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RESEARCH ARTICLE

Development of a novel health drink from millets

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ABSTRACT : Small millets have immense health benefits as they are rich in phytochemicals and nutrients, particularly beneficial to overcome the current life style diseases. On the other hand, in India more than 50 per cent of children are malnourished. Millet based foods help to overcome these two extremes. Millet based products is economically viable and also it highlights the excellent medicinal and nutritional qualities. An attempt was made to develop millet health drink using germinated pearl millet, kodo millet and whole wheat along with pulses. The grains were soaked in water for 3 h and allowed to germinate for 24 h followed by shade dried for 10 h. The dried germinated millets were roasted until husks spilt open and then milled in a burr mill to obtain a fine flour. The flour was then blended with green gram flour, roasted bengal gram flour and skim milk powder. For the standardized health mix, DPPH scavenging activity, product properties such as bulk density, water solubility index and swelling index, proximate composition were studied and also sensory evaluation was conducted for the health drink prepared by using the standardized health mix. DPPH scavenging activity of the health mix was found to be 0.664±0.08 mg/g. Bulk density, water solubility index and swelling were calculated as 0.85 g/cm^3, 9 and 1 per cent, respectively. The standardized mix had 17.08 per cent protein, 4.05 per cent fibre, 20.68 mg calcium and 7.57 mg of iron in 100 g. The drink had high consumer acceptability. The nutrient rich health drink was suitable for all groups of people. The mix can be used for preparation of different snacks like sweet ball, steamed food etc.

KEY WORDS : Millets, Health food mix, Health drink, Nutrients, Anti oxidant activity

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INTRODUCTION

Millets are one of the cereals asides the major wheat, rice, and maize. Millets are major food sources for millions of people, especially those who live in hot, dry areas of the world. Millet is one of the oldest foods known to humans and probably the first cereal grain used for household purposes. In Africa and India, millet has been used as a staple food for thousands of years. There are major millets includes Pearl millet (*Pennisetum glaucum*), Foxtail millet (*Setaria italica)* Proso millet (*Panicum miliaceum*) and Finger millet (*Eleusine coracana*) and minor millets are Barnyard millet (*Echinochloa* spp), Kodo millet (*Paspalum scrobiculatum*), Little millet (*Panicum sumatrense*) etc.

Millet is highly nutritious, non-glutinous and non-acid forming food, so is soothing and easy to digest. Millets are rich in B vitamins, especially niacin, B6 and folic acid, calcium, iron, potassium, magnesium and zinc.

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Millets being natural sources of fibre, calcium, magnesium, the medication automatically comes down and other functions are also perfectly balanced. Alternative to wheat based foods diabetics should be advised to choose diet from a variety that includes Sorghum, pearl millet, kodo millet, barnyard millet, proso millet, finger millet, little millet, foxtail millet. The slow absorption regulates the insulin produced in the body system. Millets not only brings down the sugar levels but also improves the insulin response. Millets are rich in fibre and nutritional photochemical which fight stress. Fibre rich, millets help prevent constipation, thus, helping toward a healthy digestive system.

Utilization of minor millets was less when compared to cereals, because, the production and consumption has been declined due to rapid urbanization (in 2013 – 11520 MT and in 2014 – 9500 MT, USDA), changing food preferences, supply of fine cereals at subsidized prices and social status attached to fine cereals. However, in recent years the resilience of Indian agriculture weathering all the vagaries of the monsoon has resulted in fall in food grain production, in spite of increase in area under the cereals.

This necessitates a paradigm shift towards the increase in production and utilization of millets. Further, the global trend towards urbanization has resulted, the diets markedly deficient in dietary fibre, now the food technologies, doctor's and dietician's feels, dietary fibre is essential for preventing various health aliments. Vander *et al.* (2001) reported that change in diet from millet based to refined wheat and rice diets contributed to increased prevalence of diabetes and other health ailments. Decker *et al.* (2002) reported millets contain a wide variety of antioxidants, which aptly complements their fibre content in reducing the risk of cancer and heart disease. During the last decades a number of experimental and epidemiological studies have brought in to focus the presence of potential chemo preventive substances in coarse millet grains (Kamp and Jones, 2003). Thus, minor millets play an important role in health foods.

The major constraints for less utilization of millets are coarse seed coat, characteristic flavour and poor keeping quality of its products. Hence, there is a need to develop suitable processing technique to suit the needs of the households and food industry. The development of processed ready to cook product from millets by the commercial processing centers will greatly increases the demand for these crops and also it helps to improve the diet of the consumers.

