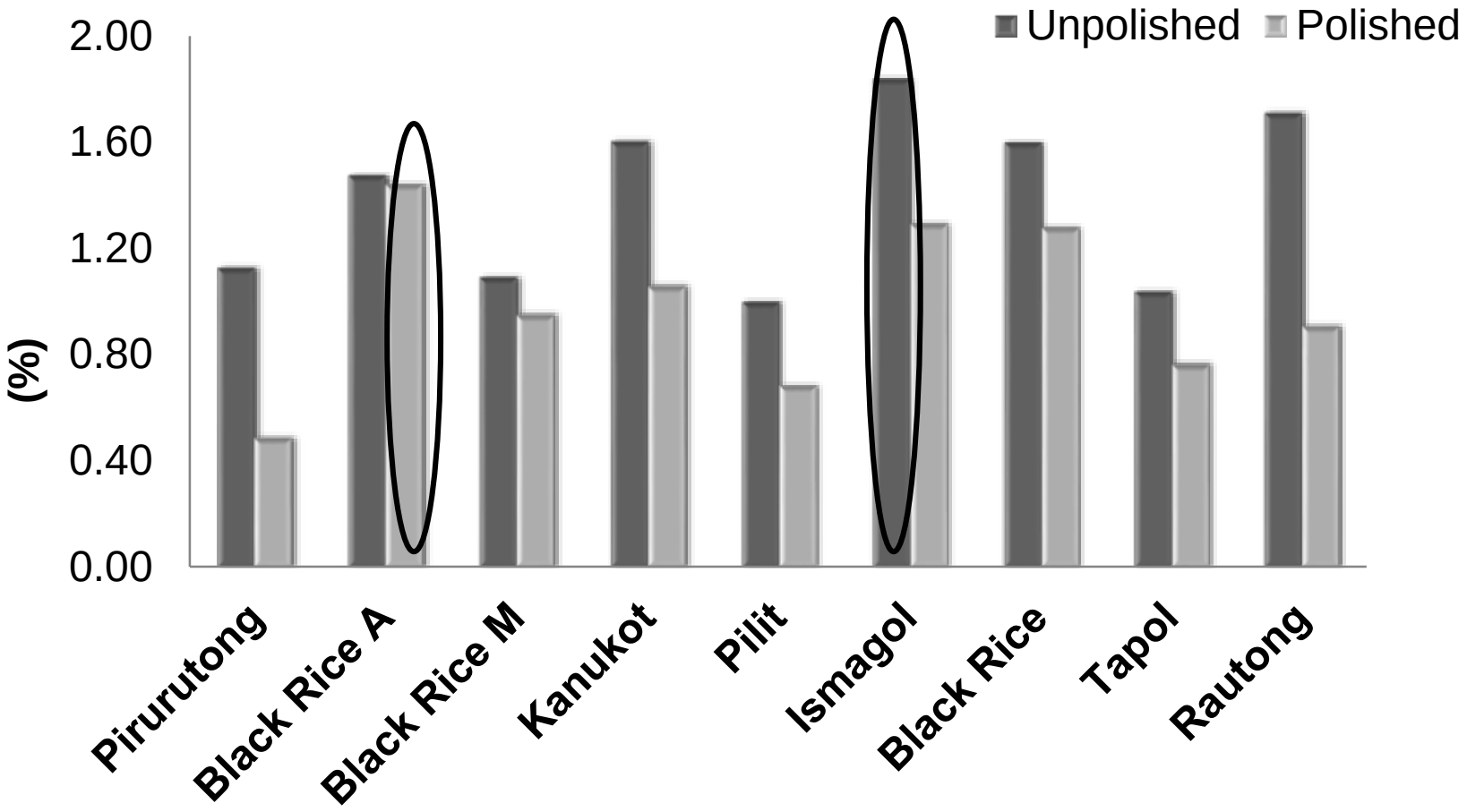
Proximate Composition

Crude Ash



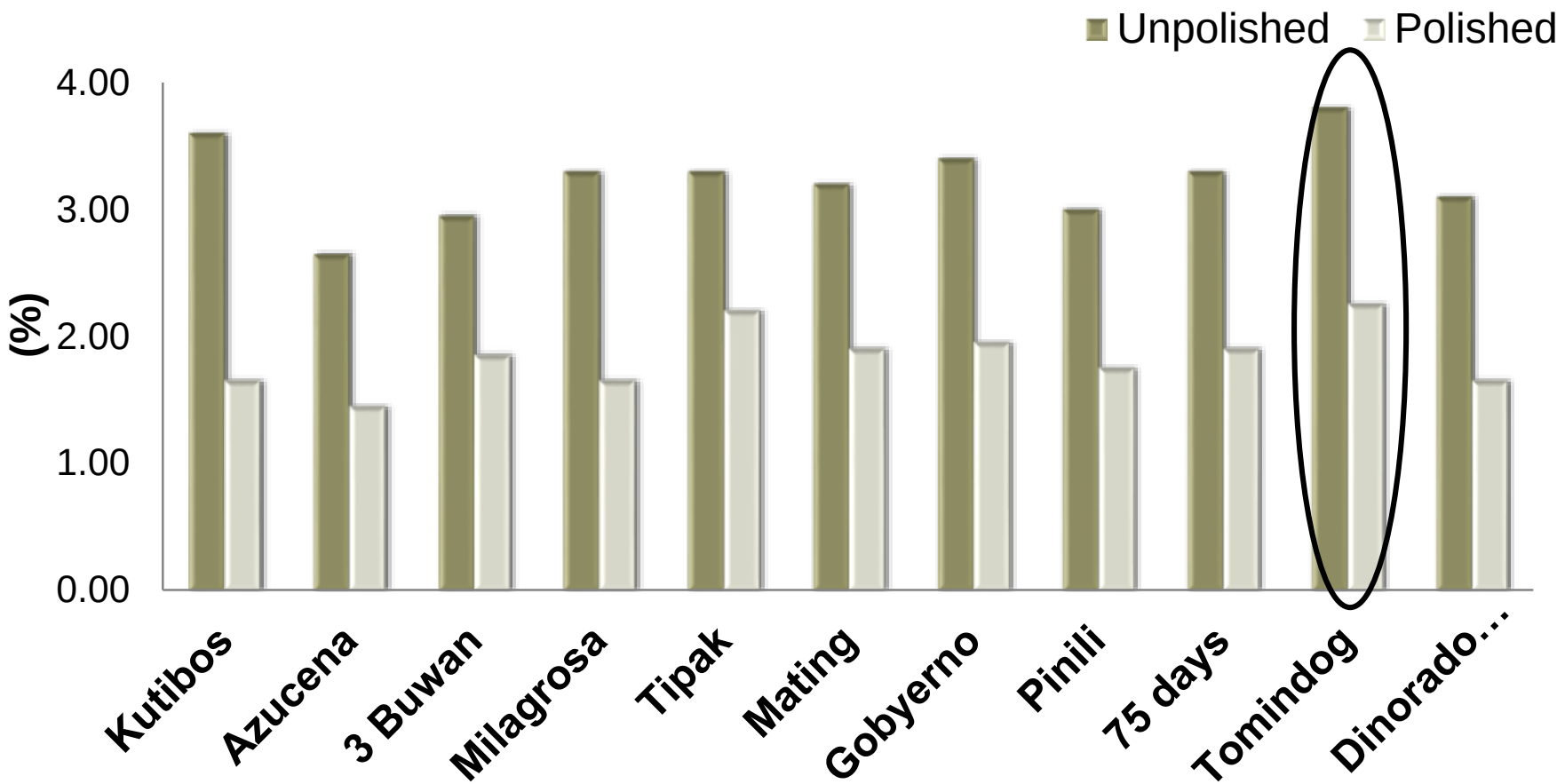
Proximate Composition

Crude Ash



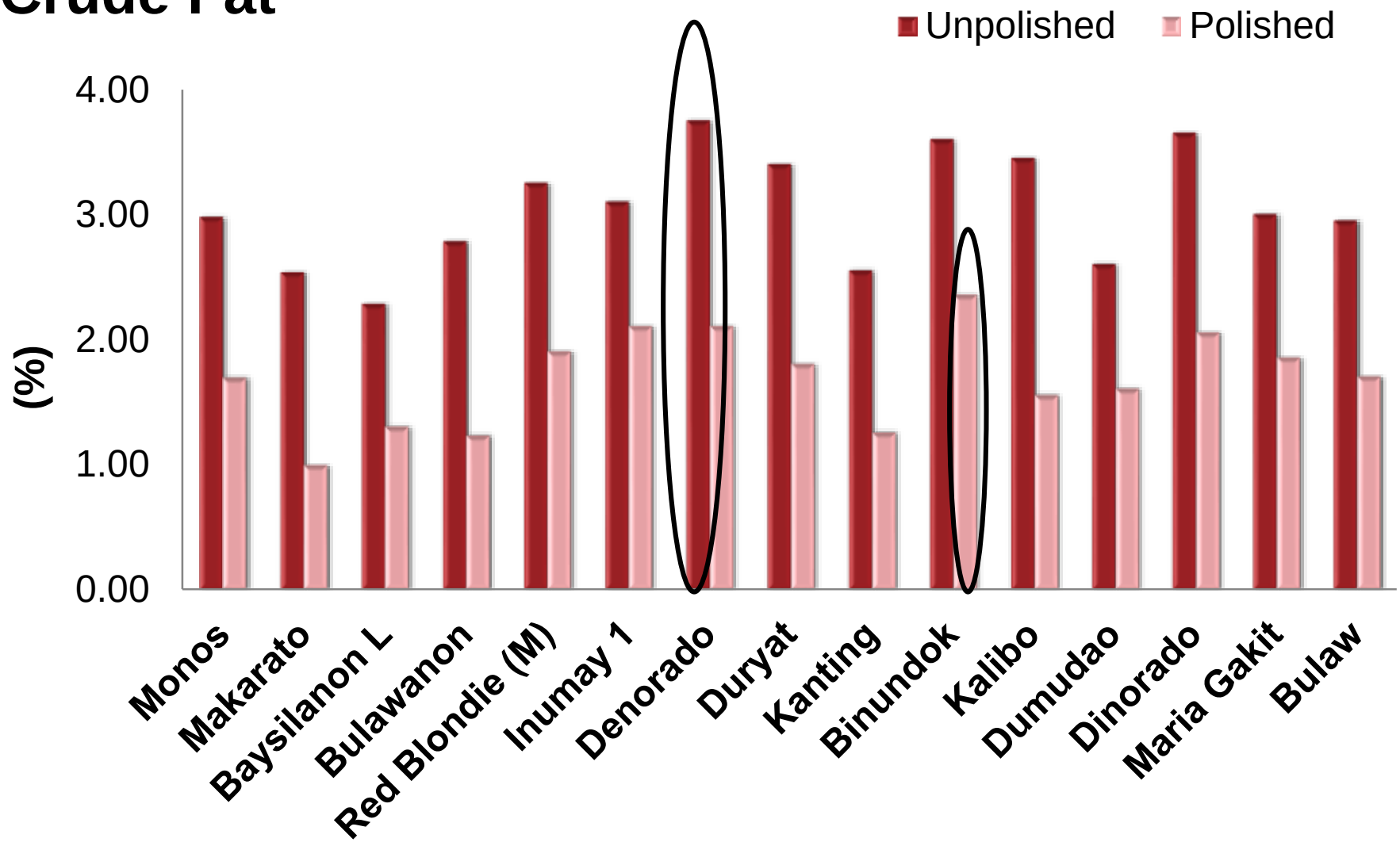
Proximate Composition

Crude Fat



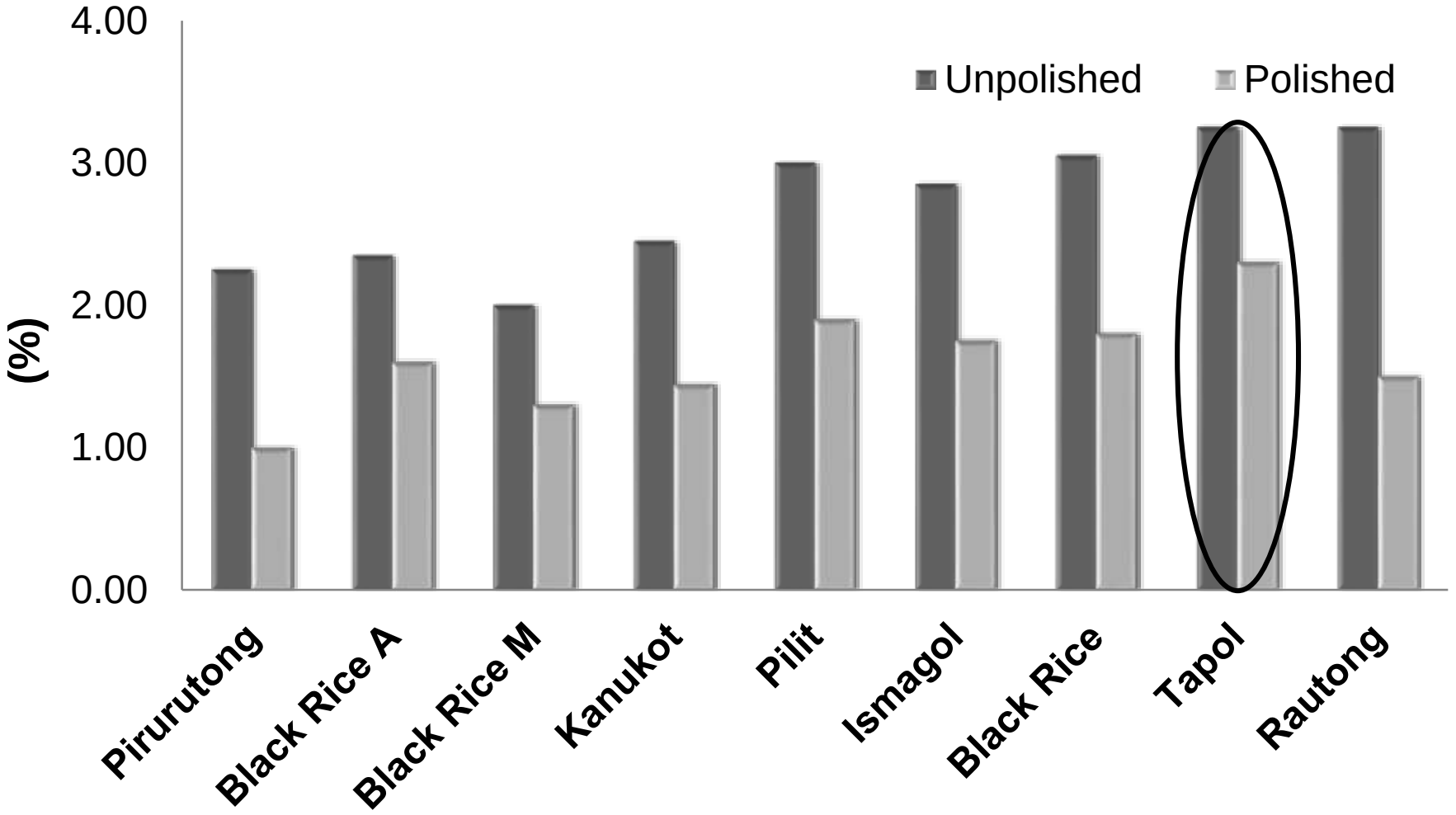
Proximate Composition

Crude Fat

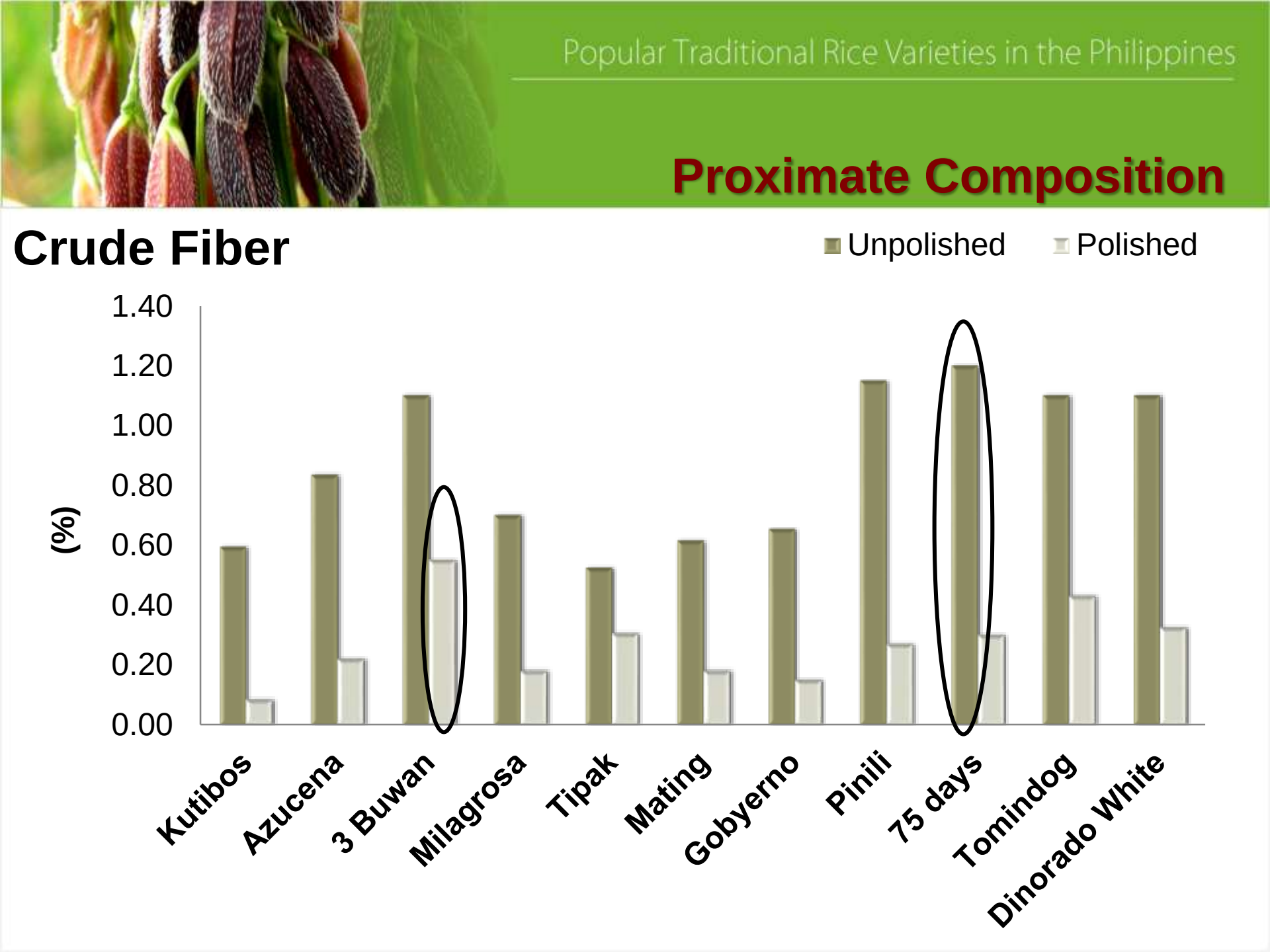


Proximate Composition

Crude Fat

