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ARTICLE

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NUTRI-CEREALS FOR LIFESTYLE DISORDERS

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Background

Millets stand out as nutritionally rich grains, offering a multitude of health benefits to consumers. These crops play a significant role in ensuring food and nutritional security in our country. Millets are categorized into major millets, such as sorghum (jowar) and pearl millet (bajra), and minor millets, including finger millet (ragi/mandua), foxtail millet (kangni/Italian millet), little millet (kutki), kodo millet, barnyard millet (sawan/jhangora), proso millet (cheena/common millet), and brown top millet (korale).

Once considered the oldest foods known to humanity, millets lost their prominence due to the widespread cultivation and use of rice and wheat, driven by urbanization and industrialization. However, in the face of rising lifestyle-related diseases like diabetes, hypertension, and cardiovascular issues, millets have made a comeback as a healthy alternative, offering a way to combat these conditions. Millets boast numerous nutritional, nutraceutical, and health-promoting properties, notably their high fiber content and unique starch nature, which plays a pivotal role in reducing the risk of diabetes and related ailments. Millets act as prebiotics, nourishing the micro-flora in our inner ecosystem, and keep the colon hydrated, preventing constipation. Consumption of millets decreases triglycerides and C-reactive protein, thereby safeguarding against cardiovascular diseases. Additionally, millets exhibit high antioxidant activity and are both gluten-free and non-allergenic[1].

Epidemiological studies have demonstrated that diets rich in millets and whole grains protect against non-communicable diseases such as diabetes, cancer, and cardiovascular disorders, owing to their wealth of health-promoting phytonutrients. Millets are especially beneficial for individual's intolerant to gluten. Sorghum proteins, when cooked, are less digestible, potentially benefiting specific dietary groups. Finger millet, with its brick-red colored seed coat, traditionally used in preparations like roti, muddle, and ambali (thin porridge), can shield against diabetes mellitus, gastrointestinal diseases, and cardiovascular risks. Finger millet-based diets have shown lower glycemic response due to high fiber content and also alpha amylase inhibition properties which are known to reduce starch digestibility and absorption[2]. Pearl millet, rich in phospholipids, aids general metabolism, brain function, and stress management[3]. It also helps maintain stable blood sugar levels in diabetic patients. Proso millet boasts the highest protein content (12.5%), while barnyard millet is exceptionally rich in crude fiber and iron[4].

From a nutritional standpoint, finger millet is notably rich in minerals, and its micronutrient density surpasses that of the world's major cereal grains, such as rice and wheat. Specifically, it is one of therichest source of calcium among day to day consumed cereals like wheat and rice.the role of finger millet in disease prevention, its connection to providing health benefits is quite substantial. Finger millet serves as a storehouse of salubrious properties, being rich in proteins, dietary fibers, minor and major nutrients, as well as phytochemicals essential for human health.

Introduction

Diseases triggered by one's lifestyle and dietary choices are referred to as lifestyle disorders. These non-communicable diseases (NCDs) are not transmitted by infected individuals but are instead associated with one's way of living. Often termed as "Western diseases," they are increasingly prevalent in the Indian population. Common non-communicable diseases include

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Atherosclerosis, Stroke, Respiratory ailments, Obesity, and Type 2 diabetes. Implementing lifestyle and dietary changes can play a crucial role in managing non-communicable disorders. Millets, which were traditionally a staple in our daily cuisine, can be particularly beneficial in addressing these prevalent health conditions. Millets - the earliest food of civilization Before the 1960s, millet was a staple in the Indian diet. However, from 1960 to 2022, the annual per capita consumption of millet in India significantly decreased from 30.94 kg to 3.87 kg[5]. This decline can be attributed to the growing preference for wheat and rice in people's diets. The shift was influenced by efforts to achieve food security through the cultivation of high-yielding crops like wheat, maize, and rice. Rice-wheat centric policies and the implementation of India's Public Distribution System (PDS) scheme also played a role in shaping dietary patterns during this period. Farmers shifted to cultivating high-yield hybrid varieties of wheat, maize, rice, and other crops. Given India's lack of food security at the time of independence in 1947, the government prioritized and supported the cultivation of wheat and rice to achieve food security. The low demand for millet might be due to the taste and texture, preferences of many, especially the youth find millet less appealing as compared to wheat and white rice. Other reason could be India's Public Distribution System (PDS) scheme which provides financially disadvantaged citizens with free rice or wheat monthly, thus, perpetuating "rice-wheat centric policies" that favour these grains. Despite millet's numerous health benefits, including antioxidants and prebiotics that enhance gut health, its popularity remained limited until the coronavirus pandemic highlighted the significance of immunity-boosting foods. However, despite this temporary surge in popularity, the overall demand for millets continues to be low.

