MILLETS IN ENSURING NUTRITIONAL SECURITY

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Rising population is placing enormous pressure on the food security of certain regions of the world and potential food security challenges are going to affect all the world residents, regardless of their location. This leads to serious threats to our natural resources (fresh water withdrawal is highest (761 km3 yr_{-1}) in India.

During independence, traditional agriculture was followed where small Indian farms were protected by windbreaks, followed organic husbandry, crop rotation and leave fields fallow for long periods to allow soil to retain its nutrients. These practices lowered the demand on land and maintained soil equilibrium. The crops grown were rice, millets, sorghum, wheat, maize, pearl millet and barley. In traditional agriculture production of rice and millets were higher than wheat, barley and maize combined all together. Food grain production was 50.8mt. People had to live "from ship to mouth existence". Afterwards green revolution came in the country which increased the production of rice, wheat, pulses and other crops leading to the self-sufficiency of food in the country. High Yielding Varieties increased the growth rate of food-grain output from 2.4% per annum before 1965 to 3.5% after 1965. Initially, major increase in food grain production increased because of wheat. It increased from 50 m tonnes in 1950 to 79 m tonnes in 1964, 95.1 m tonnes in 1968 and later to 308.65 m tonnes (2020-21). During this time, crop productivity increased by application of chemical fertilizers, pesticides and using groundwater resources. Mismanagement and overuse of chemical fertilizers, pesticide and lack of crop rotation led to infertile soil and loss of groundwater. It increased expenditure on crop cultivation and made farmers more miserable.

The impact of green revolution resulted in our diet also. Finer cereals and processed foods took place in diet that resulted in deficiency of iron, zinc, calcium, vitamin A, folate, and riboflavin causing anaemia, night blindness and infertility. Indian diets based on cereals and pulses are qualitatively deficient in micronutrients. Crops consumed by humans earlier became fodder crops in post Green Revolution era.

Millets are the coarse cereals which are drought resistant, thrive better under adverse weather conditions such as hot and dry weather and erratic rainfall. According to the Fourth advance estimate released by Directorate of Economics and Statistics (2020-21), the total area covered under nutri/coarse cereals is 23.83 mha, while, the total production produced under nutri/coarse cereals is 51.15 mt, with productivity of 2146 kg ha_{-1}.

Millets play a pivotal role in nutritional security. They are often referred as 'nutri-grains' since they are rich in protein, micronutrients, minerals and B-complex vitamins. They are good source of sulphur containing amino acids viz., methionine and cysteine, dietary minerals (Ca, Fe, Zn & P). Finger millet contains nine to tenfold higher calcium than others. Barnyard millet contains highest amount of crude fibre among the cereals. Per 100 gm of pearl millet contains 11 g protein, 11.5 g dietary fibres, 5.4 g fat and 62 g carbohydrates. Considering the importance of these nutritious small grain crops the U.N. General Assembly recently adopted a resolution, sponsored by India and supported by more than 70 countries, declared year 2023 as the International Year of Millets.

Nutrient composition of millets per 100 g

Grain/ nutrient	Bajra	Jowar	Ragi	Fox tail millet	Proso millet	Barnyard millet	Kodo millet
Energy	361	349	328	331	341	397	309
Protein (g)	11.6	10.4	7.3	12.3	7.7	6.2	8.3
Fat (g)	5.0	1.9	1.3	4.3	4.7	2.2	1.4
Calcium (mg)	42.0	25.0	344	31.0	17.0	20.0	27.0
Iron (mg)	8.0	4.1	3.9	2.8	9.3	5.0	0.5
Zinc (mg)	3.1	1.6	2.3	2.4	3.7	3.0	0.7
Thiamine (Vit. B1) (mg)	0.33	0.37	0.42	0.9	0.21	0.33	0.33
Riboflavin Vit. B2 (mg)	0.25	0.13	0.19	0.11	0.01	0.10	0.09
Folic acid (mg)	45.5	20	18.3	15.0	9.0	-	23.1
Fibre (g)	1.2	1.6	3.6	8.0	7.6	9.8	9.0

BENEFITS OF PEARL MILLET IN DIET

Pearl Millet, a small seeded cereal crop grown at large scale in India. It is known as Bajra, Kamboo in Tamil and Malayalam; Sajjalu in Telugu, and Bajri in Marathi and Gujarati. The grains are small, round, and golden yellow and usually used for hay, pasture, seed crops, and food. It grows rapidly and well adapted for cultivation in harsh arid climates and drought-prone regions. In India, pearl Millet is commonly used as a major cereal in the states of Rajasthan, Maharashtra, Gujarat, Haryana, and Uttar Pradesh. Besides pearl millet, some other popular millets are fonio, finger millet (ragi), foxtail and kodo millet. These millets have impressive nutritional profiles.

NUTRITIONAL IMPORTANCE OF MILLETS

Gluten-free:

Patients with celiac disease and gluten intolerance can opt for a pearl millet-based diet as it is gluten-free. Wheat, the widely consumed cereal in world along with rice and corn, contains a protein gluten that causes gastrointestinal problems like bloating, flatulence and irritable bowel syndrome.

Enriched with Vital Nutrients:

It contains most of the Vitamin-B and rich in other minerals such as iron, magnesium, calcium, phosphorus, manganese, potassium, copper, zinc, and chromium. It also contain higher potassium, calcium, and iron content amongst other cereal crops. It has the highest folic acid amongst the cereals, which makes it the diet of choice for pregnant women.

Plant-Based Protein Source:

It contains approximately 14% protein, thereby becomes the best source of protein among common millet varieties. However, it is does not contain adequate amounts of the amino acid lysine. Hence, consuming pearl millet flour combined with lysine-rich foods such as beans, moong dal, chana dal, etc. make meal into a complete source of protein.

