International Journal of Food Science and Nutrition
ISSN: 2455-4898; Impact Factor: RJIF 5.14
Received: 12-01-2019; Accepted: 14-02-2019
www.foodsciencejournal.com
Volume 4; Issue 2; March 2019; Page No. 53-58

Incorporation of underutilized millets in breakfast recipes and evaluating its sensory and nutrient content

Meethu Subrahmaniyan[1], Aswin K Manoj[2], G Latha[3]
[1-3] Department of Foods and Nutrition Rathnavel Subramaniam College of Arts and Science (Autonomous), Sulur, Coimbatore, Tamil Nadu, India

Abstract
The present study of formulation of foxtail millet flour incorporated breakfast products like idly mix, apppam mix and vermicelli. The principal ingredients used like rice flour, black gram dhal and wheat flour. Foxtail millet flour incorporated in breakfast in different variations of 20%, 40%, 60%, and 80%.A foxtail millet flour incorporated with the improved colour, flavor, texture, appearance, taste and nutrient content was formulated. The product was assessed for its sensory and nutritional properties. The foxtail millet flour incorporated with 20% foxtail millet flour has almost equal acceptance to the breakfast products. nutrient analysis and shelf life study when compared with the standard product, the selected best products was rich in nutrients like energy, protein, carbohydrate, fibre, phosphorus. So it can be given to all adolescent girls in order to improve their protein and fibre status in their body. Popularization was done for a total population of 30 members and most of the adolescent girls were answered positively for the product. Cost analysis was different from standard and sample product, so the cost is affordable and can be given for all income groups of adolescent girls.

Keywords: breakfast products, nutrient analysis, shelf life study, microbial analysis

Introduction
Foxtail millet (*Setaria italica*) is a diploid grass with a relatively small genome (515 Mb). It is an important grain crop in temperate, subtropical, and tropical Asia and in parts of Southern Europe, and is grown for forage in North America, South America, Australia, and North Africa. Foxtail millet is a close relative of an important biofuel crop, switch grass (*Panicum virgatum*). It is also closely related to pearl millet (*Pennisetum glaucum*), which is under investigation as a biofuel grain feed stock in regions unsuitable for maize cultivation, and napier grass (*Pennisetum purpureum*), a grass with bio fuel potential in hot/humid regions such as the southeastern United States. Foxtail millet should serve as an excellent surrogate genome to assist future study and improvement of switch grass and related befoul crops.

Foxtail millets are ideal for reducing the cholesterol of the body, controlling blood sugar and aiding metabolism rate. It is highly rich in anti-oxidants, which removes all the acidic elements away from the body. It is a readily available crop, having a crop cycle of only 60-90 days. It is cheaper to acquire and widespread in use. India and Andhra Pradesh has a wide circle of consumers of foxtail millets**.** Foxtail millets are also high in dietary fiber, which aids in proper breakdown of food and complete digestion. In addition, it helps in keeping the glycemic index (the rate at which blood sugar level spikes up after eating) low. Therefore, maintaining a balance in the body and making it more durable are few of the key advantages of foxtail millets.

Breakfast provides the body and brain with fuel after an overnight fast - that's where its name originates, breaking the fast! Without breakfast you are effectively running on empty, like trying to start the car with no petrol. Nutritionist's advice: breakfast should be eaten within two hours of waking, a healthy breakfast should provide calories in the range of 20-35% of your guideline daily allowance (GDA).Apart from providing us with energy, breakfast foods are good sources of important nutrients such as calcium, iron and B vitamins as well as protein and fibre. The body needs these essential nutrients and research shows that if these are missed at breakfast, they are less likely to be compensated for later in the day. Fruit and vegetables are good sources of vitamins and minerals so try to include a portion of your daily five at breakfast, whether that is a banana or glass of fruit juice. Breakfast can be good for waistline too, research shows those who eat breakfast are less likely to be overweight and more likely to be within their ideal weight range compared with breakfast skippers. If you skip breakfast, you're more likely to reach for high sugar and fatty snacks mid-morning.

