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A Comparative Study of Physicochemical properties, Organoleptic attributes, Cooking Quality, and Nutritional composition of selected Traditional rice varieties of Tamil Nadu

[1]Rashmi. J and *S. Kavitha

[1*]Department of Plant Biology and Plant Biotechnology, Ethiraj College for Women (Autonomous) Chennai - 600008 (India),
Affiliated to University of Madras, Chennai - 600005 (India)

Abstract

Traditional rice varieties (TRVs) possess significant potential to enhance nutritional quality and promote health security. This study comparatively evaluated six TRVs (*Mappilai samba* (MS), *Karuppu kavuni* (KK), *Aruvatham Kuruvai* (AK), *Sivappu Kavuni* (SK), *Kattuyaanam* (KY), *Garudan Samba* (GS) and a local rice cultivar ADT-37 (LC) for their physicochemical properties, organoleptic attributes, cooking behaviour, and mineral composition. Sensory evaluation assessed aroma, texture, taste, and colour among the samples. All TRVs exhibited medium grain size (5.51–6.60 mm), whereas SK, AK, and the local cultivar (LC; 4.81 ± 0.09 mm) were classified as short-grain types. Grain density of TRVs (~1.3 g/cm³) was comparable to that of LC. Moisture content varied significantly ($p < 0.05$), with GS showing the highest (4.10 ± 0.10%) and LC the lowest (1.23 ± 0.57%). Total ash content ranged from 0.56 ± 0.05% to 1.56 ± 0.05%, indicating differences in mineral composition. TRVs showed relatively higher crude fibre, while LC recorded the lowest (2.24%). Cooking time ranged from 21.67 to 97.0 minutes, with TRVs exhibiting higher water uptake. Minimal gruel loss and uniform elongation ratio (~1.1) were observed. Mineral profiling (EDX-FESEM) confirmed the nutrient-rich nature of TRVs. Among the varieties, Sivappu Kavuni, Karuppu Kavuni, and Kattuyanam were most desirable. Overall, TRVs demonstrated superior nutritional and cooking qualities, supporting their potential for value-added food product development.

Key words : Traditional rice variety, Local rice cultivar, cooking characteristics, physicochemical properties.

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*Associate Professor

India possesses a vast and diverse repository of traditional rice germplasm distributed across different agroecological regions. These indigenous rice varieties are highly regarded for their enhanced nutritional attributes[20]. Moreover, Traditional Rice variety (TRVs) is inherently low in fat, cholesterol, and salt, rendering it a suitable dietary component for individuals with hypertension and contributing to the prevention of various lifestyle-related disorders[31]. TRVs contain several nutritional benefits as they are exemplary sources of carbohydrates with low fat, low salt, and the absence of cholesterol, and are reliable sources of vitamins and minerals such as thiamine, riboflavin, calcium, fibre, vitamin D, niacin, and iron. TRVs contain resistant starch, which helps to improve the growth of beneficial bacteria that maintain a healthy bowel[38]. According to the Annual Report on Agriculture, 2021-2022 in India, rice is harvested in a region of forty-five million hectares, along with a yearly production of one hundred and twenty-two million tonnes and a productivity of 2173 kg/ha. The Tamil Nadu Salient Statistics on Agriculture, 2021, reports that the rice crop is cultivated on almost one-third of the whole area in the state. Though modern rice cultivars yield high, grain quality is subpar, and hence, there is a need for an alternate crop to maintain grain quality and nutritional benefits. As an outcome, improving rice grain quality has attracted the prime focus of the world in rice breeding[34]. Traditional rice varieties (TRVs), often referred to as 'heritage rice,' have been cultivated in the state since ancient times. These rice varieties are known to possess an excellent source of minerals and vitamins, possessing high fibre, making these rice varieties to be used as an alternative in their daily diet routine habits, as it is highly recommended for patients with diabetes[4]. These rice varieties contain a lesser amount of fat and a good amount of oryzanol compared with that of modern rice varieties, which helps in reducing the cholesterol levels[38]. In recent times, these TRVs were considered functional food instead of being known as staple food or the chief source of carbohydrate or starch. It serves as a nutraceutical because of its low glycemic index as compared with that of modern rice varieties. Thus, it serves as a novel food for individuals with diabetic complications[4]. This study was undertaken to systematically evaluate and compare traditional rice varieties with a local cultivar in terms of physicochemical, sensory, cooking, and nutritional attributes. Such an investigation is significant because traditional rice varieties, though rich in nutritional and functional properties, remain underutilized and insufficiently characterized. Generating scientific evidence on their quality and health benefits can support their conservation, promote their inclusion in modern diets, and contribute to improved nutritional security and sustainable agricultural practices. The results seek to affirm the pre-eminence of TRVs and furnish a scientific rationale for their adoption as viable alternatives or substitutes for prevalent local rice cultivars.

