



Barnyard Millet's Health and Nutritional Significance

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<p>Review Article Received on July 19, 2023 Revised on August 13, 2023 Accepted on August 22, 2023 Published on October 07, 2023</p> <p>Article Authors Neelesh Kumar Maurya, Joginder Singh, Ena Gupta, Neha Kumari, Latika Yadav, Poonam Maurya</p> <p>Corresponding Author Email neeleshkumar.maurya@gmail.com</p>	<p>ABSTRACT One of the most significant minor millet crops in Asia, barnyard millet (<i>Echinochloa</i> species) is displaying a steady rise in world output and has become one of the most important minor millet crops in the world. <i>Echinochloa esculenta</i> and <i>Echinochloa frumentacea</i> are the two most important species that belong to the genus <i>Echinochloa</i>. Both of these species are primarily farmed to provide food and feed for humans and cattle. They are more resistant to the adverse effects of both biotic and abiotic stress. The grain of barnyard millet is an excellent source of protein, carbohydrates and fibre, it has a particularly high concentration of minerals iron and zinc compared to other main cereals. In spite of the fact that it is advantageous both nutritionally and agriculturally, barnyard millet is still a relatively neglected crop. Jhangora, also known as Indian barnyard millet, is an excellent addition to a healthy diet since it is high in both fibre and mineral content. The fact that it is low in carbohydrates, has a low glycemic index, and does not include gluten in its grains is an added advantage for various health problems, including obesity and diabetes. Regarding its nutritional value and pharmacological benefits, Jhangora is discussed in detail in this article.</p>
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One of the hardiest types of millet is called barnyard millet (*Echinochloa frumentacea*). It is also known as Japanese barnyard millet, ooda, oadalu, sawan, sanwa and sanwank. These names are all variations of the same species. The crop known as barnyard millet is significant for its nutritional value (Nandede, 2023). In addition to the essential elements, the grain from barnyard millet has a higher concentration of the micronutrients iron and zinc than the majority of other cereals.

In the hills of Uttarakhand, *Echinochloa frumentacea* is also known as Indian barnyard millet, Sawa millet, Japanese millet, billion-dollar grass, and Jhangora. These seeds are also known as "Oodalu" in the Kannada language, "Bhagar" in the state of Maharashtra and "Kuthirai Vaali" in the Tamil Nadu language. All of these names are prevalent in India. Because Jhangora has undergone evolutionary changes that have allowed it to adapt to conditions that are both warm and temperate.

It possesses a rich gene pool for stress tolerance as well as other abiotic stresses (Nandede, 2023, Bhinda *et al.*, 2023). It is an adequate supply of protein, which can be broken down into its constituent parts with relative ease, and it is an outstanding source of dietary fibre that contains both soluble and insoluble fractions in sufficient quantities. The amount of carbohydrates present is modest, and they are digested very slowly. As a result, barnyard millet is an excellent example of natural designer food. Currently, when diabetes mellitus is becoming more common, barnyard millet could turn out to be the appropriate meal. Millets have, throughout the course of time, gained favor among the general populace of Asia and the western globe, and as a result, the entire output of millets has surged in recent decades. The small millet crop known as barnyard millet has also made it to the top of the ranking. The *Echinochloa* genus contains two primary species: *Echinochloa esculenta* and *Echinochloa frumentacea* (Jha, 2023).

Barnyard millet is classified as a member of the *Echinochloa* genus. Both species can be consumed by humans and used as food for animals without any adverse effects. In spite of the numerous health and agricultural advantages it offers, barnyard millet is still a relatively underutilized crop. In addition to being rich in sources of crude fibre, crude protein, and antioxidants, one of the distinguishing characteristics of the majority of millets is that they are less vulnerable to biotic and abiotic stressors, and as a result, they require less attention as a standing crop in the field (Bhinda *et al.*, 2023, Sagar *et al.*, 2022, Pushpa and Kumar, 2023). The genetic mechanism that is responsible for this hereditary capacity to endure stressors might be a useful tool in the process of producing modified cultivars of barnyard millet or other agronomic crops by transferring the genes that are of interest. Although barnyard millet, like other minor millets, has a nutritional profile that is superior to that of cereals, its application in food production is restricted. In addition, barnyard is a fast-growing multipurpose crop that can provide both food and forage in a short amount of time and with a minimum amount of inputs, even when grown in unfavorable climates. In addition, (Kumari and Thayumanavan, 1997) found that rats given meals manufactured from native and treated starch of barnyard millet.

