Review Article

Shree Anna: The Nutritional Elixir Paving the Path for Health in India

Abstract

Millets often referred to as **Shree Anna**; represent a group of small-seeded cereal grains renowned for their remarkable health benefits and drought tolerance. They boast a rich history of cultivation and consumption across various regions worldwide, with a particular emphasis on Asia and Africa. However, recent years have seen a decline in shree anna cultivation and consumption due to a shift towards more profitable and higher-yielding crops. This shift has resulted in reduced food and nutritional security for communities that rely on millets for their livelihoods and sustenance. It is a rich source of protein, fiber, micronutrients, and vitamins, making it a valuable resource in addressing iron, zinc, and protein deficiencies, particularly among women and pre-school children. In India, shree anna holds a critical position as a predominant cereal crop, especially among low-income families, owing to its well-known nutritional value. It is notable for its high content of phenolic compounds (0.03%–3%), dietary fiber (18%), and calcium (0.38%). However, despite its nutritional potential, shree anna remains underexplored in India, and there is significant untapped potential for its utilization. Unlocking the full potential of shree anna could have a profound impact on nutritional security, sustainable agriculture, and the economic well-being of communities.

Keywords: Shree anna, nutritional, elixir, health potential, nutritional security.

Background and Recent Approach of Shree Anna

Shree Anna holds a profound historical significance deeply rooted in our traditions. The renowned poet Ghagh eloquently depicted the virtues of millets through his couplets, highlighting their exceptional qualities. One verse extolled the rejuvenating effects of millets, proclaiming, **"Uth ke bajra u hassibolai, khayebudhajuvahojaaye"** (Even an old person becomes young after consuming millets). Another couplet emphasizes the harmonious combination of millets with fish and yogurt, stating, **"Maduameen, peen sang dahi, kodo ka bhaatdoodh sang dahi"**. Similarly, an Ayurvedic couplet proclaims, **"Roti makke ki bhali, theek kare liver aapka TB bhiho door"**(Maize bread is beneficial, it improves your

Comment [SK1]: check

Comment [SK2]: It available to all shree anna crop???

Comment [H3]: Need references for couplet

liver and even helps alleviate tuberculosis). In Punjab, maize bread and mustard greens continue to be revered as excellent sources of nutrition.

Beyond their nutritional benefits, millets shine as environmentally friendly crops. They thrive with minimal fertilizer and water, adapting to diverse soil types. The cultivation process, including field preparation, plowing, and irrigation, requires less energy and diesel, contributing significantly to environmental conservation. Moreover, reduced dependence on chemicals, fertilizers, and pesticides safeguards the health of individuals, land, and water resources. The history of Shree Anna is intertwined with the evolution of human civilization. These grains have been an integral part of our ancestors' diets since ancient times. The discovery of Shree Annatraces in the remains of the Indus Valley Civilization, which dates back 3,000 years and stands as one of the world's oldest civilizations, serves as a testament to their historical significance. Shree Annahas endured the test of time, offering valuable sustenance and nourishment to people across generations.

In the past, coarse grains were not only a staple food but also deeply rooted in our traditions. They formed an essential part of crop rotation and our diets until the advent of the Green Revolution. Approximately five to six decades ago, certain crops were named based on their combinations, such as **Dhankodai for the cultivation of paddy and kodo,** and **Gozai for wheat and barley**. These crops held such prominence in our traditions that some individuals in villages were even identified by the names of these crops. According to a 1962 survey, the average per capita consumption of millets in the country was around 33 kg. However, by 2010, this figure had dropped to approximately 4 kg. With the Green Revolution, the focus shifted towards cultivating wheat and paddy, leading to increased irrigation resources and the availability of chemical fertilizers.

India, especially states like Uttar Pradesh, Madhya Pradesh, and Rajasthan, stands at the forefront of the Millet Revolution, a transformative initiative aimed at revitalizing traditional crops like shree anna. Hon'blePrime Minister Narendra Modi's endorsement of the Shree Anna Revolution in his **Mann Ki Baat** program underscored India's commitment to this endeavour. The groundwork for this initiative began in 2018, focusing on promoting coarse grains as nutritious staples.

As a result of the government's persistent efforts, there have been significant improvements in millet production. Over the past four years, production has surged from 164 lakh tonnes to 176 lakh tonnes, with per-hectare yield increasing from 1,163 kg to 1,239 kg. Encouraged by

Comment [H4]: Quote the session

Comment [H5]: References ???

government support, organizations like the Indian Institute of Millet Research (IIMR) in Hyderabad have played a pivotal role. IIMR, in collaboration with the Department of Science and Technology, has established Nutri Hub, a technology incubator supporting the development of millet-related startups. The goal is ambitious: to nurture 1,000 startups by the Under the visionary leadership of Hon'ble Chief Minister Yogi Adityanath, the Department of Agriculture in Uttar Pradesh has meticulously crafted a comprehensive action plan to raise awareness about coarse grains durin

g the International Year of Millets. The initiatives undertaken are diverse and impactful, reflecting a holistic approach towards millet cultivation.