Based on the above facts a study was planned with the following objectives.

- To formulate foxtail millet incorporated breakfast products.
- To evaluate the organoleptic qualities of the foxtail millet incorporated breakfast products.
- To evaluate the shelf life of the best product and popularize it.

Materials and Methods
The methodology pertaining to the present study "Incorporation of under Utilized Millets in Breakfast

Recipes and Evaluating its Sensory and Nutrient Content" is presented under following headings:

3.1. Selection of Topic
3.2. Selection of Ingredients
3.2.1 Preparation of Powder
3.3. Selection of Breakfast Products for Incorporation
3.4. Formulation of Breakfast
3.4.1 Breakfast product Idly Mix is formulated on different proportion
3.4.2 Breakfast product Appam Mix is formulated on different proportion
3.4.3 Breakfast product Vermicelli is formulated on different proportion
3.5 Sensory Evaluation
3.6. Selection of Best Product
3.7. Nutrient Analysis
3.8. Shelf Life Study
3.8.1. Sensory Analysis
3.8.2. Microbial Analysis
3.9. Popularization
3.10. Cost Analysis

Preparation of Powder

Preparation of powder consists of the following steps.

- The foxtail millet has to selected with good quality
- After selecting it has to be washed to remove the unwanted particles present in the ingredient
- Next step involves drying in order to remove the moisture present in it. Highly moisture leads to microbial spoilage
- After drying it has to be roasted nicely which helps to improve the shelf life of the product
- Roasted foxtail millet has to be grinded nicely to a powder and it is incorporated into breakfast products.

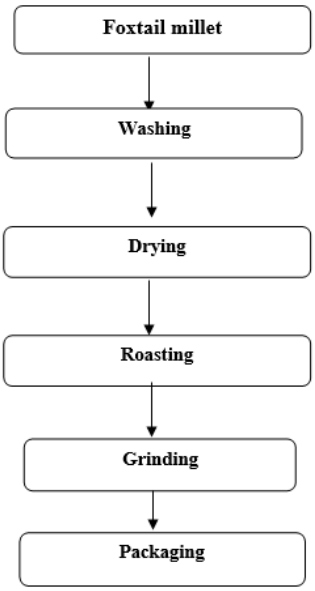

Fig 1

Formulation Breakfast Products

The selected foxtail millet flour was incorporated in to the selected breakfast products in to different proportions like 20%, 40%, 60%, and 80% in idly mix, appam mix and vermicelli. The basic recipe used for the preparation of breakfast products like idly mix, appam mix and vermicelli**.** Tables I indicates the level of incorporated foxtail millet flour in selected breakfast products namely idly mix, appam mix, vermicelli

Breakfast product Idly Mix is formulated on different proportion

Table 1: Breakfast product Idly Mix is formulated on different proportion

S.No	Idly mix	Rice flour	Foxtail millet flour
1	Standard	100g	0
2	Sample 1	80g	20g
3	Sample 2	60g	40g
4	Sample 3	40g	60g
5	Sample 4	20g	80g

Fig 2

Fig 2: Breakfast product Appam Mix is formulated on different proportion

Table 2: Breakfast product Appam Mix is formulated on different proportion

S.no	Appam mix	Rice flour	Foxtail millet flour
1	Standard	100g	0
2	Sample 1	80g	20g
3	Sample 2	60g	40g
4	Sample 3	40g	60g
5	Sample 4	20g	80g

Fig 3

Fig 3: Breakfast product Vermicelli is formulated on different proportion

Table 3: Breakfast product Vermicelli is formulated on different proportion

S.no	Vermicelli	Wheat flour	Foxtail millet flour
1	Standard	100g	0
2	Sample 1	80g	20g
3	Sample 2	60g	40g
4	Sample 3	40g	60g
5	Sample 4	20g	80g

Fig 4

Fig 4

Organoleptic Evaluation of Product

Organoleptic evaluation of foxtail millet flour incorporated breakfast products like idly mix, appam mix, and vermicelli was carried out by comparing with standard. Sensory evaluation of the breakfast products was analyzed for sensory quality by 5 trained panel members and 25 semiskilled panel members in Ponnus Food Industry at 11-3.00pm to whom the prepared the score card were given. The characteristics used for evaluation were appearance, colour, flavour, texture and taste with ranking five to one. Sensory analysis was conducted in a clean, undisturbed environment at 11.00am and 3.00pm. Score card was used to evaluation.

