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Review Article

Millets for Dietary Diversification

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Abstract

Millets grown under traditional methods, no millet attracts any pest. They can be termed as pest-free crops. A majority of them are not affected by storage pests. Thus they are a great boon to the agricultural environment. Millets are amazing in their nutrients content. Each of the millets is three to five times nutritionally superior to the widely promoted rice and wheat in terms of proteins, minerals and vitamins. Millets produce multiple securities such as food, fodder, health, nutrition, livelihood and ecological making them the crops of agricultural security. Most of us seek micronutrient such as Beta Carotene in pharmaceutical pills and capsules, millets offer it in abundant quantities. The much privileged rice, ironically, has zero quantity of this precious micronutrient. Every single millet is extraordinarily superior to rice and wheat and therefore is the solution for the malnutrition that affects a vast majority of the Indian population. Millets remain our agricultural answer to the climate crisis that the world is facing. Climate Change is expected to confront us with three challenges. 1) Increase in temperature up to 2-5 degree Celsius 2) Increasing water stress 3) Severe malnutrition. Only millets have the capacity to meet this challenge. In views of all these features that they so amazingly combine, millets can only be called as Miracle Grains.

Keywords: Millets; Pest; Grains

Introduction

Millet crops primarily constitute a diverse group of small grains. These are usually categorized under Coarse Cereals in India. Millets are classified into Major millets and Minor Millets or Small millets.

Major millets are Sorghum (*Sorghum bicolour*) and Pearl millet (*Pennisetum typhoides*).

Minor millets are a group of grassy plants with short slender stalk and of smaller grain size, which are spherical to oval shaped with coloured seed coats. Some of the commonly known small millets in India are Finger millet (*Eleusine caracona*); Foxtail millet (*Sateria italica*) Bamyard millet (*Echinoclova colona*), Kodo millet (*Paspalum serobiculatum*), Little millet (*Panicum sumatrance*); and proso or common millet (*Panicum millaceum*).

Utilization of millets

Millets are used in several food preparations. Unleavened flat breads (chapatti) Fermented breads (Kisra, injera, dosa etc.) Porridge, Muddle or dumping.

Biscuits, snacks, malt, Opaque beer, Millet stalks are used as fodder and thatching.

Nutritious sorghum

Health Food: Sorghum has unique nutritional and functional properties which allows for development of healthy nutritious foods as it is gluten free; it has unique phenolic compounds which

have medicinal properties and also complements well with lysine rich vegetable and animal proteins to form nutritionally balanced foods. Sorghum also can be considered as a functional food since it is hypocholesterolemic and hypoglycemic in nature. Millet, the miracle grain can be grown under harsh conditions, and the poor and marginalized people who live upland, and have no irrigation facility could grow the grain easily without any external input.

It is important to push for millets by its inclusion in different programmes and policies of the Government, including PDS and Mid-Day Meals. Inclusion of its nutritional, medicinal and other values in course curriculum is also required from the primary level. Active research is needed on its production, value addition and marketing. Value addition to millet is required through technological intervention by taking care of its nutritional values.

The various constraints and opportunities for commercialization of sorghum and pearl millet food products. The constraints include misplaced social stigma, subsidized rice, wheat, inconsistent grain supplies, mixed grain marketing, short shelf life of flour, lack of procurement and food technology at the laboratory scale and declining cultivation. However there are opportunities which emphasize the fact that millets are highly nutritious and have a health value.

Therefore there is a need for a PDS policy for sorghum and pearl millet along with stable economical commercial production.

Sorghum is a major source of energy and protein for a large section of people inhabiting the semiarid tropics of India. Mechanical dehulling technology developed by Post graduate Research Center, Acharya N.G. Ranga Agricultural University, Hyderabad for sorghum, other millets and legumes has reduced the drudgery of dehulling process and enhanced the quality of sorghum. Sorghum based supplementary foods such as Sweet and salt biscuits were also developed as alternate supplementary food in combination with sorghum and chickpea. Supplementation has also helped in preventing growth faltering and resulted in low morbidity.

Ready to Cook Mixes: In view of increasing demand for convenience foods, ready to use breakfast mixes (idly and dosa mixes) were developed substituting sorghum in place of rice.

Composite Roti Mixes: Since sorghum is consumed in the form of roti by majority of population, four nutritious roti blends of sorghum and legume were developed. The most acceptable rotes can be made with a combination of sorghum, wheat and bengalgram flours mixed in the ratio of 2:2:1.

Sorghum Based Traditional Foods: In Fermented batter products like Dosa and Idli, rice was substituted either fully or partially with sorghum and these products were standardized with few modifications products like Khar Idli, Vegetable Idli, Pepper Idli, Fenugreek dosa, Uthappam and Dokla were standardized to improve acceptability. Preparations like Upma, biriyani were standardized using semolina. Several snack items (like Muruku, Chekkalu, Pakodi etc.) were standardized using sorghum. In some of the products pulse flour was added which improved the nutritional quality and acceptability of sorghum foods.