Plant Collection and Preparation :

The TRVs *Mappilai samba* (MS), *Karuppu kavuni* (KK), *Aruvatham Kuruvai* (AK), *Sivappu Kavuni* (SK), *Kattuyaanam* (KY), *Garudan Samba* (GS)and the local rice cultivar *ADT-37*(LC) were procured from the Swami Dayananda Educational Trust Farm, Manjakudi, and the Valanadu Sustainable Agriculture Producer Company Limited, Sirkazhi, respectively, both located in the Mayiladuthurai District. The collected rice grains were thoroughly cleaned, dehusked, and subsequently milled into a fine powder for further analytical procedures.

Organoleptic characters :

The organoleptic test was done to evaluate the colour, odour, texture, and taste of the rice varieties using the standard methods[23,32]

Physical parameters :

The physical parameters of the rice varieties were assessed. Grain shape and length were measured using a vernier calliper, following the guidelines established by IRRI,2004. The density was determined using the pycnometer method[16,23] Viscosity was measured with a Brookfield viscometer, as outlined by Hamaker and Griffin[13,23].

Chemical parameters :

The chemical parameters, including moisture content and ash content, were estimated following the method described by Bhavya[6]. Crude fibre and crude fat were determined using the standard procedures outlined by the Association of Official Analytical Chemists[3]. The qualitative analysis for the presence of vitamins A, B/B12, and C was carried out based on the protocol of Biren and Nyak[7].

Cooking Characteristics :

Optimum cooking time :

The optimum cooking time was determined following the Ranghino method[28]. In this procedure, 2 grams of rice sample was placed in a 100 mL beaker containing 20 mL of water and subjected to cooking in a boiling water bath maintained at 95°C. At fixed time intervals, individual grains were removed and gently pressed between two glass slides to assess the presence of an ungelatinized white core. The cooking process was considered complete when no residual white core was observed, indicating the optimum cooking time.

Water uptake ratio :

As described by Bhattacharya and Sowbhagya[5]. 2 g of rice samples were cooked in 20 mL of water using a boiling water bath maintained at 95°C for the predetermined optimum cooking time. Following cooking, the residual water was drained, and the samples were placed on filter paper to remove any surface moisture. The cooked rice samples were then accurately weighed to determine the water uptake ratio, calculated using the following formula:

Water uptake ratio = Weight of cooked kernels (g) / Weight of uncooked kernels (g).

Gruel solid loss :

The residual water obtained from the water uptake ratio experiment was used to estimate gruel solid loss using the method of Oko[24]. Initially, the weight of a clean, empty Petri dish was recorded as W_1 (g). The residual gruel (liquid) was then transferred into the Petri dish along with minimal washings, and the combined weight of the dish and gruel was noted as W_2 (g). Subsequently, the Petri dish was placed in a hot air oven at 110 C for 5 hours to ensure complete evaporation of moisture, resulting in dry gruel residue. The final weight of the Petri dish containing the dried gruel solids was recorded as W_3 (g). This procedure was performed in triplicate for each treatment group to ensure reproducibility. The gruel solid loss was calculated using the formula:

Gruel solid loss (g) = $W_3 - W_1$,

where W_1 represents the weight of the empty Petri dish

W_3 denotes the weight of the Petri dish containing the dried gruel residue.

The percentage of gruel solid loss was expressed as:

Gruel solid loss (%)=$[(W_3-W_1)/(W_2-W_1)]\times 100$.

Elongation ratio :

The elongation ratio was calculated according to Oko[24] as the average length of cooked rice divided by the average length of uncooked rice. It was expressed using the formula:

Elongation ratio = Average length of cooked rice (mm) / Average length of uncooked rice (mm).

Cooked rice length-breadth ratio :

The length-to-breadth ratio of cooked rice was calculated according to Oko[24] by dividing the length of the cooked rice by its corresponding breadth. The ratio was expressed using the following equation:

Cooked length breadth ratio = Length of cooked rice (mm) / Breadth of cooked rice (mm).

