

## Nutritional and Therapeutic Properties of Traditional Food Shree Anna (Millets): A Review

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**Abstract:** Millets and their products are used in various health as well as disease condition because of their rich contents of minerals, vitamins, and dietary fiber, and it is very easy to cultivate. As a result, The United Nations General Assembly declared the year 2023 as the International Year of Millets. The main purpose of this is to create awareness of the health benefits of millet to the general public. Millets are mainly grown in Asian and African countries. Majorly grown millets in the world are pearl millet, finger millet, finger foxtail millet, barnyard millet, sorghum, kodo millet, and little millet. Millets are nutritionally superior to wheat and rice, used as Nutri-cereals. It has gluten-free and low glycemic index. Millets can help in preventing heart disease, cancer, hypertension, obesity, diabetes, and various other health benefits. In ancient times it was extensively cultivated, but its cultivation declined eventually because of people's shift towards wheat and rice farming during the green revolution. The present reviews introduce different types of millets.

**KEYWORDS:** Millets, Nutraceuticals, Traditional medicine, **Shree Anna**, Nutri-cereals.

### INTRODUCTION :

Millets are fast-growing cereals that are more efficient in utilizing moisture and have a high level of heat tolerance properties compared to maize. It can be grown in sandy soil in low rainfall areas, although light loams and well-drained soil are preferred. Millets are required high temperatures to mature the crop. All millets are majorly divided into two categories major and minor millets. Minor millets have higher nutritional value compared with major millets. but in India, production of major millets is more than minor millets<sup>5</sup>. Mainly Millets include five genera, like Panicum, Setaria, Echinochloa, Pennisetum, and Paspalum. The different categories of millets are foxtail millet (*Setaria italica* (L.) Beauv.), finger millet (*Eleusine coracana* (L.) Gaertn.), Pearl millet (*Pennisetum glaucum* (L.) R. Br.), Little millet (*Panicum sumatrense* Roth. ex Roem. & Schult.), Proso millet (*Panicum millaceum* L.), kodo millet (*Paspalum scrobiculatum* L.), Sorghum (*Sorghum bicolor* (L.) Moench), oats (*Avena sativa* L.) and barley (*Hordeum vulgare* L.) (Sunil et al., 2016). The millet grains have different shapes, like elliptical, oblong, conical, hexagonal, or globular in shape, and different colors, like grayish white, yellow, brown, cream, ivory, light blue, purple, or grey<sup>1-4</sup>.

Food plays a very important role in maintaining health. Millets grain has a rich source of protein, fat, fiber, carbohydrates, minerals, and vitamins as compared to major cereals. The nutritional contents of food are essential for metabolism. Nutritional profiles among the major cereals are shown in Table 1

**Table 1. Nutritional profile of millets in comparison with cereals (per 100 g).**

Grains	Energy	Protein	Carbohydrate	Starch	Fat(g)	Dietary Fiber	Minerals	Ca	P
	(kcal)	(g)	(g)	(g)		(g)			
Maize	334	11.5	64.7	59	3.6	12.2	1.5	8.9	348
Wheat	321	11.8	64.7	56	1.5	11.2	1.5	39	306
Rice	353	6.8	74.8	71	0.5	4.4	0.6	10	160
Sorghum	334	10.4	67.6	59	1.9	10.2	1.6	27	222
Pearl millet	363	11.6	61.7	55	5	11.4	2.3	27	296
Finger millet	320	7.3	66.8	62	1.3	11.1	2.7	364	283
Proso millet	341	12.5	70	-	1.1	-	1.9	14	206
Foxtail millet	331	12.3	60	-	4.3	-	3.3	31	290
Kodo millet	353	8.3	66.1	64	1.4	6.3	2.6	15	188
Little millet	329	8.7	65.5	56	5.3	6.3	1.7	17	220
Barnyard millet	307	11.6	65.5	-	5.8	-	4.7	14	121

(source: Indian Food Composition Tables and nutritive value of Indian foods<sup>6,7,8.</sup> )

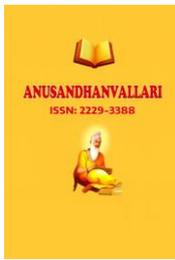
### 1. Barnyard millet (*Echinochloa frumentacea*)

