Evaluation of Physical Quality Parameters of Rice Collected from Millers and Markets in Different Parts of Sri Lanka

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INTRODUCTION

Qualitative characters are important for plant description and mainly influenced by the consumers preference, socioeconomic scenario and natural selection (Kurlovich, 1998; Hien *et al.,* 2007). In response to changing concerns of the modern consumer, improving quality aspects of rice are becoming more and more important. The grain quality characters of rice among other demanded parameters highly contribute to the value of rice to both consumers and producers. Moreover, rice should be free from abnormal flavours, bad odours, insects, foreign matter and admixtures. Lower moisture limits are also considered important for shelf life and storage of rice. Specifications for grain quality of rice were first published in Sri Lanka in 1984 as a Sri Lanka Standards Institute (SLSI) standard. Since then there had been a marked improvement in rice processing techniques adopted in Sri Lanka to produce better quality rice and hence, revisions are required for specifications of rice considering both raw milled rice and parboiled milled rice (Anon, 1995).

Rice comes in several sizes, colors and forms. Milled rice is commonly called white rice or polished rice. Total milled rice contains whole grains or head rice, and broken rice. The by-products in rice milling include rice hull, rice germ, bran layers, and fine broken rice. The husk, bran and possibly even the germ layers are removed to varying degrees during milling. From a given sample of rough rice about 70 percent of milled rice is obtained. The proportion of whole grains is known as head rice recovery and is expressed as percentage of rough rice. The head-rice recovery may vary from as low as 25% to as high as 65% (Khush *et al.,* 1979). The appearance of milled rice is important to the consumer. Thus grain size and shape are the main criteria of rice quality that breeders consider in developing new varieties to release for commercial production. Parboiled rice is a form of processed rice in which pressure steaming of rice is done prior to milling. Similar parameters are considered in determining quality of parboiled rice types. The objective of this study was to gather the information on grain quality traits of rice types obtained from both millers and markets in Sri Lanka.

***** Short Communication***

MATERIALS AND METHODS

Thirty four rice samples (1-34) were collected directly from millers and markets in different parts of Sri Lanka namely Ibbagamuwa, Nikavaratiya, Anuradhapura, Maha-Illuppallama, Samanthurai and Kilinochchi. The obtained types comprised of nadu, basmati and samba (Table 1). These samples were analyzed in the grain quality laboratory of Rice Research and Development Institute (RRDI), Batalagoda during *Yala* 2017. Each sample was mixed thoroughly and 100g was used for analysis. Quality parameters including percentages of moisture, head grain, broken grain, foreign matter, admixture, damage grain and physical appearance of rice, smell, grain type, type of rice (raw rice/parboiled), colour and chalkiness were determined. Moisture meter was used to measure moisture content of each sample. Grain separator was used to separate broken and unbroken rice. Physical properties such as length and breadth were measured using micrometer. Samples obtained were categorized based on long slender (LS), long medium (LM), intermediate bold (IB) and short round (SR) according to information provided by RRDI. For each sample percentages of head grain, foreign matter, admixture, damage grain and physical appearance of rice, smell, type of rice (raw rice/parboiled), colour and chalkiness were measured manually using IRRI standards (Cruz *et al.,* 2000). Specification included in SLSI standard for raw rice, parboiled rice and milled rice (Table 2) were considered for the evaluation of some grain quality traits.

Table 1. Categorization of rice types (1-34) collected from millers and market

LS-Nadu	LS-basmati	LM-Nadu	IB-Nadu	SR-Samba
-	17	1,3*,18*,20*	2*,4*,7,8*,10*,12*,16*,19,21*,22,23*,24,25,26,27,28,29*,33	5,6,9,11,13,14,15,30*,31,32*,34*

LS-Long slender, LM-Long medium, IB-Intermediate bold, SR-Short Round, * Parboiled rice type

Table 2 – Sri Lankan Standard SLS 633: for raw (R)/ Parboiled (PB) and milled rice

Sp. no	Characteristics	Premium		1		2		3	
		Raw	PB	Raw	PB	Raw	PB	Raw	PB
i	Moisture, per cent by mass, max	14	14	14.	14	14	15	14	15
ii	Foreign matter, per cent by mass, max.	Nil	Nil	0.3	0.3	0.3	0.5	0.5	1
iii	Type admixture, per cent by mass, max.	Nil	Nil	2	2	6	6	8	10
iv	Damaged grain, per cent by mass, max.	Nil	0.5	1	2	2	4	4	5
v	Broken grain, per cent by mass, max	5	1	10	5	20	15	25	20
Vi	Paddy seeds, grains per kilogram	Nil	Nil	5	5	15	15	30	30
vii	Stones/sands	Nil	Nil	Nil	Nil	Nil	Nil	0.5	0.5

Sp. no= Specification no., Raw= Raw rice, PB=Parboiled rice

RESULT AND DISCUSSION

Values obtained for tested grain quality traits are depicted in Table 3. According to the results, percentage of head grain in tested types was ranged from 46.4 % to 96.4 %. There was only one exception in which broken rice percentage was 98.9 %. Maximum moisture percentage found was 14.8 % and minimum value was 11.6 % with mean value of 13.2%. More than half of (52.9 %) of rice samples had mixed with other types of rice. The amount of admixtures ranged from 0.18 to 9.62% with mean value of 2.32.