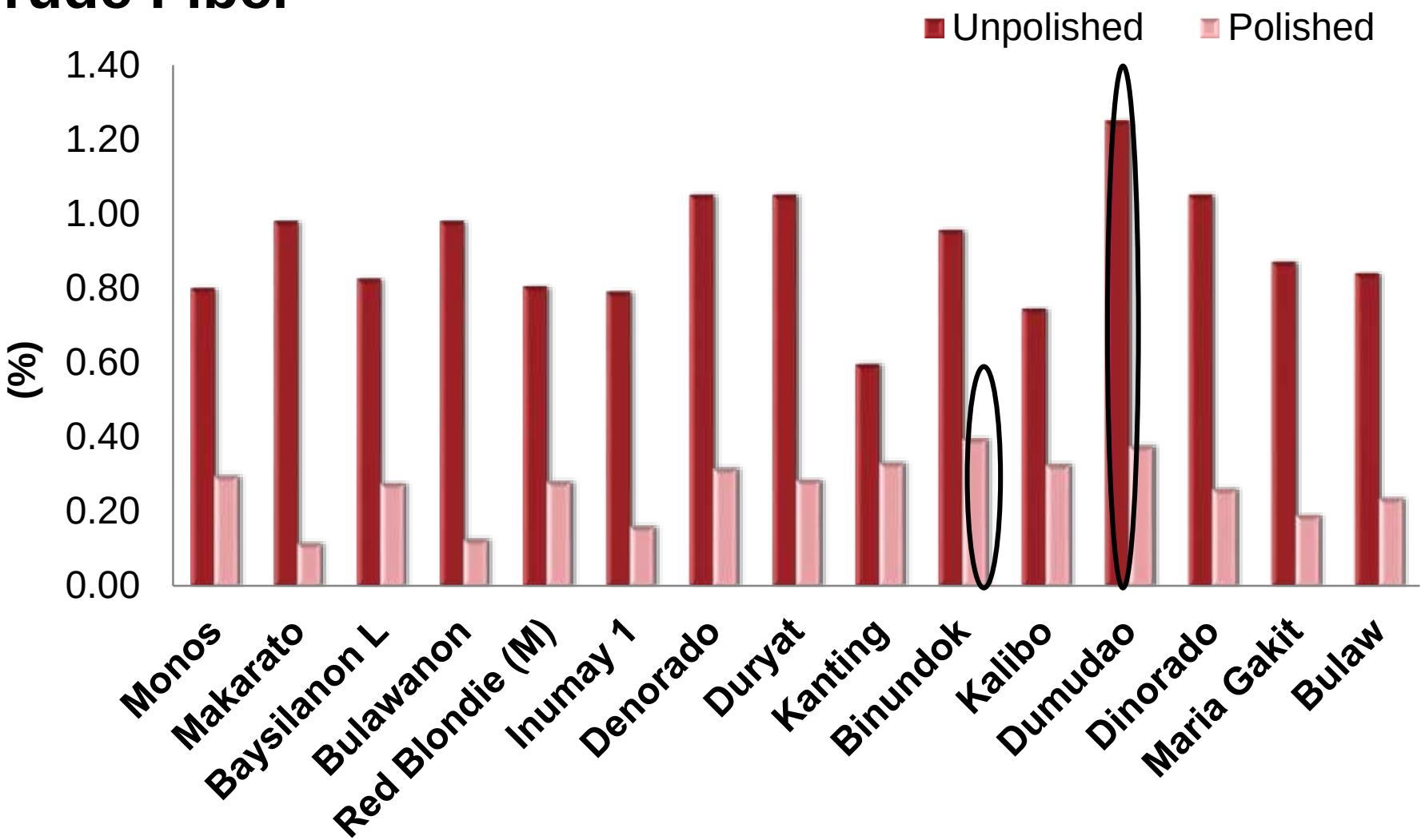


Proximate Composition



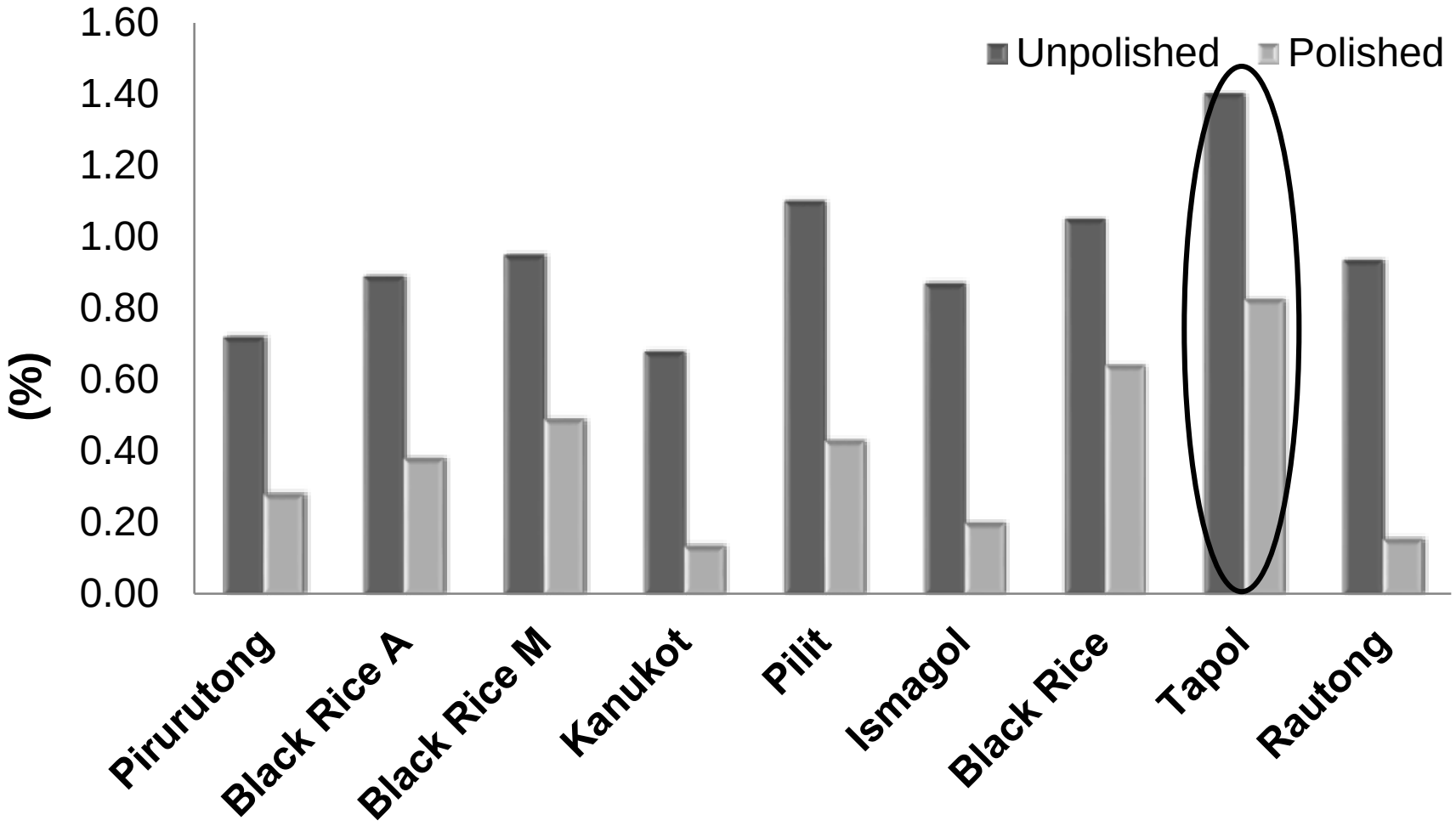
Proximate Composition

Crude Fiber



Proximate Composition

Crude Fiber

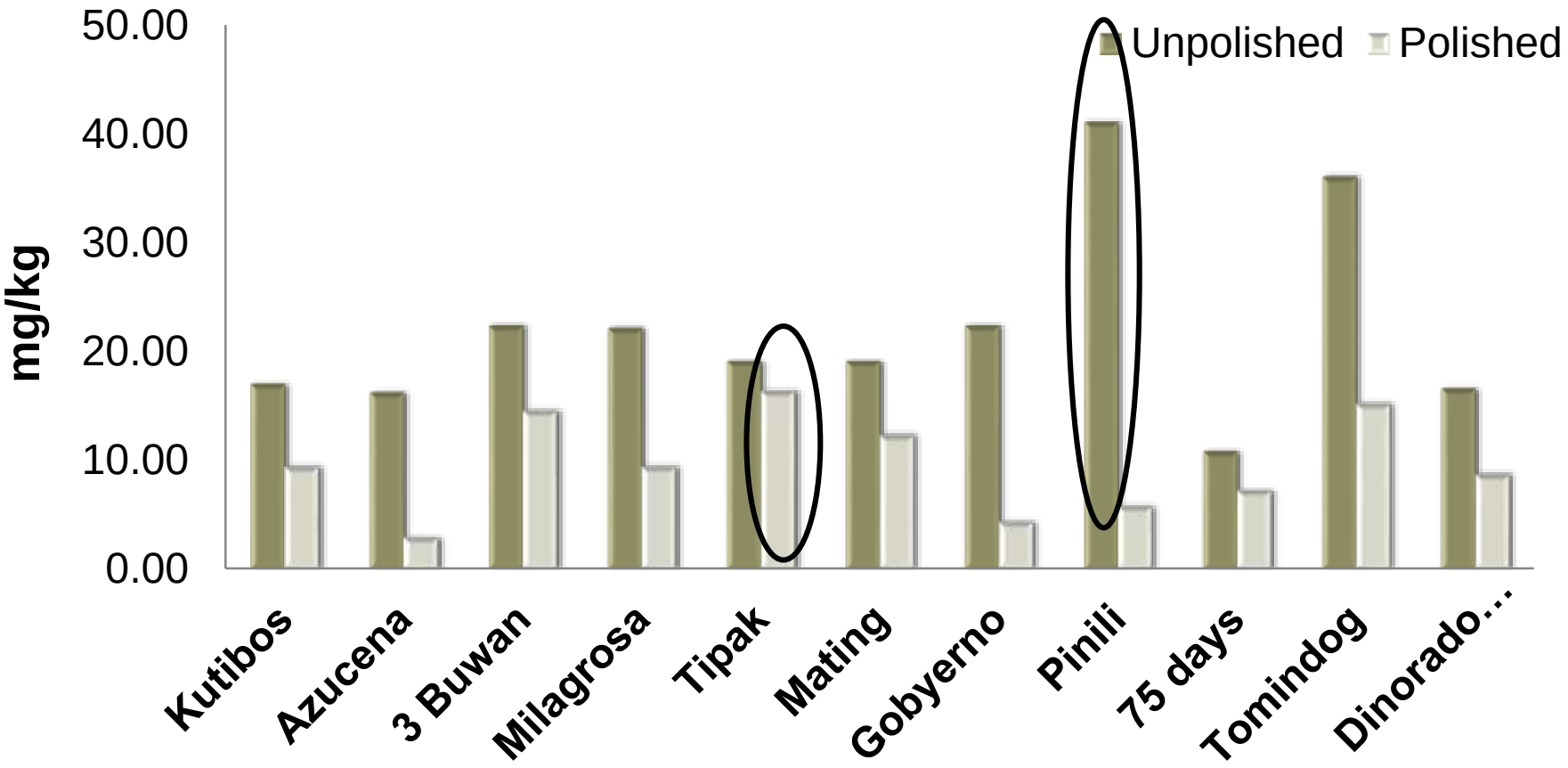


Reduction in Proximate Composition

Parameters	% Reduction
Crude Protein	3.5 - 15.0
Crude Ash	1.4 - 56.7
Crude Fat	29.2 - 60.9
Crude Fiber	39.1 - 88.3

