

# Quality Evaluation of Speciality Rice Varieties Available in South Indian (Chennai) Market

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## Abstract

**Background:** Several speciality rice with health claims are emerging in the south Indian market. The study aims to examine the nature of speciality rice with health claims available in the Chennai market. **Methodology:** A market survey was conducted in randomly selected outlets from 4 zones of the Chennai city urban market (100 stores including supermarkets/hypermarkets/departmental stores/pharmacies were visited and rice samples were collected). The product label information, claims declared on the pack and morphological features of the rice samples were examined and recorded using stereo-zoom microscope. **Results:** Fifteen rice samples of different categories including whole-grain rice (8), semi-polished rice (2) and polished white rice (5) were evaluated. Three samples had low-glycaemic index claims among whole-grain rice and 2 among polished white rice. The health claims were not supported with scientific evidence and were sometimes misleading as revealed by stereo-zoom microscopic examination. **Conclusions:** The authenticity of many of the health claims declared on the rice packs is questionable due to the lack of scientific evidence. The awareness about the quality of rice would be helpful for the consumer to make a wise choice about which cereal staple to purchase.

**Keywords:** Claims, low-glycaemic index, market survey, scientific evidence, speciality rice

## INTRODUCTION

The rapid increase in the prevalence of type 2 diabetes (T2D) in Asian Indians over the past three decades can only be explained by lifestyle factors, predominantly the adoption of faulty dietary habits and decrease in physical activity levels.<sup>[1,2]</sup> Asian Indians, both in urban and rural areas, derive most of their dietary calories from refined cereals, a high intake of which has been shown to increase the risk of T2D and the metabolic syndrome.<sup>[3-7]</sup> The commonly consumed refined cereal in south India (white rice) has been reported to have a high glycaemic index (GI),<sup>[8,9]</sup> which may in part account for its adverse metabolic effects.

For the above-mentioned reasons, foods with lower glycaemic properties are recommended for this population.<sup>[10,11]</sup> In this context, whole grains such as brown rice may be beneficial.<sup>[12]</sup> We have shown that brown rice (IUAC 34.7 mg-5 min/dl) elicits a lower glycaemic response as compared to undermilled rice (IUAC 55.5 mg-5 min/dl) and fully polished rice (IUAC 58.4 mg-5 min/dl).<sup>[12,13]</sup>

The food industry now in India has a constant supportive action towards health and its promotion. The food sector is introducing innovative products every day with the cause and concern for health. Cereals are the only majorly consumed food as it is our staple. The food industry has started to innovate on cereal and cereal-based products for the betterment of the society. Polished white rice, the most common cereal staple are of high GI as reported earlier.<sup>[8,9]</sup> Regular consumption of this fibre depleted, high GI cereals may mediate T2D through insulin resistance. In this context, the food industry is coming forward with speciality rice varieties with lower glycaemic properties to enable consumers to make healthier choices'.

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Subsequent to the publication of the above results, several 'specialty rice' varieties have made their appearance in the India market, claiming superiority over polished white rice in terms of metabolic effects. However, few of these are backed by scientific evidence. A rice variety for which some evidence of benefit exists is the novel high fibre white rice (HFWR), which is available in the market as Dr. Mohan's HFWR. This variety has been shown to have 5 times higher fibre content than regular polished rice, and a lower GI of 61.3.<sup>[14]</sup> Through a market survey, we examined the characteristics of the various other types of 'specialty rice' commercially available in Chennai, South India.

## METHODOLOGY

### Market survey on speciality rice available in Chennai

A market survey on the speciality rice was conducted in different zones (North, South, East and West) of Chennai city, Tamil Nadu, India during January 2017. A total of 100 outlets (including supermarkets, hypermarkets, organic stores and pharmacies) were visited. The speciality rice available under different brands, the product label information, and their morphological features (polished/whole grain) were evaluated using physical examination as well as stereo-zoom microscopic (SZM) evaluation. All the necessary information declared on the product label was compiled as shown in Table 1. Visual and SZM evaluation (SZM-LED 2 model, Optika, Italy) was performed for the different rice varieties, and the morphological features such as bran and germ integrity were documented.

## RESULTS

The highest number of shops visited was in the south zone (35%) followed by west. Of all the outlets, supermarkets (46%) and organic stores (41%) dominated, whereas hypermarkets and pharmacies were fewer (9% and 4% respectively) as shown in Figure 1.

A total of 15 brands of speciality rice were identified. The different categories of rice included whole-grain rice (8), semi-polished rice (2) and polished white rice (5). The details available on the front of pack and back of pack of the market samples are shown in Figure 2. Health and nutritional claims were found to have been stated on all the brands. The health claims stated on the packs are shown in Table 1. The cost per Kg of whole-grain rice ranged from Rs. 67 to 155, semi-polished ranged from Rs. 80 to 90 and polished white rice ranged from Rs. 105 to 176.