Hence, the present study was undertaken with the following objectives of developing a new innovative value added millet based food product for regular consumption by applying new technologies, biochemical analysis of newly developed product and assessment of its acceptability through sensory evaluation.

METHODOLOGY

Source of raw materials and reagents used :

Pearl millet, kodo millet, whole wheat, whole green gram, roasted bengal gram were purchased from local market. All the chemicals and reagents used were of analytical grade.

Table A : Standardization of millet health food mix

Sr. No.	Ingredients (g)	T_1	T_2	T_3
1.	Whole wheat flour	30	30	30
2.	Malted finger miller flour	10	--	--
3.	Malted sorghum flour	--	10	-
4.	Malted pearl millet flour	--	--	10
5.	Italian millet flour	10	--	--
6.	Little millet flour	--	10	--
7.	Kodo millet flour	--	--	10
8.	Malted green gram flour	15	15	15
9.	Malted horse gram flour	10	--	--
10.	Malted cowpea flour	--	10	--
11.	Roasted Bengal gram flour	--	--	10
12.	Jaggery	20	20	20
13.	Skimmed milk powder	5	5	5

Standardization of millet health food mix :

Health food mix was standardized using cereals, millets and pulses in different proportions. The detail of standardization of mix was given (Table A).

Processing of health mix :

All the raw materials were cleaned to remove dust and dirt and washed. Pearl millet, whole wheat and whole green gram were soaked for 2 h. Then they were allowed for sprouting overnight. Then the sprouts were taken shade dried for 10 h, the remaining kodo millet and roasted Bengal gram were dried and subjected to roasting (5 min). The roasted mixture were powdered using pulvarizer, sieved (80 mm mesh). To prepare health mix powdered sugar and skim milk powder were added to the flour. The health mix was then stored in MPP packaging to under ambient condition.

Preparation of health drink :

Health mix of 20 g was added to 200 ml of boiled milk and mixed well to get malt.

Biochemical analysis of health mix :

DPPH radical scavenging activity of the health mix :

The powdered sample was extracted at room temperature by homogenizing with 30 ml of 60 per cent methanol. The sample suspensions were centrifuged and supernatant filtered through Whatman #1 filter paper. DPPH radical scavenging activity is based on the antioxidant to scavenge the DPPH cation radical. 200 µl aliquot sample extract or standard was added to 1.9 ml of DPPH (0.3 mM in methanol) and vortexed vigorously. It was incubated in dark for 30 min at room temperature and the discoloration of DPPH was measured against blank at 517 nm.

Product properties :

Bulk density :

This was determined by the method of Narayana Rao (1984). A graduated cylinder tubes were weighed and flour sample filled to 5 ml by constant tapping until there was no further change in volume. The contents were weighed and the difference in weight determined. The bulk density was computed as grams per ml of the sample.

$$\text{Bulk density} = \frac{\text{Weight of the sample taken}}{\text{Volume occupied by the sample}}$$

Water solubility index :

WSI was determined in triplicate following the method described by Carine *et al*. (2010). Each sample (1 g) would suspend in 20 mL of distilled water in a tared 45 mL centrifuge tube and be stirred with glass rod then put in water bath for 30 min at 30ºC temperature then centrifuge at 3000 r min^{-1} for 15 min. The supernatants would pour into dry evaporator dishes of known weight and stored overnight at 120ºC for the process of evaporation.

$$\text{WSI} = \frac{\text{Weight of solids in supernatant}}{\text{Weight of dry samples in the original sample}} 100$$

Swelling index :

The method of Abbey and Ibeh (1998) was employed. One gram of the flour samples were weighed into 10 ml graduation measuring cylinder. Five milliliters of distilled water was carefully added and the volume occupied by the sample was recorded. The sample was allowed to stand undisturbed in water for 1 h and the volume occupied after swelling.

$$\text{Swelling index} = \frac{\text{Volume occupied by sample after swelling}}{\text{Volume occupied by the sample before swelling}}$$

Proximate composition analysis of health mix :

The nutrient content of the health mix was analysed according to the AOAC (1980) method.

