

## EXPLORING TRADITIONAL PADDY VARIETIES: PRESERVING A LEGACY OF HEALTH, CULTURE, AND BIODIVERSITY— A REVIEW

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**Abstract.** Traditional paddy varieties have been revered for their remarkable medicinal properties and rich nutritional profiles. The nutritional content of colored traditional paddy varieties were praised for higher protein content, iron, zinc as well as fiber content than the modern day white rice varieties. Black rice is abundant in minerals and tocopherols and play a significant role in prevention of non-communicable diseases like Parkinson's disease, auto-immune diseases, heart diseases, osteoarthritis etc. Red colored rice varieties are known to be rich in iron and zinc. The anthocyanin pigments give them a red color which also has free radical scavenging and antioxidant properties. Brown rice is nutrient dense than white rice. It has high fiber and low in calories. Brown rice contains high levels of selenium and manganese that has a major role in the fight against development of cancer. Different states of India have a wealth of rice landraces with special medicinal uses. To mention few are Jonga Sirhatti of Assam (to increase lactation), Kala Jira of Bihar (to provide body strength), Mehar Dhan of Chhattisgarh (for diabetic patients), Bhama of Jarkhand (valued by the tribals for stamina), Atikaya of Karnataka (used as health tonic), Nivara of Kerala (to cure tridoshas), Karhani of Madhya Pradesh (for paralysis), Mehar of Odisha (as post-natal tonic for women), Karuthakaar of Tamil Nadu (to cure piles and to control diabetes) and Kalanamak of Uttar Pradesh (to cure skin diseases and lower blood pressure). There are landraces for high protein content (Poongar), high total fat (Kuzhiyadichan), high potassium (Kaatuyanam), high iron (Sivappukuruvikaar), high calcium (Kullakaar), high zinc (Kalarpalai) and high phosphorous (Poovan samba). Further, there are rice landraces for different categories of people. For example, there are rice landraces to provide high energy to heavy workers (Kalajeera); for long-time stay in stomach (Sunaseri); for men's vitality (Mappillai Samba); for women's vitality (Poonkaar) and for filariasis cure (Karunkuruvai). Traditionally, there are rice landraces specially used for ceremonies and festivals. For example, Tulaipanji for marriages and Annaprasan; Osagathiali for religious festival occasions; Sela for religious ceremonies, Chakhao for social ceremonies; and Mayamatti for special occasions. Similarly, there are landraces Dambersali for weed control; Thulo gurdi for high fodder value, Laxhmi Kajal for intercropping; and also Hallaga for good keeping quality. Also there are landraces for varied traditional

dishes such as puffed rice (Thengaipoo samba); for kheer preparation (Erra mallelu); for rice pudding (Nilabati); for rice flakes preparations (Kala Birain); for flattened rice (Sanara); for fried rice (Gudumatia); for idiyappam preparation (Raamakurikaar); for kozhukattai preparation (Vallarakan), for puttu preparation (Karuppu Nel); and finally for rice soup preparation (Sela). To mention few very special purpose of rice landraces, are Hallaga for rope making and roof thatching; Fulpatash for good swelling capacity and Machhakanta for handicraft works. The rice landraces were passed down through generations, and they form a vibrant tapestry of cultural heritage and genetic diversity. Preserving and promoting traditional paddy varieties is crucial for our well-being, cultural legacy, and biodiversity.

**Keywords:** rice landraces, colored rice, nutrient and therapeutic value, special purpose

## Introduction

Rice serves as a crucial staple food for over half of the global population, with Asia contributing 90% of the world's production (Fukagawa and Ziska, 2019). Beyond its role in nutrition, rice offers several health advantages. For centuries, rice water has been used in skincare for its hydrating and soothing properties (Marto et al., 2018). Various components of rice have demonstrated significant health benefits, leading to their growing inclusion in dietary supplements, culinary additives, and pharmaceutical applications (Sen et al., 2020). The conservation of traditional paddy varieties, known as landraces, is essential for maintaining genetic diversity, particularly in the face of widespread high-yielding rice cultivation (Das et al., 2012). These landraces, as highlighted in ancient Indian Ayurvedic texts for their medicinal properties, have long been used for healing (Mohammed Ashraf and Lokanadan, 2017). They are also deeply embedded in cultural traditions, playing important roles in festivals, ceremonies, and social customs (Chang, 1984; Mishra et al., 2013). Traditional paddy varieties are tailored to meet specific nutritional needs, benefiting various groups such as children, women, and pregnant or lactating women. Additionally, they offer economic benefits to farmers by enabling the preservation and marketing of unique, high-quality rice products with distinct flavors, textures, and nutritional values (Krishnan et al., 2023a). Processing these varieties into brown rice, which retains the bran and germ layers, enhances their nutritional content compared to white rice. Overall, rice not only provides essential nutrients but also offers diverse health benefits. Its components are increasingly used in various applications, underscoring the importance of preserving traditional paddy varieties. These landraces are crucial for maintaining genetic diversity and supporting cultural practices. In India, they offer specific nutritional benefits and economic opportunities for farmers. The process of collecting and preserving rice landraces involves bulking seed samples from farmers' fields or storage, compiling valuable information from farmers and tribal communities during exploration missions, and documenting this germplasm.

## Nutritional and medicinal purposes of colored traditional paddy varieties

The nutritional profiles of various traditional rice varieties exhibit considerable diversity. Researchers have highlighted the importance of landraces and traditional rice types for their high contents of minerals, protein, and antioxidants (Chaudhari et al., 2018). Consuming colored rice, in particular, can enhance human health by lowering the risk of non-communicable diseases. Traditional rice varieties are notably rich in dietary Fibers, resistant starch, minerals, carotenoids, flavonoids, and polyphenols (Anupriyalashmi et al., 2019). These components contribute to the overall health benefits of these rice varieties, making them valuable additions to a nutritious diet (*Table 1*).

