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Review on Nutritional Profiles and Health Benefits of Little Millets –India

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ABSTRACT
This is a review journal about Panicum sumatrense which is known as little millets (Samai Rice) and its varieties. The study focuses on the precise importance of the little millets. The experts and many researchers report their views about the nutritive values, important health benefits, and healthy recipes related to the particular millets. As the cultivation concerned only the little amount of water is required stated by the agriculture specialists. The result illustrates that the failure of the little millet cultivation is due to the consumption of rice, wheat, and oats more compared to millets. Millets have been treated as a luxury food to the consumer because of their cost-effectiveness and rice is a cheap and common source of food. In Additional, the decline may be controlled when the Government schemes and policy involved more in Public Distribution System. The health benefits of little millets should be recognized by the public and consumption will be increased in the future. This nutritious food, little millet which is cultivated in India. Mainly it is harvested in the monsoon season in south India. Little millet is also known as "Tribal Millet and King of Cereals" which are consumed more by tribal and more non-perishable food which can be stored for a long time and promote healthy eating to the consumer too.

Keywords: *Little millets, Nutritive Value, Non-perishable food, Health benefits*

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I. INTRODUCTION

Millets are widely grown around the world as major grains for provender and human food in the olden days. It is belonging to the grain family which has been classified into many varieties in ancient periods. It is an important crop in the semi-desert climate or steppe climate of Asia and Africa (especially in India) with 97% of millet production in developing countries, ie,38.6% in India when compared to China (McDonough,2000). Especially, the Agriculture sector has played a major role in encouraging farmers on millet production. Thus, Rajasthan is on the top of the list with total produce of 3750 tonnes and a share of 41.03%. As per the records of 2018, UP grabbed the second position in bajra millet production. The total production was recorded to be 1800 tonnes and a share of 19.69% (Food and Agriculture Organisation of the United Nations,1995). The other states like Tamil Nadu, Madhya Pradesh, Andhra Pradesh, Karnataka, Maharashtra, and Orissa also contribute their major share in the total millet production of India. Mainly Samai grains are harvested in large amounts at Coimbatore, Namakkal district, and the hilly region of Tamil Nadu state. It is one of the major foods for tribal daily consumption. The different species of millets are not closely related. All are belonging to the family members of Poaceae ie, Grasses like crops. The most commonly cultivated millets are Panicum sumatrense (Little Millet-Samai), Panicum millaceum (Proso millet-Panivaragu), Pennisteum glaucm (pearl millet-Kambu), and Setariaitalica (Foxtail millet-Thinai) (Relative importance of millet species,1992).

In this different variety of millets, Little Millet- samai plays a major role in the Indian diet. It is an excellent source of nutraceuticals and micro-nutrients which gives medicinal beneficial properties. Little millet (Panicum sumatrense), is a minor cereal, and it is recognized for several health benefits due to the presence of bio-active nutraceuticals such as phenolic compounds, tocopherols, carotenoids, and low in glycaemic index mainly which is good for diabetic patients. It is a good source of phosphorus and the presence of fibre helps to lower the fat level in the body. The anti-oxidant and low-calorie content which is present in the samai, helps to maintain a balanced diet and weight that can promote weight loss.

1.1 HISTORY AND CULTIVATION OF SAMAI (LITTLE MILLET):

Little millet, P. sumatrense, is native to India and is also called Indian millet. This millet species name is originated from Sumatra (Indonesia) (de Wet et al., 1983). It is mainly grown in the Caucasus, China, East Asia, India, and Malaysia. Little millet is altered to both temperate and tropical climates and it also can

withstand drought and waterlogging. At present, the crop is almost limited to around hilly areas in India and it is grown on about 500,000 ha. It is a significant faster growing crop in some tribal farms in India

Small Millet / Little Millet / Indian Millet / Tribal Millet
Scientific name: **Panicum sumatrense**
Kingdom **Plantae**
Division Magnoliophyta
Class Liliopsida
Order Poales
Family Poaceae
Genus **Panicum**
Species sumatrense

