

Survey of millets explored for the traditional food and medicine by the Rural Inhabitant of Salem District, Tamil Nadu-India

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Abstract



This study investigated communication traits influencing awareness and adoption of recommended small millet cultivation practices among tribal millet farmers in the Salem District's Kolli hills and Salem forest divisions, Eastern Ghats of Tamil Nadu. Data, collected through personal interviews and informal discussions, aimed to address agrarian and nutritional challenges, emphasizing the potential of millets in dry lands for increased grain production. Millets, climate-resilient and nutritionally rich, offer benefits such as gluten-free composition, phytochemicals, and micronutrients crucial for immune function. Traditionally cultivated by Malayali tribes, millets exhibit medicinal and nutraceutical properties, contributing to the prevention of various health issues. The study highlights the rising interest in millets among scientists, technologists, and nutritionists, emphasizing their potential for value addition and processing to create ready-to-eat items. This not only benefits the masses but also provides income opportunities for rural and tribal farmers, promoting food security, employment, and revenue generation. Researchers focus on innovative approaches to enhance millet production, further underlining its significance in addressing current agricultural and nutritional challenges.

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INTRODUCTION

The word millet is derived from the French word "mille" which means that a handful of millet contains thousands of seed grains (Taylor and Emmambux 2008). Millets are the staple food in the developing world, especially in the dry lands of Africa and Asia. Most of the millets are indigenous to Africa and later domesticated to other parts of the world. Millet is one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. It is mentioned in the Bible and was used during those times to make bread. Millet has been used in Africa and India as a staple food for thousands of years

and it was grown as early as 2700 BC in China where it was the prevalent grain before rice became the dominant staple food. It is documented that the plant was also grown by the lake dwellers of Switzerland during the Stone Age.

Millet is a grain used traditionally for their nutritional and medicinal value (Choi, 2005). Millets are small-sized grained; grow in warm weather and belong to the grass family. Millets are hardy grains and tolerant to diversified weather conditions. They provide the nutrients required for the physiological functioning of the human body. Millets on the basis of the size of grain are mainly of two types Major and Minor Millets. Millets are nutritious than other fine cereals and contain protein, fat, carbohydrates and fiber, etc. Millets also served as sources of phosphorous and iron. Millets possess medicinal values due to the presence of tannins, polyphenols, phytosterols and anthocyanins, etc. Millets are used for preventing metabolic diseases and also offer antioxidant activity. Considering the importance of Millets present article summarizes the medicinal and nutritional significance of Millets.

Millets are non-allergenic gluten-free grains that are the rich source of nutrition. Medicinally Millet helps to decrease triglycerides and inflammation, thus preventing cardiovascular disease. Millets serve as a source of dietary fiber, reduce the chances of inflammatory bowel disease, and also help to detoxify the body.

The nutritional superiority of millets compared to regular staples like wheat and rice has entitled them to be gazetted as Nutri-Cereals by the Government of India. Millets are the stapled crops adapted to dry land agro-ecologies of the arid and semi-arid tropics. In India, millets are produced in most of the states characterized by low to moderate precipitation (200–800 mm rainfall). Major millet crops include Jowar or Sorghum (*Sorghum bicolor*), bajra or pearl millet (*Pennisetum typhoides*), mandua/ragi or finger millet (*Eleusine coracana*), and small millets comprising of kangni or foxtail millet (*Setaria italica*), kutki or sama or little millet (*Panicum miliare*), kodo millet (*Paspalum scrobiculatum*), jhangora or sawan or barnyard millet (*Echinochloa frumentacea*), cheena or proso millet (*Panicum miliaceum*), and korale or brown top millet (*Brachiaria ramosum*).

Minor millets are small coarse of grains belonging to the group of forage grass called millet, belongs to the family Poaceae. Most of the genera of the millet belong to the sub-family Panicoideae. Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. They account for <1% of global cereal production and 3% of coarse cereal production. India, Niger and China are the largest producer of millet in the world, accounting for more than 55% of global production.