Baked Foods: Baked foods are prestigious foods which cater to the needs of elite. Now it is possible to prepare almost all baked products with dehulled sorghum flour except bread. In products such as biscuits, cookies and cakes, incorporation of 20% refined flour was found to be essential to increase the palatability.

Therapeutic foods: Sorghum foods can be beneficially utilized for lowering blood glucose levels in diabetic subjects. Consumption of whole sorghum recipes resulted in significantly (0.05) lower plasma glucose level in diabetic subjects when compared with dehulled sorghum recipes, rice and wheat recipes. Least glycemic response was observed with whole sorghum semolina (74.6mgs) followed by missi roti (77.8 mg) and dokla (84.5 mgs). Fiber rich sorghum can be advantageously used in the formulation of therapeutic foods.

Malted Foods: Sorghum is malted in large scale in parts of Africa. The goal of malting is to produce high enzyme activity and characteristic flavor with a minimum loss of dry weight. Malt has number of uses. It can be used in brewing industry and baking industry and also in breakfast food industry as a flavouring agent.

Dehydrated Foods: Dehydrated foods like papads are usually prepared with blackgram. But dehulled sorghum flour lends itself very well for the preparation of papads.

Pearl millet for health and nutrition

Pearl millet is one of the most extensively cultivated cereals in the world, after rice, wheat, and Sorghum. Pearl millet, which is commonly known as bajra, accounts for about two-thirds of India's

millet production and is grown in the dry land and areas of the country.

.Recent research work suggests that the millets possess unique nutritional and functional prosperities that can lend themselves to the development of healthy and nutritious foods at low costs. Pearl millet is gluten free and has certain phenolic compounds which are being identified as antioxidants. Unique health foods that have high levels of insoluble dietary fibre, phytates and phytochemicals could be made from pearl millet. The starch in pearl millet is release more slowly than those in other cereals and so it is considered beneficial to diabetic patients. In India is estimated that 8% of population are affected by diabetes, and consumption of grains such as pearl millet helps diabetic and obese population and promotes natural intake of Zn and Fe as well as prevents mineral malnutrition. Creating awareness among the public, is therefore a great need.

Utilization of pearl millet in Andhra Pradesh : A survey conducted in Andhra Pradesh revealed that pearl millet grain is mostly used for preparation of roti and sangati after removing the husk using mortar and pestle and converting into flour through hand pounding or milling.

Utilization of pearl millet in Andhra Pradesh

Food	Product Type	Form of grain Used
Roti	Unleavenedbread	Flour
Sangati	Stiff porridge	Mixture of coarse particles and Flour
Annam	Rice like	Dehulled grain
Kudumulu	Steamed	Flour
Boorelu	Deep fried	Flour
Dosa	Pancake	Flour
Thapala Chakkalu	Shallow fried	Flour
Ambali	Thin porridge	Flour

Table 1

Creating demand for Millet foods : A study was conducted in Ananthapur District, Lepashi Mandal to study the effect of feeding malted food on the nutritional status of vulnerable groups of population, to develop ready to use malted mixes using malted wheat/Ragi and green gram, to assess the physico-chemical and organoleptic quality characteristics of the developed malted mixes and to develop the training manual and education material on malting. Knowledge, Attitude and practices on Malted Mixes of Self Help Groups showed 60-70% improvement after the training programme. Supplementation of Amylase Rich Malted Mixes(ARMM) helped to improve the nutritional status of the vulnerable groups of population in rural areas especially with regard to protein, energy, iron, calcium and B-complex vitamins. Promotion of malt based small scale food industry not only provides opportunity for rural women to develop entrepreneurship and employment but also provided Food and Nutritional Security through income generation.

Steps taken to sustain the activities after the completion of the project

Established small scale food processing industry for income generation in two selected villages namely Manempally and Sirivaram. Two self help groups comprising 20 members in each group established the preparation of malted mixes unit at community level. A voluntary organization i.e. Sri. Kodi Ranganatha Swamy Seva Trust agreed to donate two ceiling machines. The then Honorable Minister for Agriculture Dr. Raghveera Reddy was very keen to introduce these malted mixes in ICDS Programme.

Several Processing techniques are adopted to convert coarse sorghum grains in to consumer acceptable and commercially viable products. Dehulling by Traditional hand pounding method, Time consuming, Labourous, inefficient method. Mechanical dehulling improved Physical appearance, Better quality grain, Reduces drudgery and lower level of bran and brokens [1-6].

Conclusion

Some of the relevant processing technologies which would result in value addition and increased utilization are: Dehulling, Germination, Popping/Puffing, Flaking, Malting, Baking, Extrusion and Fermentation. As Mechanical dehulling improves the quality of grain better quality flour and rawa made it possible to develop commercially viable products such as, Baked foods, Breakfast foods, Snack Items, Ready to cook mixes, Dehydrated foods, Infant mixes, Composite roti mixes, Puffing, Popping and Malting contributing for Dietary Diversification. How ever high oil content and poor keeping quality of millet malt are the constraints for its utilization in brewing industry.

Millets have a great answer to all kinds of crisis, including that of water, nutrition and climate change. These crops are an ecological bonus to millet farmers.

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