Sensory evaluation of health drink :

Sensory evaluation provides an index of overall acceptability of foodstuffs, which depends on its appearance, flavour, taste, texture, aftertaste and overall acceptability. To ensure the acceptability of the modified recipes, they were subjected to evaluation by composite scoring for their sensory qualities. The health drink was prepared and presented to a panel of 15 judges. Specific sensory characteristics of each recipe (appearance, colour, flavour, taste, texture and overall acceptability) were rated separately using hedonic scale on a scale of 1 to 9. Scores were defined as follows: 1 - dislike extremely, bad; 9 - like extremely, excellent. Numerical averages were then calculated for a composite test score.

Statistical analysis :

Data were subjected to statistical analysis using SPSS 10.0 statistical package and given as mean ± SD.

OBSERVATION AND ASSESSMENT

The results obtained from the present investigation are summarized below.

Biochemical analysis of health mix :

DPPH radical scavenging activity of the health mix :

The DPPH free radicals, which are stable in methanol, show maximum absorbance at 517 nm. When DPPH radicals encounter a proton-donating substance such as an antioxidant, the radicals are scavenged and the absorbance is reduced. Thus, the DPPH radicals were widely used to investigate the scavenging activity of some natural compounds. DPPH is widely used to evaluate the antioxidant activity of natural compounds (Udenigwe *et al*., 2009). However, DPPH's scavenging activity indicates the ability of the antioxidant compound to donate electrons or hydrogen, thereby converting the radical to a more stable species (Bougatef *et al*., 2009). These antioxidants donate hydrogen to free radicals, leading to non-toxic species and therefore the inhibition of the propagation phase of lipid oxidation. Results revealed that the health mix samples at 2.0 mg/mL exhibits the highest DPPH radical-scavenging activity 0.664±0.08 mg/g However, health mix samples showed considerable DPPH radical-scavenging activities with a significant difference ($P < 0.05$).

Product properties :

Bulk density is depended upon the particle size of the samples. The value of millet based health mix obtained from the study was 0.85 g/cm^3. Water solubility index measures the rate and extent to which the component of powder material or particles dissolves in water. The water solubility index of the health mix was found to be 9 per cent. Swelling index of the mix was calculated as 1 per cent which indicates there is no swelling power in the health mix (Table 1).

Table 1 : Product properties of the health mix

Product properties	Millet based health mix
Bulk density	0.85 g/cm^3
Water solubility index	9 %
Swelling index	1.0 %

Ocloo *et al.* (2010) studied that the bulk density of jackfruit seeds flour was 0.80 g/cm^3. Water solubility index of ready to eat food prepared from finger millet based composite mixer was found to be in composite mix sample 9.21±0.52 (Sawant *et al.*, 2013) which in accordance with the result of the present study. Ojukwu *et al.* (2012) reported that the swelling index of the full fat, defatted and lime bean protein isolate are 1.3167±0.0231%,1.16±0.436% and 2.8±0.0854%, respectively.

Proximate composition :

The nutritive value of the millet based health mix was calculated. It had moisture content of 9.75 per cent, protein content of 17.08g, fibre content of 4.05g. The mineral content of the health mix was found to be calcium 20.68 mg, phosphorus 244 mg, iron 7.57 mg.

The nutrient contents of the health mix is given below (Table 2).

Table 2 : Proximate composition of the millet based health mix

Sr. No.	Proximate composition	In 100 g
1.	Moisture (%)	9.75
2.	Protein (g)	17.08
3.	Fibre (g)	4.05
4.	Calcium (mg)	20.68
5.	Phosphorus (mg)	244.00
6.	Iron (mg)	7.57

Sensory evaluation of health drink :

The health drink which was determined to be the most acceptable and preferable by the consumers. The overall composite score for the health mix was at 8.3. Scores for each of the individual attributes for health drink ranged from 8.3 to 8.6. The sensory evaluation of millet health drink revealed that it was more acceptable and preferable by the consumers. The mix can be used for preparation of different snacks like sweet ball, steamed food (sweet and savory) etc.

Conclusion :

In conclusion it can be stated that kodo and Pearl millets are staple food in different parts of India. Apart from, meeting the food requirements of the population of the cultivation catchment, they have sound nutritional and medicinal values. Though the consumption patterns of these millets are very specific and continue to remain regional specific, there popularization in the broader range is essential. Specific design of foods acceptable to the population of the region specific and group specific can help in promoting the millet consumption and thereby nutritional intake of the consumers significantly. This will also contribute to the food basket of the nation in

addressing the food security.