The declared nutritional content varied between the brands, as shown in Table 2. The stereozoom images of the market rice samples are shown in Figure 3. Among the whole-grain rice category, BRB-43 declared a very low protein content (4.88%). BRB-43 claimed to be brown rice, but when it was observed under the stereo-zoom microscope, the grains were found to be completely polished. The dietary fibre content of the brown rice samples ranged from 2% to 5%. BRM-23 had the highest fat content of 2.6% among the rice samples.

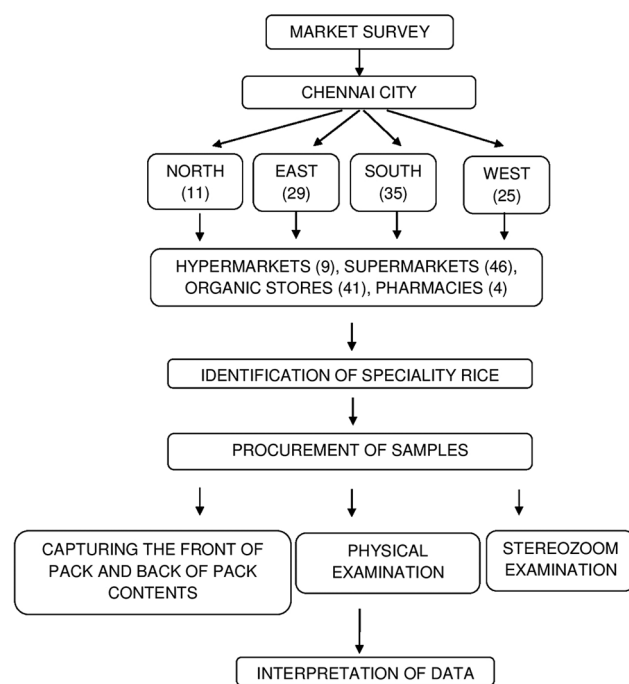


Figure 1: Study protocol

Among the polished white rice category, WBQ-60 showed the highest dietary fibre content of 13% whereas WRB-95 showed only 0.2%. The fat content of the same ranged from 0.3% to 3%. WRF-45 had the least fat content of 0.3%. The protein content of the rice ranged between 6.5%–11%. WBQ-60 showed a very low carbohydrate content of 57%, whereas the rest of the samples fell under the range of 75%–77%.

The market rice samples were taken up for physical examination and microscopic evaluation to correlate with the claims declared on the pack. The observations from the physical and microscopic evaluation of the rice samples are shown in Table 1. On stereo-zoom microscopy, some of the rice samples which claimed to be brown rice were shown to be highly polished white rice with a complete absence of bran and germ. In most of the brown rice samples, the bran and germ layer were found to be disrupted. Furthermore, multiple horizontal fissures were observed on various rice samples especially in hydrothermally processed rice varieties and herbally treated rice. Herbally treated rice showed adherence of greenish particles on the surface. Broken grains were observed in red rice varieties.

## DISCUSSION

This study reports on the nature of 'specialty rice' with health claims available in Chennai market during January 2017. The higher availability of speciality rice in supermarkets and organic stores may be due to the increase in the demand for such speciality products created by the health-conscious population. However, we found, for the most part, that there was little scientific evidence mentioned on the pack label supporting the health benefits ('Low GI', 'High fibre' and 'Diabetic friendly')

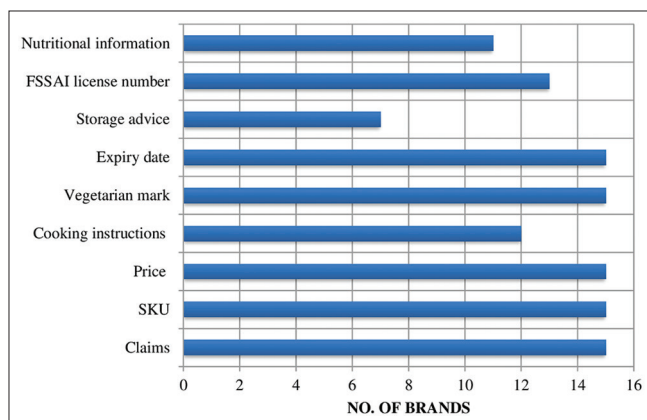
**Table 1: Claims declared on the pack of market speciality rice samples**

