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Security Through Nutritional Millet Crops

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India food security is mainly depended on Rice followed by Wheat. Nowadays, peoples are concerned about health and more about nutritional security, Hence the millets are the next important sources on the basic nutrition. Millets are rich in macro and micronutrients, vitamins and minerals, antioxidant etc., thereby it could be popularized in developing countries to treat the various diseases, providing the essential nutrients and satisfying the food demand .

The term millet is a number of small grained cereals grasses. Based on the grain size, millets, have been classified as a major millets which include sorghum and pearl millet and several small grain millets which included finger millet (ragi), foxtail millet (kangni), kodo millets (kodo) , proso millet (cheena),barnyard millets (sawan) and little millet (kutki).
Millets have high nutritional value, are resilient to a changing climate, required fewer resources compared to other popular grains, and are often regarded as "nutri-cereal" or "superfood". It is also known as nutri-grains because they have rich minerals and B-complex.

Millets, which have long been a traditional staple crop for million of farmers, especially in India, China and Nigeria. The additional advantages of millets are their high fiber content, low glycemic index and richness in bioactive chemicals, making them an ideal health food.

The average protein content of millets 10-11% expect finger millets that contains in the range of 4.76 to 11.70g\100 g. Millets are rich in carotene and B vitamins, notably riboflavin, niacin and folic acid comparable to rice and wheat . It has antioxidant properties that enable them to provid a balance diet and are very nutritious (Mishra *et al*., 2014). Foxtail millet has the highest thiamine concentration with 0.60 mg/100 g. The riboflavin level of millets is several times higher than the staple cereals, with barnyard millet having highest content of riboflavin as 4.20 mg/100 g) followed by foxtail millet (1.65 mg/100 g) and pearl millet (1.48 mg/100 g) . Finger millet protein is abundant in essential amino acids such as methionine, valine, and lysine, and 44.7% of the amino acids.

Millets are important crops for food security, particularly in areas where climate change and other factors have made traditional crops such as rice and wheat difficult to grow. Millets require less water than rice and wheat, making them ideal for areas with low rainfall. Millets are also more resilient to pests and diseases, reducing the need for pesticides and herbicides. In addition, millets are often grown by small-scale farmers, providing a source of income and food security for rural communities.

Despite their many benefits, millets have been neglected in recent years in favor of more profitable crops such as rice and wheat. This has led to a decline in millet cultivation,

particularly in India, where millets were once a staple food. To address this issue, organizations such as the Millet Network of India and the International Crops Research Network of India and the International Crops Research promote millet cultivation and consumption.

Governments can promote the production of millets and provide education on the millets for the farmers and beneficial effects, medicinal and nutritive values of the millets. The government of India had proposed to United Nations for declaring 2023 as the International Year of Millets (IYOM). The proposal of India was supported by 72 countries and United Nation's General Assembly (UNGA) declared 2023 as the International Year of Millets on 5th March 2021. The goal of the International Year is to promote the production, consumption, and trade of millets, as well as to encourage research and innovation in millet agriculture.

Millets were shown to have a significant potential to contribute to India food and nutritional security. To overcome the nutrient deficiency like protein, calcium and iron, millet-based foods must be included in the international, national and state-level feeding programmes that will aid in addressing the present nutritional deficiency in developing countries.

Value added products that can be made from millets are

1.PUFFS FROM SORGHUM Puffs are product which is a resultant of explosive puffing or gun puffing where the sorghum grain is expanded to maximum expansion consistent with the grain identity (similar shape of the grain). It is the RTE (ready to eat) snack which is developed using puff gun machine. The puff gun machine is loaded with dehulled sorghum grain onto a rotating barrel and the mixture is roasted for and fired resulting in a puffed sorghum product

2.PUFFS FROM FOXTAIL MILLET Foxtail puffs are product which is a resultant of explosive puffing or gun puffing where the foxtail grain is expanded to maximum expansion consistent with the grain identity (similar shape of the grain). It is the RTE (ready to eat) snack which is developed using puff gun machine. The puff gun machine is loaded with dehulled foxtail grain onto a rotating barrel and the mixture is roasted for and fired resulting in a puffed sorghum product.

3. PUFFS FROM PEARL MILLET Pearl Millet (bajra) puffs are product which is a resultant of explosive puffing or gun puffing where the bajra grain is expanded to maximum expansion consistent with the grain identity (similar shape of the grain). It is the RTE (ready to eat) snack which is developed using puff gun machine. The puff gun machine is loaded with bajra grain onto a rotating barrel and the mixture is roasted for and fired resulting in a puffed sorghum product.