Fig-1: Sources: Roth ex Roem. & Schult Taxonomic Position According to Cronquist (1988)

Little millet (*Panicum sumatrense*), was first grown in Indian peninsula (Weber and Fuller, 2007) There are two types of little millet namely, ***nana*** and ***robusta*** (House et al., 2000). The type of *nana* varies plants that can grow about 60 to 170 cm in height and the inflorescence is 14–15 cm long, erect, open, and highly branched. These branches sometimes droop at maturity. Plants in the race of *robusta* are 120–190 cm tall and the inflorescence is 20–45 cm long, opening compact, and highly branched. It is primarily a self-pollinated crop with approximately 3.5% cross-pollination. Little millet is grown throughout India up to altitudes of 2100 m, but it has only a little importance in different places (Hulse et al., 1980).

Out of the two races, *P. miliare* or generally called little millet is grown or accepted throughout India and Sri Lanka, and also it is cultivated in adjoining countries of India. To date the ancient times of *P. sumatrense* cultivation is unknown. This species is nowhere mentioned in any of the archaeological records of cereal farming in India. Its most extensive supply as a small millet across the agricultural zones of India may suggest ancient domestication. (Manisha Guha, In Processing and Impact on Active Components in Food, 2015).

Fig 2: Panicum. Miliare (Source)

II. TYPES OF SAMAI RICE

2.1 Sadan Samai

Sadan samai is an annual topknotted grass species with slender culms, 90-120 cm high at harvest depending upon the soil fertility, narrow leaves with soft margin, 45-60 cm long and 8-10 cm broad, panicle loose drooping with primary and secondary branches, spikelet 4-4.5 mm, long, globous, flattened, caryopsis glorious light. It is an early maturing race (100-120 days) cultivated as a mono-crop in a terraced field. It is less

profuse in tillering; pink colour pigmentation is present at the base of the second or third intermodal area. Sadan samai is cultivated at high altitude which ranging from 1200-1400mt that means above sea level. It needs a cool climate as compared to other landraces. Since the tertiary brushwood of the ear head look like the plait of a bride, this millet is commonly known as Sadan (Sadai = plait of a bride) samai. This samai variety is grown in dense which is very difficult to harvest.

2.2 Kattavetti Samai

It is annual erect grass species with thicker culms, narrow leaves with a serrated margin of 75-90 cm long, 150-180 cm in height at the harvest depending upon the soil fertility and 8-10 cm broad, panicle loose drooping primary and secondary branches spikelet 5-5.5 mm, long, glabrous, flattened, caryopsis glabrous light brown color in grains. Kattavetti samai is a late-maturing variety, usually cultivated in rocky terrain or kola kadu under a bush fallow system. In case of extreme vegetative growth due to good soil fertility and favorable climatic conditions, farmers cut the crop above the unopened panicle during tillering phase mainly to induce the early maturity of the spikelet and to arrest the further vegetative growth that will empower the early harvest of the crop.

The tillers of Kattavetti samai are very thick as that of the early tillers of sugarcane. The thick tillers are referred to as Kattai (Wood in Tamil) and while harvesting they use a sickle of a bigger size locally called vetti (cut). The combination of these two terms makes this name different i.e., Kattavetti samai rice.

2.3 Thirukula samai

It is also erect grass species with thinner culms, 90-100 cm high at harvest depending upon the soil fertility, narrow leaves with soft margin 45-60 cm long and 6- 7 cm broad, panicle loose drooping primary and secondary branches, spikelet 5- 5.5 mm long, glabrous, flattened, caryopsis glabrous dark brown color in grains. It is tolerant to drought and high temperatures than other races. Thirukula samai can be raised as monocrop or as a mixed crop with perum samai. The secondary branches in the panicles are arranged in a twisted manner like a thin rope- thiri indicates twisted and kula implies the short stature of the crop and thus it is called Thirukula samai.