Phytochemical Properties

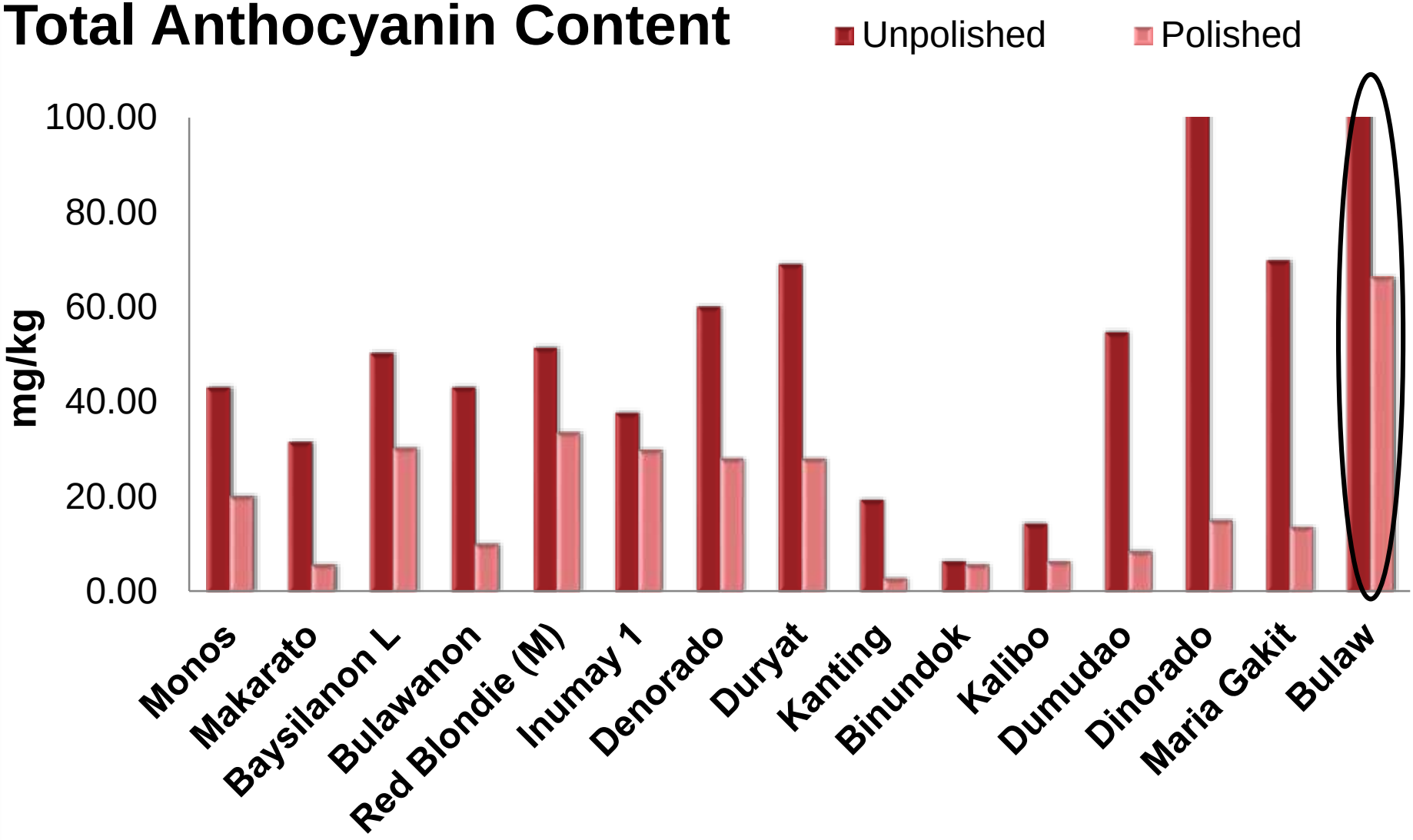
Total Anthocyanin Content



Popular Traditional Rice Varieties in the Philippines

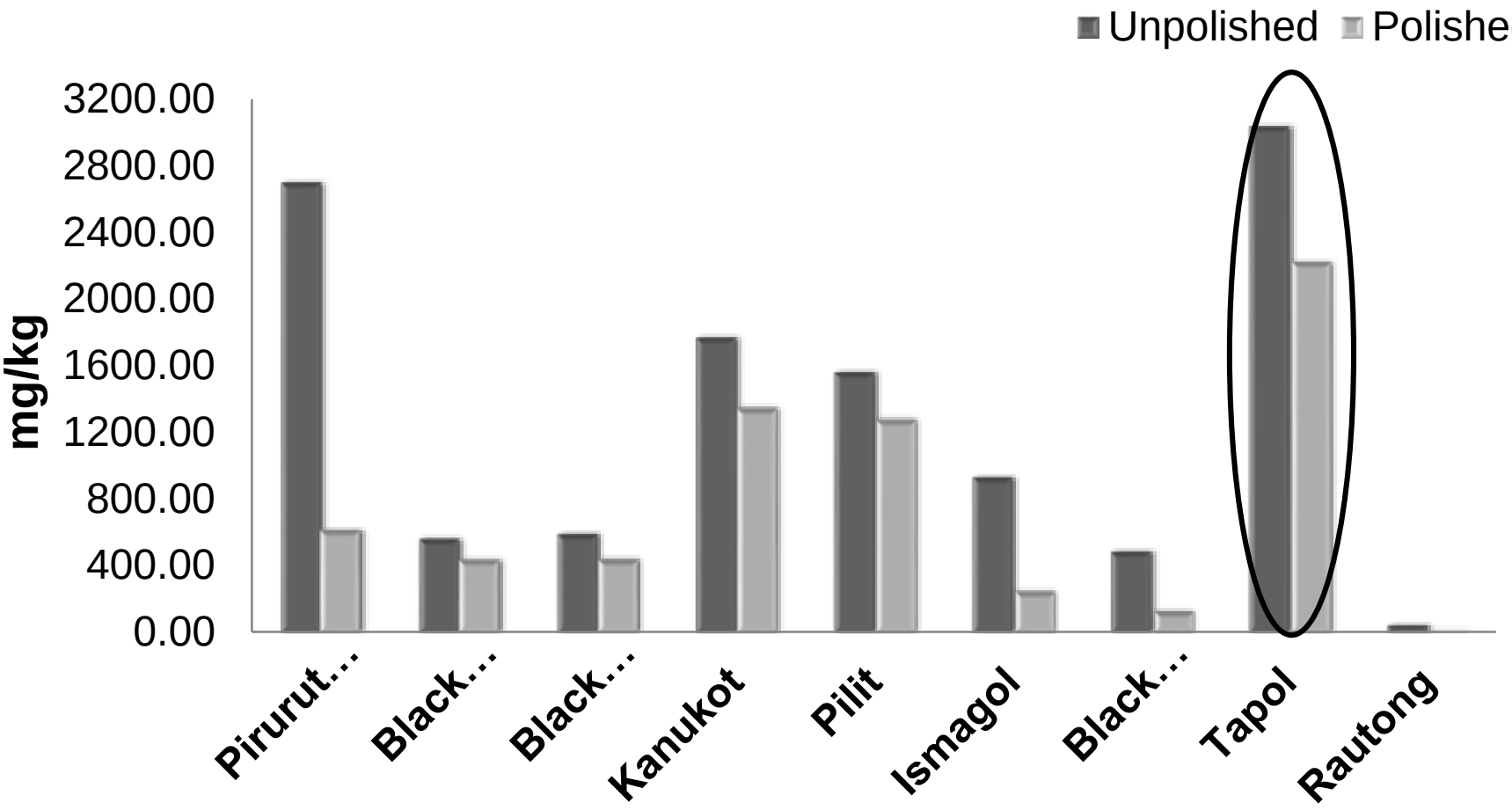
Phytochemical Properties

Total Anthocyanin Content



Phytochemical Properties

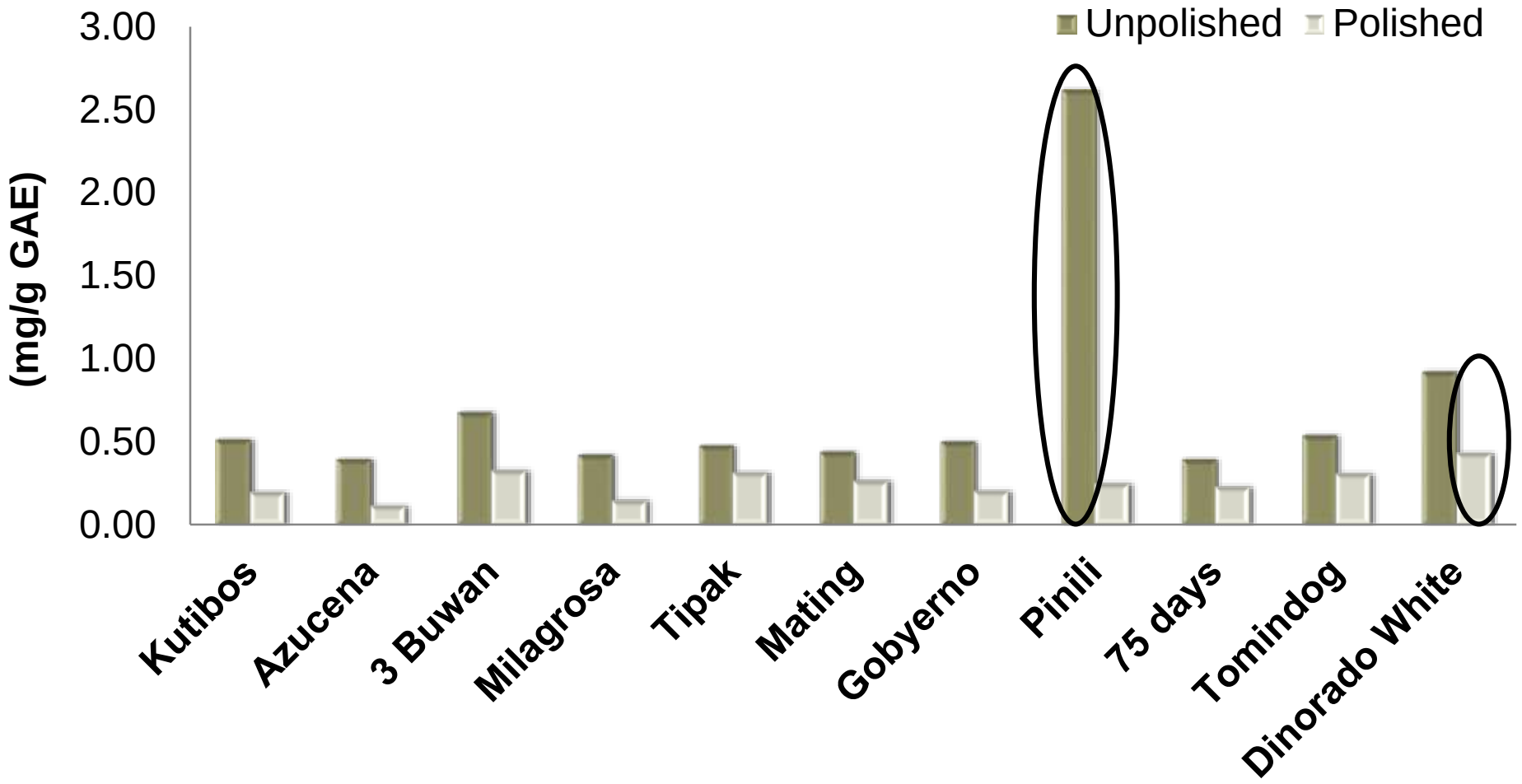
Total Anthocyanin Content



Popular Traditional Rice Varieties in the Philippines

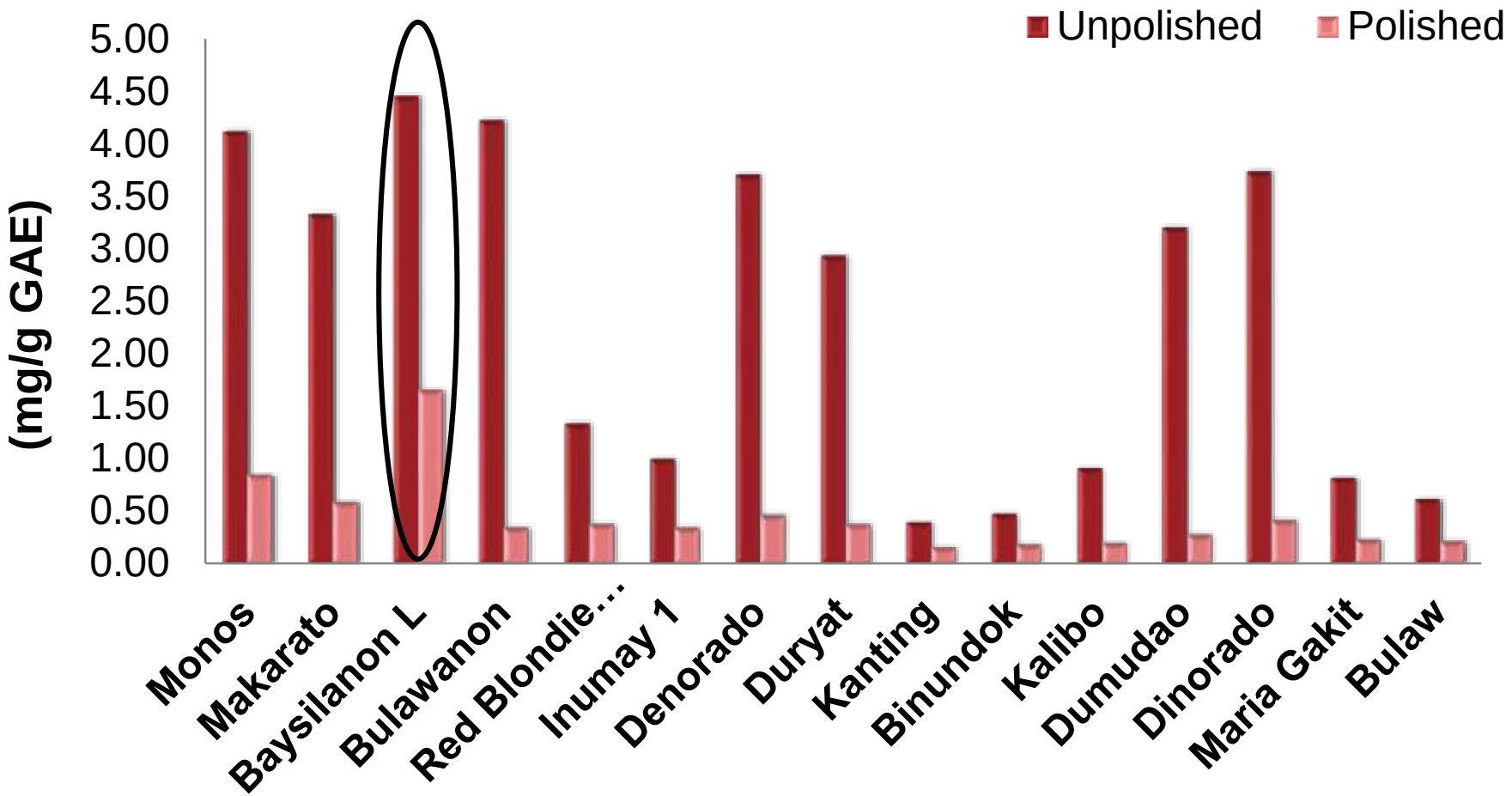
Phytochemical Properties

Total Phenolic Content



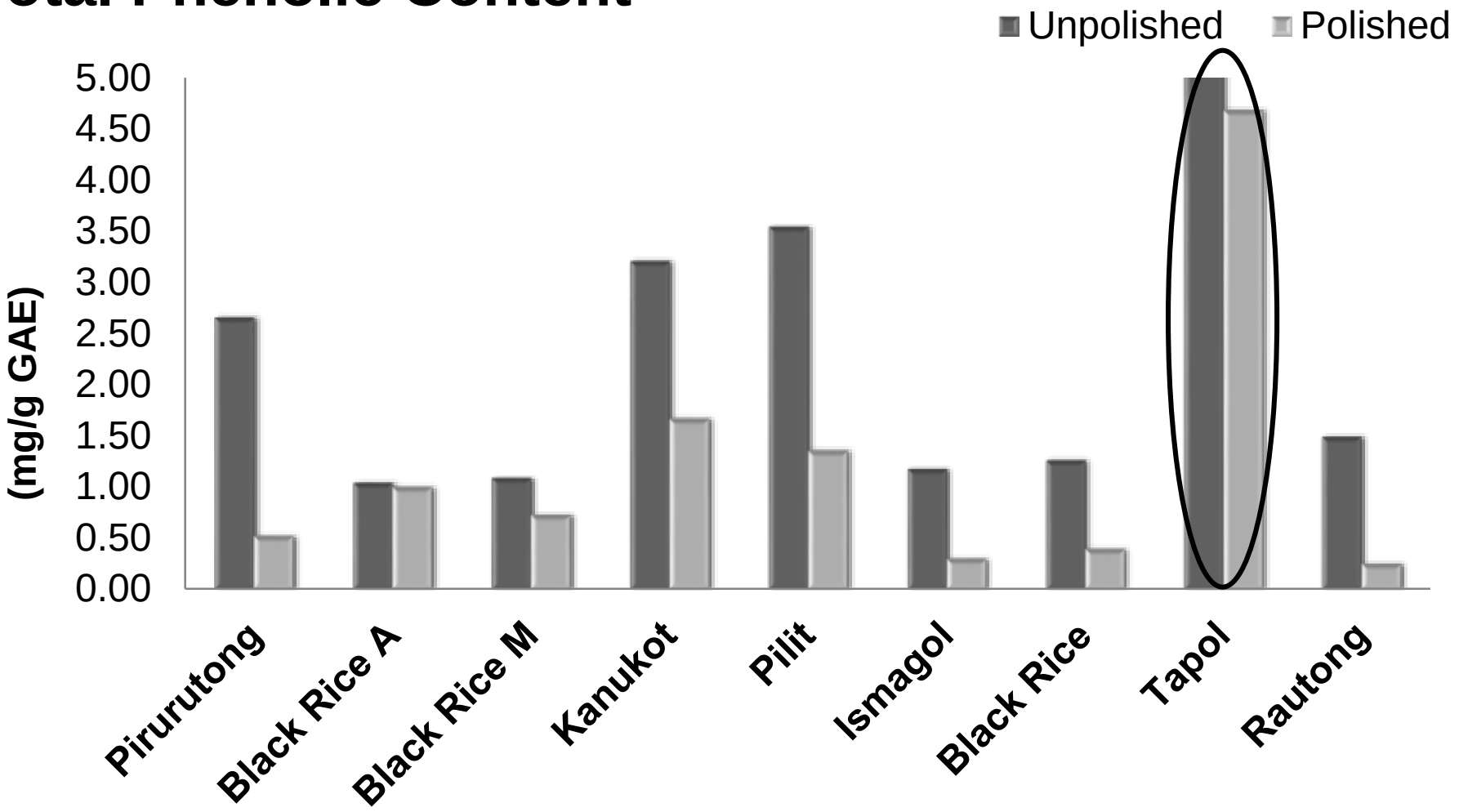
Phytochemical Properties

Total Phenolic Content



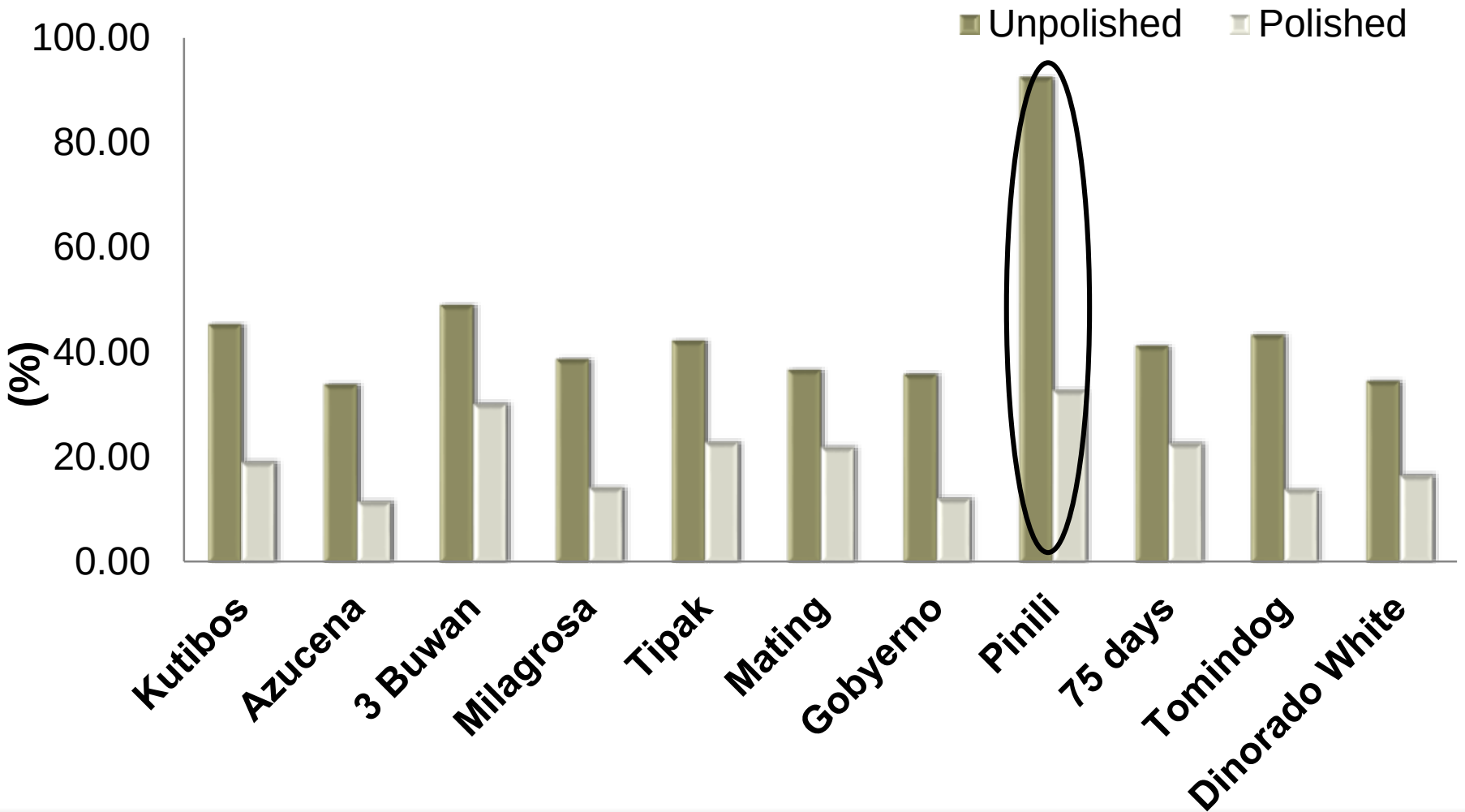
Phytochemical Properties

Total Phenolic Content



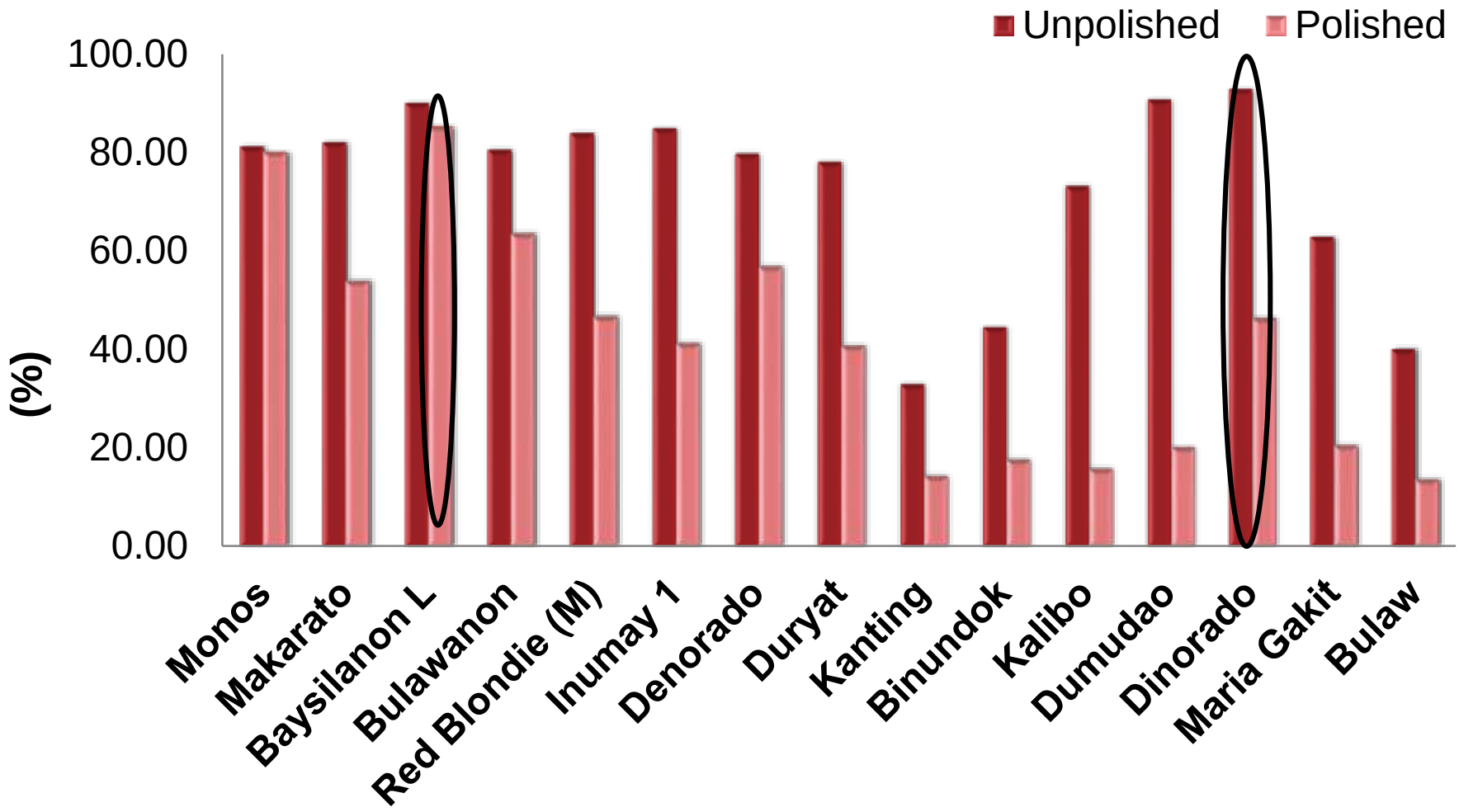
Phytochemical Properties

Antioxidant Activity



