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Batool Kanorwala

Research Scholar, Department of Food Science and Nutrition, CCAS, MPUAT, Udaipur, Rajasthan, India

Dr. Nikita Wadhawan

Associate Professor & Head, Department of DFT, CDFT, MPUAT, Udaipur, Rajasthan, India

Prerna Shekhawat

Research Scholar, Department of Food Science & Nutrition, CCAS, MPUAT, Udaipur, Rajasthan, India

Rupali Jain

Research Scholar, Department of Food Science and Nutrition, CCAS, MPUAT, Udaipur, Rajasthan, India

Corresponding Author:

Batool Kanorwala

Research Scholar, Department of Food Science and Nutrition, CCAS, MPUAT, Udaipur, Rajasthan, India

Significance of finger millet consumption on nutritional status and management of diabetes mellitus: A review

Batool Kanorwala, Dr. Nikita Wadhawan, Prerna Shekhawat and Rupali Jain

Abstract

Millets are a staple food in many developing countries due to their resilience in the face of adversity. Millets, in addition to wheat, rice, and maize are cereals which are an important source of nutrition for millions of people, particularly those who live in hot, arid climates. The study's primary goal was to identify the nutrient content of finger millet and the importance of finger millet consumption for diabetic patients. Secondary sources were used to collect data. It was discovered that finger millet contains a wide range of nutrients that have a variety of positive health effects, including anti-diabetic, hypocholesterolemia, chronic disease prevention, antioxidant, and antibacterial effects. Finger millet is also a low glycemic index food, with a GI value ranging from 54 to 60, which aids in lower blood glucose response and is therefore beneficial to diabetics. As a result, to comprehend the significance of finger millet, an awareness campaign demonstrating the benefits of finger millet to people suffering from diabetes mellitus is required.

Keywords: Finger millet, diabetes mellitus and glycemic index

Introduction

Millets are the cereals apart from the major wheat, rice, and maize. Especially for individuals who live in hot, arid climates, millets constitute a significant source of nourishment for millions of people. Most of them are grown in marginal locations under agricultural settings when major grains don't produce significant yields (Adekunle, 2012^[1]). A member of the grass subfamily Panicoideae, millets are grouped alongside maize, sorghum, and Coix (Job's tears) (Yang *et al.*, 2012)^[20]. Millets are a staple meal in many developing nations due to their resilience in the face of challenging environmental factors like less rainfall. Thousands of people in Africa, however, rely heavily on millet as their primary source of protein and energy. According to reports, millet performs a variety of therapeutic and nutritive tasks (Yang *et al.*, 2012)^[20]

One of the earliest millet crops still grown today is finger millet (*Eleusine coracana*), which is grown in several parts of India. Major prolamin fractions found in finger millet protein have a higher amount of glutamic acid, proline, valine, isoleucine, leucine, and phenylalanine and a lower proportion of lysine, arginine, and glycine. Compared to milled rice, finger millets have higher levels of the sulphur-containing amino acids methionine and cystine. In addition, finger millet has a high potassium concentration. Finger millet has 350 mg of calcium per 100 grams. Dietary fibre and minerals abound in milled finger millet. The leaves of finger millet contain many flavonoids, including orientin, isoorientin, vitexin, isovitexin, saponarin, violanthin, lucenin-1, and tricic, which have antitumor and anti-leukemic activities. Antioxidant, antibacterial, antihypocholesterolemic, anti-diabetic (type 2 diabetes) and antifungal activities are present in finger millet.