2.4 Mallia samai

This type of samai also belongs to yearly erect grass species with very little tillers, 80-100 cm high at harvest, a very thin leaves with soft margin, 35-50 cm long and 3-6 cm broad, panicle loose drooping primary and secondary branches, spikelet 4- 4.5 mm long, glabrous, flattened, caryopsis glabrous dark brown color grains. It is mostly raised as an early crop using summer showers before the main agricultural sowing season (June – July) in the terraced fields. It is an early maturing low tillering race mostly cultivated as a monocrop in the terraced field and also as a mixed crop with Perum samai. The reason for cultivating this particular race is that it enables the farmers to harvest grains during off-season agriculture. According to the people, the grains of Mallia samai is white in color and soft in texture. Because of its color (like the jasmine flowers which are called Malli) and texture, the farmer calls it so.

2.5 Perum samai

This grass species with thicker culms 160-190 cm high at harvest depending upon the soil fertility, narrow leaves with serrated margin 75-90 cm high and 8-10 cm broad, panicle loose-fitting primary and secondary brushwood, spikelet 5- 5.5 mm long, glabrous, flattened, caryopsis glabrous dark brown color in grains. It is a late maturing race and cultivated in the high hillocks (Kolla kadu) and in some places in the terraced fields in the crop mixtures i.e., in finger millet-based mixed cropping systems. Perum refers to the tall height of the crop as well as the lengthy period of its cultivation. Due to its dense growth and the sharpness of the leaf blades is a major problem during harvesting periods. The sharpness causes small skin irritations to those, who are harvesting it. This is cited as one of the reasons for its less preference to cultivate it.

2.6 Vellaperum samai

In this species of Poaceae family with thicker culms 170-190 cm high, 85-90 cm height, and 8-10 cm broad which is light brown colour in grains. Vellaperum samai resembles like the Perum samai in its growth.

The only difference is in the colour of caryopsis, which is whitish brown (vellai in Tamil denotes colour of white) colour whereas the latter is dark brown. Some of the women and men farmers said these races are one and the same. According to them, the difference in the colour of caryopsis is only due to the type of the soil and agro- climatic conditions.

2.7 Kottapatti samai

It also belongs to grass species with thicker culms, 150-160 cm high at harvest depending upon the soil fertility, narrow leaves with a serrated margin, 75-80 cm height and 7-8 cm broad, panicle loose drooping primary and secondary branches, spikelet 5- 5.5 mm long, glabrous, flattened, caryopsis glabrous dark brown colour in grains. It is a late maturing variety and prone to lodging problems particularly during periods of heavy winds. Because of this character, its cultivation is almost reduced, and only in few remote places, it is still cultivated on a smaller scale where the problem of wind is less. (Ethno taxonomical classification of little millet (Panicum sumatrance) by the tribal people in Tamilnadu, India P. Venkatesan1*, M. Sundaramari2 and R. Venkattakumar)

NUTRITIVE VALUE OF SAMAI RICE

Table-1: Nutrient Composition of Little Millets compared to fine Cereals (per 100gm)

Nutrients	Rice (Raw milled)	Wheat (Whole)	Little Millet
Carbohydrates (gm)	78.2	71.2	67
Protein (gm)	6.8	11.8	7.7
Fat (gm)	0.5	1.5	4.7
Energy(gm)	345	346	341
Crude Fibre (gm)	0.2	1.2	7.6
Mineral Matters(gm)	0.6	1.5	1.5
Calcium (mg)	10	41	17
Phosphorous(mg)	160	306	220
Iron(mg)	0.7	5.3	9.3

Little millets are fibrous which is next to barnyard millets. According to a researcher some varieties of kodo millets and little millet have 37 -38% of dietary fiber, which is the chief among cereals. Little millets are high in fats which comprises healthy polyunsaturated fatty acids. The flavonoids present in little millets play important role in self-defence and the immune system. Although it content high amount of protein, it has poor amino acid composition. (www. nutritionvalue .org)

III. GERMINATION OF LITTLE MILLET ENHANCES NUTRACEUTICAL PROPERTIES

The different processes of little millets such as germination, malting, steaming, and roasting improves the total phenolic, flavonoid, and tannin contents which may act as a beneficial effect on the nutraceutical and antioxidant properties. Germination is known to develop the digestibility of little millets, improve the availability
of amino acids, monosaccharides, disaccharides and oligosaccharides, fatty acids, soluble dietary fiber and bio-accessible minerals along with reducing antinutritional factors.