**Table 1.** Nutritional content in different colored rice (Sagma et al., 2021)

Varieties	Protein (g)	Iron (mg)	Zinc (mg)	Fiber (g)
Black rice	8.5	3.5	0.0	4.9
Purple rice	8.3	3.9	2.2	1.4
Brown rice	7.9	2.2	0.5	2.8
Red rice	7.0	5.5	3.3	2.0
White rice	6.8	1.2	0.5	0.6

The nutritional content of rice can be influenced by factors such as soil quality, microclimatic conditions, and processing methods, leading to variations in the exact nutritional profile of specific traditional rice varieties. Nonetheless, rice offers several nutritional benefits: it is a rich source of carbohydrates and an excellent source of energy, low in fat and salt, cholesterol-free, and a good source of vitamins and minerals. Additionally, rice has a low sugar content, it is gluten-free, and non-allergenic (Umadevi et al., 2012). These attributes make rice a valuable and versatile component of a healthy diet.

### **Black rice**

This rice is primarily grown in Asian nations like China, Japan, India, Sri Lanka, Thailand, Indonesia, Myanmar, and Bangladesh. Black rice also goes by the names emperor's rice, fortune rice, forbidden rice, purple rice, and king's rice (Chauhan et al., 1991).

In addition to having an abundance of minerals, black rice also contains tocopherols, or vitamin E, which play a significant role in health benefits and the prevention of non-communicable diseases like Parkinson's disease, auto-immune diseases, heart diseases, osteoarthritis *etc.* By removing the built-up free radicals in our bodies, they combat cancer. Black rice can help prevent or treat conditions like diabetes, atherosclerosis, hypertension, osteoporosis, asthma, digestive health issues and cancer, as well as lower the risk of stroke in females (Deepak et al., 2022).

The different types of black rice varieties that help to prevent conditions like diabetes, atherosclerosis, and hypertension are Ilupaipoo Samba and Maisamba (Krishnan et al., 2022). Also, Karuppu Kavuni need a special mention for their excellent health and nutritional value. This Karuppu Kavuni rice was in use since 400 BC. It is known to treat gastric ulcers and gastritis, strengthen the body, and enhance blood circulation. This variety is rich in antioxidants, which also serve as anti-diabetic agents, reduce inflammation, and prevent arthritis, showcasing its comprehensive health benefits (Hemamalini et al., 2018).

### **Red rice**

In Ayurveda, the traditional Indian medical system colored rice has been called Shastika rice and it is claimed that it can restore imbalances in the human body. The red color, varying from light to dark red, is confined to the bran layer. Red Rice consumption can prevent obesity, diabetes and cancer (Bhat and Riar, 2015). Red-colored rice varieties are known to be rich in iron and zinc. The anthocyanin pigments give them a red color which also has free radical scavenging and antioxidant capacities, as well as other health benefits (Rathna et al., 2019; Krishnan et al., 2022).

The different types of bold red rice varieties are Mysore Malli, Raktashali, Tulsi Vasanai Samba, Grarudan Samba, Mattakuruvai, Madhimuni, and Vellai Kuruvai; the different types of slender red rice varieties are Arubadam Kuruvai, Kattu Ponni, Kudaivazhai, Kothamalli Samba, Madumuzhingi, Mappilai Samba, Poxongar, Ariyan, Kaliyan Samba, Kar Samba, Karthigai Samba, Kullakar, Sithirai Kar, Sornavari, Pattaikar, Pisini, Periyavari and Perunkar.

The Raktasali rice has a multitude of effects on human physiology according to Ayurveda. It was thought to be an effective therapy for fevers and ulcers, as well as an enhancer of voice, aphrodisiac, diuretic, coolant, cosmetic, tonic, and antitoxic (Krishnamurthy, 1991) (*Table 2*).

**Table 2.** Phenolic and peroxidase activity in red rice (Anupriyalashmi et al., 2019)

Traditional rice varieties	Phenolic (mg/g)	Peroxidase activity (*A/min/mg)
Red rice	15	0.25
Kattuyanam	15	0.19
Navara	22	0.16
Kudavazhai	15	0.23
Poongar	13	1.39
Mappillai Samba	39	1.51

\*A- Peroxidase activity

### **Brown rice**

Brown rice is very nutrient-dense rice. It is high in fiber and low in calories. Additionally, it is an excellent source of manganese and a good supplier of magnesium, phosphorus, selenium, thiamine, niacin, and vitamin B<sub>6</sub>. Brown rice contains high levels of selenium and manganese, both of which are essential in the fight against free radicals which are a major factor in the development of cancer. The consumption of brown rice may reduce the chance of developing metabolic syndrome, which is a strong indicator of cardiovascular disease (Rathna Priya et al., 2019).

The intake of whole grains is protective against diabetes, obesity and cancer (Newby et al., 2007). Brown rice provides several health advantages because it has proven effective in several diseases and those conditions that lead to chronic symptoms and ultimately are life menacing. Also, brown rice helps to prevent coronary artery disease and gallstones and has antioxidant properties (Zahra and Jabeen, 2020).

The different types of brown rice varieties that help to prevent coronary artery diseases and gallstones are Kattuyanam, Sivapukavuni, Siginikar, Vellaikuruvai, Onnrarai Samba, Kuruvai Kalaiyan, Pallakadan Matta rice, Soorakuruvai, Sannam Samba, Sooran Kuruvai, Pattaikar, Vellai Samba (Krishnan et al., 2022) (*Table 3*).

### **Medicinally important landraces of different states of India**

India is a rich source of thousands of rice landraces and its different states possess a wide range of medicinally important rice landraces that have a specific role on nutritional and health benefits for the people of that particular state. To mention few examples are the different rice landraces of ten different states of India with their special medicinal values in *Table 4*. Each rice landraces have a specific medicinal as well as health benefits for different sect of people.