In India, barnyard millet is grown in warm and temperate regions from the Himalayan region to Deccan plateau like Orissa, Maharashtra, Madhya Pradesh, Tamil Nadu, Bihar, Punjab, Gujarat and the hills of Uttarakhand . It is mainly cultivated in that area where very few options exist for cultivation. It is a genteelly cultivated hill area. It is an indispensable crop of the Himalayan region because it is easily cultivated and voluminous fodder<sup>9</sup>. Barnyard millet is one of the most valuable and fourth most produced among minor millets. It provides food security to many poor people across India. India is the biggest producer of barnyard millets in the area as well as production<sup>10</sup>.

The genus *Echinochloa* (Poaceae) includes 35 species that are widely distributed in the warmer parts of the world<sup>9</sup>. Among many species of barnyard millet, *Echinochloa frumentacea* (Indian barnyard millet) and *Echinochloa esculenta* (Japanese barnyard millet) are the two most popular species of barnyard. Barnyard millets can be grown in adverse climatic conditions. Barnyard millets have high nutritive value and are less expensive as compared to rice, maize, wheat, etc. It contains carbohydrate protein iron, magnesium fiber, and zinc and is useful for various pathological condition<sup>11-13</sup>.

### 2.Kodo millets (*Paspalum scrobiculatum* )

In India, Kodo millet has been available for more than 3000 years ago. Humid habitat has been suitable climatic conditions for kodo millets. It is classified under minor millets . In India, it is cultivated in Gujarat, Karnataka, Chhattisgarh, Eastern Madhya Pradesh, and parts of Tamil Nadu. Millets are an important substitute for cereals like rice, wheat, maize, etc. It is the best alternative to major cereals in both developing as well as developed countries. Kodo millets are mainly cultivated in India, China, the USA, Japan, and Africa. Kodo grain has a rich source of protein, fat, carbohydrates, minerals, and vitamins. kodo grains contain protein, fat, carbohydrate and fiber, vitamins, and micronutrients .It is an alternative for rice in diabetes mellitus patients. India is the largest producer of millets<sup>14-15</sup>. Phosphorus concentration in kodo millets is lower, and antioxidant property is higher as compared to other millets and cereals. Kodo millets contain various active phyto-constituents like saponin, flavonoids, glycosides, alkaloids, triterpenoids, steroids, tannin, and phenolic acid and are responsible for



Improving immune function by stimulating of production of T cell Cardiovascula Diuretic effect Antioxidants Diabetic complications Reduce systemic inflammation Tonsillitis, Pharyngitis, and Cancer treatment respectively<sup>16</sup>. The seed of Kodo millets can be stored for several years because of its excellent storage life<sup>17</sup>.

### 3. Pearl millets

Coix lacryma jobi commonly known as Job's tears, coix seed, Chinese Pearl Barley have been cultivated since 4000 years. It is an annual herbaceous plant that height of up to 3 feet. Pearl millets belongs to the Poaceae family. It is rich in nutrition and essential chemical compounds, either as food or herbal in India. It is used as a nutritional food. Its bran have flavonoids which have anti-inflammatory property. Seeds of Pearl millets contain Starch, Proteins, Fixed Oil, Lipids like Glycolipids, Phospholipids, Sterols, Fatty Acids like Palmitic acid, Stearic acid, Oleic acid, and Linoleic acids, and Trace Minerals. Benzoxazinone compounds are also found in the root of Pearl millets. Pearl millets have found some pharmacological activity like Diuretic, Hypoglycemic, Anti-Cancer, Anti-rheumatic, Anti-inflammatory, Antidiarrheal, Anthelmintic, Antipyretic and Antispasmodic<sup>18-21</sup>. Coix plant also contain Vitamin B1, B2, E, Niacin and fibers. Its seed contain 8 types of amino acid which is easily absorbed in the body. It is used as medicine and food but also used in cosmetic industries<sup>22</sup>. There are 4 different varieties of Coix,

1. *C. lacryma-jobi* var. *mayuen* (Rom. Caill.) Stapf.,
2. *C. lacryma-jobi* var. *Puellarum* (Balansa),
3. *C. lacryma-jobi* var. *lacryma-jobi*,
4. *C. lacryma-jobi* var. *Stenocarpa* Oliv.