The lowest levels of blood glucose, serum cholesterol and triglycerides, when compared to rats given diets prepared from foxtail, proso, kodo and little millets, respectively. It is necessary to evaluate the effect of barnyard millet in terms of its nutritional properties and the possible health advantages it may offer among volunteers who are either normal or diabetic. As a result, researchers decided to investigate the nutritional characteristics, glycemic index, and potential health advantages of barnyard millet among type II diabetics (Pushpa and Kumar, 2023, Oswal, 2023).

Nutritional Benefits Glycemic Index (GI)

The glycemic index (GI) of both dehulled and heat-treated grains (dehulled grains heated at 60°C in four cycles with intermittent cooling for 1 hour) was evaluated using a postprandial glucose tolerance test (GTT) of the test carbohydrate (barnyard millet) and comparing it to a reference carbohydrate (glucose) in six non-diabetic healthy volunteers using the procedures. Both the reference carbohydrate and the test meal, which was also equivalent to 50 g of carbohydrate, were given to the volunteers in separate doses on three different days, with a week in between each set of doses. For the gastrointestinal (GI) test, the researchers recruited normal and healthy individuals between the ages of 37 and 40 (three of them were male), who had sedentary lifestyles and did not use any medications (Ugare *et al.*, 2014).

An Interventional Study

Volunteers with and without diabetes took part in the long-term feeding trial with dehulled and heat-treated barnyard millet. There were nine diabetics and six volunteers without diabetes. The feeding intervention was carried out on various groups of volunteers while keeping a control group that was identical to the experimental group in terms of age, gender, eating habits, lifestyle, and anthropometry. The volunteers were each given a unit package containing 73 gm of heat-treated grains, which was equivalent to 50 gm of carbohydrate content, these unit packages were then used to prepare the test meal.

The volunteers were given the test meal to consume for breakfast, lunch and/or supper in the form of an upma-like product (made by cooking dehulled and roasted barnyard millet in water 1:4, w:v, with 2 gm of green chillies) or cooked like rice. They were also given the option of consuming the test food raw. During and after the course of the study, the volunteers were asked for reports on their compliance. Before and after the intervention, venous blood samples were taken from the participants in order to evaluate the effects of the treatment on blood glucose, triglycerides, total cholesterol, HDL-C, LDL-C and VLDL-C levels. These measurements were determined with the use of Swemed diagnostic kits and a Swemed semi-auto analyzer. In order to assess the significance of the feeding intervention, a paired test was carried out (Bhinda *et al.*, 2023, Ugare *et al.*, 2014).

Cardiovascular Diseases

Obesity, smoking, an undesirable eating routine, and physical dormancy increase the danger of heart disease and stroke. A significant proportion of the world's nations are experiencing high and rising rates of illness associated with the cardiovascular system. When compared with rice and other minor millets, it has been demonstrated that rodents fed a diet consisting of native and treated starch from barnyard millet had the lowest levels of blood glucose, serum cholesterol, and triglycerides (Oswal, 2023, Anitha *et al.*, 2011).

Celiac Disease

Also referred to as celiac sprue, non-tropical sprue, and gluten-sensitive enteropathy, celiac disease is one of the autoimmune disorders that can be caused by eating gluten. Although the precise reason for celiac disease is unknown, it is known to have a genetic (inherited) component. Celiac disease is characterized by intolerance to gluten. Consuming gluten, which is a protein found in wheat, can lead to the autoimmune disease known as celiac disease. This condition causes the immune system to attack normal tissue, most notably the tissue that lines the inside of the small intestine. Prolamins are the specific reaction that causes irritation in the body. The replacement of items manufactured from wheat, rye, and barley with gluten-free grains such as sorghum, barnyard millet and buckwheat helps people adhere to a gluten-free diet (Anitha *et al.*, 2021).