**Table 3.** Nutritional aspects of brown rice compared with white rice (Babu et al., 2009)

Parameters	Brown rice	White rice
Calories	232	232
Protein	4.88 g	4.10 g
Fat	1.17 g	0.205 g
Dietary-fiber	3.32 g	0.74 g
Thiamin (B1)	0.223 mg	0.176 mg
Riboflavin (B2)	0.039 mg	0.021 mg
Vitamin B6	0.294 mg	0.103 mg
Niacin (B3)	2.73 mg	2.050 mg
Folacin	10.00 mcg	4.10 mcg
Vitamin E	1.40 mg	0.426 mg
Phosphorous	142 mg	57.40 mg
Selenium	26.00 mg	19.00 mg
Potassium	137 mg	57.40 mg
Zinc	1.05 mg	0.841 mg
Magnesium	72.20 mg	22.60 mg

**Table 4.** Medicinal uses of rice varieties in the various states of India

Rice variety	Medicinal use	References
1. Assam		
Karanga	Used to treat dysenteric patients	Rahman et al., 2006; Wangpan et al., 2019
Jonga Sirhatti	Used to increase lactation and provide more nutrition to the child	
Bora	Starchy water is given to patients suffering from jaundice	
Danwar	Given to pregnant cows for safe pregnancy, to improve the health of the calf and for easy removal of the placenta	
Gudna	Used to treat chronic gastric patients	
2. Bihar		
Kala Jira	Eaten during spring time – is an aromatic variety that provides great strength	Balasubramaniam et al., 2019
3. Chhattisgarh		
Gathuwan	Joint pain	Parikh et al., 2014; Chaudhari et al., 2018
Bhejari	Fed to cow and she-buffalo after delivery for easy removal of placenta	
Sarai Phool	Removing weaknesses in Human beings	
Sul Dhan	Useful to recover stomach problems in human beings	
Mehar Dhan	Useful for diabetic patients	
Karhani	Rice is useful for patients suffering from paralysis	
Danwar	Grains mixed with crushed linseed grains and semi-cooked, fed to a cow and she-buffalo after delivery for easy removal of placenta	
Baisur	Smoke from the burning husk, on inhaling cures half-side headaches and epilepsy in human beings	

Resari	Can cure prolonged cough	Chaudhari et al., 2018
Laycha	Useful for pregnant mothers as a preventive measure for getting a healthy child	
Soth	Useful for patients suffering from coldness	
Katheri	Post-delivery restoration of the size of reproductive organs	Chaudhari et al., 2018
Kaflaya	Leucorrhea	
Matali, Lal Dhan	High blood pressure, fever	
4. Jharkhand		
Bhama	Red rice variety highly valued by the tribals for stamina that it provides	Balasubramanium et al., 2019
5. Karnataka		
Karikagga	Cooling effect	Chaudhari et al., 2018
Atikaya	Health tonic	
Kari Bhatta	Skin infections, increase milk in women	
Mullarya	Cooling effect	
6. Kerala		
Nivara	Cure of tridoshas	Chaudhari et al., 2018
Erumakkari	Cough	
7. Madhya Pradesh		
Aalcha	Pimples, small boils in infant	Sarawagi et al., 2000; Chaudhari et al., 2018
Baissor	Chronic headache, epilepsy	
Gathuwanor	Rheumatism	
Karhani	Paralysis	
Kalimooch	Skin diseases	
Maharaji	Post-natal tonic for women	
Bhajari	Renewal in the placenta in cows	
Dhanwar	Renewal in the placenta in cows	
8. Odisha		
Lohitaka	Red rice variety is good for eyesight, cooling the body and as a tonic	Patra, 2000; Chaudhari et al., 2018; Balasubramanium et al., 2019
Mehar	Post-natal tonic for women	
Saraiphol	Post-natal tonic for women	
9. Tamil Nadu		
Annamazhagi	Used to cure fevers and body heat	Richharia and Govinswamy, 1990; Savitha and Kumari, 2016; Balasubramanium et al., 2019
Karuthakaar	Regular consumption cures piles and also can control diabetes	
Kodai samba	Cures Vatha-related diseases	
10. Uttar Pradesh		
Kalanamak	A salt-tolerant variety used to cure skin diseases and blood pressure. A Has a high amount of potassium	Bajpai et al., 2012; Balasubramanium et al., 2019

## Rice landraces with different nutrient content

Rice landraces have essential nutrients that are rich in different nutritional qualities. Certain rice landraces have their highest nutrient content as against their normal

nutrient contents. Different rice landraces having highest nutrient content are presented in *Table 5*.

**Table 5.** *Rice landraces that are high in different nutrients for human health*

Nutrients	Names of the landrace	References
Total protein	Kalanamak, Kuzhiyadichan	Breseghello et al., 2013
	Kattu vanipam, Poongar, Palkichadi, Karuppu Kavuni, Kaivara samba, Barma Kavuni, Lalmati and Sivappu malli	Prasad et al., 2021
Total fat	Kuzhiyadichan and Neelan samba	Breseghello et al., 2013
Potassium	Kaivara samba, Kaatuyanam, Navara and Poovan samba	
Iron	Sivappukuruvaikar and Sanna Samba	
Calcium	Kullakar, Kalian Samba, Sivappukuruvaikar and Kaatuyanam	
Zinc	Kalarpalai and Karunkuruvai	
Phosphorous	Poovan Samba	

## Rice landraces for different categories of people

Rice landraces serve a diverse array of purposes for individuals across various occupations and sectors. These landraces are integral not only to nutrition and health but also to cultural practices and sustainable agriculture, ensuring the preservation of genetic diversity and cultural heritage. *Table 6* presents some examples of commonly used landraces.