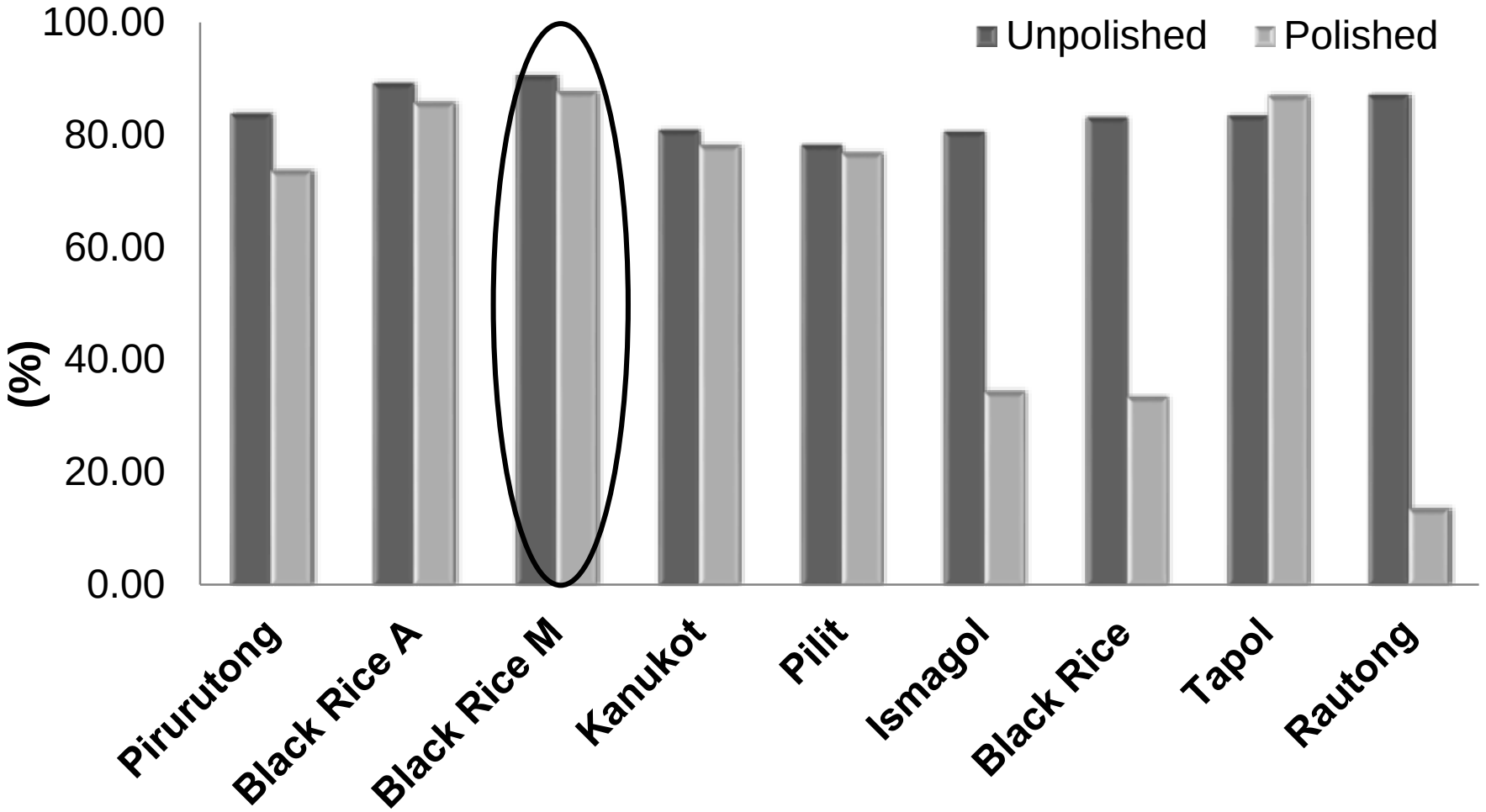
Phytochemical Properties

Antioxidant Activity



Phytochemical Properties

Antioxidant Activity



Reduction in Phytochemical Properties

Parameters	% Reduction
Total Anthocyanin Content	11.11 - 88.92
Total Phenolic Content	4.04 - 91.88
Antioxidant Activity	1.37 - 84.41

Summary

- Proximate composition of white, red and black traditional rice varieties in unpolished and polished forms are comparable.
- Pigmented traditional rice varieties had significantly higher amount of total anthocyanin, total phenolic content and antioxidant activity compared to white traditional rice varieties.
- Significant amount of proximate composition and phytochemical properties were lost upon polishing of traditional rice samples.