Mineral analysis :

The mineral nutrients in the rice varieties were quantified using the EDX-FESEM method.

Statistical analysis :

The experiments were performed in triplicate and statistically evaluated in Excel to ascertain the mean ± standard deviation values. The cooking parameters of the rice varieties were subjected to one-way ANOVA analysis facilitated by IBM SPSS Statistics Software version 29.0.2.0(20)

Organoleptic characters :

The organoleptic test was conducted to study the colour, odour, texture, and taste of the selected rice varieties. The colour of the rice was red, reddish white, light red, black and white (Table-1). The odour of the rice was almost all the TRVs, which were aromatic, and the LC was mild in odour. The texture of the rice varieties was moderately hard, moderately soft, hard and soft. The taste was good for all the TRVs. The colour of the Rice is mainly based on the presence of pigments, especially anthocyanin, whereas there is no such pigment in the LC. The odour of the rice mainly depends on the freshness of the rice seeds. The aromatic smell is mainly due to the scent of the fresh rice that is stored after post-harvest. Thus, if rice is stored under suitable conditions, the Aroma will be retained, which in turn maintains the quality of the rice. Food texture can be defined as the manner in which various components and structural elements are organised and integrated to form both microstructural and macrostructural characteristics[35]. Organoleptic testing constitutes a sensory evaluation methodology that employs human senses such as colour, odour, texture and taste to assess product quality and characteristics[21]. Taste is one of the most essential parameters in food quality evaluation. Although taste perception is highly subjective, it can still serve as an important criterion in foot quality research. Although taste perception is inherently subjective, it remains a critical determinant in food quality evaluation, particularly in studies involving consumer acceptance. Supporting this, Singh[33] conducted a comprehensive assessment of 23 rice cultivars, integrating physicochemical properties, cooking characteristics, organoleptic attributes, and consumer preferences to provide a holistic understanding of grain quality.

Physical parameters :

The physical parameters were studied and are represented in Fig. 1 and Table-2. The Grain shape determines the evaluation of the grain quality of the rice varieties. According to IRRI (2004 the rice grains' shape was classified as follows: Slender (>3.0), Medium (2.1 - 3.0), Bold (1.1 -2.0) and round (<1.1). Based on this classification, the MS (2.38±0.07mm), GS (2.29±0.02mm), KY (2.19±0.06mm), KK (2.42±0.07mm) and AK (2.10±0.10mm) were found to be medium-shaped grains, whereas SK (2.09±0.02mm) and LC (1.93±0.03mm) were found to be bold-shaped grains. A study by Pillai[25] found that the TRVs of Kerala was short and medium-sized grains. Grain length is one of the important characteristics to determine the grain quality of rice varieties. According to IRRI 2004, the length of the rice grains was classified as follows: extra-long (>7.5 mm), long (6.61- 7.5 mm), medium (5.51- 6.60 mm) and short (< 5.5 mm). The results of our study showed that MS (6.14 ±0.02mm), GS(5.71±0.06mm), KY (5.90±0.07mm), and KK(6.31±0.03mm) were found to be medium-sized grains, whereas S K(5.24±0.16mm), AK(5.29±0.07mm), and LC(4.81±0.09mm) were found to be short-sized grains[25]. Grain length is a highly stable varietal trait and serves as a valuable criterion for selection in breeding programmes. The medium and short size the grains were significantly different ($p < 0.05$). Density measurement for rice varieties is distinguished as an important parameter in determining their grain quality. Determination of density by pycnometer is a very precise method. The density of TRVs compared to local rice varieties was found to be 1.3 gr/cm^3. The viscosity is one of the factors to evaluate the quality of the rice grain. Viscosity, defined as the resistance of a substance to flow, is an important parameter influencing food quality. In the present study, viscosity was measured in centipoise (cP). The local cultivar (LC) and AK exhibited identical viscosity values (31.67 ± 0.57 cP), representing the highest among the samples. In contrast, KY (28.33 ± 0.57 cP) and GS (28.33 ± 1.15 cP) showed similar but moderately lower values. Comparatively, SK (27.0 ± 0.01 cP), KK (27.67 ± 0.57 cP), and MS (25.67 ± 0.57 cP) recorded lower viscosity levels, with MS exhibiting the least among all the varieties studied. Traditional rice with higher viscosity tends to slow gastric emptying, which can enhance fullness and influence glycaemic response—an important consideration for nutritional quality[8].