Currently Government of India has taken a lead role and has launched widescale strategies to promote millets in order to make India a global hub for millets. Millets has immense potential in enhancing the socioeconomic and health status of people. Regular consumption of millets translates into better post prandial blood glucose and better HbA1c levels. Millets mitigates atherosclerotic cardiovascular disease (ASCVD) risk by lowering insulin resistance, better glycemic control, lowering non high-density lipoprotein (HDL) cholesterol, lowering BP and by virtue of presence of various antioxidants. There is a need to revive the awareness about nutritive and therapeutic values of millets. Scientific community is increasingly realising the enormous potential of millets in enhancing the nutritional quality of the population and as a tool to halt the global pandemic of lifestyle diseases. In Karnataka, millets are referred to as 'Siri Dhaanya.' The state has been a significant producer of various millet varieties, including Raagi (Madiya), Navane (foxtail millet), Saame (little millet), Haraka (Kodo), Kooralu (Browntop millet), Udalu (Barnyard Millet), Baragu (Proso millet), Sajje (pearl millet), and Bili Jola (great millet). These millets, recognized for their nutritional value, are commonly known as 'Siri Dhaanya' due to their dense nutritional content. Indian government has also promoted millets in daily cuisine by giving them the colloquial name 'Shree Anna.'

India holds the leading position among nations such as America, Nigeria, China, Ethiopia, Niger, and Sudan in millet production, contributing 19% of the total share. In terms of state-wise millet production in India, Rajasthan takes the lead with a 27% contribution, followed by Maharashtra (15%), Uttar Pradesh (14%), Karnataka (13%), Madhya Pradesh (8%), Gujarat (7%), Haryana (7%), Tamil Nadu (4%), Andhra Pradesh (2%), and Uttarakhand (1%). These states collectively play a crucial role in India's significant share of global millet production[6].

Millets offer a multitude of benefits, making them advantageous for consumers, the planet, and farmers alike. For consumers, millets help overcome significant nutritional and health challenges, providing essential nutrients such as iron, zinc, folic acid, and calcium. They also contribute to managing health conditions like diabetes. From an environmental perspective, millets have a low water footprint, making them environmentally sustainable. Their ability to thrive in hot and dry climates positions them as valuable crops in addressing the challenges posed by climate change.

For farmers, cultivating millets can result in a substantial increase in yields, sometimes up to threefold. Millets have versatile uses, serving as a source of food, fodder, and fuel. Additionally, millets exhibit resilience in the face of drought, often being the last crop standing, making them a robust risk management strategy for farmers dealing with unpredictable weather conditions. Overall, the combined advantages make millets a holistic and beneficial choice for consumers, the environment, and those engaged in agriculture.

The comparison of nutritional composition of different cereal grains and millets revealed highest amount of protein in pearl millet (14.5%), highest amount of fat in pearl millet (5.1%), crude fiber content was on higher side for rice (10.2%) though comparable to proso millet (9%) and kodo millet (9%), ash content also followed the same trend rice

(4.7%) being higher followed by proso (3.6%) and kodo millet (3.6%), total dietary fiber highest for two millets - finger milet (19.1%) and Foxtail millet (19.1%), and phenol content was quiet high for millets - finger millet (102 mg/100gm), foxtail millet (106 mg/100gm) and kodo millet (368 mg/100gm)[7].

The mineral and vitamin composition comparison of different cereal grains and millets revealed good amount of calcium content (0.33%) in finger millet , phosphorus (0.56%) and potassium (0.50%)content quiet high in barley, sufficient amount of iron (74.9%) and zinc (29.5%)in pearl millet, good amount of thiamine content (0.63 mg/100gm) in proso millet, pearl millet and proso millet shared the same amount of riboflavin content (0.22 mg/100gm) and barley exhibited the highest amount of nicotinic acid (7.20 mg/100gm)[7].