The advantages of Millets as grain over other crops are as follows:

- Millets are highly nutritious and possess medicinal value.
- Millets are non-glutinous and can be used by a person who suffers from gluten allergy.
- Millets are non-acid-forming foods.
- Millets possess high fiber content.
- Millets act as a probiotic for the microbial flora of our body, thus improve digestion.
- Millets maintain or retain water in the colon thus prevent from constipation.

Millets are considered as dietary fibre, used as source of protein and phytochemicals. The nutritional compositions of millets are described as follows:

- Protein: 5-10%
- Fat: 3-5%
- Carbohydrates: 68-75%
- Dietary fibre: 15-20%

It also contains essential amino acids, cross-linked prolamins, which contribute towards the digestibility of the millets. Millet is a poor sources of lysine and proteins which contributes towards the high biological value of Millets. Polyphenols, tannins, phytosterols and anthocyanins, etc. play important role in metabolic diseases. Millets offer anti-aging and antioxidant activities. Millet contains potassium which supports kidney and heart function and also helps in nerve signal transmission. Millet contains Vitamin A, Vitamin B,

Phosphorus, Potassium, Niacin, Calcium and Iron, etc.

Millets in India

In India, millets were traditionally consumed, but due to the push given to food security through the Green Revolution in the 1960s, millets were rendered as 'orphan crops' – less consumed and almost forgotten. Before the Green Revolution, millets made up around 40% of all cultivated grains, which has dropped to around 20% over the years.

Not only has the consumption of millets declined, but the area under production has been replaced with commercial crops, oilseeds, pulses, and maize. These commercial crops are profitable, and their production is supported by several policies through subsidized inputs, incentivized procurement, and inclusion in the Public Distribution System. This has resulted in changes in dietary patterns with preferential consumption of fine-calorie-rich cereals.

Against this backdrop, the Government of India realized the importance of millets in building nutritional security in the country and made several efforts such as gazetting millets as Nutri-Cereals, the celebration of the National Year of Millets, 2018, small-scale policies on millets and proposing the International Year of Millets to UNGA.

International Year of Millets

Millets (Bajra, Jowar, Ragi, etc) are one of the oldest foods known to humans. Millets were among the first crops to be domesticated in India with several pieces of evidence pointing to their consumption during the Indus Valley civilization.

Recognizing the importance of millet, and creating a domestic and global demand along with providing nutritious food to the people, the Government of India, guided by the vision of Hon'ble Prime Minister Shri Narendra Modi, and spearheaded the United Nations General Assembly (UNGA) resolution for declaring the year 2023 as International Year of Millets.

So, keeping all these views an Ethnobotanical survey was carried out in the Salem forest division, Salem District, Tamil Nadu, India. Tamil Nadu is the southernmost State of the country and covers an area of 1, 30,060 Sq.km which is 3.96% of the

geographical area of the country. Millet species (Table 1) were collected and documented to analyze the diversity status of the species cultivated by rural inhabitants of this area. Till now no systematic effort has been taken to study the Ethno medicinal properties of millets in the country in general and in the state, in particular. In this context, the present study was carried out among the Malaiyali tribes of Salem District, Tamil Nadu state with the following objective:

- To find out the medicinal properties of millets as prevalent among the tribal farmers of the tribal belt.
- To reveal the other than food uses of millets by the tribal farmers of the study area.
- To identify and collect information about millets used by the rural inhabitants as traditional food and folk medicine

MATERIAL METHODS

SALEM DISTRICT

Salem is a Geologist's paradise, surrounded by hills and the landscape dotted with hillocks. Salem has a vibrant culture dating back to the ancient Kongu Nadu. It is in the North latitude between 11° 14' and 12° 53', and East longitude between 77° 44' and 78° 50'. The total geographical area of the district is 5, 20,530 hectares among that 125,682 hectare is the forest area. It is bounded by the Dharmapuri district on the North, by the Namakkal district on the South, by Erode district on the West and by Villupuram district on the East. The elevation of the landscape generally ranges from 500 ft to 1200 ft. above MSL, with the exception of Yercaud, which is at 5000 ft. above MSL. Salem is the 5th largest city in Tamilnadu and it is situated on the banks of Thiru Manimuthar River. Local tradition claims Salem as the birthplace of Tamil poetess Awaiyar.