The same study that investigated the mineral composition of millet and the five other grains also assessed the *in vitro* antioxidant capacity of these grains, both in terms of DPPH scavenging and ABTS scavenging capacity. In DPPH test, millet was high in terms of antioxidant capacity, as antioxidants gobble up free radicals which in turn are highly reactive molecules that can cause damage to your body at the cellular level. While considering the product properties of the health mix bulk density was 0.85 g/cm^3, WSI was found to be 9 per cent and swelling index was 1 per cent which was with highly acceptable in sensory evaluation.

Millet based products are economically viable and also it highlights the excellent medicinal and nutritional qualities. The nutritional value of millet health mix contains high protein, iron and phosphorus. The nutrient rich health drink is suitable for all age groups. The mix can be stored up to six month in MPP packaging without loss of nutrients.

REFERENCES

Abbey, B.W and Ibeh, G.O. (1998). Functional properties of raw processed cow pea flour. *J. Food Sci.*, **53** : 1775 – 1777.

Association of Official Analytical Chemists (1980). *Official method of analysis* 13rd Ed. Association of official analytical Chemist. Washington, D.C. USA.

Bougatef, A., Hajji, M., Balti, R., Lassoued, I., Triki- Ellouz, Y. and Nasri, M. (2009). Antioxidant and free radical-scavenging activities of smooth hound *(Mustelus)* muscle protein hydrolysates obtained by gastrointestinal proteases. *Food Chem.*, **114** : 1198– 1205.

Carine, M.A., Santos-Guerra, A., Guma, I.R. and Reyes-Betancort, J.A. (2010). Endemism and evolution of the macaronesian flora. In: *Beyond cladistics, 101- 124. Berkeley,* C.A. University of California Press.

Decker, E., Beecher, G., Slavin, J., Miller, H.E. and Marquart (2002) . Hole grains as a source of antioxidants. *Cereal Food World*, **47** (8) : 370-373.

Kamp, J.W.V.D. and Jones, J.M. (2003). A focus on dietary fibre and grains. *Cereal Foods World*, **48** (1) : 41.

Mohamed, T. K., Issoufou, A. and Zhou, H. (2012). Antioxidant activity of fractionated foxtail millet protein hydrolysate *Internat. Food Res. J.*, **19**(1): 207-213.

Narayana, K. and Rao, M.S. Narasinga (1984). Effect of partial proteolysis on the functional properties of winged pea (*Psophocarpus tetragonolobus*) flour. *J. Food Sci.*, **49** : 944 - 947.

Ocloo, F.C.K., Bansa, D., Boatin, R., Adom, T. and Agbemavor, W.S. (2010). Physico-chemical, functional and pasting characteristics of flour produced from jackfruits (*Artocarpus heterophyllus*) seeds. *Agric. & Biol. J. North America*, **1** (5) : 903-908.

Ojukwu, Moses, Olawini, I. and Iwouno, J.O. (2012). The proximate composition and functional properties of full-fat flour and protein isolate of Lima bean (*Phaseolus Lunatus*). **1**(7): 1-349 .

Ranganna, B., Ramya, K.G., Kalpana, B. and Veera, R. (2013). Development of small millet malt – A novel health drink. International Conference of Food Technology, Food Processing technologies challenges and solution for sustainable food security 4th&5th, Jan 2013.

Sawant, A.A, Thokar, N.J., Swami, S.B. and Divate, A.D. (2013). Physical and sensory characteristics of ready-to-eat food prepared from finger millet based composite mixer by extrusion. *Agric. Engg. Internat. CIGR J.*, **15**(1): 100-105.

Sreeramulu, D., Reddy, C.Vijaya Kumar and Ragunath, M. (2009). Anti oxidant activity of commonly consumed cereals, millets, pulses and legumes in India. *Indian J. Biochem.& Biophys.*,**46** : 112-115.

Udenigwe, C. C., Lu, Y. L., Han,C. H., Hou, W. C. and Aluko, R.E. (2009). Flaxseed protein-derived peptide fractions: antioxidant properties and inhibition of lipopolysaccharide-induced nitric oxide production in murine macrophages. *Food Chem.*, **116** : 277–284.

Vander Merwe, B., Erasmus, C. and Taylor, J.R.N. (2001). African maize porridge: A food with slow *in vitro* starch digestibility. *Food Chem.*, **72** (2) : 247-353.

WEBLIOGRAPHY

Swaminathan, M.S. (1980). Food science chemistry and experimental food. Bangalore: The Bangalore Printing and Publishing Co. Ltd., (*http://www.answer.com*).

USDA, 2014. (*www.usda.gov*).