Nutrient Analysis

Energy is needed by the body to stay alive, grow, keep, warm and be active. It comes from fat, carbohydrate and protein. The energy content was determined using Parr Oxygen Bomb Calorimeter

Proteins are essential nutrients for the human body. They are one of the building blocks of body tissue, and can also serve as a fuel source. As a fuel, proteins contain 4 kcal per gram, just like carbohydrates and unlike lipids, which contain 9 kcal per gram. The most important aspect and defining characteristic of protein from a nutritional standpoint is its amino acid composition.

Carbohydrates are a common source of energy in living organisms; however, no carbohydrate is an essential nutrient in humans. Humans are able to obtain most of their energy requirement from protein and fats, though the potential for some negative health effects of extreme carbohydrate restriction remains, as the issue has not been studied extensively so far. However, in the case of dietary fiber indigestible carbohydrates which are not a source of energy inadequate intake can lead to significant increases in mortality.

Dietary fiber increases the weight and size of your stool and softens it. A bulky stool is easier to pass, decreasing your chance of constipation. If you have loose, watery stools, fiber may help to solidify the stool because it absorbs water and adds bulk to stool**.** Helps maintain bowel health. A high-fiber diet may lower your risk of developing hemorrhoids and small pouches in your colon.

Result and Discussion

The results and discussion of the present study entitled **"**Incorporation of under Utilized Millets in Breakfast Recipes and Evaluating its Sensory and Nutrient Content" is discussed under the following headings.

Impact of Sensory Attributes of Foxtail Millet Flour Incorporated Breakfast Products

Sensory analysis is a combination of responses that our bodies use to evaluate the foods we ingest. The complex sensation the result from the interaction of our sense and is used to measure the quality of the new product. The evaluation may be carried out by or several hundred people**.**

Table 4: Sensory Attribute of Foxtail Millet Flour Incorporated Idly Mix

Criteria	Standard (as)	A (mean±sd)	B (mean±sd)	C (mean±sd)	D (mean±sd)
Appearance	4.87±0.35	4.80±0.41	4.73±0.52	4.6±0.62	4.27±0.74
Color	4.67±0.48	4.70±0.60	4.6±0.56	4.5±0.63	4.3±0.63
Flavour	4.77±0.50	4.57±0.63	4.57±0.68	4.47±0.68	3.93±1.05
Texture	4.77±0.43	4.7±0.47	4.73±0.45	4.87±0.35	4.8±0.41
Taste	4.80±0.41	4.83±0.38	4.70±0.47	4.67±0.55	4.7±0.53

The above Table IV shows the sensory attributes of the standard and Foxtail millet flour incorporated idly mix at different proportion (A-20%, B-40%, C-60%, D-80%). The scores of various levels of incorporation were compared with standard. On comparing the four different proportions (A) 20% level of incorporation score highest of 4.80±0.41 for appearance, 4.70±0.60 for colour, 4.57±0.63 for flavour, 4.7±0.47 for texture, and 4.83±0.38 for taste, which was found to be highest. From the results it is clear that as and when the level of Foxtail millet flour incorporation increased, the appearance, colour, flavour, texture, and taste started to change resulting in higher mean score when compared to standard.