Salem District experiences low rainfall and the climate is semi-arid. It receives an annual rainfall of 925 mm. The temperature often exceeds 20° C. Paddy, jowar, tapioca, sugarcane, groundnut, and cotton are the major commercial crops. Horticultural crops like pineapples, mangoes and citrus fruits are also cultivated. Magnesite, bauxite, quartz, limestone, soapstone, rough stone and granite are the minerals found in the district.

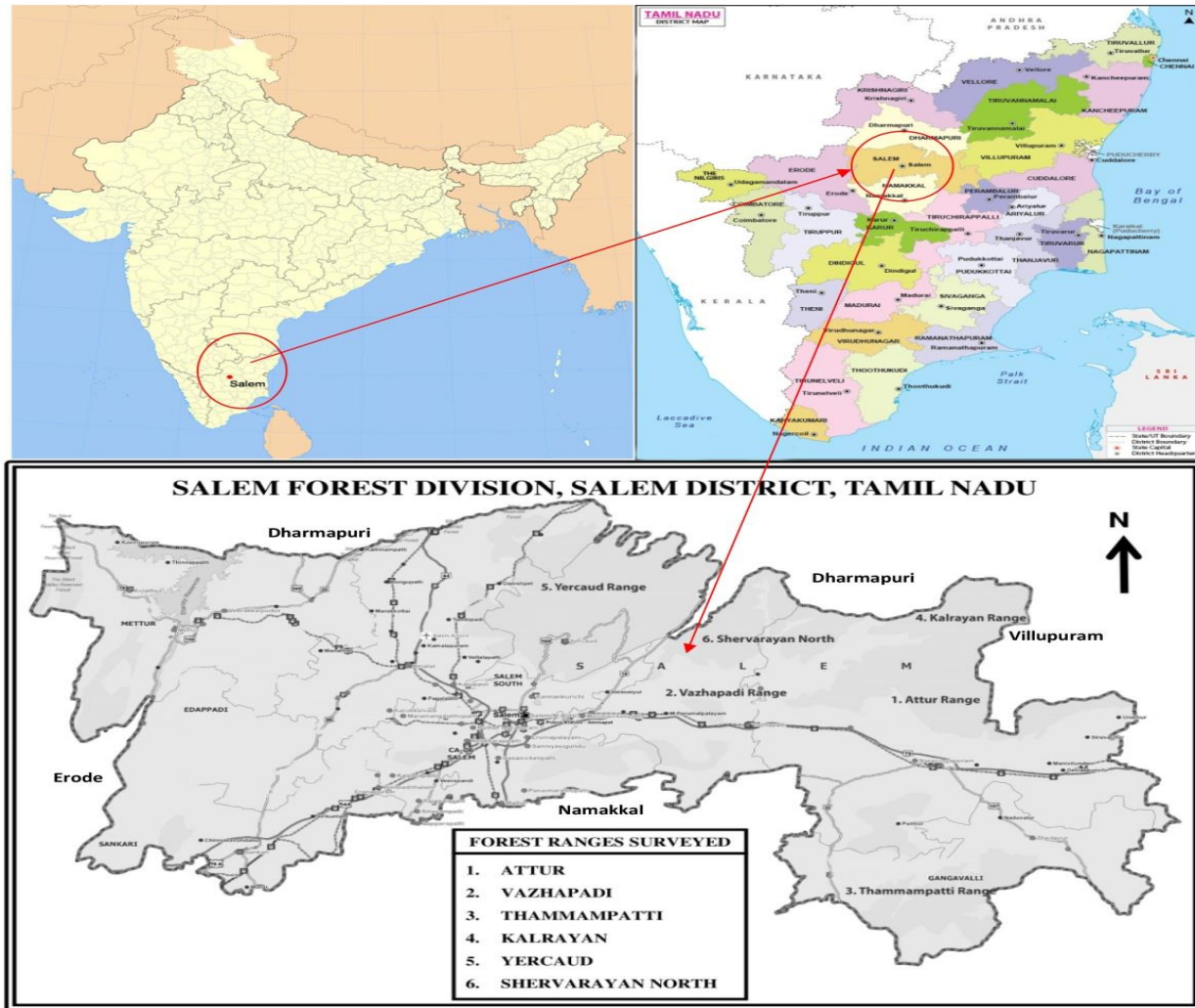


Figure 1 Map of the Study Areas

SALEM FOREST DIVISION

Salem forest division consists of nine large forest ranges which is Vazhapady Range, Thambampatty Range, Kalrayan Range, Attur Range, Yercaud Range, Shervarayan North Range, Shervarayan south Range, Danishpet Range and Mattur Range. However the survey team Surveyed in Six forest ranges only, they are Vazhapady Range, Thambampatty Range, Kalrayan Range, Attur Range, Yercaud Range, Shervarayan North Range, on the stipulated time. The tribal communities Malayali inhabited in the forest areas of all the Ranges of Salem forest division. The tribal and rural communities of this district are basically farmers and they are hard workers and economically belong to backward status. They are also involved in the collection of honey, bee wax, and minor forest products. In terms of agriculture,

they are engaged in the cultivation of vegetables, fruit, spices and cash crops.

The Ethnobotanical survey was conducted in Vazhapady Range, Thambampatty Range, Kalrayan Range, Attur Range, Yercaud Range, Shervarayan North Range. During the ethno botanical survey programme, the survey team has surveyed about twenty forest areas belonging to six forest ranges such as Ananaivari Muththal, Pattimedu tribal colony, Kariyakoil, Moolapadi, Iyankaradu, Ramanathampalayam, Mamarathumadai forest areas in Attur Range. Santhumalai, Pungan madavoo, Puthukadu forest areas in Vazhapady Range. Pachamalai, Odai kadu, Kudalmalai, Naripadi, Nanalkarai forest areas in Thambampatty Range. Karumanthurai, Theerthakarai, Killakadu, Periyakalvarayan, Maniyarkundam, Sellankurichi,