Millets are characterized by complex carbohydrates, abundant dietary fiber, and distinct phenolic compounds and phytochemicals, imparting them with medicinal properties[8].

Millets serve as a natural reservoir of essential nutrients, including iron, zinc, and calcium, which play a crucial role in addressing the issue of malnutrition in India. They contain elevated levels of niacin, B6, folic acid, as well as calcium, iron, potassium, magnesium, and zinc. Among them, finger millet stands out as the richest source of calcium, containing 300-350 mg/100 g, while other millets contribute significantly to phosphorous and iron. Millets are easily digestible, rich in lecithin, and prove excellent for fortifying the nervous system.Millets are rich in dietary fiber, and their high viscosity and water holding capacity play a crucial role in reducing blood glucose levels and insulin response. Additionally, the dietary fiber in millets contributes to lowering cholesterol levels and reducing the risk of bowel disorders.Millets not only contain high quality nutrients but also possess phytates, polyphenols, tannins, anthocyanins, phytosterols, and pinacosanols. These components play a crucial role in addressing issues related to aging and metabolic diseases[9].

Finger millet (Eleusine coracana) is known for its numerous health benefitsincluding anti-diabetic, anti-tumorigenic, atherosclerogenic effects, as well as antioxidant and antimicrobial properties.It contains high calcium content at 0.38%, a well-balanced composition of dietary fiber at 18%, and a significant presence of phenolic compounds ranging from 0.3% to 3%[10]. Finger millet stands out for its considerable richness in minerals, and its micronutrient density surpasses that of major cereal grains worldwide, such as rice and wheat[11,12]. Finger millet is composed of approximately 5–8% protein, 1–2% ether extractives, 65–75% carbohydrates, 15–20% dietary fiber, and 2.5–3.5% minerals[13]. The seed coat of millet is an edible component of the kernel and serves as a rich source of phytochemicals, including dietary fiber and polyphenols, with concentrations ranging from 0.2% to 3.0%[14,15]. It is now recognized that the presence of phytates, polyphenols, and tannins in millet foods can contribute significantly to their antioxidant activitywhich is an important factor in health, aging and metabolic diseases[16].

Antimicrobial Properties

Phenolic compounds in finger millet grain especially in the seed coat provide resistant to the grain from fungal invasion[17]. Polyphenol content in seed coat exhibited high antibacterial and antifungal activitycompared to whole flour extract which is reported by studying the effect of acidic methanol extracts from the seedcoat[18]. Inhibitory effect of phenolic compounds against microorganisms provides extremely good storage properties to finger millet and its value added products.

Antioxidant Properties

Phenolic acids and their derivatives, flavonoids and tannins present in millet seed coat are of multifunctional in nature. These can act as lipid stabilizers, supress excessive oxidation that causes cancer and ageing, free radical terminators, metalchelators, and singlet oxygen quenchers[19-21]. Roasting, boiling, germination, fermentation decreased the free radical quenching activity which might be due to hydrolysis of tannins[22].

Antidiabetic Properties

Risk of diabetes mellitus and gastrointestinal tract disorders reduced with regular consumption of finger millets[23,24]. These health benefits are attributed to the high polyphenol and dietary fiber contents present in finger millet[25]. Phenolic components of millet are creditedtheir ability to partially inhibit amylase and α-glucosidase during the enzymatic hydrolysis of complex carbohydrates. This action delays the absorption of glucose, ultimately contributing to the control of postprandial blood glucose levels[26]. Carbohydratespresent in finger millet are slowly digested and assimilatedthan those present in other cereals. This leads to a slower emptying of the intestine, and it is associated with the formation of unabsorbable complexes with available carbohydrates in the gut lumen.The ultimate outcome is the delayed absorption of carbohydrates and

a reduction in the absolute quantity absorbed[27-31]. Synergy between phenolics and dietary fiber may play a role in mediating amylase inhibition and therefore, have the potential to contribute to the management of type II Diabetes mellitus[32,33].