Table 5: Sensory Evaluation of Foxtail Millet Flour Incorporated With Appam Mix

Criteria	Standard (bs)	A (mean±sd)	B (mean±sd)	C (mean±sd)	D (mean±sd)
Appearance	4.83 ±0.38	4.87 ±0.35	4.57±0.73	4.5±0.63	4.03 ±0.96
Colour	4.7 ±0.47	4.73±0.58	4.53 ±0.63	4.43 ±0.63	4.37 ±0.67
Flavour	4. 77±0.50	4.6 ±0.62	4.5±0.73	4.43 ±0.68	3.8 ±.03
Texture	4.73 ±0.45	4.73 ±0.45	4.6 ±0.62	4.83 ±0.38	4.73 ±0.52
Taste	4.73 ±0.45	4.83 ±0.38	4.43 ±0.73	4.63 ±0.56	4.5 ±0.73

The above Table V shows the sensory attributes of Standard and foxtail millet flour incorporated Appam mix at different proportions (A-20%, B-40%, C-60%, D-80%). The scores of various levels of incorporation were compared with standard. On comparing the four different proportions (A) 20 percent level of incorporation score highest of 4.87

±0.35for appearance, 4.73±0.58 for colour, 4.6 ±0.62for flavour, 4.73 ±0.45for texture, and 4.83 ±0.38for taste, which was found to be highest. From the results it is clear that when the level of foxtail millet flour incorporation increased, the appearance, colour, flavour, texture, and taste started to change resulting in little higher mean score when compared to standard.

Table 6: Sensory Evaluation of Foxtail Millet Flour Incorporated With Vermicelli

Criteria	Standard (bs)	A (mean±sd)	B (mean±sd)	C (mean±sd)	D (mean±sd)
Appearance	4.87±0.35	4.87±0.35	4.57±0.73	4.4±0.77	4.41±0.80
Colour	4.67±0.48	4.90±0.31	4.5±0.68	4.37±0.76	4.23±0.73
Flavour	4.77±0.50	4.60±0.72	4.57±0.68	4.40±0.72	3.77±1.04
Texture	4.77±0.43	4.73±0.45	4.6±0.62	4.73±0.58	4.53±0.73
Taste	4.80±0.41	4.83±0.38	4.57±0.63	4.47±0.73	4.3±0.84

The above Table VI shows the sensory attributes of standard and foxtail millet flour incorporated vermicelli at different proportion (A-20%, B-40%, C-60%, D-80%). The scores of various levels of incorporation were compared with standard. On comparing the four different proportions (A) 20 percent level of incorporation score highest of 4.87±0.35for appearance, 4.90±0.31for colour, 4.60±0.72for flavour, 4.73±0.45 for texture, and 4.83±0.38 for taste, which was found to be highest. From the results it is clear that as and when the level of foxtail millet flour incorporated increased, the appearance, colour, flavour, texture, and taste started to change resulting in little higher mean score when compared to standard.

Sensory Evaluation of Selected (Best Incorporated) Products

Table 7: sensory evaluation of selected breakfast product

Criteria	Idly mix (a)	Appam mix (a)	Vermicelli (a)
Appearance	4.80±0.41	4.87 ±0.35	4.87±0.35
Colour	4.70±0.60	4.73±0.58	4.90±0.31
Flavour	4.57±0.63	4.6 ±0.62	4.60±0.72
Texture	4.7±0.47	4.73 ±0.45	4.73±0.45
Taste	4.83±0.38	4.83 ±0.38	4.83±0.38
Total	4.72	4.752	4.786

From the above table X and shows the best incorporated proportion of Foxtail millet flour in all the 3 products. In idly mix (A) with the highest score of 4.72was selected, among Appam mix (A) with the highest score of 4.752, vermicelli (A) with the highest score of 4.786.

Nutrient Evaluation of Selected Foxtail Millet Flour Incorporated Breakfast Products

Energy Content of Standard and Selected Foxtail Millet Flour Incorporated Breakfast Products.

Energy is needed by the body to stay alive, grow, keep, warm and be active. It comes from fat, carbohydrate and protein. The energy content was determined using Parr Oxygen Bomb Calorimeter**.**

Table 8: Energy content of standard and selected foxtail millet flour incorporated breakfast products

S. No.	Products	Energy content (kcal)/100g	
		Standard	Foxtail millet Flour incorporated breakfast products
1	Idly mix (a)	332.75kcal	428.95kcal
2	Appam mix(a)	276kcal	342.2kcal
3	Vermicelli (a)	281.6kcal	347.8kcal

From the above table X it represent that, energy content of foxtail millet flour incorporated Idly mix(Sample A) was found to be 428.95kcal, which was found to be higher than standard idly mix with 332.75kcal. Energy content of Foxtail millet incorporated appam mix (Sample A) was found to be 342 kcal when compared to standard Appam mix, which had a calorie content of 276 kcal. Energy content of sample (Sample A) was found to be 347kcal when compared to standard (Sample A) vermicelli, which had energy content of 281.6kcal.