A series of workshops have been organized, including a state-wide two-day workshop where 250 farmers received expert training on advanced cultivation, storage, and processing methods for coarse grains. Similar training programs have been conducted at the district level, ensuring that farmers across the state have access to knowledge and techniques that enhance their agricultural practices. In addition, farmers' fairs have been held over two days in districts renowned for traditional coarse grain cultivation. These fairs, attended by 500 farmers each, foster direct interaction between farmers and scientists, facilitating valuable knowledge exchange and encouraging best practices in millet cultivation. To augment these efforts, awareness rallies are being organized. These rallies serve as powerful tools to educate the public about the myriad benefits of millets. Accompanied by aggressive campaigns through media channels such as Doordarshan, Akashvani, FM radio, newspapers, banners, and posters in public locations across the state, these initiatives ensure that the message of millet cultivation and its advantages permeates every corner of society.

Comment [H6]: Make a suitable sentences with references

Comment [H7]: Your manuscript is scientific paper. So maintained the scientific attitude rather than a magazine article

Introduction

The term "Shree anna" refers to a group of nutritional crops encompassing various grass crops whose seeds are harvested for human food or animal feed [34]. In India, the major millets including Jowar, Bajra, Ragi, and other small millets have been extensively studied in terms of their state-wise area, production, and productivity. Notable trends have emerged, with Madhya Pradesh boasting the highest area under small millets, Uttarakhand leading in production, and Puducherry demonstrating the highest productivity. Among these millets, Maharashtra takes the lead in both area and production of jowar, while Andhra Pradesh

Comment [H8]:

Comment [H9]: All the millet crop or particular millet ???

excels in productivity. Rajasthan dominates in the cultivation of Bajra, with six states contributing to 95% of its production. Similarly, Karnataka stands out in both area and production of Ragi, contributing to 67% of the total production. However, it is concerning to note that the area under small shree_annahas shown a decline over the years, with a growth rate of -3.60% per annum, although productivity has seen a slight increase of 0.74% per annum.

Comment [H10]: Refernces

India holds the distinction of being the world's largest producer of shreeanna, contributing 19% to the global production. Shree Annais cultivated extensively across the country, although the concentration varies significantly from state to state. Currently, shree anna covers a total cultivated area of 13.82 million hectares, producing 17.60 million tonnes with a productivity of 127.35 kg/hectare [2].

Shree Annaare renowned for their exceptional nutritional value, boasting high levels of protein, fiber, vitamins, and essential minerals such as iron, magnesium, and phosphorus. Moreover, Shree Annais naturally gluten-free, making them a valuable dietary option for individuals with gluten intolerance. Additionally, Shree Anna stands out as a more sustainable crop choice when compared to major cereal crops like wheat and rice. They require significantly less water, fertilizer, and pesticides, making them environmentally friendly. Scientific studies have further confirmed the nutritional density of millets, showcasing their ability to reduce iron deficiency, lower the risk of type II diabetes, and regulate BMI and combat obesity, while addressing calcium deficiencies.Shree Anna as future gold crops will require well-planned and long-term public sector investment in multidisciplinary research activities by major growing countries [18].

Comment [H11]:

Figure- 1. Different types of Shree Anna

Sources: **Tiwari*et al.*, 2023**

Comment [H12]:

Shree anna holds a prominent position among cereals, ranking just behind rice, sorghum, and wheat in terms of significance. For thousands of years, it has been a staple food in various regions of Africa and India. Shree Annahas played an indispensable role in the diets of numerous individuals, particularly those residing in hot and tropical climates. These hardy grains thrive in challenging environmental conditions with minimal precipitation, making them a cornerstone of sustenance in many developing countries.

Comment [H13]:

In arid regions, Shree Anna assumes a critical role as the primary source of both protein and energy for the local population. Beyond its role as a dietary staple, It is recognized for its diverse nutritional and therapeutic applications, as highlighted in studies by [20, 39].

Shree Anna, despite their exceptional nutritional value, often remains overlooked as a primary food source, primarily due to a lack of awareness among the general populace. However, in the realm of biomedical research, shree anna have been gaining increasing significance, driven by mounting evidence suggesting their positive effects on human health [24].