Chemical parameters :

A moisture content in the range of

12-14% was considered optimal for maintaining rice quality and ensuring its suitability for long-term storage[25]. The chemical parameters of the rice variety evaluated in our study, the moisture content was in the optimal range; it was high in GS (4.10±0.10%) and KY (3.25±0.05%), and low in LC (1.23±0.57 %) (Table-3, Fig. 2). The moisture content was significantly different at $p < 0.05$. The moisture content is important in preserving the nutritional quality of the rice grains and also their shelf life[36]. A study by Koshy[17] reported that the moisture content of TRVs of Kerala ranged from 7.33% to 12.80%. Ash content reflects the total mineral composition of grains and serves as a key indicator of their inorganic nutrient profile. As noted by Lamberts,[18] ash concentration is strongly influenced by the degree of milling or polishing, with higher values typically observed in less processed or whole-grain rice due to the retention of the mineral-rich bran layer. In the present study, the total ash content of TRVs ranged from 0.56 ± 0.05% to 1.56 ± 0.05%. The highest value was recorded in SK (1.56 ± 0.05%), while the lowest was observed in GS (0.56 ± 0.05%). These findings are comparatively lower than those reported by Pillai *et al*. (2020), who documented an ash content range of 0.98% to 1.94% in TRVs from Kerala.

Rice is generally characterised by a low dietary fibre content. However, the consumption of fibre from unpolished rice has been reported to contribute to the reduction of cardiovascular symptoms in humans[12]. In our study, the percentage of crude fibre content ranged from 2.24±0.03% to 10.13± 0.05%. Most of the TRVs contained a high percentage of crude fibre, whereas the local cultivar contained the lowest percentage, about 2.24%. A study by Pillai *et al*., 2020 on total, insoluble, and soluble dietary fibre suggested that polishing significantly reduces the fibre content of rice; therefore, the consumption of TRVs may serve as a valuable alternative for improved health benefits. An intake of approximately 25 g of dietary fibre is recommended to reduce the risk of chronic diseases, including Type II diabetes, which continues to be a major public health concern in developing countries[2].

Although fat is present in relatively small quantities in rice, it remains an important macronutrient that contributes significantly to grain quality, with studies indicating a positive association between fat content and the sensory attributes of rice[11]. In the present study, traditional rice varieties (TRVs) exhibited appreciable crude fat content, ranging from 0.70 ± 0.01% in LC to 1.22 ± 0.01% in AK, aligning well with earlier reports of approximately 1% fat in Indian rice varieties and highlighting their nutritional relevance despite being minimally processed[29]. Notably, TRVs are widely recognized for their superior nutritional profile, particularly their richness in essential vitamins that extend beyond the benefits of modern cultivars[20]. In this study, Vitamin B1 and B12 were detected in multiple TRVs, including MS, GS, AK, SK, KK, and KY, whereas these vitamins were not detectable in the local cultivar, underscoring the enhanced micronutrient retention in traditional varieties. This observation is consistent with earlier findings of Sangeetha, which reported elevated levels of B vitamins in traditional rice such as Kattuyanam and Mapillai Samba, thereby reinforcing the nutritional superiority ad health-promoting potential of traditional rice varieties[30].

Table-1. Determination of Organoleptic Characters of the Rice Varieties

S. no.	Name of the rice variety	Colour	Odour	Texture	Touch/ Taste
1	MS	Red	Aromatic	Moderately hard	Good
2	KK	Black	Aromatic	hard	Good
3	AK	Red	Aromatic	Moderately hard	Good
4	SK	Red	Aromatic	Moderately soft	Good
5	KY	Light red	Aromatic	Moderately hard	Good
6	GS	Red/White	Aromatic	Moderately soft	Good
7	LC	White	Mild	soft	Desirable