Conclusion

- Genetic resource
- Healthy food
- Business/Export potential


Thank you!
PHILRICE

GRAIN QUALITY EVALUATION OF INTRODUCED CHINESE HYBRID RICE LINES AND PHILSCAT-DEVELOPED LINES PLANTED DURING THE 2012-2015 PRELIMINARY YIELD TRIALS

Erick Allain C. Flores[1], Emmanuel V. Sicat[2], Carlos C. Abon, Jr.[3], Cheng Liangji[4], Xiao Wei[5], Hu Jiyin[6], Sun Shenbiao[7], Francis E. Mina[8], Trojane V. Soberano[9], Erickson C. Frediles[10], and Maribel P. Mananguit[11]

1 – Science Research Analyst, Hybrid Rice Technology Unit

2 – Director, PhilSCAT

3 – Chief, Technology and Products Development Division

4 – Co-Director, PhilSCAT

5 – Chinese Hybrid Rice Expert, Hybrid Rice Technology Unit

6 – Chinese Hybrid Rice Expert, Hybrid Rice Technology Unit

7 – Chinese Hybrid Rice Expert, Hybrid Rice Technology Unit

8 – Science Research Specialist II, Hybrid Rice Technology Unit

9 – Science Research Specialist II, Hybrid Rice Technology Unit

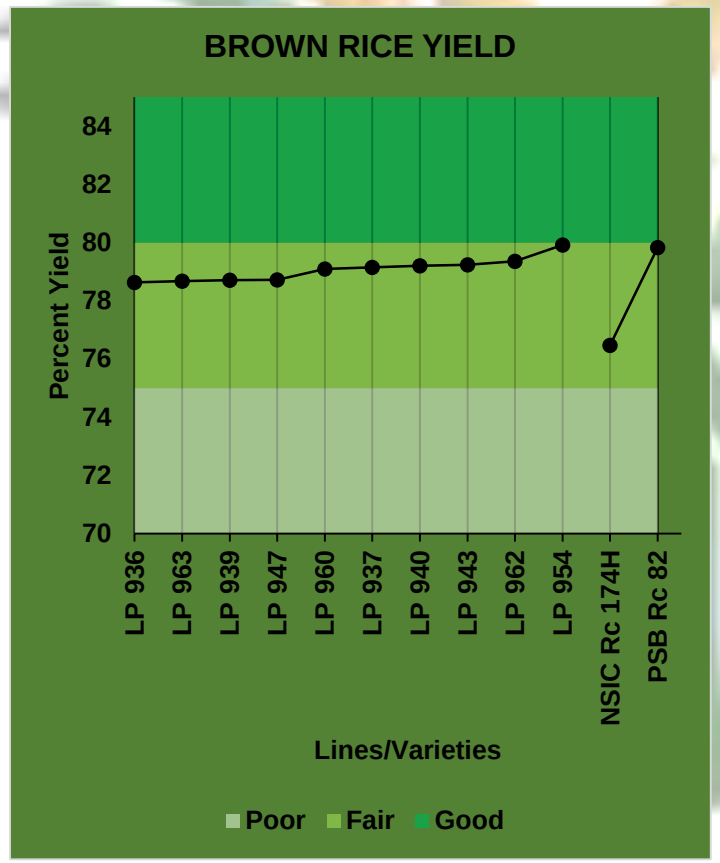
10 – Science Research Specialist II, Hybrid Rice Technology Unit

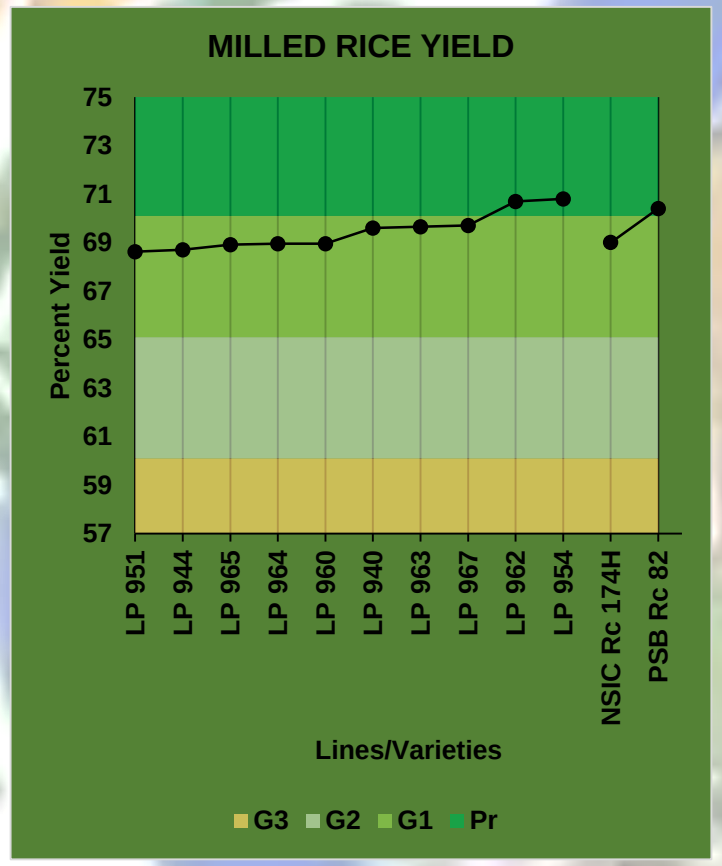
11 – Science Research Specialist I, Hybrid Rice Technology Unit

OBJECTIVES

1. To evaluate the grain quality of CHRLs and PhilSCAT-developed lines planted in the PhilSCAT Demonstration Farm during 2012-2015 PYT.
2. To provide seasonal data on grain quality of rice lines during 2012-2015 PYT.

MILLING POTENTIALS





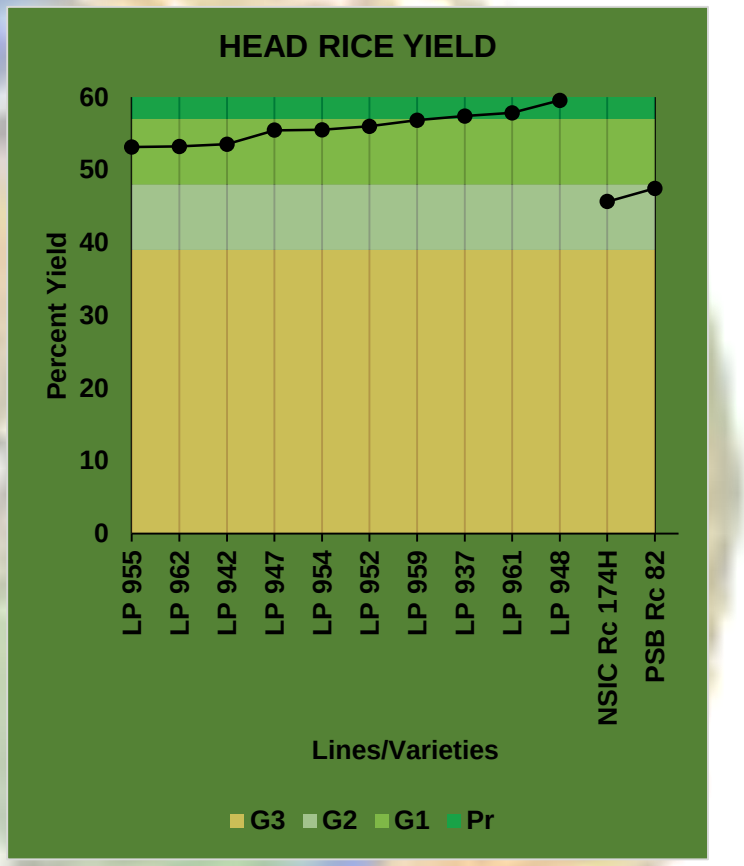


Figure 1. Milling Potentials of CHRLs and Check Varieties

PHYSICAL ATTRIBUTES

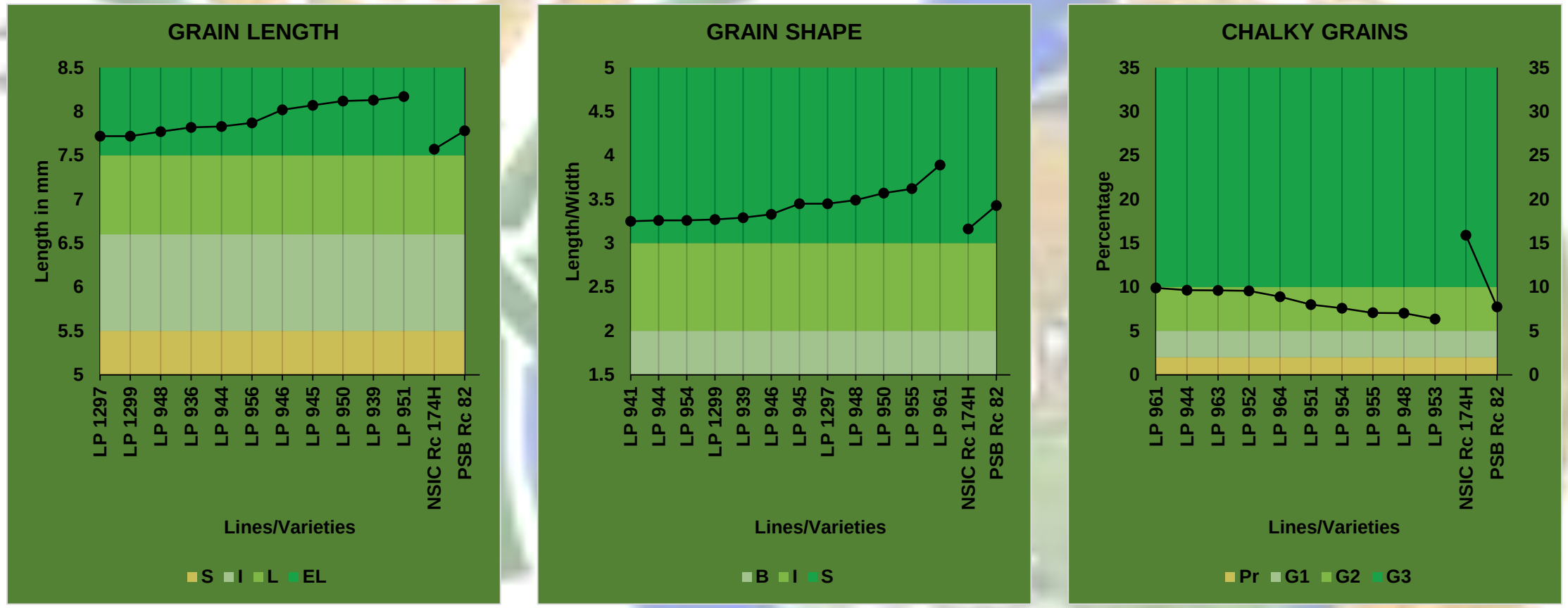
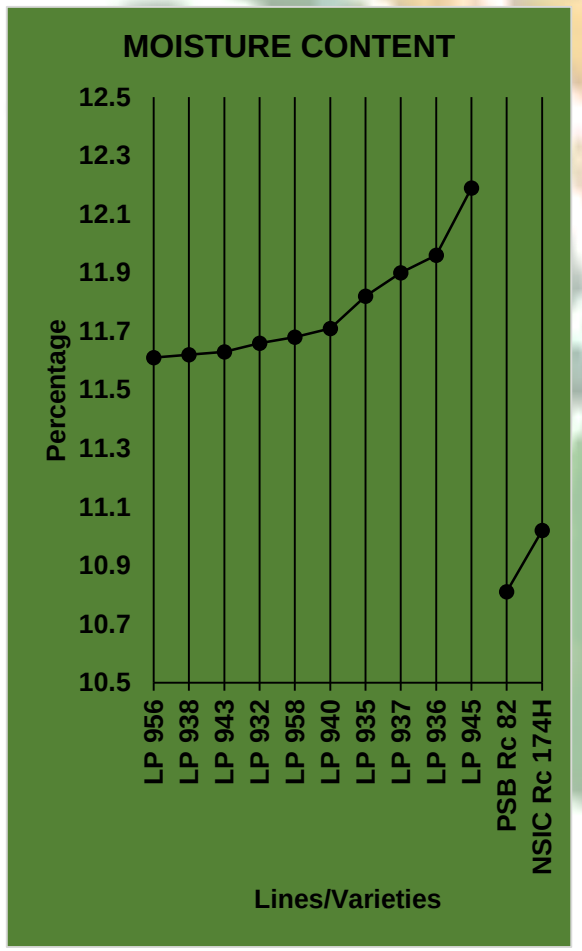
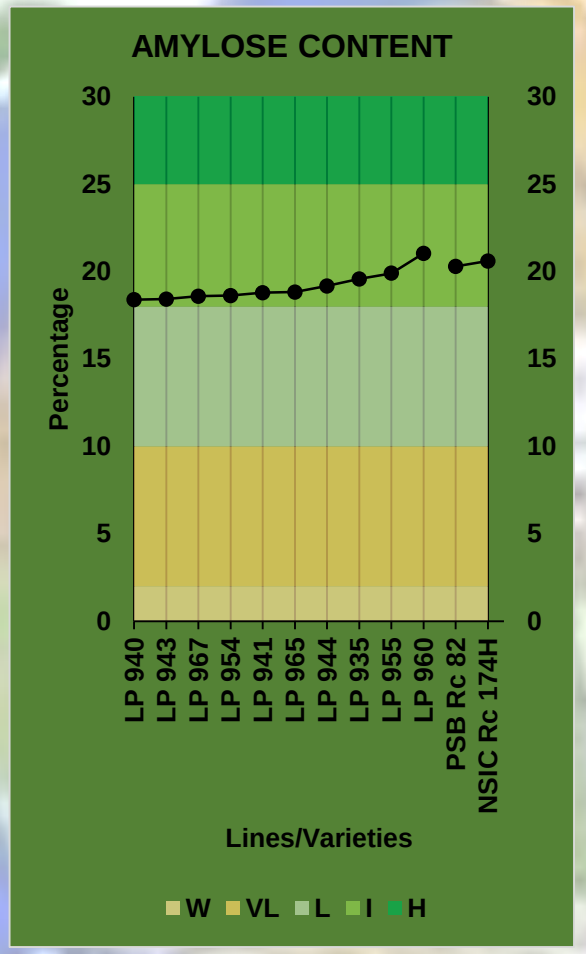


Figure 2. Physical Attributes of CHRLs and Check Varieties

CHEMICAL ATTRIBUTES



Gelatinization Temperatures
2.08 H/HI
2.25 H/HI
2.33 H/HI
2.42 H/HI
2.50 H/HI
2.58 HI/H
2.67 HI/H
2.75 HI/H
2.83 HI/H
2.92 HI/H
3.00 HI
3.00 HI/H/I



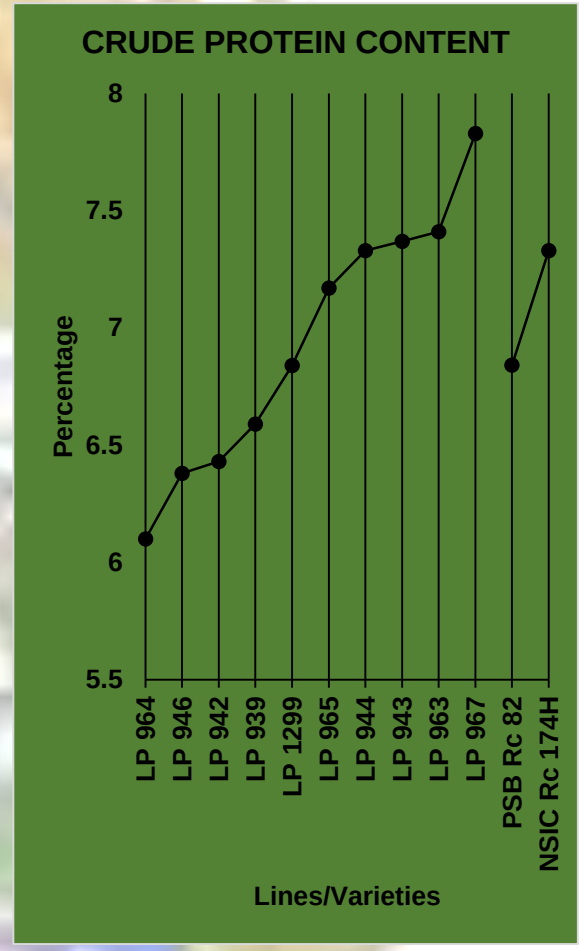


Figure 6. Chemical Attributes of CHRLs and Check Varieties

SENSORY ATTRIBUTES

Table 1. Sensory Attributes of Raw Milled Rice

ATTRIBUTE	LINES	CHECKS
Aroma	no aroma	no aroma
Off-odor	no off-odor	no off-odor
Color	white, creamish, grayish	creamish, white
Gloss	dull, glossy	dull
Translucency	21-40% white belly, 41-60% white belly, translucent	21-40% white belly, 41-60% white belly
Hardness	hard	hard