**Table 6.** *Rice landraces suitable for different categories of people*

Purpose	Name of the landraces	References
Farm work and other heavy work (energy)	Kalajeera, Umuriachudi	Mishra et al., 2013
	Chhatoki, Chhoeamara, Mayamati and Koibaruah	Das et al., 2014
	Parmai-sal and Kabiraj – Sal	Savitha et al., 2016
Long-time stay in the stomach	Sunaseri and Umariachudi	Mishra et al., 2013
Men	Mappillai Samba	Breseghello et al., 2013
Women	Poonkaar - overcome overall health problems	Breseghello et al., 2013; Bhat and Riar, 2015
	Athikaraya and Kayame – Pregnant women	Jakkerel et al., 2018
Diabetic patients	Karunkuruvai, Mappilai samba, Kudhaivazhai, Kalanamak, Perungkar, Kovuni, kullakar and Neelam samba	Bhat and Riar, 2015; Sivakumara et al., 2021
	Sivappukudaivazhai, Paalkudaivazhai, Milagu Samba, Kuzhiyadichan, Kothamalli Samba, Singinikar, Kaar, Navarai, Naatu Samba and Kattuyanam	Bhat and Riar, 2015; Krishnan et al., 2022
Anaemic patients	Arupatham Kuruvai, Kaalanamak, Vaalan Samba, Illupaipoo Samba	Bhat and Riar, 2015; Krishnan et al., 2022
Cancer patients	Jeeraga Samba, Kaatuyanam	Bhat and Riar, 2015; Krishnan et al., 2022
Cure for Filariasis	Karunkuruvai	Krishnan et al., 2022

## Rice landraces for various dishes

Indian festivals paly a vital role in culminating the local traditions, cultural heritage and social dimensions of different linguistics and sects of varied beliefs. These festivals display not only their cultural traditions, but also their special attributes in various dish preparations. Every occasion has their own specialty and as such, different rice landraces were used for different dishes of every special ceremony and festival. Accordingly, a variety of dishes can be prepared using rice landraces, each offering unique taste, aroma, and color. Each of these dishes highlights the unique characteristics of the rice landraces, making them integral to both everyday meals and special occasions. These diverse applications highlight the multifaceted importance of rice landraces beyond their basic nutritional and culinary roles. *Table 7* presents some examples of dishes made with different rice landraces.

**Table 7.** *Rice landraces for preparation of various dishes*

Purpose	Name of the landrace	References
Popped/puffed rice	Assamchudi, Bodikaveri, Umuriachudi	Mishra et al., 2013
	Ratnachuda, Nizamshait, Honnekattu	Hanamaratti et al., 2008
	Kalanamak, Chakhao and Mappillai Samba	Rajagopalan et al., 2022
	Binni Dhan, Varakunnanellu, Njavara, Nagari	Semwal et al., 2014
	Thengaipoo Samba, Sembaalai, Poombaalai, Vaigunda, Salem Sanna, Soorukuruvai	Ravi et al., 2012; Krishnan et al., 2022
Kheer/Payasam	Navara, Mullan Kaima, Rajamudi	Krishnan et al., 2022
	Magur sail	Semwal et al., 2014
	Erra mallelu, Garo joha, Kola joha, Tulsi joha, Rambhog, Til kasturi, Dhundhuni, Kalamdani, Kashiphul, Lakhansal, Rani kajal, Raschora, Deepika rani, Dodda baira, nellu, Jolaga, Mullu kayame, Sharbati, Dubraj, Garam masala, Hiranakhi, Kali kamod, Tivshya Tulsa Velchi, Chak haw, Poireithon	Debal et al., 2021
Rice Pudding	Nilabati, Meghamala, Machakanta, Mahalaxmi	Panda et al., 2013
Rice flakes	Donger Gathia, Mati dhan, Para dhan	Mishra et al., 2013
	Udarsali, Valya, Sanna Mullare, Dodda Valya, Bilinellu	Hanamaratti et al., 2008
	Kaala Birain, Pakhi Birain	Das et al., 2014
Flattened rice	Sanara, Rajmalli, Meghananda, Pakhiasali	Panda et al., 2013
	Kaivara Samba, Sivappukudaivazhai, Kaar, Sivappu Kavuni, Mozhikaruppu Samba	Krishnan et al., 2022
Fried rice	Gudumatia	Panda et al., 2013
Kesari	Mysore sanna, Sanna Bhatta, Vasane Sanna Bhatta	Khera et al., 2012
Idiyappam	Raamakurikar, Rajamudi, Karupu Nel, Kaivara Samba, Madumuzhungi, Tulasi vaasanai samba, Vaasanai Jeeraga Samba	Krishnan et al., 2022
Kozhukottai	Vallarakan	Krishnan et al., 2022
Puttu	Karuppu Nel, Sornavari, Muttan Kuruvai, Karudan Samba, SivappuKavuni, Kothamalli Samba, Tulasi vaasanai samba	Krishnan et al., 2022
Rice soup	Sela, Lalnakanda, Fulpatash, Mushqbudji, Nunbeoul, Qudirbeigh, Zager, Jattoo, Safedbrez, Shahie	Rana et al., 2009
Kichadi	Kichadi samba	Madhavan et al., 2012
Parboiled rice	Dodiga, Halaga, Honasu	Hanamaratti et al., 2008
	Dhikinasali, Ghusuritinka, Harimuti, Laxmikajala, Motougiri, Mugudi, Raspanjari	Panda et al., 2013



## Special purposes of rice landraces

### *Rice landraces used in ceremonies and festivals*

These traditional rice varieties are not only valued for their nutritional benefits but also for their cultural significance, helping to preserve local traditions and heritage. The different landraces used for different ceremonies are mentioned in *Table 8*.