Table-2. Determination of Physical parameters of the rice varieties

S. no.	Name of the Rice variety	Grain Length (mm)	Grain Shape (mm)	Density gr/cm^3	Viscosityc P units
1	MS	6.14±0.02	2.38±0.07	1.32±0.00	25.67± 0.57
2	KK	6.31±0.03	2.42±0.07	1.30±0.00	27.67± 0.57
3	AK	5.29±0.07	2.10±0.10	1.30±0.00	31.67± 0.57
4	SK	5.24±0.16	2.09±0.02	1.30±0.00	27.0± 1.0
5	KY	5.90±0.07	2.19±0.06	1.34±0.00	28.33± 0.57
6	GS	5.71±0.06	2.29±0.02	1.33±0.00	28.33±1.15
7	LC	4.81±0.09	1.93±0.03	1.32±0.00	31.67± 0.57

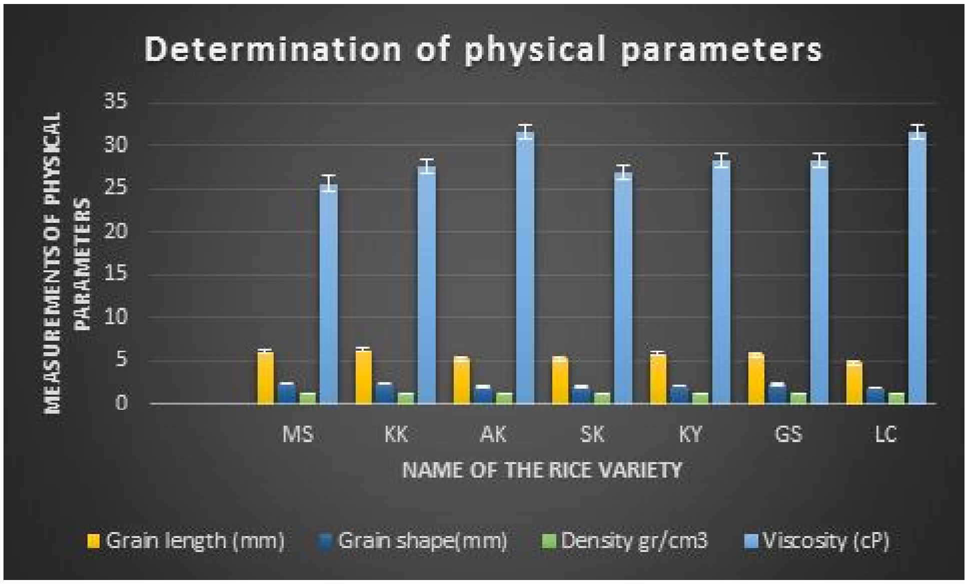

Fig. 1. Determination of Physical parameters of the rice varieties

Table-3. Determination of Chemical parameters of rice varieties

S. no.	Name of the rice variety	Percentage of Moisture Content	Percentage of Ash content	Percentage of Crude fibre content	Percentage of Crude Fat content
1	MS	2.16±0.15	1.23±0.05	7.06±0.05	0.96±0.05
2	KK	2.20±0.20	1.40±0.10	8.10±0.10	1.03±0.05
3	AK	2.03±0.05	0.70±0.10	10.13±0.05	1.21±0.01
4	SK	2.10±0.10	1.56±0.05	8.16±0.05	0.93±0.01
5	KY	3.25±0.05	1.10±0.10	5.56±0.05	1.10±0.01
6	GS	4.10±0.10	0.56±0.05	3.86±0.05	0.93±0.11
7	LC	1.23±0.57	0.76±0.05	2.24±0.005	0.70±0.01