Oxidative Stress and Glycemic Status

In diabetes, oxidative stress and hyperglycemia lead to the production of reactive oxygen species, resulting in the peroxidation of membrane lipids, protein glycation, and various health complications. These complications may include retinopathy, neuropathy, nephropathy, and vasculopathy[34]. Antioxidants play a crucial role in inhibiting glycation by scavenging reactive oxygen species. Enzymes like superoxide dismutase (SOD) and metal chelators contribute to protecting against alloxan-induced diabetes in animals[35]. Hegde etal. (2005) studied the effect of the antioxidantproperties of millet species on oxidative stress and glycemicstatus in alloxan-induced rats. In diabetic animals, the levels of both enzymatic and non-enzymatic antioxidants, as well as lipid peroxides, were noticeably decreased and restored to normal levels in the millet-fed groups.This restoration could be attributed to the presence of phenolics, tannins, and phytates in finger millets[36].

Inhibition of Collagen Glycation and Crosslinking

Monnier 1990 reported that increased oxidative stress and hyperglycemia contribute significantly to the accelerated accumulation of advanced glycation end products and the cross-linking of collagen in diabetes mellitus[34]. Free radicals play a significant role in the nonenzymatic glycosylation of collagen and crosslinking processes. Antioxidative conditions and free radical scavengers are instrumental in inhibiting these reactions[37]. Hegde et al. (2002) studied the effects of methanolic extracts of finger millet and kodo millet on glycation and crosslinking of collagen. When collagen was incubated with glucose (50 mM) and 3 mg methanolic extracts of finger millet, it resulted in the inhibition of glycation[38]. The inhibition of glycation observed in collagen incubated with glucose and finger millet extracts may be attributed to the presence of natural antioxidants, primarily of polyphenolic nature, and other phytochemicals extracted from the seed coats of millet grains. This suggests that finger millets could potentially serve a therapeutic role as dietary supplements to prevent complications induced by glycation, as seen in conditions such as diabetes or aging.

Supportive Role in Wound Healing Process

Diabetic conditions adversely impacted the wound healing process by disrupting normal physiological responses.Free oxygen radicals can inflict damage to cells within the zone of stasis, resulting in necrosis and the conversion of a superficial wound into a deeper one. Antioxidants play a significant role in preventing tissue damage and promoting the wound healing process[39]. The study conducted by Rajasekaran et al. (2004)investigated the antioxidant effects of finger millet on the dermal wound healing process in rats with diabetes-induced oxidative stress, examining its impact on the modulation of inflammation. The study reported a positive influence of finger millet feeding on the skin's antioxidant status, production of nerve growth factor (NGF), and various wound healing parameters in early diabetic rats, contributing to the improvement of impaired healing processest[40].

Inhibition of Aldose Reductase

Diabetes-induced cataract is marked by the accumulation of sorbitol, a process mediated by the action of the key enzyme aldose reductase (AR). Diabetes-induced cataract is characterized by the accumulation of sorbitol, and this process is mediated by the action of the key enzyme aldose reductase (AR). Elevated sorbitol levels contribute to the development of cataracts in individuals with diabetes.AR enzyme is crucial in cataractogenesis via a polyol pathway.Crude phenolic extracts from finger millet demonstrated potent inhibitory effects on aldose reductase (AR) activityt[41].

Conclusion

The increasing demand for healthier food is driven by factors such as the effectiveness and quality of the consumed products, as well as a heightened awareness within both the public and the healthcare industry. Finger millet (Ragi) could play a crucial role in meeting the new emerging requirement in managing non-communicable diseases. Value added products from finger millet could help in coping with the prevailing health issues and fighting malnutrition. Research should aim to establish the impact of these products on the body's absorption, defense mechanisms, regulation of homeostasis, and nervous systems, paving the way for a modern approach to nutraceutical production. Initial research indicates that finger millet holds significant potential in the nutraceutical industry. It provides a scientific rationale for its use as an economically viable nutrient source to mitigate chronic pathologies. ❐