Shree Anna is diminutive, round grains renowned for their rich nutritional content, primarily composed of crude fibre (2–7%), protein (7–11%), and fat (1.5–5%). Additionally, Shree Anna stands out as gluten-free grains, and they are notably high in essential minerals such as zinc, magnesium, iron, calcium, and Vitamin-B [16].

Recognizing the vital role of Shree Anna in global food security and nutrition, the United Nations officially designated 2023 as the "International Year of Millets" in response to India's request. Prior to this, India had celebrated the "National Year of Millets" in 2018. These declarations aim to enhance public awareness regarding the significance of shree anna in ensuring food security. The common names and nutritional values of Shree Anna are shown in **Table 1** and **Table 2**.

Table 1. Types of Shree Anna their Common and Scientific Name

S.No.	Millets/ Shree Anna	Common Name	Scientific Name
1.	Finger Millets	Ragi	*Eleusine coracana*
2.	Foxtail Millets	Kangni	*Setariaitalica*
3.	Sorghum Millets	Jowar	*Sorghum bicolor*
4.	Pearl Millets	Bajra	*Pennisetum glaucum*
5.	Proso Millets	Chena	*Panicum miliaceum*
6.	Kodo Millets	Kodon	*Paspalum scrobiculatum*
7.	Barnyard Millets	Sanwa	*Echinochloacrusgalli*
8.	Little Millets	Kutki	*Panicum sumatrense*

Table 2. Shree Anna and its Nutritional Composition (mg/100 g)

S. No.	Millets	Protein	Fat	Fibre	Minerals	Carbohydrates	References
1.	Finger Millets	7.30	1.30	11.50	2.70	72.20	[12]
2.	Foxtail Millets	11.20	4.00	6.70	3.30	63.20	[13]
3.	Sorghum Millets	10.40	3.10	2.00	1.68	70.70	[35]
4.	Pearl Millets	11.80	4.80	2.30	2.20	67.00	[28]

5.	Proso Millets	11.00	3.50	8.50	1.90	56.15	[7]
6.	Kodo Millets	8.35	1.50	5.20	3.30	65.56	[5]
7.	Barnyard Millets	10.50	3.60	12.60	2.00	68.70	[36]
8.	Little Millets	8.92	2.50	6.39	1.72	65.48	[24]

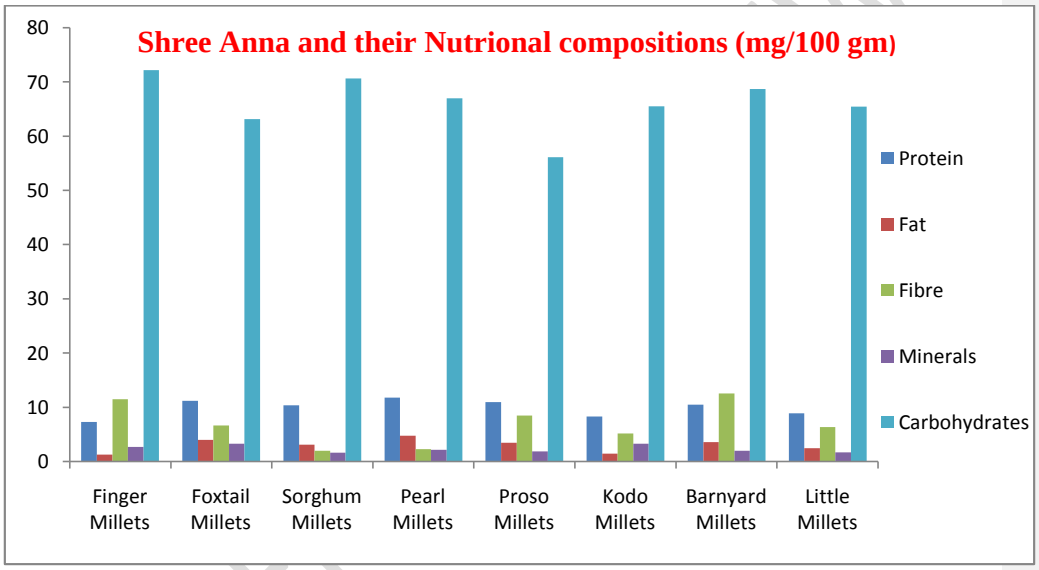

Figure 2. Shree Anna and their Nutrional Compositions (mg/100 gm)

Shree anna typically comes in seven different varieties, each with unique colours, shapes, sizes, and growing regions. The Poaceae family includes these small-seeded, spherical cereals, which are the earliest and most likely the first cereal grain that humans have used fordomesticpurposes [9]. The grain with the sixth-highest yield in the world is millet. India is the world's second-largest exporter of millets and its primary producer. The Foreign Agricultural Service of the United States Department of Agriculture reports that as of February 2023, India produced 39% of the millets grown globally for the year 2022. The Nutritional compositions of millets have been shown in Table 2 and depicted in Figure1.