Table 2. Sensory Attributes of Cooked Milled Rice

ATTRIBUTE	LINES	CHECKS
Aroma	no aroma	no aroma
Off-odor	no off-odor	no off-odor
Color	white, grayish	white
Gloss	glossy	glossy
Tenderness	tender	tender
Cohesiveness	cohesive	cohesive
Smoothness	smooth	smooth
Taste	bland	slightly tasty, bland
Off-taste	no off-taste	no off-taste

MILLING POTENTIALS

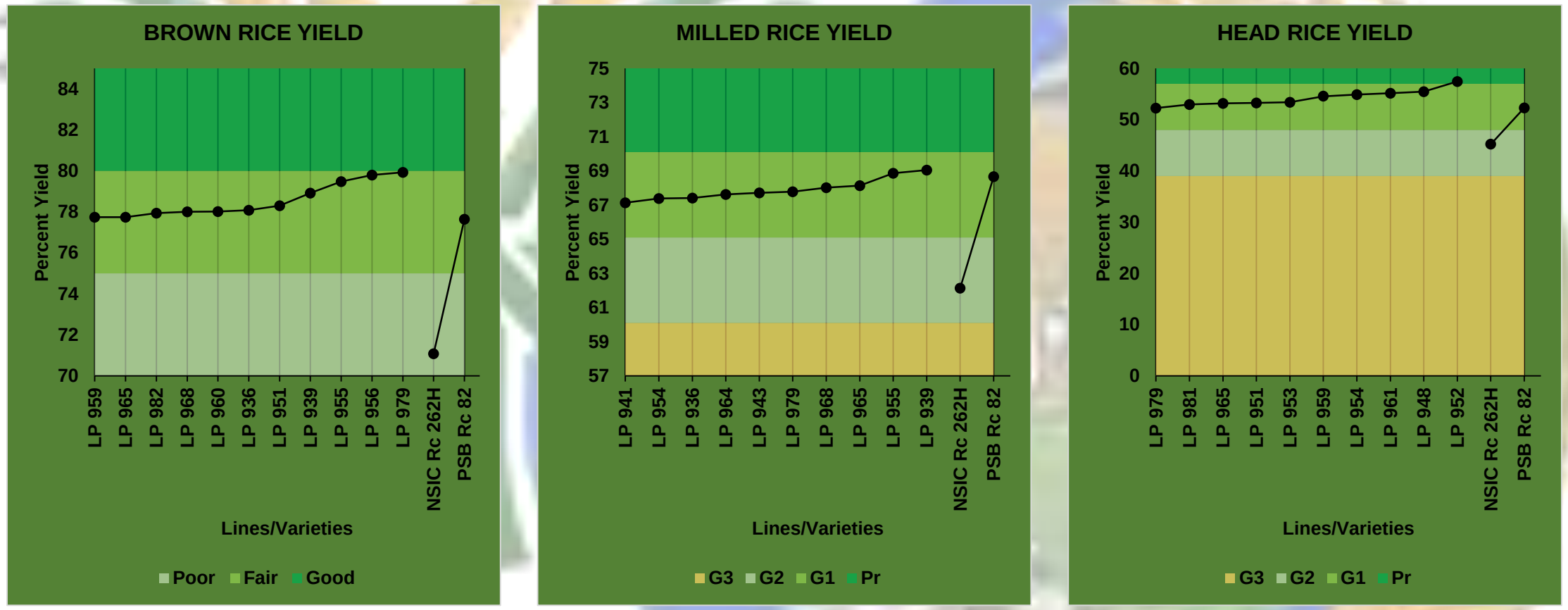


Figure 4. Milling Potentials of CHRLs and Check Varieties

PHYSICAL ATTRIBUTES

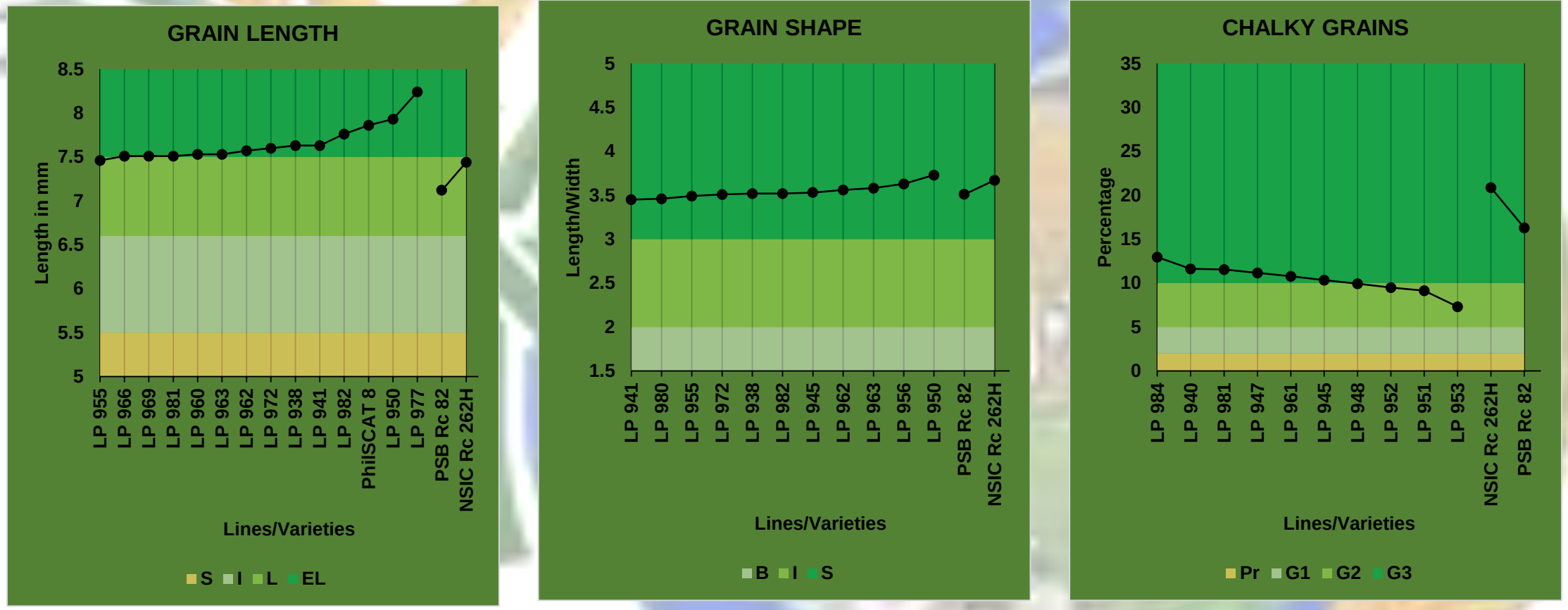
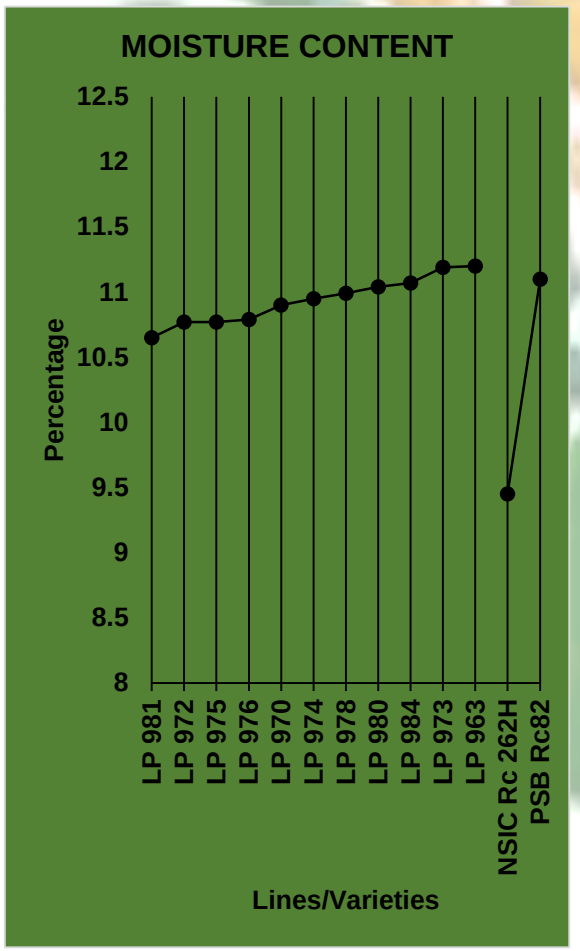
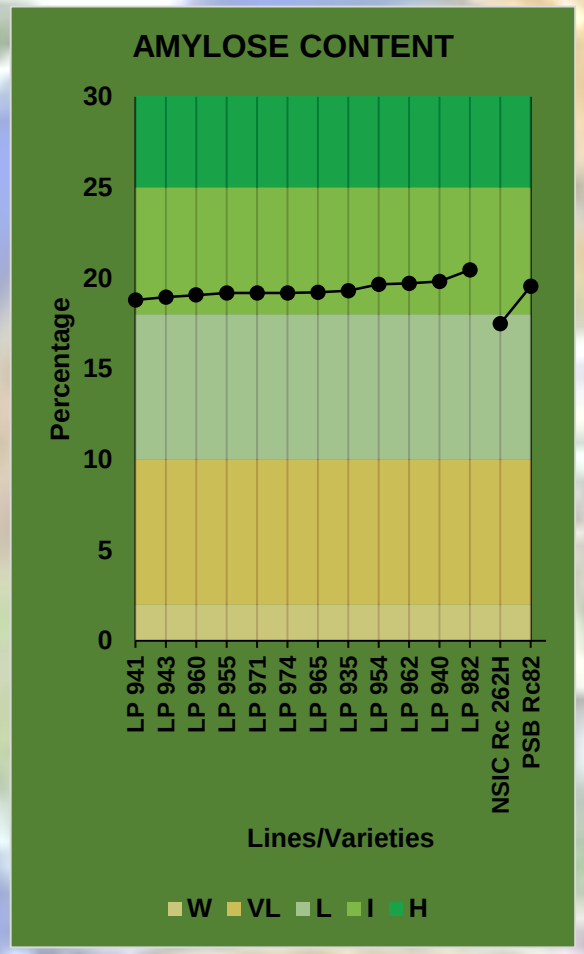


Figure 5. Physical Attributes of CHRLs and Check Varieties

CHEMICAL ATTRIBUTES



Gelatinization Temperatures
2.00 H
2.08 H/HI
2.17 H/HI
2.17 H/I
2.25 H/HI
2.25 H/HI/I
2.33 H/HI
2.33 H/HI/I
2.42 H/HI
2.50 H/HI
2.67 H/HI
3.25 H/I/HI



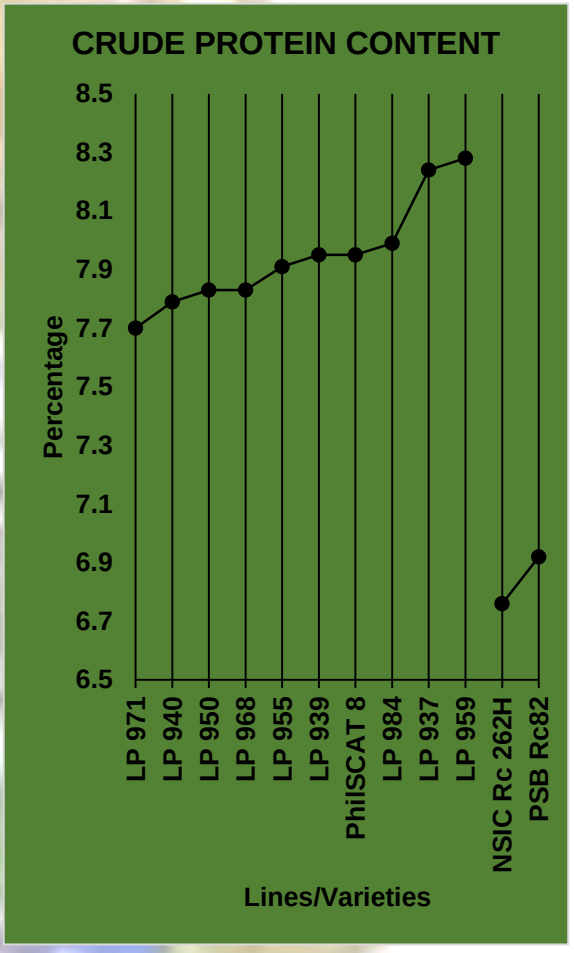


Figure 6. Chemical Attributes of CHRLs and Check Varieties

SENSORY ATTRIBUTES

Table 3. Sensory Attributes of Raw Milled Rice

ATTRIBUTE	LINES	CHECKS
Aroma	no aroma	no aroma
Off-odor	no off-odor	no off-odor
Color	white, creamish	creamish
Gloss	dull, glossy	glossy
Translucency	21-40% white belly/chalky, 41-60% white belly, 61-80% white belly, translucent	41-60% white belly
Hardness	brittle	brittle

Table 4. Sensory Attributes of Cooked Milled Rice

ATTRIBUTE	LINES	CHECKS
Aroma	no aroma, slightly aromatic	no aroma
Off-odor	no off-odor	no off-odor
Color	white, creamish	white
Gloss	glossy	glossy
Tenderness	tender	tender
Cohesiveness	cohesive	cohesive
Smoothness	smooth	smooth
Taste	tasty	bland
Off-taste	no off-taste	no off-taste

CONCLUSIONS

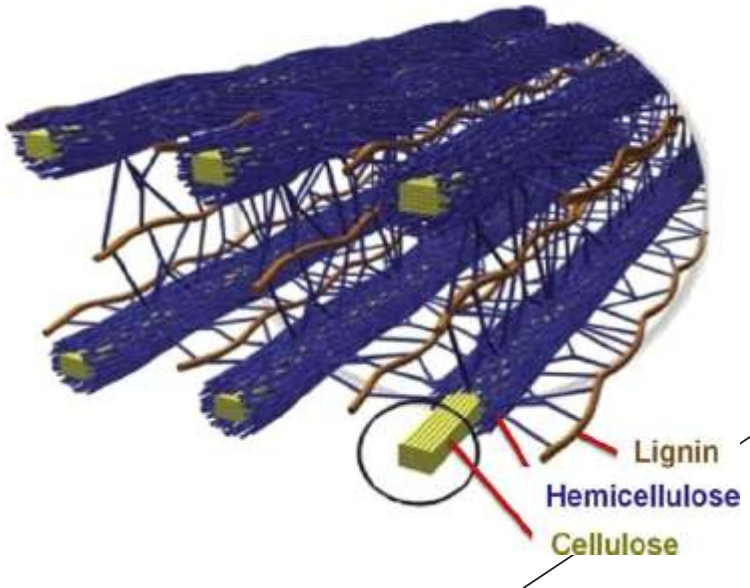
- The CHRLs and PhilSCAT lines were comparable to local inbred and hybrid varieties in terms of brown rice and total milled rice yields.
- Most of the lines were long and slender.
- Moisture contents of the lines were below 12%.
- Amylose contents ranged from very low to intermediate.
- Gelatinization temperatures of the lines were high.
- Crude protein contents were comparable to the checks.
- CHRLs were mostly non-aromatic and bland.
- PhilSCAT lines were aromatic and tasty.