Theakampattu forest areas in Kalrayan Range. Manjanaththi, Vellaikadu, Semmanathai, Kottachedu, Koothumedu forest areas in Yercaud Range. Bodhaikadu, Kombai, Arimalai, Vappampadi, Manjavadi forest areas in Shervarayan North Range.

RESULT AND DISCUSSION

The present study identified that the traditionally used millets are a group of 6 millets comprising finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica* L.), kodo millet (*Paspalum scrobiculatum*), little millet (*Panicum sumatrense*), barnyard millet (*Echinochloa frumentacea*) and proso millet (*Panicum miliaceum*). These crops have a long history of more than 1000 years and are known for their suitability for dry lands, hill and tribal agriculture, contributing to food, fodder, and nutritional securities at farm and regional levels of Salem district. They require a small quantity of water, mature early, and well suited for cultivation under scarcity conditions. They are considered Nutria- cereals and are the source of food, feed, fodder, and medicine. They are grown from sea level to mid-hills right from Salem district of Tamil Nadu.

In the ethno botanical studies we have interviewed and had informal discussions with traditional inhabitants for the documentation of the following the *Eleusine coracana* L., *Paspalum scrobiculatum* L., *Setaria italica* L., *Pennisetum glaucum* (L.) R. Br., *Panicum miliaceum* L., *Echinochloa crus-galli* (L.) P. Beauvois. Among them, *Eleusine coracana* L. is used for good sleep, body pain, and weakness. *Paspalum scrobiculatum* L. is used for nervous weakness, diabetes and obesity. *Setaria italica* L. used as astringent, digestive, emollient, and stomachic. *Pennisetum glaucum* (L.) R. Br. is used for external tumors and asthma complaints. *Panicum miliaceum* (L.) is used to reduce diabetes and weight loss. *Echinochloa crus-galli* (L.) P. Beauvois is used for wound healing and sores are tabulated. (Table: 1).