1. Finger Millets (Ragi)

Ragi, commonly known as finger millets, is a crucial staple food for people from low socio economic backgrounds and those who suffer from metabolic illnesses like diabetes and obesity. Rice or wheat can be substituted with finger millet, which is regarded as a healthy, nutritious food. They are a good source of minerals, dietary fibre, protein, and carbohydrates [17]. Its great ability to store food and nutritional value make it important [32].

It is a good laxative and helps to avoid constipation because of its high fibre content. It contains a lot of calcium; finger millet is beneficial for young children, the elderly and pregnant women. Additionally, it is highly beneficial for nursing mothers as it helps in the production of adequate breast milk [1].

2. Foxtail Millets (Korra)

Foxtail millet is a generally farmed and consumed cereal that is important to the worldwide economy, particularly in India, China, and other areas of Asia, North Africa, and the Americas. It is a cereal grain that is a member of the Setaria genus and the Panicoideae subfamily of the Poaceae family [31]. The synthesis of the neurotransmitter acetylcholine, which transmits signals between muscles and nerves, is aided by foxtail millet's gluten-free, high protein, low carbohydrate composition. Foxtail millet keeps up the stamina, keeps you stronger, and increases immunity to combat numerous diseases that may be lurking because it is a nutritional powerhouse.

Comment [H14]:

3. Sorghum Millets (Jowar)

Sorghum is one of the most significant crops in terms of cultivated land and global production. Sorghum is a grain that is both gluten-free and rich in nutrients and chemical compounds that have physiological effects. The fifth-largest cereal crop in the world, sorghum is widely grown as a grain, sweet, forage, low-lignin, and biomass crop. It can grow in a variety of climates. It is a crop that can be grown in arid environments since it is heat- and drought-tolerant[25]. Sorghum includes iron, calcium, fibre, protein, and wax policosanols, all of which have health advantages, including lowering cholesterol levels [26]. Sorghum's abundance of tannins and polyphenols provides both anticancer and anti-mutagenic effects [4].

4. Pearl Millets (Bajra)

Pearl millet is a resistant cereal crop compared to wheat and rice, is cultivated in places with deficient rainfall. It is the sixth-most important grain in the world, and semiarid parts of Asia

and Africa mostly depend on it for food [37].Pearl millet, a significant member of the millet family, holds a prominent position in global agriculture, accounting for a substantial 40% of worldwide production [39].Over 95% of pearl millets are produced in developing nations, with India producing the most with 9.8 million hectares worldwide [23]. Pearl millet's high oil content (4–9%) allows for easy storage of the grain at low temperatures and low levels of moisture. Additionally, there are considerable amounts of unsaturated fatty acids, folate, copper, zinc, iron, magnesium, calcium, vitamin B complex, and other minerals [35].

5. Proso Millets (**Broomcorn**)

Proso millet is definitely a climate-smart, gluten-free, small-grain cereal that is good for both people and the environment. Protein and vitamins are found in proso millet. It is traditionally used as a restorative dish, particularly after childbirth or illness.

Niacin, a form of Vitamin B_3, is what causes the Pellagra illness, which proso millet is helpful in treating. Niacin is highly concentrated in proso millet. Pellagra is a skin condition that results in dry, scaly, and rough skin [22]. Proso millet has a lot of benefits when used as human food. Proso millet has various specific properties (such as drought tolerance and a short growth season) that make it a suitable rotational crop for dry land farming systems based on winter wheat. When employed in a two-year wheat/summer fallow cropping system, proso millet offers the most economically advantageous production strategy [7].

6. Kodo Millets (Varagu)

Kodo millet has been suggested that it originally originated in India. Kodo millet is considered to have first been domesticated around 3000 years ago [3]. A traditional food that promotes weight loss and has a taste akin to rice is kodo millet. It is easily absorbed and abundant in phyto-chemicals and antioxidants, which help to prevent a number of diseases associated with a sedentary lifestyle [1]. Kodo millet can be consumed regularly by postmenopausal women who exhibit symptoms of cardiovascular disease, such as high blood pressure and excessive cholesterol. It has higher antioxidants, which guard against oxidative stress and maintain stable blood sugar levels and diabetes. Asthma, migraines, high blood pressure, heart attacks, atherosclerosis, and diabetic heart disease can all be treated with kodo millet [7].