References

1. S.H. Lee, I-M. Chung, Y.S. Cha, and Y. Parka, (2010). Millet Consumption Decreased Serum Concentration of Triglyceride and C-reactive Protein but not Oxidative Status in Hyperlipidemic Rats. *Nutrition Research*. 30:290-296.
2. P.L. Kumari and S. Sumathi, (2002). Effect of Consumption of Finger Millet on Hyperglycemia in non-insulin dependent diabetes mellitus (NIDDM) subjects. *Plant Foods for Human Nutrition*. 57: 205-213.
3. S.K. Kumari, and B. Thayumanavan, (1997). Comparative Study of Resistant Starch from Minor Millets on Intestinal Responses, Blood Glucose, Serum Cholesterol and Triglycerides in Rats. *Journal of the Science of Food Agriculture*. 75: 296-302.
4. J. Kalinova, and J. Moudry, (2006) Content and Quality of . In Book: Millets Magical Crops (Volume II) (pp.15 -21)
5. https://apeda.gov.in/milletportal/files/Indian_Superfood_Millet_APEDA_Report.pdf
6. https://apeda.gov.in/milletportal/Production.html
7. S. Saldivar (2003) Cereals: Dietary Importance. In: Caballero B, Trugo L, Finglas P (ed) Encyclopedia of Food Sciences and Nutrition, Reino Unido: Academic Press, Agosto, London, pp 1027–1033.
8. S. Shobana, S.R. Usha Kumari, N.G. Malleshi, S.Z. Ali (2007) Glycemic Response of Rice, Wheat and Finger Millet Based Diabetic Food Formulations in Normoglycemic Subjects. *Int J Food Sci Nutr,* 58 (5):363–372.
9. https://www.millets.res.in/pub/2018/The_Story_of_Millets.pdf
10. B.D. Palanisamy, V. Rajendran, S. Sathyaseelan, G.M. Nagappa and B.P. Venkatesan (2014). Health Benefits of Finger Millet (Eleusine coracana L.) Polyphenols and Dietary Fiber: A Review. *J Food Sci Technol*, 51(6):1021–1040.
11. U. Antony and T.S. Chandra (1998). Antinutrient Reduction and Enhancement in Protein, Starch and Mineral Availability in Fermented Flour of Finger Millet (Eleusine coracana). *J. Agric. Food Chem*. 46, 2578–2582. doi: 10.1021/jf9706639.
12. A.S. Vadivoo, R. Joseph and N.M. Ganesan, (1998). Genetic Variability and Diversity for Protein and Calcium Contents in Finger Millet (Eleusine coracana (L) Gaertn) in Relation to Grain Colour. *Plant Foods Hum. Nutr*. 52, 353–364. doi: 10.1023/A:1008074002390.
13. S. Chethan, N.G. Malleshi (2007) Finger Millet Polyphenols: Optimization of Extraction and the Effect of pH on their Stability. *Food Chem*, 105:862–870.
14. N.A. Hadimani, N.G. Malleshi (1993) Studies on Milling, Physicochemical Properties, Nutrient Composition and Dietary Fiber Content of Millets. *J Food Sci Technol*, 30:17–20.
15. G. Ramachandra, T.K. Virupaksha, M. Shadaksharaswamy, (1977) Relationship Between Tannin Levels and in vitro Protein Digest Ibility in Finger Millet (Eleusine coracana Gaertn). *J Agric Food Chem*, 25:1101–1104.
16. L. Bravo, (1998) Polyphenols: Chemistry, Dietary Sources, Metabolism and Nutritional Significance. *Nutr Rev*, 56:317–333.
17. A. Seetharam, R.L. Ravikumar, (1994) Blast Resistance in Finger Millet—its Inheritance and Biochemical Nature. In: K.W. Riley, S.C. Gupta, A. Seetharamn, J.N. Mushonga (Eds) Advances in Small Millets. International Science Publisher, New York, pp 449–465.
18. V. Viswanath, A. Urooj, N.G. Malleshi, (2009) Evaluation of Antioxidant and Antimicrobial Properties of Finger Millet Polyphenols (Eleusine coracana). *Food Chem*, 114:340–346.
19. M. Namikii, (1990) Antioxidants/antimutagens in food. *Crit Rev Food Sci Nutr*, 29:273–300.
20. F. Shahidi, P.K. Janitha, P.D. Wanasundara, (1992) Phenolic Antioxidants. *Crit Rev Food Sci Nutr*, 32:67–103.
21. G. Sripriya, K. Chandrasekharan, V.S. Murty, T.S. Chandra, (1996) ESR Spectroscopic Studies on Free Radical Quenching Action of Finger Millet (Eleusine coracana). *Food Chem*, 57(4):537–540.
22. P.S. Hegde, T.S. Chandra, (2005) ESR Spectroscopic Study Reveals Higher Free Radical Quenching Potential in Kodo Millet (Paspalum scrobiculatum) Compared to Other Millets. *Food Chem*, 92:177–182.
23. C. Gopalan, (1981) Carbohydrates in Diabetic Diet. *India: Bulletin of Nutrition Foundation*, p3.
24. F.I. Tovey, (1994) Diet and Duodenal Ulcer. *J Gastroenterol Hepatol*, 9:177–185.
25. S. Chethan, Y.N. Sreerama, N.G. Malleshi, (2008) Mode of Inhibition of Finger Millet Malt Amylases by the Millet Phenolics. *Food Chem*, 111:187–191.
26. S. Shobana, Y.N. Sreerama, N.G. Malleshi, (2009) Composition and Enzyme Inhibitory Properties of Finger Millet (Eleusine coracana L.) Seed Coat Phenolics: Mode of Inhibition of á-glucosidase and Pancreatic Amylase. *Food Chem*, 115:1268–1273.
27. M.S. Kavitha, L. Prema, (1995) Post Prandial Blood Glucose Response to Meals Containing Different CHO in Diabetics. *Indian J Nutr Diet*, 32:123–126.
28. K. Kawai, Y. Murayama, Y. Okuda, K. Yamashita, (1987) Post Prandial Glucose, Insulin and Glucagon Responses to Meals with Different Nutrient Compositions in NIDDM. *Endocrinol Jpn*, 34(5):745–753, abstract.
29. O. Rasmussen, C. Winther, K. Hermansen, (1991) Glycemic Responses to Different Types of Bread in IDDM Patients: Studies at Constant Insulinaemia. *Eur J Clin Nutr*, 45(2):97–103.
30. Shobana et al. (2010) had reported finger millet as hypoglycaemic, hypocholesterolaemic, nephroprotective and anti cataractogen giving it a status of true nutraceutical.
31. S. Shobana, M.R. Harsha, K. Platel, K. Srinivasan, N.G. Malleshi, (2010) Amelioration of Hyperglycaemia and its Associated Complications by Finger Millet (Eleusine coracana L.) Seed Coat Matter in Streptozotocin-Induced Diabetic Rats. *Br J Nutr*, 104(12):1787–1795.
32. N. Saito, H. Sakai, H. Sekihara, Y. Yajima, (1998) Effect of an α-glucosidase Inhibitor (voglibose), in Combination with Sulphonilureas, on Glycemic Control in Type II Diabetes Patients. *J Int Med Res*, 26:219–232.
33. M. Toeller, (1994) α-Glucosidase Inhibitors in Diabetes: Efficacy in NIDDM Subjects. *Eur J Clin Invest*, 24:31–35.