Diabetes is currently the most common condition, prevailing in the society. It is caused by decreased insulin secretion, insulin resistance, or a combination of both, and can affect anyone owing to their sedentary lifestyle, dietary habits, etc. Type 2 Diabetes Mellitus is the most prevalent of the three primary forms of diabetes, accounting for more than 90 per cent of all cases, more frequently than either type 1 diabetes mellitus (T1DM) or gestational diabetes. Our knowledge of the onset and evolution of T2DM has quickly advanced during the last few decades. Its primary cause is increasing impairment of pancreatic cells' ability to secrete insulin, which typically occurs in the context of pre-existing insulin resistance in skeletal muscle, the liver, and adipose tissues. (Defronzo *et al.*, 2015)^[11]. The classification frequently depends on the clinical presentation upon diagnosis, and the following criteria are frequently used in clinical practise to categorise patients:

1. Age of diabetes onset
2. The suddenness of hyperglycemia
3. A ketotic state was evident at presentation
4. Obesity level
5. The diagnosis of the requirement for insulin

Methodology

Starting with 2012 to present 2022 the published term papers, review papers and write-ups from internet which are in English concerning to finger millet, its nutrient content and its impact on diabetes were reviewed. A number of data collection sources and web browsers, together with Google scholar, Research Gate, Krishikosh, Academia were used to search the articles related to the study. The references mentioned in printed publications were also carefully examined in order to find the appropriate research papers. Most frequently used terms like "nutrient content of finger millet," "importance of finger millet," "type 2 diabetes mellitus," etc. were used as search terms to find relevant research publications.

Nutrient content of finger millet

Mathangi *et al.* (2012) ^[9] investigated the health benefits of finger millet and found that in addition to lowering blood sugar and cholesterol, finger millet is said to offer antiulcerative qualities. It was discovered that the finger millet seed coat matter, which is a rich source of dietary fibre and phenolic compounds, has qualities that decrease blood sugar and cholesterol as well as being nephroprotective and anticataractogenic.

Saleh *et al.*, (2013) ^[14] stated that finger millet contains up to 283.0 mg of phosphorus per 100 grams, which helps with energy metabolism and the growth of body tissue. With Mg content of 78 to 201 mg/100 g, finger millet can help lower the risk of heart attack, high blood pressure, asthma, and migraine headaches.

Chappalwar *et al.* (2013) ^[3] further reported that finger millet is a great source of vitamins, which are essential for proper cell division and brain function. The grains of finger millet are high in the vitamins A (retinol, 6.0 mg/100 g), B (thiamine, 0.2-0.48 mg/100 g), and C (riboflavin, 0.12 mg/100 g), as well as both fat- and water-soluble vitamins.

Gull *et al.* (2014) ^[2] reviewed the assessment of the nutritional and health attributes of finger millet and its utilization in value added foods and found that finger millet's well-balanced protein profile and gluten-free characteristics make it suitable for use in a variety of food formulations to create products with value added. Even though this millet's eating habits are unique and will likely remain such, it is still important to make it known to a wider audience, and designing dishes that are popular with the general public can aid in this effort.

Thapiyal and Singh (2015) ^[19] stated that in terms of nutrition, finger tail millet is a good source of nutrients, including calcium and other minerals as well as fibre. Finger millet has a total carbohydrate content that ranges from 72 to 79.5 per cent. A vital staple meal for those in low socioeconomic groups and those with metabolic diseases like diabetes and obesity, finger millet (*Eleusine coracana*), commonly known as ragi, is a good source of carbohydrates, protein, dietary fibre, and minerals. In comparison to wheat, rice, and relatively well-balanced proteins, it contains significantly more dietary fibre and minerals. Millets' hypoglycemic effect is a result of their high fibre content. The delayed digestion and absorption of the fibre and complex carbohydrates lower postprandial glucose levels. Chandra. *et al.*, (2016) ^[4] formulated an investigation and

found that dietary fibre and polyphenols in finger millet are known to have a number of health advantages for regular users, including anti-diabetic, defense against chronic diseases linked to diet, hypocholesterolemia, antioxidant, and antibacterial activities. Finger millet is a nutrient that, when consumed regularly, promotes blood glucose homeostasis, which aids in controlling a variety of health issues

Chelliah *et al.*, (2017) ^[12] conducted a study and found that that addition of both finger millet and pearl millet to the idli batter enhanced the amount of nutrients, including soluble fibre, calcium, and iron, as well as the idli's flavour, aroma, and other desirable characteristics.