7. Barnyard Millets (Sanwa)

In warm, temperate areas all around the world, the ancient millet crop known as barnyard millet (*Echinochloa species*) is grown. In Asia, especially in India, China, Japan, and Korea, it is extremely popular [15]. It is the fourth most widely grown minor millet and provides

food security to many poor individuals worldwide [27].Although it is also fed to animals, most barnyard millet is grown for human consumption. *Echinochloafrumentacea* (Indian barnyard millet) and *Echinochloa esculenta* (Japanese barnyard millet), which are both cultivated and wild species, are two of the most popular types of barnyard millet [33]. Barnyard millet is a short-lived crop that can tolerate a variety of biotic and abiotic stresses and grow in unfavourable environmental circumstances with essentially little input.

8. Little Millets (Kutki)

Little millet is a unique minor cereal that is grown extensively in the tropics and is a staple diet for some low-income groups around the world. Little millet provides a comparable source of protein, fat, carbohydrates, and crude fibre to other cereals like rice and wheat, and it also offers minerals and vitamins. It also includes phyto-chemicals including flavonoids, phytate, phenolic acids, and tannins [21]. Little millet may be less nutrient-rich than other grains despite its small size. It has significant amounts of vitaminsB as well as many minerals, including as calcium, iron, zinc, and potassium. This also gives the body the kinds of essential fats that promote weight loss. It also has the benefit of having a high fibre content, which makes it an excellent alternative to rice in Pongal or even Kheer [26].

Health Benefits of Shree Anna

Millets have a number of nutritional advantages that can help people stay healthy, including lowering blood pressure, decreasing the risk of heart disease, preventing cancer and cardiovascular diseases, and decreasing the occurrence of tumours, among other things. Increasing the time it takes for the stomach to empty and providing the intestines with some roughage are two additional health benefits [30]. An alkaline-forming food is millet. To attain optimal health, meaning when it interacts with digestive enzymes, an alkaline-based diet is frequently advised. Millets possess calming alkaline properties that play a crucial role in maintaining the body’s optimal pH balance, a vital aspect of immune health and defense against infections [38]. Notably, in numerous African and Asian countries, millets are a dietary staple due to their high content of phytic compounds and essential minerals. Remarkably, millet stands out as the grain with the most cost-effective agricultural production [11]. The processing, nutritional value, and potential health advantages of shree anna grains [29]. The bioavailability of micronutrients is improved by processed food. They are both very nutritious and include many elements that are good for human health. Postmenopausal women usually suffer from symptoms of cardiovascular disease, such as increased blood pressure and cholesterol levels. Therefore, including Kodo millet in a

person's regular diet is quite beneficial for maintaining great health [6]. The high protein content of millet supports children's healthy growth and development. Millet's level of calcium stimulates the development of bones and lowers the risk of bone fractures. Additionally, it has high-quality iron, which helps with anaemia treatment. Millet's gluten-free status benefits those with celiac disease and, consequently, those who are gluten sensitive [22].

Although millets should be a regular part of our diet due to their many nutritious advantages, the majority of informed people have never ever heard of millets or their advantages. Foods devoid of fibre are causing serious health problems for people all over the world [10, 19].

By incorporating millets into a person's normal diet and avoiding refined foods like rice, wheat, processed meats, refined flours, refined oils, and ready-to-eat foods, all lifestyle diseases can be eradicated, according to prior research findings [22]. Millets are high in phenolic acids, phytates, and tannins, which are antinutrients that lower the incidence of colon and breast cancer. Millets can lower blood sugar levels by enzymatically hydrolyzing complex carbohydrates in hyperglycemia. The aldose reductase enzyme benefits in reducing sorbitol formation and lowers the chance of developing diabetes.

Magnesium, which lowers the risk of heart attack, is abundant in millets. A good source of phyto-chemicals that lower cholesterol and help prevent heart disease is millets [30]. Fibre is present in millet, which promotes healthy digestion and helps to control bowel habits. Additionally, it possesses prebiotic qualities that aid in the development of prebiotic bacteria in the micro biome by enhancing immune function all around and digestion; this has positive health effects [14].