34. V.M. Monnier, (1990) Nonenzymatic Glycosylation, the Maillard Reaction and the Aging Process. *J Gerontol*, 45:105–111.

35. S. Chattopadhyay, M. Ramanathan, J. Das, S.K. Bhattacharya, (1997) Animal Models in Experimental Diabetes Mellitus. *Indian J Exp Biol*, 35:141–145 .

36. P.S. Hegde, N.S. Rajasekaran, T.S. Chandra, (2005) Effects of the Antioxidant Properties of Millet Species On Oxidative Stress and Glycemic Status in Alloxan-Induced Rats. *Nutr Res*, 25:1109–1120.

37. M.X. Fu, K.J.W. Knecht, S.R. Thorpe, J.W. Baynes, (1992) Role of Oxygen in Cross Linking and Chemical Modification of Collagen by Glucose. *Diabetes*, 41:42–48.

38. P.S. Hegde, G. Chandrakasan, T.S. Chandra, (2002) Inhibition of Collagen Glycation and Cross Linking in vitro by Methanolic Extracts of Finger Millet (Eleusine coracana) and Kodo Millet (Paspalum scrobiculatum). *J NutrBiochem*, 13:517–521.

39. L. King, (2001) Impaired Wound Healing in Patients with Diabetes. *Nurs Stand*, 15(38):39–45.

40. N.S. Rajasekaran, M. Nithya, C. Rose, T.S. Chandra, (2004) The Effect of Finger Millet Feeding on the Early Responses During the Process of Wound Healing in Diabetic Rats. *BiochimBiophys Acta*, 1689:190–201.

41. S. Chethan, S.M. Dharmesh, N.G. Malleshi, (2008) Inhibition of Aldose Reductase from Cataracted Eye Lenses by Finger Millet (Eleusine coracana) Polyphenols. *Bioorg Med Chem*, 16:10085–10090.