Diabetes

Despite the fact that barnyard millet has a decent amount of starch, it has a relatively low sugar level overall. Because of this, those who have diabetes can greatly benefit from eating barnyard millet. Because diabetics tend to favor foods with a low glycemic index, this possibility cannot be ruled out. By swapping white rice for barnyard millet, the diabetic can avoid the spike in glucose levels that would otherwise result. Diabetes was shown to occur less often in populations where barnyard millet was the predominant food source. Millet phenolic inhibits enzymes such as alpha-glucosidase and pancreatic amylase, which leads to a reduction in postprandial hyperglycemia. This is accomplished by the limited inhibition of the enzymatic degradation of complex sugars. Inhibitors such as aldose reductase prevent the aggregation of sorbitol, which in turn lowers the likelihood of developing diabetes and other diabetic complications. A low glycemic index for dehulled millet was reported (50.04.19) and for heat-treated millet (41.72.55) (Ugare *et al.*, 2014). This indicates that dehulled and heat-processed barnyard millet is effective for the treatment of type II diabetes (Ugare *et al.*, 2014, Anitha *et al.*, 2011, Kaur and Sharma, 2020, Maurya, 2019).

Low Carb Food

Barnyard millet has a low-calorie count and is an excellent source of highly digested protein. Because of consuming it, one will feel light and energized after eating it. For individuals who are interested in maintaining a healthy diet, barnyard millets are an excellent choice because one serving (25 gm, uncooked) provides 75 calories, 1.5 gm of protein, 68% carbohydrates, and fewer than 400 calories per 100 gm and no barnyard millet is not simply a millet used for fasting; it is healthy enough to be used in the everyday meals of people of all ages (Ugare *et al.*, 2014).

Rich in Dietary Fibre

It is a great source of dietary fibre with a good mix of soluble and insoluble fractions, making it a rich source of dietary fibre with a whopping 6.9 gm for half a cup.

Constipation, extra gas, bloating and cramping that isn't essential to be created may all be avoided by eating meals that are high in fibre (<https://www.safeharvest.co.in/barnyard-millet-the-millet-for-millennials/>) (<http://www.cardiacwellnessinstitute.com/heart-diseasetreatment.prevention/uncategorized/magical-millets-for-holistic-health/>).

Low Glycemic Index

The carbohydrates in millets exhibit a high degree of retro gradation of amylase, which makes it easier to create greater levels of resistant starch. This contributes to the grain's low glycemic index. Because of this, it also has the potential to be prescribed to patients who suffer from cardiovascular disease as well as diabetics. Diabetics who consume barnyard millet see an improvement in their ability to tolerate carbohydrates, and they experience a reduction in their blood sugar levels (<http://www.cardiacwellnessinstitute.com/heartdisease-treatment-prevention/uncategorized/magical-millets-for-holistic-health/>).

A Gluten-Free Grain

Just like other millets, barnyard millet is suitable for those who are sensitive to gluten (such as those who have celiac disease) or who follow a gluten-free diet and lifestyle that does not include eating items containing wheat, barley, or other rye-based ingredients. Millet, which is readily available, can be prepared in a short amount of time, and has a delicious flavour, may easily take the place of rice, wheat, and other grains that are rich in gluten (Kaur and Sharma, 2020).

A Significant Source of Iron

Research has found that certain kinds of barnyard millet have significant levels of iron (18.6 mg in 100 g of raw millet). This makes barnyard millet the cereal grain and millet variety with the highest iron content. It has been shown that consuming barnyard millet can help improve hemoglobin and serum ferritin levels in the blood, making it a potentially useful source of iron for vegetarians.

Strengthens the Immune System

Barnyard millet contains a fair amount of iron and zinc (Ugare *et al.*, 2014). Zinc and iron are both necessary components for our body's immune system. Consuming barnyard millet, as a result, provides the body with advantages that aid it in its fight against foreign substances and illnesses (Yadav and Maurya, 2022).

Conclusion

The ingesting of barnyard millet is a traditional practice in several geographically distinct areas of the world. However, it should still be considered a standard feed. It is important to incorporate it into our diet regularly to maintain our health. Crops are frequently substituted for rice in the Indian Himalayan region's traditional cuisine. It has been determined to be a viable alternative for agriculture that is robust to the effects of climate change. High nutritional density and the ability to fight free radicals. It is recognized as a useful crop for food production. Recently, there has been a rise in demand for the crop because of its exceptionally high nutrient content cereal. As a result, it possesses the capability of supplying both food and nutrients. Protection particularly in mountainous areas with an excess of nutrients. The crop has enormous potential but has to gain appeal among the public; it was and still is considered food for those in lower socioeconomic brackets. As a result, this work is an attempt to consolidate the minimal material currently accessible. To create the history of crops, their evolution, crop breeding, and their status enhancing the crop's competitiveness and making it easier to cultivate.

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