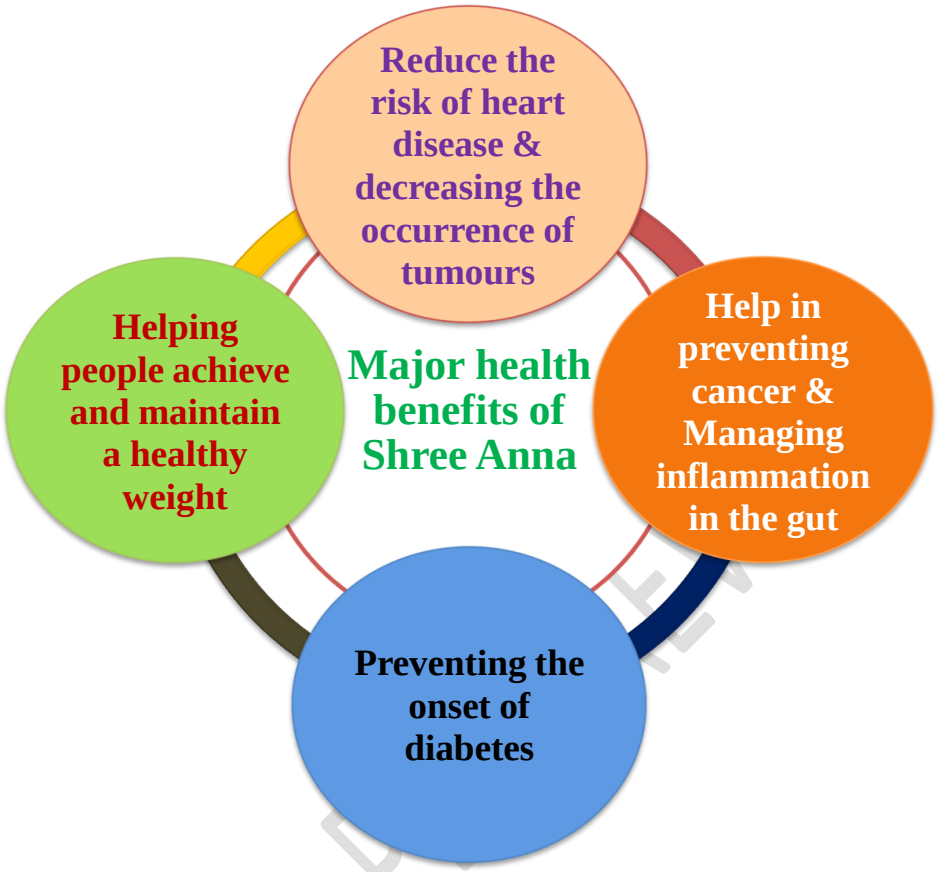

Figure3. Major Health benefits of Shree Anna

Significance of Shree Anna in Indian Diet

1. **Nutritional Abundance**-Shree Anna stands out as a nutritional powerhouse, boasting an impressive profile of protein, dietary fiber, essential vitamins, and minerals. Millet offers potential health benefits, including the protection of cardiovascular health, diabetes prevention, assistance in achieving and maintaining a healthy weight, and the management of gut inflammation. It is fiber-rich, a source of magnesium, Niacin (Vitamin B_3), gluten-free, and high in protein.
2. **Water-Efficient Crop**-Shree Anna plays a vital role in semi-arid regions, ensuring food and nutritional security for communities facing challenges such as inadequate rainfall and poor soil fertility. They are highly nutritious and serve as a crucial food source in rural areas.

3. **Soil Adaptability-**Shree Anna thrives in low to moderately fertile soils and can flourish in regions with limited rainfall. Jowar, Bajra, and Ragi are among the prominent millets cultivated in India.
4. **Profitable Farming Choice-**Shree Annais an excellent choice for farmers seeking profitability, versatility, and sustainability in their agricultural practices.
5. **Drought Resilience and Sustainability-** Often hailed as the "wonder grains" of the future, Shree Anna exhibit remarkable drought resistance, requiring minimal external inputs. Due to their high resilience to harsh environmental conditions, millets are not only sustainable for farmers but also environmentally friendly. They offer cost-effective, nutrient-rich options for consumers.
6. **Extended Shelf Life-** In a country where approximately 40 percent of the food produced is wasted annually, millets play a crucial role in reducing food wastage. Millets have a long shelf life and remain suitable for consumption even after 10-12 years of cultivation, contributing significantly to food security and minimizing food wastage.

Conclusion

The major millets in India, including Jowar, Bajra, Ragi, and various small millets, have been analyzed for their area, production, and productivity on a state-wise basis. Among these, Madhya Pradesh boasts the largest area under small millets, while Uttarakhand leads in production, and Puducherry demonstrates the highest productivity. Turning to the four major millets individually, Maharashtra takes the lead in both area and production of jowar, while Andhra Pradesh excels in productivity. Rajasthan stands out for its extensive area and production of Bajra, with six states contributing to a remarkable 95% of its overall production. Karnataka, on the other hand, dominates in terms of area and production of Ragi, accounting for an impressive 67% of the total production. However, it's worth noting that the area dedicated to small millets has witnessed a decline over the years, with a negative growth rate of -3.60% per annum, while productivity has shown a modest increase of 0.74% per annum.