**Table 8.** *Rice landraces specially used for ceremonies and festivals*

Ceremony/festival	Name of the landraces	References
Marriages and Annaprasan	Tulaippanji, Binni dhan, Chini Sakkar, Kalonunia	Semwal et al., 2014
Sakti puja (Dussera), Chaita Parab (worship for arrival of Spring season), Bihanabuna (Sowing of seeds), Baisakha (full moon day), Nuakhia (first ceremonial eating of the harvested produce)	Osagathiali, Bodikaveri, Ladiari, Gathia, Umuriachudi, Machhakanta, Matidhan, Kalajeera, Sapuri, Para Dhan, Assamchudi, Sunaseri	Mishra et al., 2013
Religious ceremonies	Sela, Sawa, Barpasso, Tilkakchandani, Lalchandani	Rana et al., 2009
Festivals and social ceremonies	Chakhao	Roy et al., 2014
Worshipping Goddess Kali	Binni dhan	Semwal et al., 2014
Religious ceremonies and special occasions	Karthika, Mayamatti and Kaalijira	Das et al., 2014

### *Rice landraces used in weed control*

Rice landraces with purple foliage and purple-colored base help in the identification of weeds. These varieties are grown in alternate years to facilitate rouging off types, wild rice etc. The landraces used for this purpose are Dambersali, Nyaremind, Antarsali, and Navalisali (Hannamaratti et al., 2008); Bodikaveri and Para dhan (Mishra et al., 2013); Vaigunda, and Singinikaar (Krishnan et al., 2022) are some landraces that are used in controlling the weeds.

### *Rice landraces having fodder value*

Landraces such as Lal Kartika, Moinahaal, Terabali, Kaala mekuri, Kaalijira, Baigon bichi, and Berapua (Das et al., 2014) have an increased fodder value. Some landraces provide good quality straw, they are Jedho budho, Pachele, Thulo gurdi, Suno gurdi (Sthapit et al., 2001); Arikirathi, Vellai Ponni, Kichili Samba and Arcot Kichili Samba (Krishnan et al., 2022).

### *Rice landraces for intercropping*

The landraces such as Laxhmi Kajal and Ottadaiyan (Krishnan et al., 2022) are the best landraces that can be cultivated as an intercrop in coconut and other horticulture crops. Laxhmi kajal (black colored) when cultivated along with yellow grain varieties will make it easier for its identification during the time of harvest. Ottadaiyan a 200 days duration crop is grown along with Poongar or Soorakuruvai a 150 days

duration crop, the latter crop is harvested first and the next is harvested after an interval of 50 days.

### ***Rice landraces having high commercial values***

Rice landraces namely Terabali, Kaalijra, Kaala birian, Lal birian, Puthi birian, Pakhi birian, Khoibaruah, Badaal, Saada Kartika (Das et al., 2014) are commercially cultivated.

### ***Rice landraces with good aroma***

Landraces with good aromas are used for making many special dishes to provide an enhancement to the dish's nature. Such landraces are Gujina, Kalonunia, Red hira sail, Kanakchur, Radhuni tilak, Dangi, basful, and Kala mogha (Semwal et al., 2014; Awasthi et al., 2005); Gujanonia, Kalajeera, Haldichudi, Machakanta, Donger Basmati (Mishra et al., 2013); Tulsibhog, Lilabati, Dar sal, Tulsi mukul, Karpurtal, Kanakchur (Ray et al., 2013); Ambemohr, Kagisali, Beeraga, Kumud, Yalakkisali, Huggi Bhatta, Karigajavile, Belguam basmati (Hanamaratti et al., 2008); Jeeragasala, Gandagasala, Briyaniari, Mullanchenna (Priya et al., 2019); Gobindobhog 1, Gobindobhog 2, Kalojeera, Taraori Basmati (Das et al., 2013); Hansraj, Mushkbudgi, Basmati, Larbeoul, Qudirbeigh, Shahie, Barpasso, Katyoor, Thapachini (Rana et al., 2009).

### ***Rice landraces with good keeping and cooking qualities***

Hallaga, Kanwa (Jakkeral et al., 2018); Aden Kelte, Alur sanna, Bangar Kaddi, Karigajavili, Padmarekha, Raj kamal, Putta Bhatta Local, Rajkhaima, Karigajavili, Padmarekha, Raj kamal (Khera et al., 2012); Ratanasagar, Padmarekha, Rajkhaima, Mysore sanna, Gowri sanna, Shankar Poonam, Wari sanna, Sampige, Alur sanna, Bangar kaddi, Adnenkelte, Mala Bangarkaddi, Motte Bangarkaddi (Hanamaratti et al., 2008) are the landraces that has excellent keeping and cooking quality. Aanaikomban, Seethavalli kuruvai, and Thirprasatham (Krishnan et al., 2022) are some landraces that can keep the food without spoiling for weeks. Osagathiali (Mishra et al., 2013) is a landrace that can be kept without spoilage overnight.

### ***Rice landraces for different amylose content***

The amylose content of the milled rice is the major determinant of rice texture – how soft or firm the cooked rice will be. After cooking, the high-amylose and intermediate-amylose rice are firm and fluffy; while the low-amylose and waxy rice are soft, moist, and sticky in texture (Table 9).

**Table 9.** Rice landraces for different amylose content

Amylose content	Name of the landrace	Dishes prepared	Reference
High	Mahsuri, Parbol, Paizam, Raghusail, Sadashankar, Talmari, kalopahar	Puttu, Poha, Rice flakes, Kichadi	Das et al., 2014
Intermediate	Laljhini, Achoo, Madhumalti, Mushkan, Qudirbeigh, Bhabri, Patari, Mehwan, Preneibar	Idly, Kozhukattai, Pongal, Paniyaaram	Rana et al., 2009
Low	Jaldhara, Jattoo, Jhangai, Jhumaria, Jawari, Roda, Chuartu, Sukhdwas, Thapachini, Danye, Zager		

### *Rice landraces with other purposes*

Apart from nutritive value, culinary purposes, cooking and keeping the quality of rice landraces, there are additional special purposes for which these landraces are being used. Some of them are mentioned in *Tables 10* and *11*.