Serial number	Sample code	Product description	Contents of the pack	Price	Claims declared on pack	Visual and microscopic observation	Remarks
<b>Wholegrain rice</b>							
1	BRG-65	Brown rice	Parboiled brown rice	Rs. 120/kg	Low GI of 8.6, rich in fibre, helps to stay full longer, healthier than brown basmati rice, smart way of shaping up, packed with protein and essential amino acids	Grains were translucent Mild disruption of germ and bran Fissures observed in few grains	No scientific evidence to support the low GI value. Presence of fissures may make the rice mushy when cooked, which may in turn increase the GI
2	BRB-43	Brown rice (sugar-free rice)	100% polished white rice	Rs. 90/kg	Regulates blood sugar level, Prevents bad cholesterol, Proved to prevent type 2 diabetes, Prevents obesity, cancer and heart diseases, kidney disorders, Improves muscular strength, Rich in Vitamin E which promotes immunity and is necessary for a healthy skin, Reduce migraine headaches, Selenium in brown rice is found to reduce the incidence of cancer and cataracts, Helps with bone structure and metabolism	Absence of bran and germ layer	The grains were 100% polished but claimed as brown rice. Too many claims without supporting scientific evidence
3	BRP-32	Brown rice	Long grain brown rice	Rs. 150/kg	High fibre	Long grain brown rice with intact bran and germ	Claimed as high fibre, but the fibre content of the rice has not been mentioned
4	BRC-02	Raw brown rice, unpolished	Raw brown rice	Rs. 80/kg	High fibre, low GI	Brown rice with intact germ and bran	The GI, nutritional information were not available
5	BRR-93	Diabetic rice	Brown rice	Rs. 120/kg	More nutritious as they are rich source of antioxidants, vitamins, and minerals	Unpolished red rice variety with disrupted bran layer in many of the grains. Germ was found to be intact	Providing unpolished grains with intact bran and germ would be desirable. Nutritional information was not available
6	BRM-23	Brown rice	Unpolished brown rice	Rs. 84/kg	Lowers glycemic response, 100% wholegrain, wholesome nutrition; research evidence on the glycemic properties of the rice has been published in Diabetes Technology and Therapeutics, 2014	Authentic brown rice with glossy appearance, undisrupted bran layer and intact germ	The GI value has not been declared on the pack, but scientific evidence has been mentioned on the pack which reports a lower 24 h lower glycemic response for this brown rice based diets as compared to white rice based diets Scientific evidence based product
7	BBD-87	Quick cooking brown basmati rice	Parboiled long grain brown basmati rice	Rs. 155/kg	Zero cholesterol, vitamins and minerals, high fibre, Wholegrain goodness, cooks in 15 min, deliciously healthy, India's only quick cooking brown rice made with hydration enhancement technology	Grains were translucent. Intact germ. Minute fissures observed in the bran layer	Quick cooking rice generally elicits high GI values. Claims like zero cholesterol may be misleading
8	RRI-84	Red rice, unpolished	Red rice	Rs. 67/kg	Diabetic friendly controls blood sugar, rich in fibre, low GI, lowers cholesterol	Red rice variety with disrupted bran layer. Germ damage and broken were observed in few of the kernels	Fibre content will be decreased if the germ and bran are disrupted. The GI value, nutritional information not declared

*Contd...*

Table 1: Contd...							
Serial number	Sample code	Product description	Contents of the pack	Price	Claims declared on pack	Visual and microscopic observation	Remarks
<b>Semi-polished rice</b>							
9	SBN-24	Sonamasuri semi-brown rice	Minimally polished brown rice	Rs. 190/2 kg	Whole grain, high fibre, naturally balanced, rich in vitamins and minerals	Minimally polished rice with partial retention of germ and bran	Not a whole grain. Even minimal polishing leads to higher extent of loss of fibre and higher glycemic responses
10	HPY-73	Hand pounded rice	Parboiled brown rice	Rs. 45/500 g	Diabetic friendly, rich in dietary fibre and protein	Whole grain with intact bran and germ	Brown rice is nutritionally better than hand pounded rice. Misleading product label. No information on GI and nutritional information
<b>Polished white rice</b>							
11	WRB-95	Diabeto rice	Parboiled white rice	Rs. 176/kg	Herbally enriched rice supplement for diabetes	Highly polished rice (complete loss of bran and germ) with numerous horizontal fissures and presence of greenish particles sticking to the surface of the grains	No supporting scientific evidence for the functionality of the product in terms of any intervention trials. Presence of fissures may not be desirable for a favourable GI
12	WRN-11	Healthy, dia special rice	Polished white rice	Rs. 150/kg	Dia-special Japanese technology	Retention of bran and germ in most of the grains	No information on the GI
13	WRD-28	Dia rice	Polished white rice	Rs. 105/kg	Low GI, rich in protein, dietary fibre, iron, vitamin B1, zero cholesterol and low in sodium	Polished white rice with complete loss of bran and germ	No information on the GI
14	WBQ-60	Low GI basmati rice	Parboiled white basmati rice	Rs. 150/kg	Suitable for diabetes and obesity, low GI of 56	Hydrothermally processed long grain parboiled basmati rice which is highly polished with loss of bran and germ	This is a medium GI product rather than low
15	WRF-45	High fibre rice	Polished white rice	Rs. 136.50/kg	5 times more dietary fibre, slower rise of blood sugar after a meal, healthier alternative for people with diabetes	Polished white rice with complete loss of bran and germ	The GI value has not been declared on the pack, but scientific evidence has been mentioned on the pack