In order to bolster the cultivation of shree anna in India, the government could consider providing incentives and subsidies to farmers, thereby encouraging greater millet cultivation. To ensure fairness and equity for farmers, procurement policies should be made more farmer-friendly, guaranteeing them a reasonable price for their millet produce and serving as an additional incentive. Furthermore, investments in research and development are crucial to

develop improved millet varieties that are resistant to drought, pests, and diseases while having a higher yield potential.

In present arena society, consumer preferences often gravitate towards fast food and bakery products, which have been associated with numerous health issues. Consequently, this study aims to underscore the nutritional value of healthy foods and encourage people to incorporate shree anna into their regular diets. Shree anna, a treasured ancient grain-like seed, offers a multitude of health benefits, even though it remains relatively unknown to many. Therefore, raising awareness about shree anna and its health benefits is essential for promoting a healthy and fulfilling life. It's a reminder of one of our distant ancestors' best-kept secrets, the remarkable benefits of shree anna is a valuable addition to our modern diets.

References

1. Ambati, K. Sucharitha, K.V. (2019). Millets-review on nutritional profiles and health benefits. *International Journal of Recent Scientific Research*. 10(7): 33943-33948.

2. APEDA and Yes Bank (2022). Indian Super food Millets: A USD 2 Billion Export Opportunity. 64.

3. Arendt, E. and Dal Bello, F. (2011). Gluten-Free Cereal Products and Beverages. *Elsevier*. 48-59.

4. Awika, J.M. and Rooney, L.W. (2004). Sorghum phytochemicals and their potential impact on human health. *Phytochemistry*. 65(9): 1199-1221.

5. Bunkar, D.S., Goyal, S.K., Meena, K.K. and Kamalvanshi, V. (2021). Nutritional, functional role of Kodo millet and its processing: A review. *International Journal of Current Microbiology and Applied Sciences*. 10(01):1972-1985.

6. Chandrasekara, A. Shahidi, F. (2010). Content of insoluble bound phenolics in millets and their contribution to antioxidant capacity. *Journal of Agriculture and Food Chemistry*. 58(11): 6706-6714.

7. Das, S., Khound, R., Santra, M. and Santra, D.K. (2019). Beyond bird feed: Proso millet for human health and environment. *Agriculture*. 9(3): 64.

8. Dayakar Rao, B., Bhaskarachary, K., Arlene Christina, G.D., Sudha Devi, G., Vilas, A.T. and Tonapi, A. (2017). Nutritional and health benefits of millets. ICAR-Indian Institute of Millets Research (IIMR) Rajendranagar, Hyderabad. 112.

9. FAO (2020). World Food and Agriculture-Statistical Year book: FAO-Rome, Italy. 175.

10. Habiyaremye, C., Matanguihan, J.B.D., Alpoim Guedes, J., Ganjyal, G.M., Whiteman, M.R., Kidwell, K.K. and Murphy, K.M. (2017). Proso millet (*Panicum miliaceum*L.) and its potential for cultivation in the Pacific Northwest, USA: A review. *Frontiers in Plant Science*. 1961.

11. Hassan, Z.M., Sebola, N.A. and Mabelebele, M. (2021). The nutritional use of millet grain for food and feed: A review. *Agriculture & food security*. 10: 1-14.

12. Himanshu, K., Sonawane, S.K. and Arya, S.S. (2018). Nutritional and nutraceutical properties of millets: A review. *Clinical Journal of Nutrition and Dietetics*. 1(1): 1-10.

13. Jaybhaye, R.V., Pardeshi, I.L., Vengaiah, P.C. and Srivastav, P.P. (2014). Processing and technology for millet based food products: A review. *Journal of Ready to Eat Food*. 1(2): 32-48.

14. Kumar, S., Singh, S., Yadav, R., Kumar M. and Yadav, S. (2023). Millets: An ancient food and its nutritional importance for human health. *Agrospheres*: e-Newsletter. 4(7): 1-4.

15. Madhusudhana, R., Padmaja, P.G., Cheruku, D., Rao, K.R. and Tonnesnesapi, V.A. (2017). ICAR- IIMR Millets Annual Report. 190.

16. Majid, A. and Priyadarshini, C.G.P. (2020). Millet derived bioactive peptides: A review on their functional properties and health benefits. *Critical Reviews in Food Science and Nutrition*. 60(19): 3342-3351.

17. Mathanghi, S.K. and Sudha, K. (2012). Functional and phytochemical properties of finger millet (*Eleusine coracana*) for health. *International Journal of Pharmaceutical Chemical and Biological Sciences*. 2(4): 431-438.

18. Meena, R.P., Joshi, D., Bisht, J.K. and Kant, L. (2021). Global scenario of millets cultivation. In: Kumar, A., Tripathi, M.K., Joshi, D. and Kumar, V. editors. Millets and Millet Technology. *Springer, Singapore*. 33-50.