Health Benefits of Kelvaragu (*Eleusine coracana* L.) Finger millets

- Finger millet is an excellent source of natural calcium which helps in strengthening bones for growing children and aging people.

- It is now established that phytates, polyphenols, and tannins can contribute to the antioxidant activity of millet foods, which is an important factor in health, aging and metabolic diseases (Coulibaly, 2011).
- Finger millet's phytochemicals help slow down the digestion process. This favours for controlling blood sugar levels in diabetes. It has been found that finger millet-based diet helps in diabetes as it contains higher fibre. It has also been reported that a diet based on whole finger millet has a lower glycaemic response i.e. lower ability to increase blood sugar level. This is due to the presence of factors in finger millet flour which lowers digestibility and absorption of starch.
- Because of its high nutritional content finger millet is recommended as a weaning food, especially in the southern parts of India.
- Finger millet is a very good source of natural Iron and its consumption helps in the recovery of Anemia.
- The Ragi-based foods are highly suited for expectant mothers and the elderly due to their high calcium and iron content.
- Finger millet consumption helps relax the body naturally.
- Green ragi is recommended for conditions of blood pressure, liver disorders, and asthma, and heart weakness.
- Green ragi is also recommended for lactating mothers in conditions of lack of milk production.
- If consumed regularly, finger millet could help in keeping malnutrition, degenerative diseases and premature aging at bay.

So, finger millet is an extremely nutritious cereal and is very beneficial for maintaining good health. Therefore, it has received attention for their potential role as functional foods. However, its high intake could increase the quantity of oxalic acid in the body. Therefore, it is not advised to patients having kidney stones (Urinary Calculi).

Table 1 Traditionally used Small Millets and their ethno medicinal uses

S. No	Botanical Name/Family name/ Voucher specimen no/	Local name	Common Name	Ethno Medicinal Uses
1	<i>Eleusine coracana</i> L./Poaceae/ Voucher Specimen No: RRIUM-CH:0264	Kelvaragu	Finger Millets	1. To reduce cold and head ache 2. Grains are used for good sleep. 3. Ball prepared from the ragi powder used as food for body pain and weakness.
2	<i>Paspalum scrobiculatum</i> L./ Poaceae/ Voucher Specimen No: RRIUM-CH:13531	Varagu	Koda Millets	1. Used for Nervous weakness. 2. The sprouted ragi seed is used to reduce diabetes and obesity.
3	<i>Setaria italica</i> L./ Poaceae/ Voucher Specimen No: RRIUM-CH:13516	Thinai	Foxtail millet/ Italian millet	1. The germinated seed of yellow-seeded cultivars is used for astringent, digestive, emollient and stomachic. 2. It is used in the treatment of dyspepsia, poor digestion, and food stagnancy in the abdomen. 3.Green seeds are diuretic and strengthen the virility 4.White seeds are refrigerant and used in the treatment of cholera and fever
4	<i>Pennisetum glaucum</i> (L.) R. Br./ Poaceae/ Voucher Specimen No: RRIUM- CH:14155	Kambu	Pearl Millets	1. The grain paste is applied on external tumors to burst the tumor. 2. Decoction of the Stigma of the grain orally taken for asthma complaint.
5	<i>Panicum miliaceum</i> (L.) / Poaceae/ Voucher Specimen No: RRIUM-CH:13419	Pani Varagu	Proso millet	1. Used in diabetes and weight loss
6	<i>Panicum sumatrense</i> Roth. ex Roem. & Schult. Voucher Specimen No: RRIUM-CH:13205	Samai	Little Millets	1. The extract of shoots and roots is applied externally as a styptic to wounds. 2. The paste is applied on the external wound to come out the pus. 3. Apply externally to sores.
7	<i>Echinochloa frumentacea</i> Link./ / Poaceae/ Voucher Specimen No:13600	Kudiraivali	Barnyard Millet	1. The boiled water of the grain is used for good sleep in the night. 2. Grain soup with pepper and garlic orally taken to reduce cough and cold. 3. Jelly preparation (Kozhu) from the powder are taken orally for bone pain and weakness.