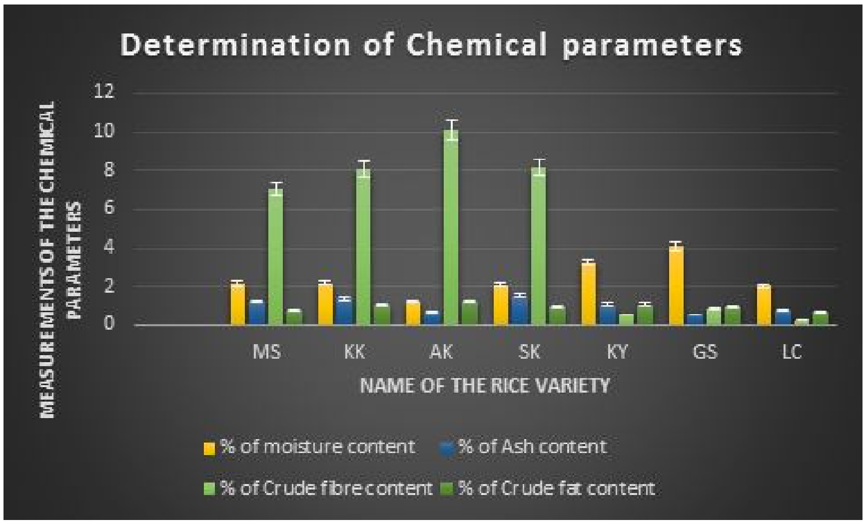

Fig. 2. Determination of chemical parameters of rice varieties

Table-4. Determination of Cooking characteristics of Rice varieties

S.no.	Name of the rice variety	OCT	WUR	GSL	ER	CLBR
1	MS	87.67±3.05	3.32±0.37	0.37±0.04	1.12±0.01	2.23±0.20
2	KK	97.0±4.58	3.51±0.43	0.29±0.03	1.15±0.005	2.10±0.10
3	AK	69.0±2.0	2.90±0.37	0.57±0.01	1.10±0.01	1.90±0.01
4	SK	43.0±2.64	3.81±0.64	0.27±0.02	1.17±0.01	2.24±0.02
5	KY	75.67±3.05	3.12±0.47	0.45±0.03	1.11±0.01	1.53±0.25
6	GS	56.67±1.52	2.53±0.41	0.74±0.04	1.07±0.01	2.26±0.20
7	LC	21.67±2.08	2.38±0.23	0.80±0.03	1.01±0.01	1.87±0.26

OCT- Optimum Cooking Time, WUR- Water Uptake Ratio
GSL-Gruel Solid Loss percentage, ER-Elongation ratio
CLBR- Cooked rice Length Breadth Ratio

Cooking Characteristics :

Optimum cooking time :

Cooking time is a critical parameter, particularly in the context of modern fast-paced lifestyles, where prolonged preparation of rice varieties is often perceived as laborious. The optimum cooking time was observed for all the TRVs (Table-4). The optimum cooking time of TRVs ranged from 21.67±2.08 mins to 97.0±4.58 mins on average. The lowest optimum cooking time was observed in LC, whereas almost all the TRVs contained optimum cooking time of about MS (87.67±3.05 mins), GS (56.67±1.25 mins), KY (75.67±3.05mins), KK (97.0±4.58 mins), AK (69.0±2.0 mins), SK (43.0±2.64 mins). The TRVs KK was significantly different ($p < 0.05$) from the LC. A reduction in cooking time is advantageous in terms of fuel and energy efficiency during preparation. In this context, the local cultivar is preferred due to its shorter cooking duration of approximately 25 minutes[22]. However, when health benefits are prioritized over convenience, traditional rice varieties (TRVs) are often preferred despite their relatively longer cooking durations. Previous studies, such as Pokhrel on Nepalese rice varieties and Jency and Vishnuprabha on Kaatuyanam rice, have similarly reported extended cooking times for traditional types[26,15]. This characteristic is often associated with their intact grain structure and higher fiber content, which contribute to slower starch digestibility. Consequently, the consumption of TRVs may offer metabolic advantages, particularly for individuals with diabetes, by aiding in the regulation of serum glucose levels.

Water uptake ratio :

The volume occupied by starch during gel formation in water is governed by the water uptake ratio. This characteristic is influenced by the presence and functional capacity of hydrophilic groups that promote gel formation and was assessed in the selected rice varieties[15]. The findings of the present study revealed that the SK rice variety exhibited a significantly higher water uptake ratio ($p < 0.05$) than the other varieties. The water uptake ratio ranged from 2.38 ± 0.23 to 3.81 ± 0.64. The lowest value was observed in LC (2.38 ± 0.23), indicating that TRVs possess a superior water uptake ratio relative to the local cultivar (LC). A comparable study by Radha and Gurusamy also reported that Kaatuyaanam rice exhibited the highest water uptake ratio[27].

Gruel solid loss :

Lower solid loss is generally characteristic of slender rice grains, which have a comparatively smaller surface area. In contrast, rice varieties with higher amylose content are more susceptible to the leaching of solids into the cooking water[14]. Additionally, highly polished rice tends to be more vulnerable to gruel solid loss. In the present study, the gruel solid loss percentage was lower in SK (1.17 ± 0.01) and higher in LC (1.01 ± 0.01), indicating that TRVs exhibit superior cooking quality compared to the local cultivar (LC). A similar investigation by Pokhrel evaluated gruel solid loss in landraces from the Lamjung and Tanahun districts of Nepal[26].