4. EXTRUDED SNACKS are Ready-To-Eat products prepared using twin-screw hot extruder which combines heating with the act of extrusion to create a shaped cooked product through a round, minus shaped dies. Commercially most of the extruded snacks are prepared from corn; here the extruded snack is made from sorghum grits, rice, ragi, wheat and corn flour. The mixture is combined and passed through twin screw extruder to produce expanded snacks which are ready to eat. The snack can be coated with desired spices to create variations in the taste and flavor.

5. EXTRUDED FLAKES are Ready-To-Eat products prepared using twin-screw hot extruder which combines heating with the act of extrusion to create round shaped product which is further flattened in roller flaker machine. The extruded Flakes is made from sorghum grits, wheat and corn flour. The snack can be coated with desired spices to create variations in the taste and flavor.

6. INSTANT SORGHUM IDLI MIX In the modern days where the life is at fast pace with the time very valuable to every person, "Instant Foods" play an important role in everyone's day-to-day life. Instant and ready to reconstitute foods have become well established products in western countries. It is the need of the hour to develop traditional foods as convenience foods and IIMR has carried out research in developing sorghum based instant mixes described, here under. Idliis an indigenous traditional breakfast food in mostly southern Indian cuisine, which is a steamed product made from rice semolina and ground pulses and typically served with a spiced vegetable filling or chutney. We have made an attempt to prepare instant sorghum idli mix sorghum fine semolina, blackgram dhal, salt and food grade additives; citric acid and sodium bicarbonate were used as main ingredients. All the ingredients were mixed uniformly in a blender.

7.INSTANT UPMA MIX Upma is an indigenous traditional breakfast food in mostly southern Indian cuisine, which is boiled semolina made from wheat/rice with added pulses, condiments and spices. We have made an attempt to prepare instant sorghum upma mix sorghum semolina, Bengal gram dal; mustard seeds, curry leaves, dried green chillies, salt, and oil were used as ingredients. Semolina, mustard seeds and Bengal gram dal were roasted separately. To the semolina, roasted mustard seeds, Bengal gram dal, dehydrated curry leaves, salt and were added and mixed

8. INSTANT DOSA MIX Dosa is an indigenous traditional breakfast food in mostly southern Indian cuisine, which is a pancake made from rice semolina and ground pulses and typically served with a spiced vegetable filling or chutney. We have made an attempt to prepare instant sorghum dosa mix sorghum flour, blackgram dhal (2:1), salt; citric acid and sodium bicarbonate were used as main ingredients and mixed uniformly in a blender

9. INSTANT PONGAL MIX Pongal is a delicious south Indian traditional breakfast recipe, generally prepared from rice and green gram. We have made an attempt to prepare instant pongal mix using processed sorghum, green gram dhal, spices & condiments. The mix has to be added to three cups boling water and cooked in pressure cooker for upto three whistles mixed with ghee or milk to make round balls before serving.

10. MILLET INSTANT LADDU MIX Ladduan Indian sweet made from a mixture of flour/semolina, powdered low calorie sugar, and shortening, which is shaped into a ball. Millet laddu mix is developed from roasted sorghum fine rawa, finger millet flour, pearl millet flour; adding to it powdered low calorie sugar, dry fruits and cardamom are added. The mix has to be mixed with ghee or milk to make round balls before serving

11. SORGHUM MUESLI is a product made by mixing of honey and dry fruits to sorghum flakes. We have made an attempt to prepare sorghum muesli mix where, thick flakes were dry roasted and then coated with honey. Cashew nuts, almonds, pista, raisins were roasted and added to this.

12. MILLETS SEMOLINA (RAWA/SUJI) Semolina are ready to cook foods. Millet grains (Pearl Millet, Finger Millet and Foxtail Millet) are processed by dry milling. The dry milling process starts with the cleaning of grains. The cleaned grain is milled by the hammer mills to separate the endosperm, germ and bran from each other to get semolina. Millets Semolina: (3 variants) Millet grain is pulverised to get semolina; variants differ with particle size. According to the variant needed to process the mesh size in the mill is adjusted.

13. MILLETS FLOUR (for all millets) Products and by products, Flour is used as a main ingredient for various recipes. Millet grains (Pearl Millet, Finger Millet and Foxtail Millet) are processed by dry milling. The dry milling process starts with the cleaning of grains. The cleaned grain is milled by the hammer mills to separate the endosperm, germ and bran from each other to get fine flour. Ragi flour, Bajra flour and foxtail millet flour: These four flours (atta) have been developed