There are two types of Pearl millets wild and Cultivated. Coix lacrymal-jobi var. *stenocardia* and var. *moniliform* is wild types of Pearl millets that have a very hard shell and white, spiral, oval, structure and are used in beads. Coix lacrymal-jobi var. *Mayen* is a cultivated type of Pearl millets which have a soft shell and has been harvested as a cereal crop in all parts of Asia<sup>23</sup>.

### 4. Foxtail millet

*Setaria italica* name is derived from the Latin word *seta*, meaning "bristle" or "hair," which refers to the bristly spikelets. *Setaria* have dense silky or bristly brushlike flowering spikes<sup>24</sup>. Foxtail millet has a high amount of proteins and minerals. It is come one of the minor millets<sup>25</sup>. Foxtail millet belongs to the Poaceae family. It can easily grow in any soil condition, even in tropical and subtropical regions of the world. Foxtail millet is also grown in Europe, China, India, Indonesia, and Korea. India has a top producer of foxtail millet. Foxtail millets have one of the major millets, but it received less attention as compared to other cereals<sup>26-27</sup>. Foxtail millets have a good source of various biologically active compounds like dietary fibers, bioactive peptides, proteins, minerals, amino acids, phenolic compounds, sterols, tools, phytic acids, carotenoids, unsaturated fatty acids, and several anti-nutritive compounds. Because of these bioactive compounds, foxtail millet is becoming important functional food ingredient<sup>28-29</sup>. Phenolic acid in foxtail millet shows anti-proliferative effect against MDA human breast cancer and HepG2 human liver cancer cells<sup>30</sup>. Various therapeutic activity found in foxtail millets like ant inflammation effect against inflammatory-related illness; anti-proliferative effect against colon, breast, and liver cancer; inhibition of  $\alpha$ -glucosidase and  $\alpha$ -amylase in increasing blood sugar, and; inhibition of angiotensin-converting enzyme to lower blood pressure<sup>32</sup>.

### 5. Proso millet

Proso millet (*Panicum miliaceum* L.) is mainly cultivated in India, Nepal, Western Burma, Sri Lanka, Pakistan and South East Asian countries. Grains of proso millet are nutritionally superior to major cereals and rich in essential amino acids. In India, Proso millet is grown in the states of Tamil Nadu, Karnataka, Andhra Pradesh, and Uttarakhnad. It is grown at an altitude of 2700 feet above MSL both in the tropics and sub-tropics area. It is grown in a low water area with a highly tolerated temperature<sup>33</sup>.



## 6. Finger millet

Finger millet (*Eleusine coracana*) is a very nutrient-rich crop that comes under the Poaceae family and is used as food and fodder in many developing countries. It is considered poor man food because it has many minerals, phytochemicals and vitamins, and amino acids. Among the various millets, finger millet has the fourth rank in production next to sorghum, pearl millet, and foxtail millet<sup>34-36</sup>. Finger millets have high amounts of fibers, iron, zinc, Ca, phosphorus, potassium, vitamin B, and essential amino acids and have a wide range of therapeutic action like diabetes antioxidant property cardiovascular system antimicrobial activity, etc<sup>37-38</sup>. Finger millets have gallic, protocatechuic, p-hydroxy benzoic, p-coumaric, vanillic, syringic, ferulic, trans-cinnamic acids, quercetin, etc. various phenolic compounds responsible to antidiabetic and antioxidant properties and inhibit cataract effectively<sup>39</sup>. Among the cereals, finger millets have a very high percentage of calcium content in the seed (0.34% in whole seeds). Finger millet is the most valuable crop because its seeds store for more than 5 years without insect damage<sup>40</sup>.