Carbohydrate Content of Standard and Selected Foxtail Millet Flour Incorporated Breakfast Products.

Table 9: carbohydrate content of the standard and selected foxtail millet flour incorporated breakfast products

S. No.	Products	Carbohydrate content (g)/100g	
		Standard	Foxtail millet flour incorporated Breakfast products
1	Idly mix (a)	640.5	652.68
2	Appam mix(a)	276	637.78
3	Vermicelli (a)	62.64	74.82

From the above table XI it represent that, Carbohydrate content for foxtail millet flour incorporated ildly mix (Sample A) was found to be 652.68g, which was found to be higher than standard idly with 640.5 g. Carbohydrate content of foxtail millet incorporated Appam (Sample A) was found to be 637.78 g when compared to standard appam mix which had a carbohydrate content of 276g. The carbohydrate content of Foxtail millet incorporated products was found to be high when it was compared with standard. This increase may be due to the high carbohydrate content of foxtail millet flour.

Table 10: protein content of the standard and selected foxtail millet flour incorporated breakfast products

S. No.	Products	Protein content (g)/100g	
		Standard	Foxtail millet Flour incorporated Breakfast Products
1	Idly mix (a)	11.4	13.9
2	Appam mix(a)	5.44	7.9
3	Vermicelli(a)	6.96	9.2

From the above table XIII it represent that, protein content of sample (Sample A) was found to be13.9 g which was slightly higher when compared to standard idly mix which had protein content of 11.4 g. The protein content of Appam mix (Sample A) was found to be 7.9g when compared to

standard, which had a protein content of 5.44g. The protein content of vemicelli (Sample A) was found to be 9.2g when compared to standard vermicelli. The protein content of foxtail millet flour incorporated products was found to be high when it was compared with standard.

Table 11: fibre content of the standard and selected foxtail millet flour incorporated breakfast products

S. No.	Products	Fibre content (g)/100g	
		Standard	Foxtail millet Flour incorporated Breakfast Products
1	Idly mix (a)	0.385	16.385
2	Appam mix(a)	0.16	16.16
3	Vermicelli(a)	0.16	16.16

From the above table XIV is represent that, Fibre content of sample (Sample A) was found to be 16.385g which was much higher when compared to standard idly mix which had fibre content of 0.385 g. The fibre content of Appam mix (Sample A) was found to be 16.16g when compared to standard, which had a fibre content of 0.16g. The fibre content of vermicelli (Sample A) was found to be 16.16g when compared to standard vermicelli. The fibre content of foxtail millet flour incorporated products was found to be much more when it was compared with standard

Table 12: phosphorus content of the standard and selected foxtail millet flour incorporated breakfast products

S. No.	Products	Phosphrous content (g)/100g	
		Standard	Foxtail millet Flour incorporated Breakfast Products
1	Idly mix (a)	224.25mg	288.25mg
2	Appam mix(a)	128mg	186mg
3	Vermicelli(a)	73.6mg	131.6mg

From the above table XV it represent that, Phosphorus content of sample (Sample A) was found to be 288.25mg which was slightly higher when compared to standard idly mix which had phosphorus content of 224.25mg. The phosphorus content of Appam mix (Sample A) was found to be 186mg when compared to standard, which had a phosphorus content of 128mg. The phosphorus content of vemicelli (Sample A) was found to be 131.6mg when compared to standard vermicelli. The phosphorous content of foxtail millet incorporated products was found to be high when it was compared with standard.