**Table 10.** *Rice landraces utilized for other special purposes*

Purpose	Name of the landraces	Reference
Rope making and roof thatching	Hallaga	Jakkeral et al., 2018
	Kullakar, Poriyavari, Korai Samba	Krishnan et al., 2022
Handcrafts	Machhakanta and Haldichudi	Mishra et al., 2013
Good swelling capacity	Fulpatash, Baber, Barket, Kathwar	Rana et al., 2009

**Table 11.** *List of important rice landraces with their maturity duration, special features and predominant state of cultivation in India*

SI. No.	Name of traditional/farmer/folk variety	Duration (days)	Any special feature/trait like tolerance to stress etc., nutritional/medicinal value	Commonly grown in the states
1	Aanai Komban	140-150	It helps in easy digestion, relieves constipation, helps the body get rid of excess fluid, and strengthens the nerves. The rice does not get spoil for a long time, so it can be used as a snack on trips	Tamil Nadu
2	Abhaya	120-125	Good for digestion and has anti-inflammatory properties.	Andhra Pradesh
3	Adukku Nel	60-70	High in healthy fats, high in iron, iron, magnesium, zinc, calcium, and phosphorus. This rice promotes blood growth and bone strength. Strengthens body muscles., Yield - 4t/ha	Tamil Nadu
4	Amaravati	130-140	Good for digestion and has anti-inflammatory properties	Andhra Pradesh
5	Ambemohar	135	It is rich in iron, lime, zinc, ash, and magnesium minerals	Maharashtra
6	Arcot Kichali Samba	145	Its rice is rich in nutrients and has a high immune system. Cattle love to eat their hay. Excessive milk secretion. You can make food, biryani, and multi-course meals in it	Tamil Nadu
7	Arikalu	120-130	High iron content and is good for diabetics	Telangana
8	Arupatham Kuruvai	90-100	It cures anemia due to its high iron content. It is rich in fiber, which relieves constipation. It also cures nervous diseases. Yield - 4.10t/ha	Tamil Nadu
9	Arupatham Samba	115-120	It cures anemia due to its high iron content. It is rich in fiber, which relieves constipation. It also cures nervous diseases. Yield - 4.10t/ha	Tamil Nadu
10	Athur Kichilli Samba	135-145	Old rice is disease resistant. This rice can be cooked for pregnant women to secrete breast milk and maintain health. Drought tolerant	Tamil Nadu
11	Balamani	130-140	Rich in antioxidants and good for digestion	Tamil Nadu
12	Bhatta	140-150	Good for digestion and has anti-inflammatory properties	Odisha
13	Bhavani Samba	130-140	Increases digestion and rejuvenates and energizes the body, reducing sugar and bad cholesterol. Rich in iron and B vitamins	Tamil Nadu
14	Bora Saul	150-160	Rich in minerals and used in traditional medicine	Assam
15	Chak Hao	120-140	Used in Manipuri cuisine and has antioxidant properties	Manipur
16	Champa Shashti	135-145	Rich in antioxidants and good for digestion	Odisha
17	Chennellu	120-130	High iron content and is good for diabetics	Andhra Pradesh
18	Chilakamma Sannalu	125-130	Good for digestion and has anti-inflammatory properties	Andhra Pradesh
19	Chinnar	145-150	Excretes waste. Cleanses the blood and bowels. Cures joint pain. Rice is rich in minerals including iron, zinc, and potassium. It is rich in calcium	Tamil Nadu
20	Chittimutyalu	130-140	Good for digestion and has anti-inflammatory properties	Andhra Pradesh

21	Dagad Phool	120-130	Good for digestion and has anti-inflammatory properties	Maharashtra
22	Dehradoon Basmati	120-125	Aromatic and used in making biryani and pulao	Uttarakhand
23	Dubraj	130-140	Good for diabetics and has anti-inflammatory properties	Madhya Pradesh, Chhattisgarh
24	Gandhakasala	120-130	Good for digestion and has anti-inflammatory properties	Andhra Pradesh, Telangana
25	Garudan Samba	150-160	Makes the body strong. It is rich in iron and reduces anemia. Heals kidney infections, and heals the body	Tamil Nadu
26	Gobindobhog	130-140	Aromatic and used in making sweets	West Bengal
27	Gotan	125-135	Rich in antioxidants and good for digestion	Rajasthan
28	Ilupai Poo Samba	125-135	Rich in iron, old rice is immune-boosting. Stabilizes bones. It has high immunity due to the high number of antioxidants. Relieves joint pain and paralysis. Since it is herbal rice, it can be cooked and eaten with other rice. Drought tolerant	Tamil Nadu
29	Indrayani	120-130	Aromatic and used in making biryani and pulao	Maharashtra
30	Jaya	120-130	Good for digestion and has anti-inflammatory properties	Tamil Nadu
31	Jeerakasala	130-140	Used in Ayurveda for treating fever and urinary tract infections	Kerala, Tamil Nadu
32	Jyothi	120-130	Rich in antioxidants and good for digestion. Blast tolerant	Andhra Pradesh
33	Kaar Arisi	120-130	It gives the body vigor and strength and is an excellent remedy for diabetes, rheumatism, and skin diseases	Tamil Nadu
34	Kaivara Samba	140-150	Contains many mineral salts including calcium, magnesium, zinc, potassium, and iron. Rice is rich in folic acid and antioxidants needed for fetal development. Eliminates nerve-related problems	Tamil Nadu
35	Kala Jeera	130-140	Rich in antioxidants and good for digestion	West Bengal, Odisha
36	Kalo Mota	120-130	Rich in antioxidants and good for digestion and blast tolerant	UP, Haryana and Assam
37	Kalanamak	115-120	It contains more than forty types of bios- and mineral nutrients. Improves brain nerve function, kidney function, skin diseases, blood purification, and cancer removal and prolongs life. Suitable for pregnant women. Causes sattvic character. Buddha is said to have eaten. Drought tolerant	Uttar Pradesh
38	Kandasali	120-125	It is medicinal rice. Gives blood development and hormonal balance in girls. Best medicine for thyroid problems. It removes toxic waste from the body and makes the endocrine glands work smoothly	Tamil Nadu
39	Karunguruvai	120-130	Natural Viagra to strengthen the body. Over time, pregnant women are given proper fertility and healthy delivery. As it releases sugar slowly, it is good for diabetes. Siddha doctors use elephant feet to cure disease	Tamil Nadu
40	Karuppu Kavuni	145-150	It is a remedy for dog bites	Tamil Nadu
41	Karuthakaar	135-140	Cures leprosy, diabetes, jaundice, and hemorrhoids	Tamil Nadu
42	Kattu Ponni	130-140	Since rice is rich in fiber, it can relieve constipation. It is rich in calcium which strengthens the bones. Being easily digested, it gives strength to the elderly	Tamil Nadu
43	Kattuyanam	130-140	High in protein and good for diabetic patient	Tamil Nadu, Kerala
44	Kichilli Samba	135-140	Increases immunity. You will get wealth and physical strength. It helps mothers to secrete breast milk and strengthen their bodies. The variety is suitable for daily cooking and eating by people of all ages. Controls sugar. Root-knot nematode tolerant	Tamil Nadu
45	Kothamalli Samba	135-140	The vital nutrients of this rice support blood clotting in case of injuries in the body. Rice is ideal for diabetes control, obesity reduction and body nutrition	Tamil Nadu
46	Kottara Samba	145-150	Increases immunity. Brain development and intelligence will improve. Puberty women can increase their body strength if they eat this rice regularly. Reduces bad cholesterol	Tamil Nadu