END OF PRESENTATION

Isolation and identification of lignin-degrading bacteria and screening for low-lignin rices suitable for bioethanol production

Reynante l. Ordonio, Jayvee A. Cruz and Trinidad C. Fernando
Philippine Rice Research Institute

- Rice is the staple food in the Philippines and its culture inevitably produces a lot of ligno- cellulosic biomass.
- It is therefore an attractive resource for the production of bioethanol to address global warming and climate change.
- However, to efficiently utilize such biomass first requires the degradation of lignin, which encases cellulose fibers, hence, impeding their saccharification.



- This study aims to identify local bacterial strains from cow/carabao dung that can potentially degrade rice lignin; and
- To screen for rice varieties with optimal lignin content suitable for bioethanol production to address global warming and climate change.

METHODOLOGY

A. Isolation and identification of lignin-degrading bacteria

Carabao/cow manures were collected from Science City of Munoz, San Jose City and Rizal, N.E.

METHODOLOGY

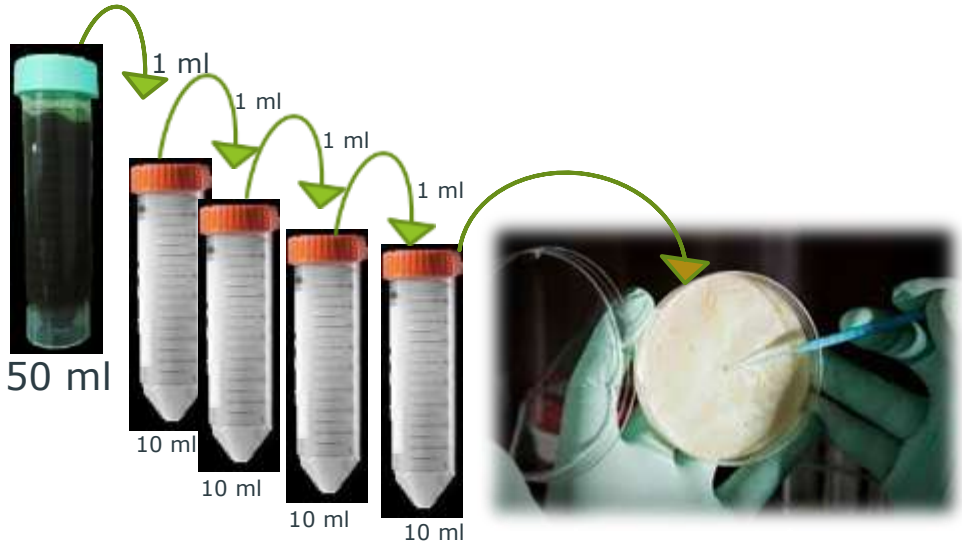


Inoculum was prepared by suspending 2.5 g of manure in 50 ml sterile 0.9 % (w/v) NaCl, and incubating for 1 h at 30^{o}C w/ shaking at 200 rpm

METHODOLOGY

2.5-ml aliquots were used to inoculate 50-ml tubes containing MML (mineral salts-lignin medium), incubated at 30°C with shaking for 48 h, 1-ml aliquots were transferred to fresh MML media, 7 successive transfers were performed over a period of 24 days

METHODOLOGY



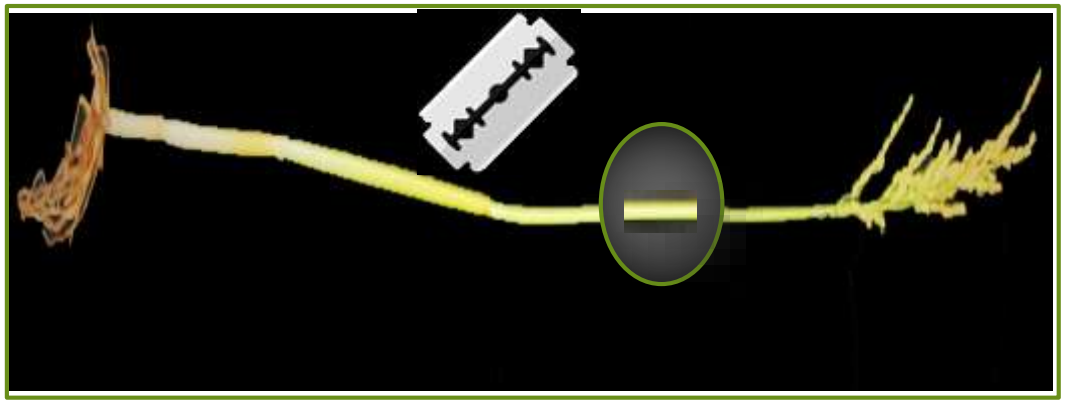
Serial dilution was done and colonies were streaked on LB agar to obtain pure culture. Cultures were incubated from 30-55^{o}C to obtain mesophilic and thermophilic lignin-degrading bacteria. Biochemical tests were also conducted.

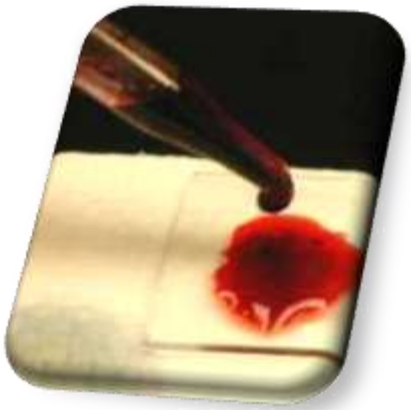
METHODOLOGY

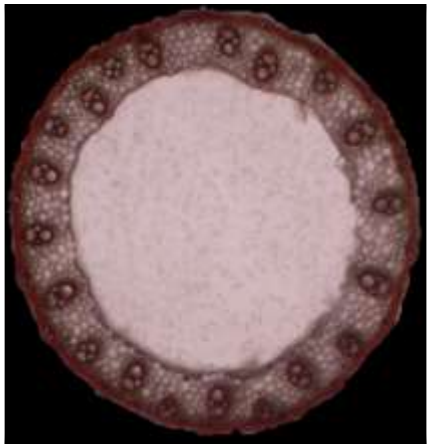
B. Profiling of elite rice varieties in terms of lignin content

Collection of internodes was done at the matured stage of rice (85% ripened grains). A total of 27 released varieties were collected for tissue staining

METHODOLOGY

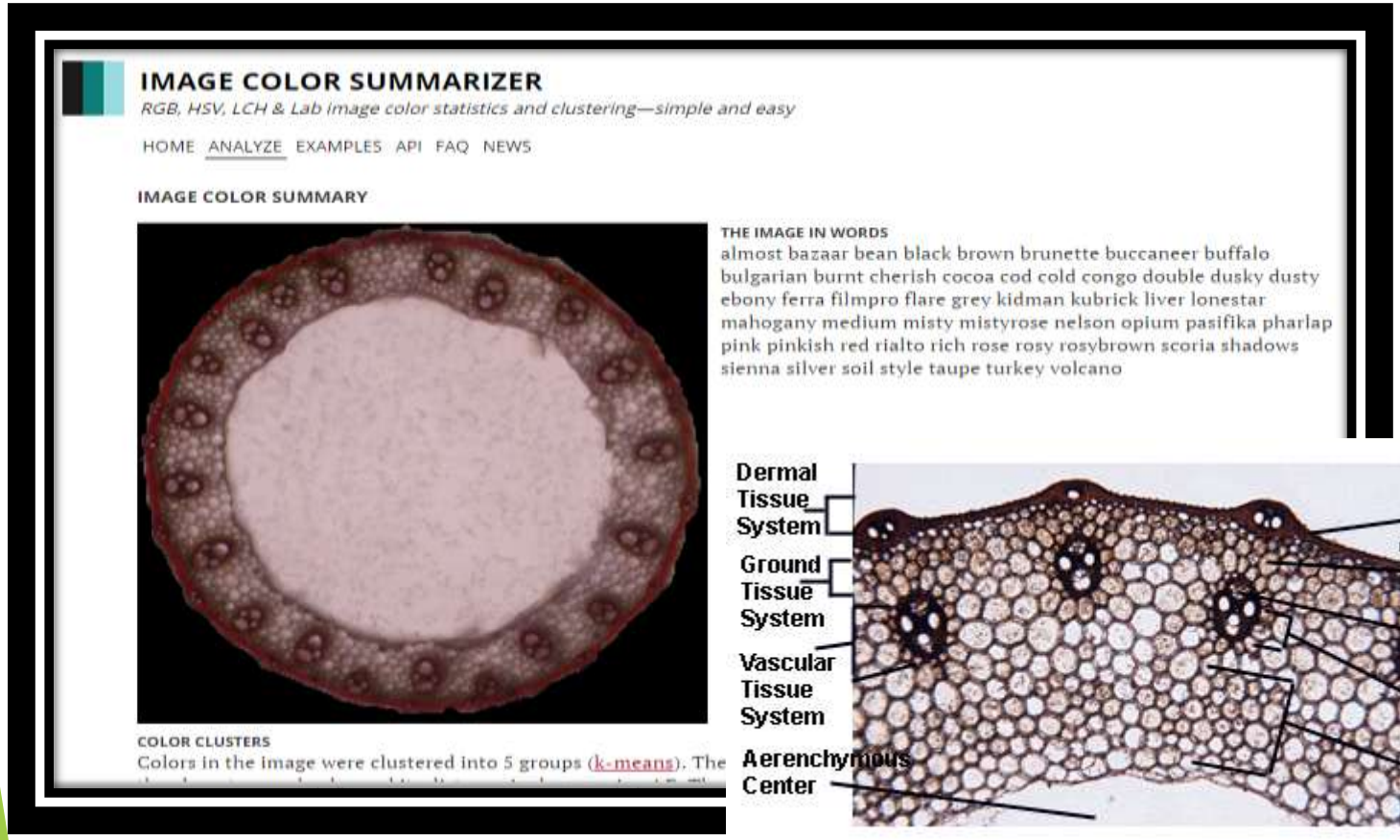






Safranin-O solution was used to stain tissue from the mid-section of a rice first internode and photo documentation was done under the microscope at 40x magnification.

METHODOLOGY



To determine and compare the relative lignified area in the photos (an indirect measure of lignin content), the Image Color Summarizer at http://mkweb.bcgsc.ca/color-summarizer was used.

RESULTS

A. Screening and testing of lignin-degrading bacterial isolates.

- ✓ 16 lignin-degrading bacterial isolates were screened

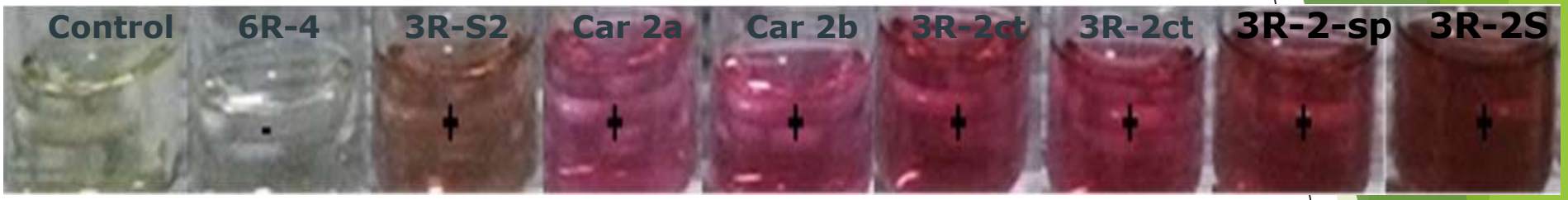
- ✓ 9 of which were found to be thermophilic

- ✓ Morphological analysis:
  8 were gram-negative and 1 was gram-positive
  1 rod and 8 coccus-shaped isolates found

RESULTS

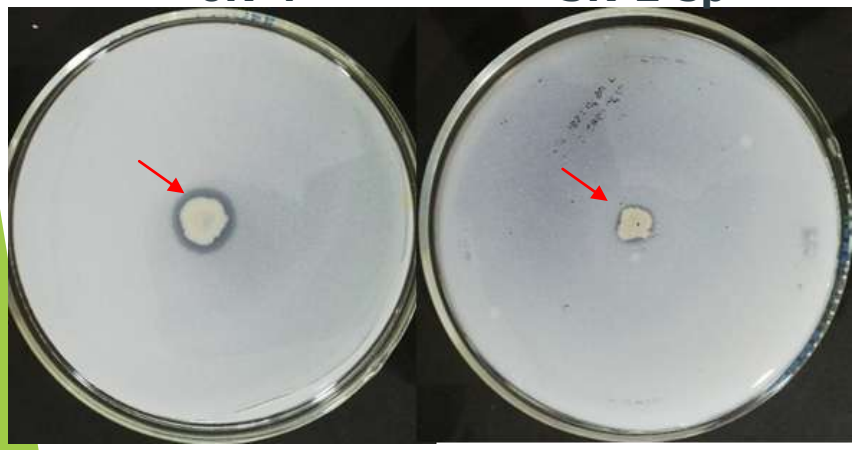
A. Screening and testing of lignin-degrading bacterial isolates.

A. IAA Production Test



B. Phosphate Solubilization Test

6R-4 3R-2-sp

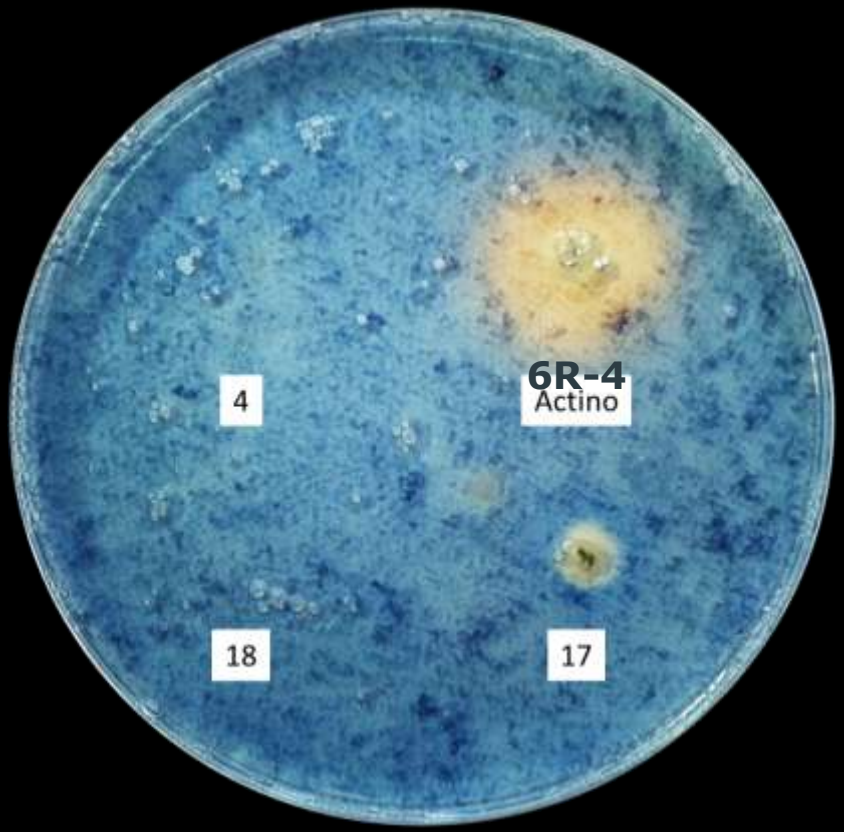


C. Starch HydrolysisTest

6R-4 6R-4

A) Analysis for the production of IAA (negative -, positive +; B) phosphate solubilization test; and C) starch hydrolysis test.