## 7. Sorghum

Sorghum is a very important cereal under the Poaceae family; it is native to Northeastern Africa and was cultivated from 3700 to 4000 years ago. Sorghum is fifth-ranked in production of cereal crops, following maize, wheat, rice, and barley. Sorghum has been grown in large areas in tropical and subtropical regions, in Asian and African Countries, especially in some underdeveloped and semiarid regions; sorghum is one of the leading crops used in making to-food. It is the main source of nutrition; in Western countries, it is mainly used as animal fodder. It is heat tolerant and can be grown in high altitude and saline soil. Sorghum grain is gluten-free and has resistant starch, and is rich in various nutrients with a diverse range of bioactive range of phenolic compounds compared to other cereal crops. It has a wide range of health activity like reducing oxidative stress, Cardiovascular disease, Diabetes, Obesity, Anti-inflammatory, and cancer prevention. Sorghum can be classified on the basis of color phenolic profile and genotype into five categories white, yellow, red, brown, and black sorghum<sup>41-45</sup>.

## Millets in Ayurveda

The description of millets found in Ayurveda. In Charaka Samhita detailed explanation of millets found in Dhanyavarga (group of grains). In Ayurveda millets have been known by different names like Trina Dhanya (grass-derived grains), Kshudra Dhanya (small-sized grains) and Kudhanya (Inferior among grains). Millets used as diet for maintenance of health as well as in different pathological conditions. These are Sama (*Echinochloa frumentacea* Linn.), Kodo (*Paspalum scrobiculatum* Linn.), Neewar (*Hygroryza aristata* Retz.), Gavedhuk (*Coix lacryma jobi* Linn.), Kanguni (*Setaria italica* Linn. Beauv.), Cheena (*Panicum miliaecum* Linn.), Jowar (*Sorghum vulgare* Pers.), Ragi (*Eleusine coracana* Linn.), Bajra (*Pennisetum typhoides* Burm.f. Stapf. & Hubbard)<sup>46-50</sup>.

**Table 2. Therapeutic uses of Millets as per Ayurveda<sup>48</sup>**

Millet	Botanical Name	Therapeutic uses
Sama (Barnyard Millet)	<i>Echinochloa frumentacea</i> Linn.	Obesity, Raktapitta, Pittaj kasa, Urustambha, Stanyadosa, Jalodara
Kodrav (Kodo Millet)	<i>Paspalum scrobiculatum</i> Linn.	Obesity, Raktapitta, Pittaj kasa, Visha, Urustambha, Trishna, Jalodara, Kustha Stanyadosa, Jalodara
Gavedhuk (Job's Tear)	<i>Coix lacryma jobi</i> Linn	Obesity, Kapaj Chardi
Kanguni (foxtail Millet)	<i>Setaria italica</i> Linn. Beauv	Kustha Vatakarak, Pittadaha nashak, Bhagnaasthi Sandhan



Cheena (Common Millet)	<i>Panicum miliaceum</i> Linn.	Brihana
Jwar (Great Millet)	<i>Sorghum vulgare</i> pers.	Brihana Malrodhak, Ruchikarak, Viryavardhak, Raktavikar
Ragi (Finger Millet)	<i>Eleusine coracana</i> Linn	Brihana Triptikarak, Balakarak, Raktapitta shamak
Bajra (pearl Millet)	<i>Pennisetum typhoides</i> Burm.f.Stapf. & Habbard	Balya, Agnideepak, Strikamodpadaka, Punsatvahar, Durjara

### CONCLUSION:

Millets are a very good alternative for various diseased conditions, especially lifestyle disorders. These have low glycemic index properties and gluten-free protein and are rich in antioxidants, vitamins, calcium, iron, copper, magnesium, vitamins, and dietary fibers. Millets-based foods are very helpful in various healthy as well as diseased condition and should be included in various national feeding programs for helpful for nutrient deficiencies of protein, calcium, and iron in developing countries.

### CONFLICT OF INTEREST:

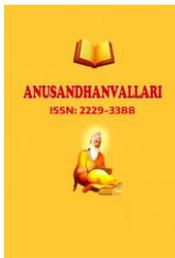
There are no conflicts of interest.

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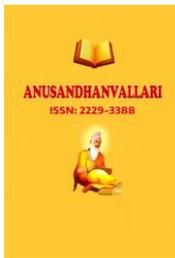
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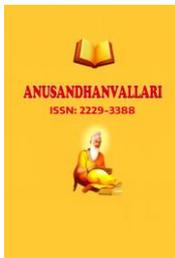
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