Rich in Antioxidants:

It is a rich source of antioxidants, their consumption offers protection against free radical mediated diseases such as cancer, arthritis, cardiovascular disease, diabetes and Alzheimer's disease.

Controls Iron Deficiency:

A healthy choice of food for pregnant women and nursing mothers due to iron and folic acid contents. The new pearl millet varieties provide higher level of dietary iron to women. Besides iron, it also contains significant amount of zinc, essential for normal growth and development of strong immunity. Iron deficiency anaemia is very common in children as they often consume rice and wheat, which is a very poor source of iron.

Reducing Blood Sugar Levels:

Pearl millet, very effective in maintaining the normal blood sugar levels, contains high fibre and carbohydrate content that are digested slowly and maintain a stable glucose level for a long period. This makes them a healthy food option for diabetics.

Reduces Cholesterol:

Rich in dietary fibres and cholesterol-lowering properties of these grains are good for heart patients. Phytic acid in pearl millet increases the cholesterol metabolism, thereby stabilizing the cholesterol level in the body. It also contains the vitamin niacin, which reduces the cholesterol.

Omega-3 Fats:

It is a better source of healthy omega-3 fats compared to other cereals. Omega-3 oils have been associated with lowering blood pressure, triglycerides, slowing the development of plaque in the arteries, maintaining a regular heart rate, and are known to be cardio protective. Bajra is also rich in potassium that is needed for those with high blood pressure. Consuming more foods rich in potassium helps in flushing out sodium from the body, which in turn will reduce blood pressure.

Relieves Constipation:

The rich fibre content of pearl millet eases the process of digestion and provides a relief from constipation. Small amount of pearl millet may be fed regularly to children suffering from chronic constipation.

Other Benefits:

Pearl millet is good for lactating mothers. Lactating mothers must include pearl millet in their diet to increase milk production. Additionally, pearl millet contains three times the amount of calcium that is present in milk. Thus, the consumption of pearl millet is beneficial for both mother and the babies. Foxtail millet exhibits anti-hyper glycaemic and anti-lipidemic activities. Millets are also a good source of carotenoids (78-366mg/100g) and possess higher antioxidant capacity due to their tocopherol content.

Although pearl millet is one of the most consumed foods in our country but it has large number of side effects. Pearl millet is not recommended for those with thyroid gland dysfunction, as it contains goitrogens, the agents suppress the activity of thyroid gland and cause goitre and lead to various metabolic disorders if it is regularly consumed in excess for a longer duration. The presence of oxalates in pearl millet can cause stones in kidney, , if not cooked properly. Therefore, the persons having any of these health problems, consult the doctor or dietician before consuming pearl millet for a longer duration.

MILLET BASED PRODUCTS:

Fortification with millets adds dietary fibre and β-glucan to the milk and also enhances total phenols and antioxidant activity of the beverage. Pearl millet can be consumed in various forms for daily consumption. Its flour can be used to make flatbreads, grains to make porridge, processed grains like flakes for breakfast and ready to eat snacks like millet or multigrain cookies. Combining millet recipe with protein-rich dishes containing lentils, cheese, soya chunks and fresh fruits make a perfect balanced diet. Finger millet is used as flour for preparation of several value-added products like cake, puddings, idli, etc. Finger millet malt is a popular product and serves as good drink. In Baster region, finger millet is used to prepare many traditional food products like Mandia pej (broken rice + finger millet), landa (semi-liquid beverage), finger millet roti and popped finger millet. The beverage of multigrain flour is commonly used during hot summer to maintain body temperature and dietary fibre. In small millet producing regions, small millets were consumed as traditional preparations viz., porridge and rice. In traditional South Indian breakfast barnyard, kodo, finger and little millets has been used in sweets and snacks preparations.

HARMFUL EFFECTS OF MILLETS:

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RECENT INITIATIVES – A VALUE CHAIN APPROACH

Initiative for nutritional security through intensive millets promotion (INSIMP)

To promote cultivation and consumption of millets and millets-based products, the Government of India allocated Rs 300 crores in the budget of 2011-12, under Rashtriya Krishi Vikas Yojna (RKVY), for INSIMP. The aim was to demonstrate improved production and post-harvest technologies in an integrated manner.

Creation of demand for millet foods through production to consumption system value chain - A consortium approach

The major objectives of this Public Private Partnership (PPP) project, mooted by the Directorate of Sorghum Research (DSR), Hyderabad include : (i) Market-driven millets cultivation for specific end products, procurement and primary processing for continuous supply-chain management, (ii) Fine-tuning the technologies for development of millet food products and up-scaling, (iii) Nutritional evaluation and safety of selected millet foods, and (iv) Entrepreneurship and appropriate strategies to promote and popularize millets for commercialization through value-addition, branding as health foods.

Employment generation for women through production and marketing of millet-based processed foods

Self Help Groups (SHGs) were involved in preparing traditional millet-based products, teaching quality control measures, packaging and labelling and hand-holding for local marketing. A variety of other traditional and contemporary (noodles) millet-based products including small millets have been developed. SHG women trained in millet production and help is being given for direct marketing as quality control and market are major challenges.

National Food Security Bill (NFSB)

The recently passed NFSB has included millets in the basket of food grains to be given at subsidized rate.

Way forward

Pearl millet provides food, energy and nutritional security to the people of the third world countries. It is important for food and nutritional security as it possess several advantages such as early maturing, drought tolerance, require minimal inputs and mostly free from biotic and abiotic stresses. Its grains have high protein content, balanced amino acid profile and high levels of iron, zinc and insoluble dietary fibre. It has special health benefiting properties for people suffering from life style diseases like diabetes, obesity etc. Pearl millet is ideal for people suffering from gluten allergy as it is gluten free and retains its alkaline properties even after cooking.