C. Starch Hydrolysis Test



RESULTS

B. Lignified area estimated from the stained stem cross sections of different released rice varieties

Variety	Lignin content (%)	Variety	Lignin content (%)	Variety	Lignin content (%)
NSIC Rc300[a]	33.4	NSIC Rc11[abcdefg]	25.0	NSIC Rc160[defgh]	18.0
NSIC Rc358[ab]	31.3	NSIC Rc238[abcdefg]	24.9	NSIC Rc392[efgh]	17.3
NSIC Rc224[abc]	29.9	NSIC Rc27[bcdefg]	22.9	NSIC Rc226[fgh]	16.7
NSIC Rc290[abcd]	27.7	NSIC Rc222[bcdef]	22.4	NSIC Rc216[hg]	15.6
NSIC Rc324[abcde]	27.7	NSIC Rc356[bcdefg]	22.1	NSIC Rc298[gh]	15.4
NSIC Rc390[abcde]	27.7	NSIC Rc214[bcdefg]	21.9	NSIC Rc218[h]	14.3
NSIC Rc360[abcde]	27.1	NSIC Rc354[cdefg]	20.6	NSIC Rc29[h]	13.3
NSIC Rc302[abcdef]	26.8	NSIC Rc25[cdefg]	20.3		
NSIC Rc308[abcdef]	26.8	NSIC Rc194[cdefg]	19.7		
NSIC Rc352[abcdef]	26.0	PSB Rc82[defg]	18.7		

5% significance level

- ✓As to the initial result of the lignin profiling, NSIC Rc300 had the highest lignified area (33.4%) while NSIC Rc29 had the lowest (13.3%). Further lignin quantification will be done through chemical analysis.

CONCLUSION AND RECOMMENDATION

- Results showed that carabao/cow manure hosts a variety of interesting lignin-degrading bacteria that can potentially be used in the conversion of rice biomass into bioethanol.

- We also found that rice vary in terms of lignin content across varieties; and

- Testing our bacterial isolates to degrade these varieties will reveal important factors governing lignin degradation of rice straw.

Thank you

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TECHNO-DEMONSTRATION OF TOP PERFORMING CHINESE HYBRID RICE LINES (CHRLs) IN 6 MAJOR RICE GROWING PROVINCES

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11 – Science Research Assistant, Hybrid Rice Technology Unit
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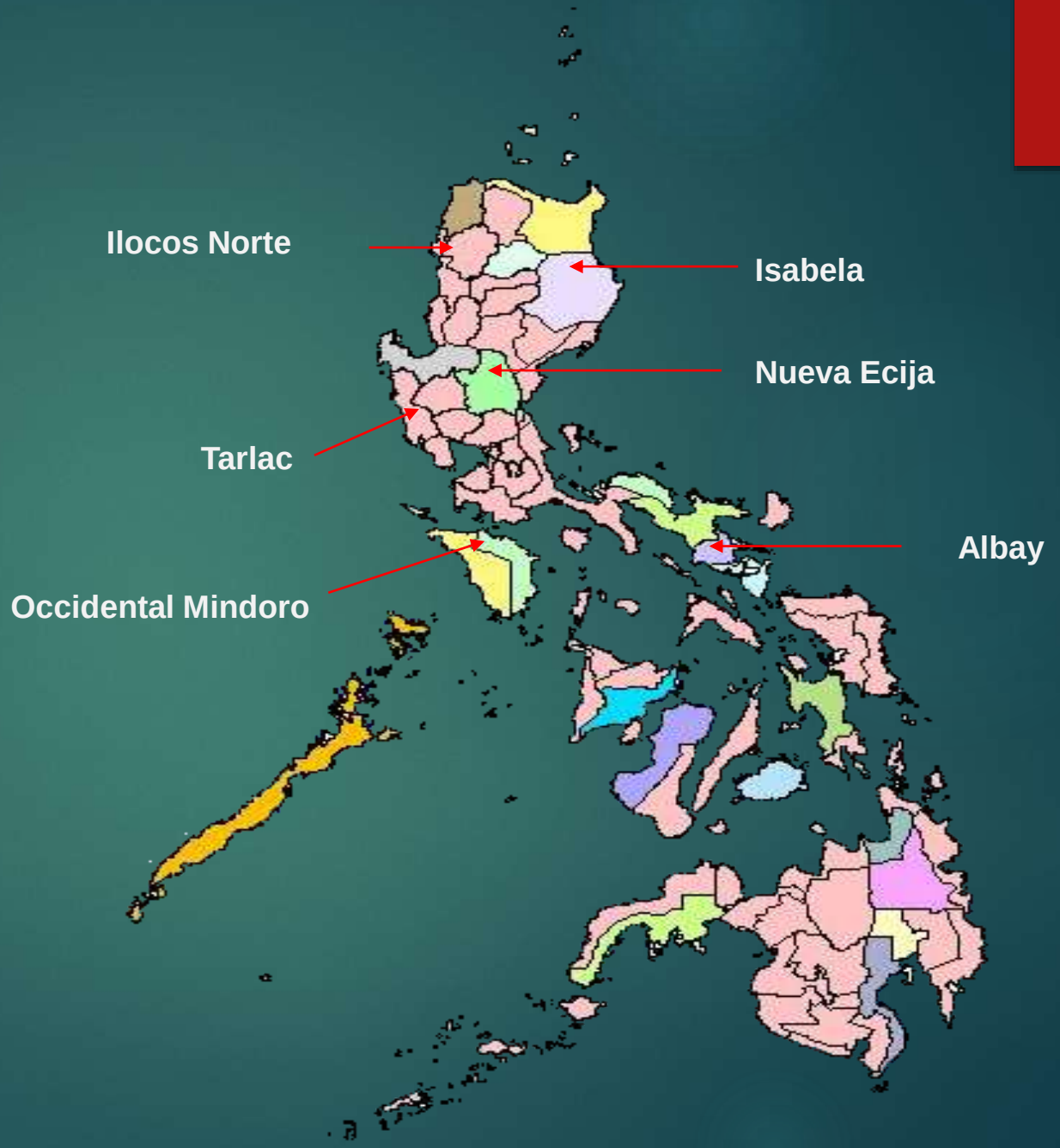
Rationale:

- Rice is the staple food of about 80% of the ever-growing Philippines population. However, rice production has not yet been able to cope up with the domestic requirement as indicated by the annual importation.
- This is due to several factors,
  - declining rate of rice production area
  - lack of incentives and support mechanisms to small farm sectors.
  - inadequate adoptions of known technologies.

Objectives:

- To promote and showcase the performance of Chinese hybrid rice lines adaptable to Philippines condition. The six (6) major rice growing province's, were as follows:



Specifically, it aims to:

1) Demonstrate the performance of the Chinese hybrid rice varieties under different regions
2) Create awareness among farmers on the advantages of using Chinese hybrid rice technology

METHODOLOGY

A. Collaboration with LGUs

B. Selection of Site and Farmer-Cooperator

C. Orientation/Briefing of Implementers and Farmer-Cooperators

- Mechanics in the conduct of techno-demonstration
- Data collection and recording
- Steps in hybrid rice cultivation particularly Chinese technology
- Monitoring and evaluation
- Feedback scheme

D. Conduct of the Techno-Demo

- Land Preparation
- Seed Soaking, Seedbed Preparation and Raising of Seedlings (Wet bed Method)
- Pulling, Transplanting and Replanting
- Water Management
- Weed Management
- Fertilizer Recommendation
- Pest/ Disease Control
- Harvesting and Threshing
- Drying/Bagging /Storing

E. Use of information materials

F. Data Gathering and Observation

G. Monitoring and Reporting

DATA PRESENTATION

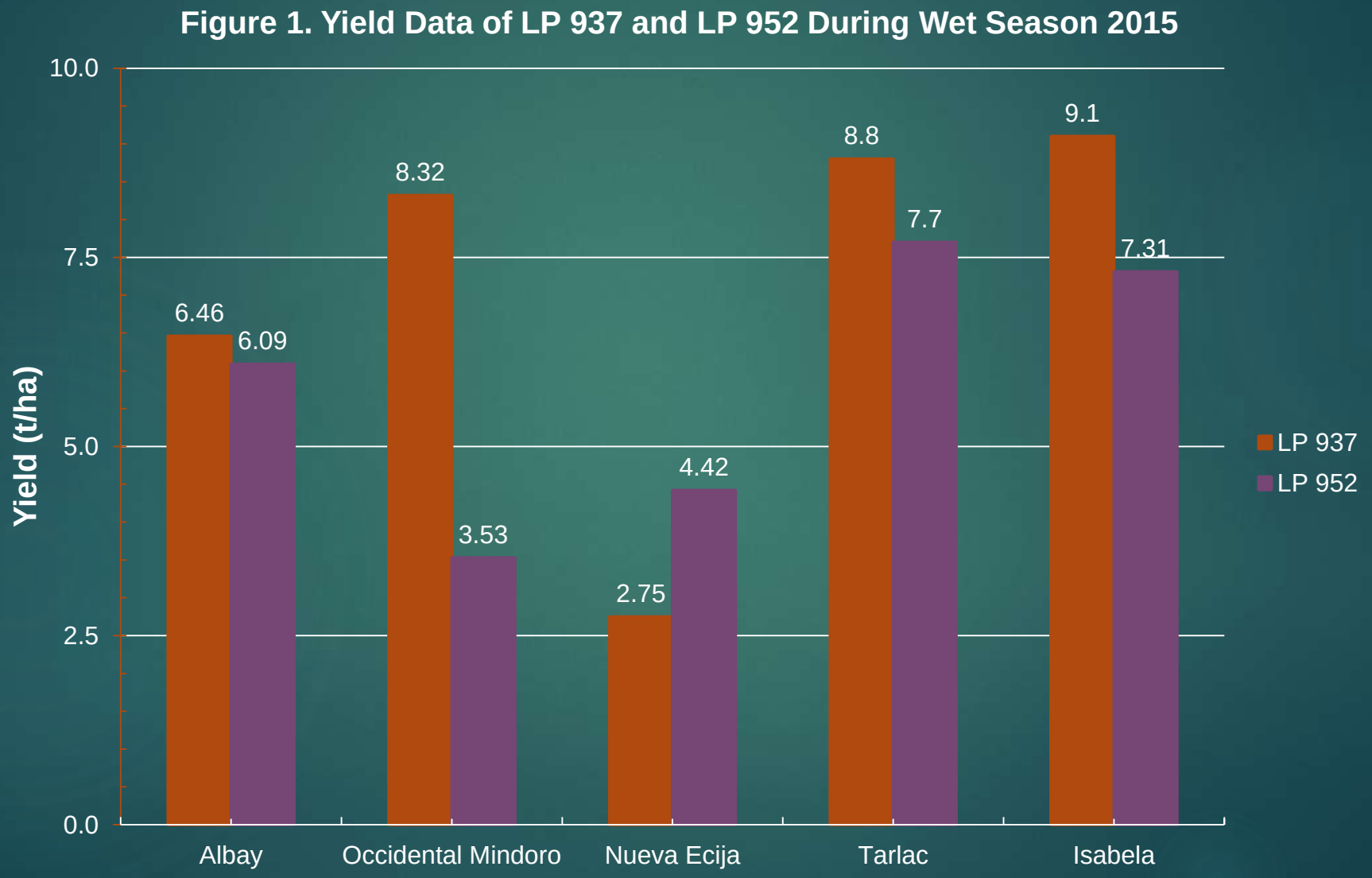
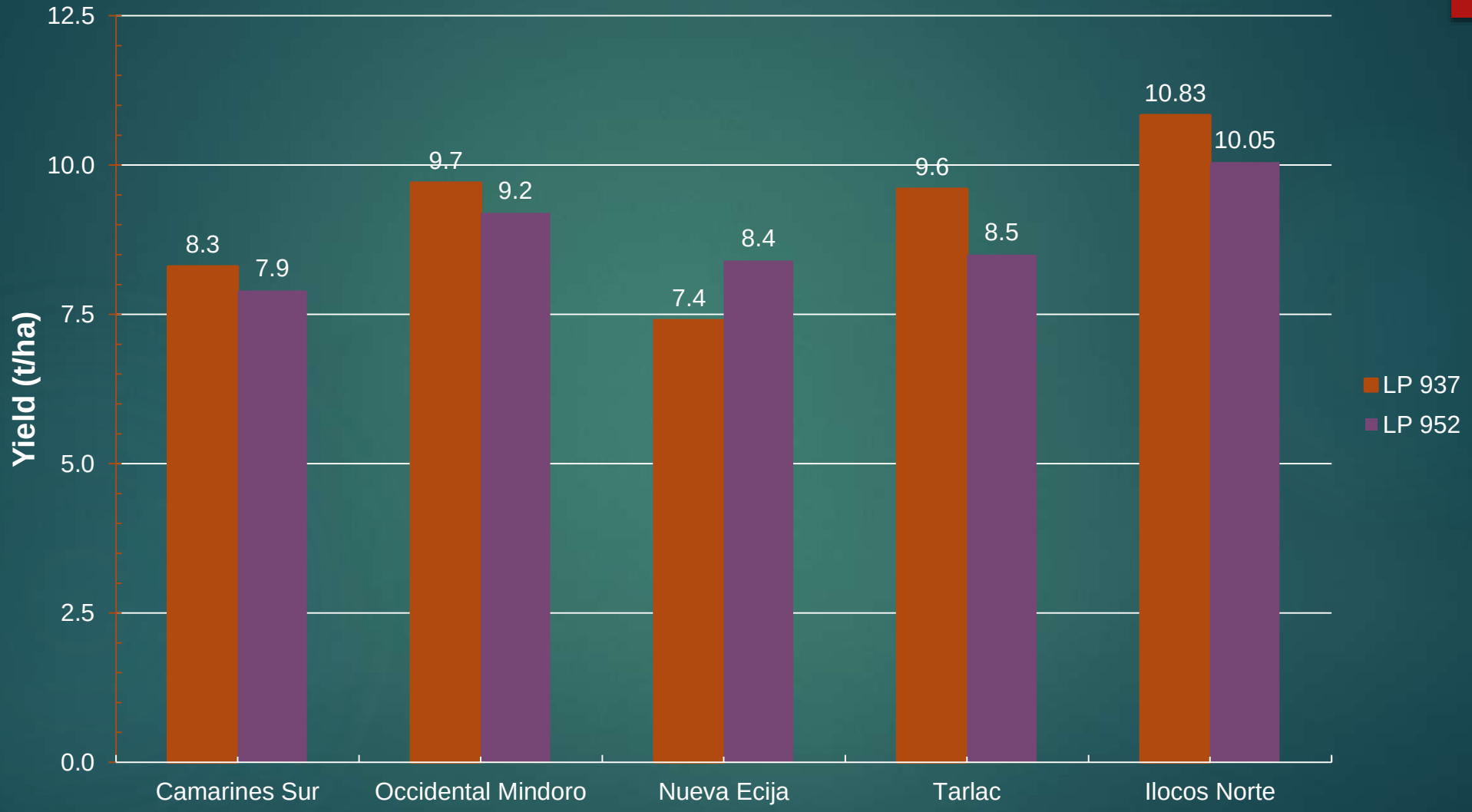


Figure 2. Yield Data of LP 937 and LP 952 During Dry Season 2015 - 2016



SUMMARY

Isabela WS 2015

LP 937- 9.1 t/ha

LP 952 yielded 7.31 t/ha.

Ilocos Norte (DS 2015-2016)

LP 937 10.83 t/ha

LP 952 10.05 t/ha

Occidental Mindoro

LP 937 9.7 t/ha

LP 952 has 9.2 t/ha.

PhilSCAT is still conducting an on-going test of this two lines in Vintar, Ilocos Norte this Wet Season 2016 to complete the two season trial.

LP 937 has already passed the NCT , June 1, 2016 , Cebu

LP 952 is in 3rd trial, Wet season 2016.

All farmers attended during field days were asking “when it will be available in the market”? This shows that it has a positive acceptance.

THANK YOU FOR LISTENING!