Remarks: All Cultivated

Finger millet can be enjoyed in different forms and preparations such as Ragi roti, ragi dosa, ragi porridge, ragi upma, ragi cakes, ragi biscuits etc.

Health Benefits of Varagu (*Paspalum scrobiculatum* L.) Koda Millets

Easily digestible Koda millet contain a high amount of lecithin and is excellent for strengthening the nervous system. It is rich in phytochemicals, phytate that help in the reduction of cancer risks. It also helps to reduce body weight and is beneficial for postmenopausal women. It is good for those suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels. (Ambati, 2019). It is recommended for diabetes as it contains quercetin, ferulic acid, p p-hydroxybenzoic acid, vanillic acid and syringic acid. It is gluten free and are good for people who are gluten intolerant. Koda millets can be used in preparations of idly, dosa, chapattis, upma, pongal, puttu, idiyappam, kozhukattai, vadais, sweet poli, biscuits, soup, adai, payasam.

Health Benefits Thinai (*Setaria italica* L.) / Foxtail millet/ Italian millet

Foxtail millet is a rich source of amino acid and thereby display has high nutritional value. The main essential amino acids include isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine and tryptophan, with the content of lysine varying the most, followed by methionine and valine. Fatty acids and minerals are also present in good amounts. Linoleic, oleic, and linolenic acids are the main unsaturated fatty acids while palmitic and stearic acids are the main saturated fatty acids present in it. It is considered to be one of the most digestible and non-allergenic grains available and has significant importance for human health.

It has antioxidant, show glucose-lowering, gastro-protective, and anti-carcinogenic properties. Foxtail millet is a rich source of fiber, protein, zinc, and magnesium. It has a moderate glycemic index (GI) of 59, which represents a low increment in blood sugar level. Obesity is a common health problem for many of us. The high fiber content in foxtail millet improves digestion and eases constipation. It is the reservoir of vitamins B (thiamin (B1), riboflavin (B2), niacin (B3), and folate (B9), vitamin A, vitamin E, iron, folic acid,

and zinc. It is an important source of potassium and magnesium and thereby plays a vital role in strengthening the immune system.

Health Benefits Samai (*Panicum sumatrense* Roth. ex Roem. & Schult.) Little Millets

Samai Rice is also known as the king of cereals because of its high nutritional and medicinal value. The flavonoids present in little millets play an important role in self-defense and the immune system. It is very vital for the kids to strengthen their body.

It also helps to fight against diabetes, cataract, improves heart health, and detoxifies the body, Samai rice is a good source of slow-digesting carbohydrates, that slows down glucose absorption and by virtue of this maintains the blood sugar level. It is gluten-free and consists of highly insoluble fibre that keeps the digestive tract clean and prevents gallstones. Little millet is a nutritional powerhouse and consists of protein, fiber, vitamins B, iron, zinc, and magnesium. It aids in respiratory conditions like asthma and bronchitis.

Health benefits of Kambu (*Pennisetum glaucum* (L.) R. Br. Pearl millet

Pearl millet grains can be considered a possible alternative for food diversification because they contain a higher content of dietary fiber, minerals, proteins, and antioxidants. Pearl millet grains are naturally gluten-free and will be advantageous for the diabetic patient. Phenolic acids such as ferulic and p-coumaric, found in whole pearl millet (*Pennisetum glaucum* (L.) R. Br.), have the capacity to reduce HT29 tumor cells. Some studies revealed that the research on millets bran-derived peroxidase from *Setaria italica* has a potential therapeutic use to treat rectal colon cancer, due to its strong inhibitory power in preventing cancer cells. It also helps to manage type 2 Diabetes, weight loss, prevents polycystic ovarian syndrome, and makes the Heart healthier.