Shelf Life Study and Microbial Analysis of Foxtail Millet Flour Incorporated Breakfast Products

Table 13: shelf life study and microbial analysis of foxtail millet flour incorporated breakfast products

Products	No. of bacterial colonies per fig in dilution	Number of organism in ml/gm							
		1st day		14th day		29th day		44th day	
Idly mix		Polythene cover	Aluminum foil	Polythene cover	Aluminum foil	Polythene cover	Aluminum foil	Polythene cover	Aluminum foil
Standard	10^3	-	-	-	-	-	-	-	-
Sample	10^4	-	-	-	-	-	-	-	
Appam mix				-	-	-	-	-	-
Standard	10^3	-	-	-	-	-	-	-	-
Sample	10^4	-	-	-	-	-	-	-	10
Vermicelli				-	-	-	-	-	-
Standard	10^3	-	-	-	-	-	-	-	-
Sample	10^4	-	-	-	-	-	-	-	
Organism identified	Only bacillus contaminations were identified and no potentially hazardous microbes were isolated.								

From the above results of microbial analysis it can be noted that, there was no microbial growth till the 29th day of storage. However 44th day of microbial analysis incorporated appam mix packed in aluminum foil showed some microbial growth. (Bacillus species).Since no other potentially hazardous microorganisms were found in the standard and selected foxtail millet flour incorporated breakfast products. It is concluded that both aluminum foil and polythene cover were equally good in maintaining the quality of standard and selected products.

Cost Estimation of Foxtail Millet Flour Incorporated Breakfast Products

Table 14: cost estimation

S.no	Products	Net weight (g)	Cost of formulated product
1	Idly mix	100	5.64
2	Appam mix	100	5.64
3	Vermicelli	100	6.44

From the above table XIV shows that the cost estimation of the formulated products was affordable as that of the cost the commercial product. Cost of the formulated products is Rs.5.64 RS for idly mix, Rs.5.64 for Appam mix, and 6.44 Rs for Vermicelli respectively.

Impact of Popularization of Foxtail Millet Flour Incorporated Breakfast Products

Table 15: Details regarding the consumption pattern of breakfast foods food among selected adolescent girls

S.no	Particulars	Yes	No
1	Do you take breakfast day daily	25	5
2	Do you know about foxtail millet	22	8
3	Will you get the products available in the market	19	11
4	Will you prepare the ready to mix breakfast product use it	20	10
5	Do you like the ready to mix products	24	6
6	Frequency of consuming millet	21	9
7	Do you know the important of protein and fiber in your diet	17	23
8	Do you know the problem caused by skipping breakfast	28	2
9	Is the product acceptable to eat	16	24
10	Do you prefer foxtail millet daily	20	10

From the above table XXVII shows the details regarding the consumption pattern of breakfast products among selected adolescent girls. The result shows that 25 of the adolescent girls were prefer daily breakfast products. Among the 22 adolescent girls know about importance of foxtail millet incorporated breakfast foods. Another 16 of the adolescent girls accept to foxtail millet incorporated breakfast foods. 21 of them like to consume foxtail millet, 25 of them accept the foxtail millet flour incorporated breakfast foods and they were interested to buy the products like foxtail millet incorporated breakfast foods in the market. From the results we can conclude that among the total population of 30 adolescent girls most of the adolescent girls were answered positively for the product.

Conclusion

Ready mix helps to provides more nutrients to the body. Ready mix can be easily prepared. It can be concluded from the present study that the formulation of Foxtail millet flour incorporated ready to cook breakfast foods helps to increase the nutrient content of various products, which will helps for preventing nutrient deficiencies. The ready mix can be stored better in polythene cover and aluminum foil for a period of 45 days without any spoilage. The formulated products had all sensory attributes similar to the standard breakfast foods. The findings when adopted and executed by food processing industries will have a great scope.