GI: Glycemic index



**Figure 2:** Details available on the market samples for each rice sample claimed by most of the brands. For instance, the ‘Low GI of 8.6’ claimed by the brown rice variety BRG-65 has not been

reported in literature till now for any rice variety in the world, with the GI of most varieties of brown rice ranging from 62 to 66.<sup>[15]</sup> Similarly, WBQ-60 had also claimed that it had ‘low GI of 56’, a value that comes under the medium GI category according to Aeberli and Zimmermann 2007.<sup>[16]</sup> These kinds of claims may be misleading to the consumer. There are also a few brands which have indicated that they have ‘Low GI’; however, the values have not been disclosed on the pack. Only one of the brands among the 14 identified, BRM-23 has disclosed their scientific evidence (research evidence) on the front of the pack.

WBQ-60 a hydrothermally processed long grain parboiled basmati rice (which claims to contain 13% dietary fibre), is completely polished and fibre depleted and the justification for the claim of higher dietary fibre content was not available on the pack.

Even the whole-grain rice samples such as BRG-65, BRB-43 and BRR-93 showing disrupted bran and germ layer may



**Figure 3:** Stereo-zoom microscopic images of speciality rice samples

possibly elicit a higher glycaemic response, as they were found to have disrupted bran and germ layer. Ruptured bran and germ layer ultimately leads to loss associated nutrients and dietary fibre content. Furthermore, fissures were observed in most of the polished and parboiled rice samples, which may be due to differential moisture gradient that is created in the kernels during processing done with a purpose to increase the rate of hydration for faster cooking of brown rice. The presence of fissures in rice makes it brittle, leading to crumbling during washing/cooking and results in sticky and mushy or sticky textured rice which

may detrimentally affect its glycaemic properties. In general, varieties of preprocessed rice with fast cooking times have been shown to elicit higher glycaemic responses.<sup>[17]</sup> Our own study has shown that quick cooking brown rice elicits a very high glycaemic response (unpublished data).

## CONCLUSIONS

While there has been a surge in the availability of purportedly 'healthy' rice varieties, the science behind the products are lacking. Many of the claims stated on the product packaging

**Table 2: Nutritional information declared on the pack of market rice samples (per 100 g)**

Brands	Energy (Kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Dietary Fibre (g)	Potassium (mg)	Magnesium (mg)	Iron (mg)	Manganese (mg)	Calcium (mg)	Sodium (mg)	Sugar (g)	Niacin (mg)	Phosphorous (mg)	Vitamin B1 (mg)	
BRG-65	360	9.52	2.5	75	2	197	100	1.51	2.37	NA	-	-	-	-	-	-
BRB-43	232	4.88	1.17	49.7	3.32	137	72.2	-	-	-	-	-	-	-	-	-
BRP-32	362.9	8.74	2.32	76.76	-	-	-	-	-	-	-	-	<1	-	-	-
BRM-23	343	7.8	2.6	72	5	-	-	-	-	-	-	-	-	-	-	-
BBD-87	350	9.7	2.5	75	2.5	-	-	1	-	11	5	-	-	-	-	-
SBN-24	362	7.5	2.7	76	3.4	-	-	1.8	-	-	-	-	-	4.3	-	-
WRB-95	327	6.5	2	75	0.2	-	-	0.7	-	10	-	-	-	160	-	-
WRN-11	362	7.5	2	76	3.3	-	-	1.8	-	-	-	-	4.3	-	-	-
WRD-28	354.2	10.1	0.5	77.2	2.6	-	-	4.4	-	-	2.6	-	-	-	-	0.2
WRF-45	335	8	0.3	75	8	-	-	-	-	-	-	-	-	-	-	-
WBQ-60	248	11	3	57	13	1102	-	-	-	-	-	14	-	-	-	-

NA: Not available

are misleading and may prompt the consumer to make the wrong choices. Consumer awareness must be created to help consumers make wise choices for the consumption of 'healthy products'.

### Declaration of interests

No competing financial interests exist. VM, SS and SV conceived the concept. RA conducted market survey, led the data collection and initiated the first draft of the manuscript. SS helped in microscopic evaluation of market samples and planning of market survey. SS, VM, SV, RMA, RU, H. A helped in data interpretation and firming up of the manuscript. All authors contributed to their vision and finalisation of the manuscript. All authors declared that they have no duality of interest associated with this manuscript.

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### Conflicts of interest

There are no conflicts of interest.

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