Health Benefits of Pani Varagu (*Panicum miliaceum* (L.) Proso Millet

Proso millet is an important source of magnesium that increases the efficiency of glucose and insulin receptors in the body and helps in preventing the development of this disease. It helps to manage type-2 diabetes. This gluten-free grain of this

millet has protein, significant vitamins, and fatty acids. Besides this, it also contains polyphenols and essential minerals like phosphorus, manganese, and magnesium. Moreover, proso millets is an excellent source of Dietary fiber.

Proso millet is loaded with Lecithin which indirectly stimulates the nervous system and keeps it functioning smoothly. It contains Phytic acid which helps to increase the good cholesterol (HDL) and lowers the Bad cholesterol (LDL). It prevents the skin disorder caused by the deficiency of Niacin. Proso millet contains ample amounts of Niacin which helps in preventing Pellagra Celiac disease. Being gluten-free it is a great option for people with gluten-sensitive enteropathy or Celiac disease (Dayakar Rao, et al, 2013). Proso millet is rich in anti-oxidants which remove the free radicals from the body and prevent aging, dullness, and wrinkles on the skin. Having a sufficient serving of Proso millet in your daily diet can help delay the process of aging.

It contains high amount of magnesium which keeps a check on blood glucose level and regulates healthy insulin levels. Daily intake of the same helps to reduce the risk of type 2 diabetes. In addition to the above-mentioned health benefits, Proso millet serves as a healthy option for bone strengthening, heart and liver health, weight loss and can protect against gallstones and cancer too (Veenu Verma, et al, 2012)

Health benefits of Kudiraivali (*Echinochloa frumentacea* Link). Banyard millet

Banyard millet is rich in macronutrients, micronutrients, dietary fibre, and vitamins. It is one of the fastest-growing small millets. It is an abundant source of bioactive compounds and antioxidants, which contribute in weight control and prevent from various health issues. Consumption of the high fibre in millets gives the feeling and creates an emotion of a full stomach and therefore, lessens the urge to consume more food, thereby prevent from taking indirectly more calories. Banyard millet has the best nutritional profile among all millets. The starch content of Banyard millet ranges between 51.5–62.0 g/100 g, which is significantly less than that of other millets.

Banyard millet is known to lower blood glucose and cholesterol levels, therefore it is beneficial for diabetic and cardiovascular patients, while it can

also be a boon for those that are gluten intolerant. They are considered as Nutria- cereals and are the source of food, feed and fodder. They are grown from sea level to mid hills right from Tamil Nadu in South to Uttarakhand in North, and Gujarat in the West to Arunachal Pradesh in the North East. (Rai *et al.*, 2008).

Till now no systematic effort has been taken to study the Ethno medicinal properties of millets in the country in general and in the state, in particular. In this context, the present study was carried out among the Malaiyali tribes of Salem District, Tamil Nadu state. More studies are needed in the future about cultivation techniques to improve more production, phytochemicals, pharmacology and new drugs discovery from millets. So this paper will be useful to further studies in this contest.

CONCLUSION

From the above discussion, it is clear that millets being an underutilized crop are being cultivated at various places. Major forms of millet have great potential for food and industrial uses. There seems to be enough scope for the development of value-added products from these underutilized crops. With the increasing demand for under-utilized crops in the near future there is a dire need to create a remunerative market and awareness among urban people regarding nutritive values.

The government bodies as well as the NGOS have to come forward to take up responsibility for this important task to save the millet crop wealth. Efforts should also be done in search of rarely cultivated millets of every region of the country for their conservation. Hence, protective measures have to be taken for this precious millet crop wealth. Moreover, protected and non-protected forests have played a vital role in the conservation of millet crop wealth.

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Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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