19. Muthamilarasan, M., Dhaka, A., Yadav, R. and Prasad, M. (2016). Exploration of millet models for developing nutrient rich graminaceous crops. *Plant Science*. 242: 89-97.

20. Obilana, A.B. and Manyasa, E. (2002). Millets. In: P.S. Belton and J.R.N. Taylor (Eds.): 177–217.

21. Pradeep, S.R. and Guha, M. (2011). Effect of processing methods on the nutraceutical and antioxidant properties of little millet (*Panicum sumatrense*) extracts. *Food chemistry*. 126(4): 1643-1647.

22. Prathyusha, N., Lakshmi, V.V. and Manasa, T. (2021). Review on consumer awareness and health benefits about millets. *The Pharma Innovation Journal*. 10(6): 777-785.

23. Rani, S., Singh, R., Sehrawat, R., Kaur, B.P. and Upadhyay, A. (2018). Pearl millet processing: A review. *Nutrition & Food Science*. 48(1): 30-44.

24. Rao, B.R., Nagasampige, M.H. and Ravikiran, M. (2011). Evaluation of nutraceutical properties of selected small millets. *Journal of Pharmacy and Bioallied Sciences*. 3(2):277–279.

25. Ratnavathi, C.V. and Komala, V.V. (2016). Sorghum grain quality. In Sorghum biochemistry. *Academic Press*. 1-61.

26. Reddy, O.S.K. (2017). Smart Millet and Human Health. Green Universe Environmental Services Society. 24-37.

27. Renganathan, V.G., Vanniarajan, C., Karthikeyan, A. and Ramalingam, J. (2020). Barnyard millet for food and nutritional security: Current status and future research direction. *Frontiers in Genetics*. 11: 500.

28. Saini, S., Saxena, S., Samtiya, M., Puniya, M. and Dhewa T. (2021). Potential of underutilized millets as Nutri-cereal: An overview. *Journal of Food Science and Technology*. 1-13.

29. Saleh, A.S.M., Zhang, Q., Chen, J. and Shen, Q. (2013). Millet grains: Nutritional quality, processing, and potential health benefits. *Comprehensive Reviews in Food Science and Food Safety*. 12(3): 281-295.

30. Sarita, E.S., and Singh, E. (2016). Potential of millets: Nutrients composition and health benefits. *Journal of Scientific and Innovative Research*. 5(2): 46-50.

31. Sharma, N. and Niranjan, K. (2018). Foxtail millet: Properties, processing, health benefits, and uses. *Food Reviews International*. 34(4): 329-363.

32. Shashi, B.K., Sunanda, S., Shailaja, H., Shankar, A.G. and Nagarathna, T.K. (2007). Micronutrient composition, antinutritional factors and bioaccessibility of iron in different finger millet (*Eleusine coracana*). *Karnataka Journal of Agricultural Sciences*. 20(3): 583-585.

33. Sood, S., Khulbe, R.K., Kumar, A., Agrawal, P.K. and Upadhyaya, H.D. (2015). Barnyard millet global core collection evaluation in the submontane Himalayan region of India using multivariate analysis. *The Crop Journal*. 3(6):517-525.

34. Thapliyal, V. and Singh, K. (2015). Finger millet: Potential millet for food security and power house of nutrients. *International or Research in Agriculture and Forestry*.2(2): 22-33.

35. Tiwari, H., Naresh, R.K., Bhatt, R., Kumar, Y., Das, D. and Kataria, S.K. (2023). Underutilized nutrient rich millets: Challenges and solutions for India's food and nutritional security: a review. *International Journal of Plant & Soil Science*. 35(2):45-56.

36. Ugare, R., Chimmad, B., Naik, R., Bharati, P. and Itagi, S. (2014). Glycemic index and significance of barnyard millet (*Echinochloafrumentacae*) in type II diabetics. *Journal of Food Science and Technology*. 51(2): 392-395.

37. Upadhyaya, H.D., Vetriventhan, M., Dwivedi, S.L., Pattanashetti, S.K. and Singh, S.K. (2016). Proso, barnyard, little, and kodo millets. In Genetic and genomic resources for grain cereals improvement. *Academic Press*. 321-343.

38. Vishakha, D.R.B. (2016). Potential of millets: Nutrients composition and health benefits. *International Journal of Universal Science and Engineering*. 2: 2454-2510.

39. Yang, X., Wan, Z., Perry, L., Lu, H., Wang, Q., Hao, C., Li, J., Xie, F., Yu, J., Cui, T., Wang, T., Li, M. and Ge, Q.H. (2012). Early millet use in northern China. Proc. *Nat. Acad. Sci.*USA. 1-5.