47	Kudavazhai	115-120	Provides excellent relief from diseases such as blood pressure, diabetes, constipation, stomach ulcer, digestive disorder, and chronic stomach pain	Tamil Nadu
48	Kullakar	105-110	Facilitates secretion of breast milk, excretion of body waste, cures blood pressure, diabetes, constipation etc. Drought tolerant	Tamil Nadu
49	Kuzhiyadichan	115-120	This rice is good for breastfeeding and controlling diabetes. Saline tolerant	Tamil Nadu
50	Lachkari Kolam	135-140	Rich in antioxidants and has anti-inflammatory properties	Chhattisgarh
51	Madumazhingi	135-140	If people who are doing a lot of physical work eat this rice, they will get rid of fatigue and get the necessary nutrients for the body. Flood tolerant	Tamil Nadu
52	Mangal Ponni	135-140	Rice is a herbal herb with high immunity. Heal's tumors and heals. Removes waste and beautifies our mane	Tamil Nadu
53	Manoharibhog	120-130	Aromatic and used in making sweets	West Bengal, Odisha
54	Mappillai Samba	150-160	It increases digestive power, soothes mouth and stomach ulcers, strengthens nerves, and increases sperm production. Good for diabetes. Flood tolerant	Tamil Nadu
55	Mashuri	130-140	Good for diabetics and has anti-inflammatory properties	Karnataka
56	Matta Rice	120-140	Rich in antioxidants and good for digestion	Kerala
57	Mudhgoji	120-130	Rich in antioxidants and good for digestion	Karnataka
58	Muttira Sannam	135-140	Immunity-boosting herbal rice. This rice is good for lack of brain development. Increases memory power	Tamil Nadu
59	Mysore Malli	130-135	Porridge made from its rice is anti-inflammatory. Its old rice is watery, flavorful and nutritious. This rice is used as an easily digestible food for children	Tamil Nadu
60	Njavara	150-180	Used in Ayurvedic medicine to treat neurological disorders	Kerala, Tamil Nadu
61	Pachari	120-130	Low glycemic index and good for diabetics	Kerala
62	Palakkadan Matta	120-140	Used in traditional Kerala cuisine	Kerala
63	Perumkari	135-140	Good for digestion and has anti-inflammatory properties	Kerala
64	Perumkathai	140-150	Used in Ayurvedic medicine to treat arthritis and gout	Tamil Nadu
65	Perunachi	130-140	Rich in antioxidants and good for digestion	Tamil Nadu
66	Pokkali	150-180	Rich in minerals and used in Ayurvedic medicine, salt resistant and flood tolerant	Kerala
67	Poongar	120-130	Rich in antioxidants and good for digestion	Tamil Nadu
68	Rajamudi	135-140	High in fiber	Karnataka
69	Rakthasali	135-140	Siddha doctors use Rakthasali as a medicine to balance rheumatism, pithama and kapha doshas, this rice is used to improve blood circulation and to agitate the blood. Drought tolerant	Tamil Nadu
70	Rangpuria	125-130	Good for digestion and has anti-inflammatory properties	West Bengal
71	Rasagadam	135-140	Rice is the first food for infants and is highly immune and reactive. Digests quickly and strengthens the digestive system. Strengthens the nervous system and helps cure anemia. Flood tolerant	Tamil Nadu
72	Salem sanna	120-130	Controls diabetes due to its high nutrient content. Rich in iron, calcium, and magnesium minerals. You can eat this rice to get the best results. Better skin health	Tamil Nadu
73	Sali Rice	120-130	Aromatic and used in making biryani	Maharashtra, Gujarat
74	Samba Mahsuri	120-130	High iron content and good for diabetics, 4-5 t/ha	Tamil Nadu, Andhra Pradesh
75	Samudri	125-130	Rich in antioxidants and good for digestion	Maharashtra
76	Seeraga Samba	125-135	It has high immunity. It is highly reactive and can prevent cancer. It helps in regular heart movement, removes bad cholesterol, relieves constipation, and improves digestion. Leaf folder resistant	Tamil Nadu
77	Sempalai	100-105	Herbal rice with high medicinal value. Rice is loved by children. Easy to digest. Rice is ideal for body nutrition	Tamil Nadu