References

1. Bhumika Tripathi., Chetana Kalpana Figl. Fortification of sorghum (Sorghum vulgare) and foxtail millet (Pennisetum glaucum) flour with zinc, 2010b.
2. Blois MS. Antioxidant determination by the use of a stable free radical. Nature. 1958; 26:199-120.
3. Boxin Ou, Dejian Huang, Maureen Hampsch Woodill, Judith A, Flanagan, Elizabeth Deemer K. Analysis of antioxidant activities of common \vegetables employing oxygen radical absorbance capacity (ORAC) and Ferric reducing antioxidant power (FRAP) assays: a comparative study, Journal of Agricultural and Food Chemistry. 2002; 50:3122-3128.
4. Brannan GL, Setser CS, Kemp KE, Seib PA, Roozeboom K. Sensory characteristics of grain sorghum hybrids with potential for use in human food. Cereal Chemistry. 2001; 78:693-700.
5. Carre B. Causes for variation in digestibility of starch among feedstuffs. World's Poultry Science Journal. 2004; 60:76-89.
6. Chrispus OA, Oduori. The Importance and Research Status of Foxtail Millet in Africa. Paper Presented at the McKnight Founda Collaborative Crop Research Program Workshop on Tef & Finger Millet: Comparative Genomics of the Chloridoid Cereals at the Biosciences for East and Central Africa (BECA) ILRI, Nairobi, Kenya. Bib, 2005.
7. Tomar VS, Behl RK, Upadhyaya SD, Bhale MS, Khare D. (Eds) Crop Production in Stress Environments-Genetic and Management Options. Agrobios.
8. Habiba RA. Changes in antinutrients, proteins solubility, digestibility, andHCl – extractability of ash and phosphorus in vegetable peas as affected by cooking methods. Food Chemistry. 2002; 77:187-192.
9. Hadimani NA, Muralikrishna G, Tharanathan RN, Malleshi NG, 2001.
10. Hallberg L, Bjorn Rasmussen E. Measurement of iron absorption from meals contaminated with iron. American Journal of Clinical Nutrition. 1981; 34(12):2808-2815.
11. Hamilton RJ. The Chemistry of Rancidity in Foods, in Rancidity in Foods, Ed. by Allen JC and Hamilton RJ, Aspen publishers, Gaithersburg, Maryland, 1999, 1-21.
12. Hanna A, Singh J, Faubion JM, Hoseney RC. Studies on odour generation in ground pearl millet. Cereal Foods World. 1990; 35:838.
13. Hazel T, Johnson IT. Influence of food processing on iron availability in-vitro from extruded maize-based snack foods. Journal of Science of Food and Agriculture. 1989; 46:365-37.
14. Imdad A, Herzer K, Mayo Wilson E, Yakoob MY, Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. Cochrane Database Syst Rev. 2010, CD008524.
15. Indicators for assessing vitamin A deficiency and their application in monitoring and evaluating intervention programmes. Geneva, World Health Organization, 2004. (Unpublished document WHO/ NUT/94.1).
16. Jacqueline. Formulation of New Products, Sujatha Publications, 2007, 34-35.
17. Journal of Trace Elements in Medicine and Biology, Bhumika Tripathi., Kalpana Figl. Fingermillet, foxtail millet (*Eleucine coracana*) flour as a vehicle for fortification with zinc. Journal of Trace Elements in Medicine. 2010a; 24:257-262
18. Karovičová J, Kohajdová Z, fermented vegetables. Horticultural Sci. (Prague). 2003; 30:152-158.
19. IJSER International Journal of Scientific & Engineering Research. 2014; 5(1):684.
20. Keefe JH, Cordain L. Cardiovascular disease resulting from a diet and lifestyle at odds with our paleolithic genome: how to become a 21st-century hunter-gatherer. Mayo Clinic Proceedings. 2004; 79(1):101-108.
21. Kielmann AA, Ajello CA, Kielmann NS. Nutrition intervention: an evaluation of six studies. Stud Fam Plann. 2002; 13:246-57.
22. Kosh, Food Standardisation. The Journal of Foods and Nutrition. 2009; 40:45.
23. Krejcova A, Cernohorsky T, Meixner D. Elemental analysis of instant foods and seasoning mixtures by ICP–OES, Food Chemistry. 2007; 105:242-247.