Table 3. Mean value for tested grain quality traits

No	Moi %	GL	GW	GS	C	T	chailkin	HG%	Ad-mix %	DG	Phy. App.	Smell
1	11.7	6.18	2.02	LM	R	I	WB 2,3	49.2	nill	nill	B	G
2	12.8	4.95	2.18	IB	W	I	WB2	86.1	nill	nill	N	B
3	13	6.1	2	LM	R	I	WB3	83.2	nill	nill	N	B
4	12.6	4.94	2.21	IB	W	I	WB3	86.3	nill	nill	B	B
5	12.4	3.59	2.13	SR	W	I	WC2	92.4	nill	nill	G	B
6	13	3.93	1.17	SR	W	I	WC2	96.4	nill	nill	G	G
7	13	5.39	2.3	IB	W	I	WB2,3	60.3	nill	nill	N	N
8	13.9	4.91	2.19	IB	W	I	WB2,3	81.7	nill	nill	N	N
9	13.2	3.79	1.82	SR	W	I	WC2	94.4	nill	nill	N	N
10	12.4	5.14	1.95	IB	W	I	WB1	95.0	nill	nill	G	G
11	12.6	4.52	1.58	SR	W	I	WB2,3	1.1	nill	nill	N	B
12	13	4.46	1.57	IB	W	I	WC2	95.6	0.18	nill	N	B
13	12.8	3.77	2.15	SR	W	I	WB2	92.9	0.75	nill	N	N
14	12.6	3.9	1.8	SR	W	I	WC2,3	85.9	0.22	nill	N	N
15	13.1	3.71	1.86	SR	W	I	WC2	93.2	0.67	nill	N	G
16	12.4	5.7	1.93	IB	R	I	WB2	94.5	1.55	nill	N	G
17	12.1	6.68	1.8	LS	W	I	WB2	96	nill	nill	G	G
18	12.4	6.04	1.94	LM	R	I	WB2,3	75	0.57	nill	G	G
19	13.3	5.04	2.19	IB	W	I	WB2,3	46.4	1.19	nill	N	N
20	13.6	5.71	2.06	IB	W	I	WB3	84.2	9.62	nill	N	N
21	13.9	5.16	2.18	IB	W	I	WB2,3	95.4	4.95	nill	N	B
22	14.8	4.88	2.09	IB	W	I	WB2/ WC3	89.6	4.2	nill	N	N
23	14.8	5.16	2.3	IB	W	I	WB2,3	79.1	5.22	nill	N	N
24	14.6	5.17	2.23	IB	W	I	WB3	52.9	1.2	nill	N	N
25	14.6	4.9	2.03	IB	W	I	WB3	52.4	1.82	nill	N	N
26	14.8	4.89	2.13	IB	W	I	WB2,3	57.9	1.25	nill	N	B
27	14.3	4.89	2.12	IB	W	I	WB2,3/ WC2,3	67.2	1.05	nill	N	N
28	14.1	5.07	2.21	IB	W	I	WB3	57.2	2.77	nill	N	N
29	14.4	5.36	2.28	IB	W	I	WB2,3/ WC2,3	81.9	2.17	nill	B	N
30	13.1	3.98	1.68	SR	W	I	WC2	95.9	2.32	nill	G	B
31	12.1	3.69	1.82	SR	W	I	WC2	56	nill	nill	B	N
32	12.8	3.89	1.66	SR	W	I	WC3	66.5	nill	nill	B	G
33	11.6	4.88	2.2	IB	W	I	WB2	58.4	nill	nill	G	N
34	12.6	3.77	2.12	SR	W	I	WB2	85.2	nill	nill	G	N

Mois%= Moisture %, GL=Grain Length, GW=Grain width L: W= Length and width ratio, GS=Grain Shape, LS=Long slender, LM=Long medium, IB=Intermediate Bold, SR=Short Round, C= Colour of pericarp, R=Red, W=White, T=Translucency,I=Intermediate, Chalk=Chalkiness, WB=White Belly, WC=White Centre, HG=Head Grain %, BG=Broken Grain %, Mois=Moisture, Admix=Type Admix, DG=Damage grain, Phy. App=Physical appearance, Smell, Gn. type=Grain type, B=Bad, N=Normal, G=Good

Majority of rice sample (61.8%) had normal physical appearance and 20.6 % of sample had good appearance and 17.6 % of samples had bad appearance. In terms of smell of collected rice types, half of the samples had normal smell. About 23.5 % of samples had good smell and 26.5% had bad smell. Grain length of samples ranged from 6.68 mm to 3.59 mm. Grain width of samples ranged from 2.3 mm to 1.17 mm. The length: breadth ratio (L/B) found to be in between 2.5 and 3.0 and that feature is widely acceptable as long as the length is more than 6 mm (Dela *et al.,* 2000). Grain types were long slender, long medium, intermediate bold and short round. Majority of collected samples (50%) exhibited the features of category intermediate bold shape, followed by short round shape (35.3%) and long medium (11.8%). Lesser percentage of 2.9% showed long slender type. All the collected samples showed intermediate translucency. The consumers prefer rice with a translucent endosperm and pay a premium price for it, even though opacity disappears during cooking and does not alter eating quality. Chalkiness of rice also important parameter of consumer preference and among tested types 31.4 % of varieties belonging to White belly 2-3 (WB 2-3) category followed by WB 2 (22.86%), WC2 (20%), WB3 (20%), WC 2-3 (5.8%), WB 1-2 (2.9%) and WC2-3 (2.9%). Majority of rice types had white color pericarp (82.8%) and the rest had red colour.

CONCLUSIONS

Evaluation of rice types collected from millers and markets clearly emphasized that a wide variability exists in physical properties of rice sold in Sri Lanka. Majority of types was belonging to the category intermediate bold type followed by short round type. Half of collected rice types mixed with other rice types and had normal odour. The information gathered in this research will assist in understanding quality parameters of rice sold in Sri Lanka and for future rice research targeting grain quality.

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