The presence of dietary fibre and polyphenols in finger millet can have a variety of positive health effects, such as antidiabetic, hypocholesterolemic, chronic disease prevention, antioxidant, and antibacterial effects.

Rathore *et al.*, (2019) ^[15] proposed an investigation and found that processing technologies can be used to increase the bioavailability of micronutrients and to raise the nutritional value of finger millet. Through adequate processing and value addition, consumption of finger millet can increase from rural to urban areas. Due to its well-balanced protein composition and gluten-free status, finger millet may be used in the development of many value-added food items.

Jagati *et al.*, (2021) ^[10] studied on the functional and nutritional activities which revealed that finger millet is more nutritious than other cereals in terms of antioxidants, fatty acids, and minerals, all of which are significant components of a diet rich in nutrients and necessary for maintaining good health.

Maharajan *et al.*, (2022) ^[8] reported that minerals such as potassium, phosphorus, magnesium, calcium, manganese, copper, zinc, and iron are all abundant in the grains of finger millet. It has three times as much calcium as milk and is 10 times more calcium-rich than any other cereal. Comparatively to other grains, finger millet seeds are particularly high in the total aromatic amino acids, cystine, methionine, and tryptophan.

Benefits of finger millet for diabetic people

Finger millet could play a significant role in the diets of diabetic patients because of its remarkable capacity for regulating post-meal blood glucose levels. It's important to evaluate the results of combining the various tested items with oral hypoglycemic medications. (Kumari and Sumathi, 2002) ^[7] Chandra *et al.*, (2016) ^[4] reported that finger millet is highly advantageous for diabetes people due to its high dietary fibre and phenolic content. In addition, it has a low glycemic index (GI), which makes it a perfect snack to stave off late-night food cravings and support stable blood sugar levels. Regular consumption of finger millet products can eliminate insulin resistance by 43 per cent and reduce fasting glucose by 32 per cent.

Tiwari and Srivastava. (2017) ^[15] performed to examine the long-term impact on diabetics of buns made from low-GI finger millet. As a result, it is determined that type 2 diabetics' long-term glycemic and lipidemic management is improved by eating finger millet, a low GI food product.

Geetha *et al.*, (2020) ^[6] studied and found that the rich amount of dietary fibre in diabetic meal mixes helps to slow down the release of glucose, and the high concentration of phytochemicals will help to prevent cell damage caused by the generation of free radicals. The findings revealed that a millet-based food blend produced for diabetics may have the capacity to lower FBS and HbA1c, indicating that this food blend is a

good choice for them.

Vedamanickam *et al.* (2020) [18] performed a cross sectional study in diabetes with hypertension and found that when compared to a non-millet diet, the millet diet significantly reduced weight and BMI levels. Additionally, while contrasting the millet diet with the non-millet diet, the biochemical indicators like lipid profiles, Fasting, and PP blood sugar levels were dramatically decreased.

Therefore, finger millet has been shown to be a crucial millet for those with diabetes. A significant amount of calcium and iron are also provided by finger millet. Additionally, vitamin D and calcium must be consumed in diabetes, making finger millet crucial for those with the disease.

Conclusion

To recognize the nutrient content of the finger millet and their benefits to diabetic people is the study's leading purpose. On the topic the benefits of finger millet for diabetic people small number of studies are published till now. Through review of literature it was found that till now finger millet has vast variety of nutrients, they have a variety of positive health effects, such as antidiabetic, hypocholesterolemic, chronic disease prevention, antioxidant, and antibacterial effects. Finger millet is cheaper than other crops and also can be grown in critical conditions. People are not aware about their benefits as they can be consumed by any age group and in any form. They contain large amount of fibre and calcium which are beneficial for diabetic patients and which induces their insulin dependency. Finger millet is also a low glycemic index food as its GI value lies from 54-60 which helps in lower blood glucose response thus helpful for diabetic people. Hence to understand the importance of finger millet there is a need to plan an awareness program which can show the benefits of finger millet to people suffering from diabetes mellitus.

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