IV. ANTIOXIDANTS PROPERTIES OF LIITLE MILLET

1. Millets are excellent sources of antioxidants like polyphenols, phenolic compounds, tannins, flavonoids play an important role in promoting health by combating lifestyle diseases such as diabetes, cardiovascular disease, obesity, cataract, cancers, inflammation, and gastrointestinal problems which are major problems currently faced by our country. The polyphenols are the biggest group of phytochemicals exhibiting antioxidant, metal chelating, and reducing powers. These antioxidants presented in little millet contribute to health, delay aging, reduce metabolic syndrome and improve the immune system. The bioactive properties of polyphenols include anticarcinogenic, anti-inflammatory, antiviral, and neuroprotective activities. (Significance of small millets in nutrition and health -A reviewSujata Bhat*, C. Nandini, V.Tippeswamy and Prabhakar Project Coordinating Unit on Small millets, AICRP on Small millets.)

V. HEALTH BENEFITS OF SAMAI

Due to lifestyles modification, many people forgot soon about old traditional millets. Especially Little Millets which have a high health benefit towards diabetic patients where they can easily overcome from severity in diabetic condition.

5.1 Helps to Fight Against Diabetes

Little millet is a low glycaemic indexed food because the high content of fiber makes the digestion of carbohydrates a slow process. It takes a long time for glucose to enter the blood and maintains the blood sugar level.

5.2 Cataract genesis Inhibition

Western countries are facing a major issue of blindness due to retinopathy and cataract worldwide. In diabetes patients there will be an accumulation of sorbitol. This accumulation is mediated by the key enzyme known as aldose reductase. It is present in little millet. This reduces the risk of developing cataracts.

5.3 Cancer-Fighting Millets

The chief grain of India is millet which is versatile, gluten-free, whole grain of India that is similar to quinoa. Small millet is a nutritional powerhouse and excellent source of protein, fibre, B vitamins, iron, zinc, phosphorous, and magnesium. Chemotherapy and radiation therapy can be exhausting the energy and the body needs the power to go through each treatment. So, these little millets contain an enormous number of anti-oxidant and phenolic compounds which detoxifies the body from therapy. This grain rectifies the conditions like asthma and bronchitis

5.4 Improves Heart Health

1. Since it is excellent in magnesium, it maintains steady blood pressure and heart rate. Magnesium is a mineral, that is essential for hundreds of biochemical reactions in which happen in the body. This grain samai is also fighting against depression especially in old age. Many research is still going on millets, countless recipes are made by using little millets which is very nutritious for many age groups and that made in different forms and varieties like (samai Pongal, samai briyani, samai kichadi, samai cutlet, samai sweet Pongal) it is reported to enhance little millet in a therapeutic diet. (Little Millet: An Indigenous Grain with Health Benefits Ms. B. Neeharika, Dr. Jessie Suneetha. W, Dr. B. Anila Kumari and Dr. J. Hemantha Kumar, Monday 12th of October 2020 03:26:13 PM)

VI. CONCLUSION

There is well-informed anticipation from the farmers that only the consumption can deliver the obtainability of the millets through farming. This encompasses the cultivation of appropriate areas, particularly to their earlier cultivating regions, which can be made. The state government is also scheduling a number of initiatives, counting linking in women in tribal areas to increase the production of millet in Tamil Nadu.

'ALWAYS BE RIGHT TO EAT RIGHT'- Promoting awareness about the consumption of little millets to the young generation may decrease chronic disease like diabetes, cardiovascular diseases condition and can build our country as a diabetic- free country. So always think about healthy eating habits and add more millets and lower rice and wheat quantity.

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