Elongation Ratio :

Rice elongation during cooking is

influenced by the length-to-breadth (L/B) ratio. Certain varieties exhibit greater longitudinal elongation upon hydration, a characteristic widely regarded as a desirable cooking-quality trait in premium rice varieties[9]. In the present study, the elongation ratio was higher in SK (1.17 ± 0.01) and lower in LC (1.01 ± 0.01), indicating that TRVs possess superior elongation characteristics compared to the local cultivar (LC), thereby qualifying them as premium-quality rice. A similar observation regarding elongation ratio after cooking has been reported by Jency and Vishnuprabha[15].

Cooked rice length-breadth ratio :

During cooking, rice grains absorb water and undergo volumetric expansion, which is expressed as an increase in either length or breadth. In a study by Thomas, the highest L/B ratio was observed in white rice; the authors reported that an increase in breadth during cooking is undesirable, whereas high-quality rice varieties are characterized and preferred for their increase in length[37]. In the present study, the cooked rice length–breadth ratio (CLBR) was highest in GS (2.26 ± 0.20), indicating that the CLBR of TRVs is superior to that of the local cultivar (LC). This highlights that varieties exhibiting predominant longitudinal elongation are more preferred and are regarded as premium-quality rice. A similar study by Poornima and Sangeetha reported the cooked rice length–breadth ratio of nine Tamil Nadu rice varieties to assess their quality and nutritional value.

Mineral Nutrients :

The Energy Dispersive X-ray (EDX) spectrum of the sample reveals the presence of several major and minor elements, indicating a diverse elemental composition. The spectrum is characterised by distinct peaks corresponding to calcium (Ca), chlorine (Cl), sulphur (S), sodium (Na), magnesium (Mg), phosphorus (P), and potassium (K), each contributing to the overall nutritional and mineral profile of the rice varieties. The most prominent peaks were observed in the spectrum corresponding to calcium (Ca) and chlorine (Cl), as indicated by their high intensity counts at lower energy levels, which were observed in MS, GS, AK, SK. Moderate peaks corresponding to phosphorus (P**)** and potassium (K) are observed around ~2 keV and ~3.3 keV, respectively. These elements were almost present in all the TRVs and not present in the local cultivar. Lower intensity peaks corresponding to magnesium (Mg), sodium (Na), and sulphur (S) were also detected. The relatively lower intensity of these peaks suggests that these elements are present in minor or trace quantities. The EDX spectrum demonstrates that the TRVs contain a mineral-rich composition, with calcium and chlorine as dominant elements, supported by nutritionally significant levels of phosphorus and potassium, and trace amounts of magnesium, sodium, and sulphur. Calcium present in rice contributes to the relaxation of the nervous system and aids in alleviating symptoms associated with hypertension[1]. These findings suggest that the rice varieties have appreciable mineral value and could contribute to dietary mineral intake, although further quantitative analyses are required for precise nutritional evaluation.

The present study conducted a comparative evaluation of the physical and chemical properties, organoleptic characteristics, and cooking attributes of 6 TRVs and the local cultivar (LC- ADT-37). Among the TRVs, Mappilai Samba, Karuppu Kavuni, and

Kaatuyanam exhibited superior physical characteristics, while Karuppu Kavuni, Sivappu Kavuni, and Kaatuyanam demonstrated significantly higher ($p<0.005$) chemical properties. With respect to cooking characteristics, Sivappu Kavuni showed a favourable optimum cooking time and water uptake ratio, and also exhibited significant gruel solid loss and elongation ratio. In contrast, the cooked length-to-breadth ratio was found to be higher in Grudan Samba. Overall, among the seven rice varieties studied, Sivappu Kavuni, Karuppu Kavuni, and Kaatuyanam were identified as the most desirable. In comparison with the local cultivar, all six TRVs demonstrated superior cooking and nutritional quality. The findings of the present study indicate considerable variability in the cooking properties of TRVs, thereby providing a foundational basis for the development of diverse food applications. TRVs possess substantial nutritional and therapeutic potential due to their rich composition of bioactive compounds, enhancing their significance in contemporary agriculture and public health. Moreover, these varieties, being rich in essential nutrients, generally exhibit higher levels of antioxidants, vitamins, and minerals compared to modern rice cultivars, thereby contributing to improved dietary quality and overall health.

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