78	Shyama	125-130	Rich in antioxidants and good for digestion	West Bengal
79	Singinni Kaar	110-115	It is a medicinal herbal rice. Prevents diabetes. Relieves joint pain. Strengthens bones. By giving this porridge to weak patients, they will get stronger and recover	Tamil Nadu
80	Sita Ashoka	125-130	Used in Ayurvedic medicine to treat female reproductive disorders	Uttar Pradesh, Bihar
81	Sivappu Kavuni	140-150	Royal families have been using it for medicinal reasons for a long time. It is herbal rice rich in potassium, magnesium and zinc	Tamil Nadu
82	Sonamasuri	130-140	Low glycemic index and good for diabetics	Andhra Pradesh
83	Soora Kuruvai	105-110	Rice helps to strengthen the weak bones of the newborn mother. Drought tolerant	Tamil Nadu
84	Swarna Mashuri	135-140	Easily digestible rice. Nutritional food for the elderly. Excellent food for skin diseases. The best rice for body strength. Flood tolerant	Andhra Pradesh
85	Thanga samba	150-160	It is a cure for skin diseases. Increased immunity. Skin manifestations including acne will disappear. Drought tolerant	Tamil Nadu
86	Thavalakannan	130-140	Good for digestion and has anti-inflammatory properties	Tamil Nadu
87	Thengai Poo Samba	120-125	Rich in iron, calcium, potassium, zinc, and magnesium minerals. As this rice is easily digestible, it can be used as baby food. Saline tolerant. Cyclone tolerant	Tamil Nadu
88	Thirupathisaram	110-120	The rice cooked in this rice will not spoil for a long time. When travelling abroad, tamarind rice can be tied to a banana leaf and used for several days. This tamarind rice will last for weeks	Tamil Nadu
89	Thooyamalli	125-135	This rice contains a moderate amount of soluble fiber. Rich in iron, magnesium, and zinc. Old rice is disease resistant. Its juice tastes like fresh water	Tamil Nadu
90	Tulaipanji	130-140	Good for digestion and has anti-inflammatory properties	West Bengal, Odisha
91	Tulsi vasanai samba	145-150	Strengthens the lungs. It cures colds and emaciated people should eat this rice regularly for a period	Tamil Nadu
92	Vadan samba	140-150	As it is easily digested, children are fed with its porridge. Adolescent girls are given pudding for balanced body development. Its porridge cures jaundice and dysentery	Tamil Nadu
93	Vaigundam	130-140	Rich in antioxidants and good for digestion	Tamil Nadu
94	Valan Samba	140-150	Cleanses the bowels, beautifies the skin, relieves bile, and stomach problems, karapan and manth. Rich in iron, magnesium, and zinc. Pudding can be given to adolescent girls during menstruation to strengthen their bodies	Tamil Nadu
95	Vanapadi	130-140	Good for digestion and has anti-inflammatory properties	Kerala
96	Varappu Kudaijan	110-115	It cures anemia due to its high iron content. It is rich in fiber, which relieves constipation. It also cures nervous diseases	Tamil Nadu
97	Vasanai Seeraga Samba	110-120	Easily digestible, prevents gastric disturbances and stimulates appetite. Cures rheumatism. Stomach ulcers, loss of eyesight and discharge of water from the body resolve	Tamil Nadu
98	Vellai Chitirai Kaar	115-120	Packed with vitamins and minerals and rich in fiber, this rice is a delicious rice that is perfect for everyone, from children to adults, to gain strength and nutrition. Saline tolerant. Drought tolerant	Tamil Nadu
99	Vellai Kolam	130-140	Rich in antioxidants and good for digestion	Tamil Nadu
100	Vellai Kuruvai	100-105	It is easily digestible, relieves constipation, strengthens the nerves, and flushes out the bad water secreted in the body	Tamil Nadu
101	Vellai Milagu samba	160-165	It Stimulates appetite, cures headaches, strengthens the digestive system, relieves arthritis, and helps remove toxins from the body	Tamil Nadu
102	Wada Kolam	125-130	Rich in antioxidants and good for diabetics	Chhattisgarh
103	Wynaad Kaima	120-130	Rich in antioxidants and good for digestion	Kerala

References: Singh and Prakash, 1990; Chauhan et al., 1991; Chikkalingaiah et al., 1999; Coomes and Thomson, 2005; Saxena and Singh, 2006; Bhonsle and Krishnan, 2010; Parikh et al., 2012; Sathya, 2014; Gross et al., 2015; Bhat and Riar, 2015; Savitha and Kumari, 2016; Chaudhari et al., 2018; Balasubramaniam et al., 2019; Krishnan et al., 2022; Krishnan et al., 2023a and Krishnan et al., 2023b

### ***Traditional food and its importance***

Traditional cuisine serves as a cornerstone of regional and communal culture, embodying culinary practices passed down through generations. Rooted in local ingredients and cooking techniques, traditional food sustains cultural identity and communal values. In Tamil Nadu, for instance, red rice forms the basis of beloved dishes like Appams and Idlis, while Koliyal and Garudan Samba are used to craft delicacies like puttlu (Sulochana et al., 2016). Meanwhile, the aromatic Jeeraga Samba rice, dubbed the ‘Basmati of South India,’ lends its fragrance to biriyani (Ahuja et al., 2008). Today, there is a growing emphasis on increasing the production of these traditional paddy varieties. This effort aims to promote consumption among younger generations and to innovate unique, nutrient-rich value-added products from colored rice. By revitalizing these traditional crops, communities not only preserve their culinary heritage but also cultivate a sustainable and nutritious food culture for the future.

### **Conclusion**

Traditional paddy varieties hold significant cultural and medicinal importance for Indian communities, yet their full potential remains largely unexplored by scientific research. This lack of understanding impedes broader recognition of their functional benefits. To unlock these advantages, stakeholders must prioritize comprehensive research on local varieties, empowering consumers to integrate them into their diets or specialized functional foods. Beyond their cultural significance, traditional paddy varieties offer sustainability and resilience, requiring fewer resources and demonstrating greater climate resilience compared to modern counterparts. By advocating for the conservation and promotion of these varieties, we can preserve cultural diversity, bolster food security, promote environmental sustainability, and support local livelihoods. Governments, farmers, consumers, and researchers all play pivotal roles in this endeavor. This includes investment in seed banks, farmer networks, education, marketing, and research to enhance productivity, quality, and value. Recognizing and harnessing the potential of traditional paddy varieties can pave the way for inclusive, healthy, and resilient agriculture that respects ancestral knowledge while addressing the diverse and evolving needs of our world.

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