Evaluation of Market Samples of Millet Products Based on FSSAI Standards

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Abstract

India is the largest producer of millets, which are often referred to as coarse cereals. The nutrient value of millets is comparable or even superior to other cereal food grains. In recent years, there has been increasing recognition of the importance of millets as a substitution for cereals because of its nutritional value and ease of cultivation. The demand for convenience products is increasing because of changing life style, socio and economic pattern, increasing number of working women and modified food habits. In recent years there has been increasing recognition for importance of millets and different types of millet processed are available now a day in urban general stores and supermarkets. Millet products made from different varieties of millets were collected from selected shops in Bengaluru city the samples size was restricted to 100 products and collected samples were divided into ready to cook (RTC) and ready to eat (RTE). The collected samples were analyzed for moisture, total ash and acid insoluble ash and compared with FSSAI standards. The results showed that the average moisture content of 97 products was within standard limit of FSSAI and remaining tree products had exceeding compared with standard limit. The average ash content of RTC was 2.10% in organic and 2.28% in regular, but in RTE millet products it was 0.71% in organic and 2.89% in regular. The ash insoluble of all millet products was within standard limit except RTC in organic category. Statistically there was non-significant difference observed between RTC and RTE as well as between organic and regular products in ash and ash insoluble contents. This study indicates that there are problems related to hygiene and quality of the products.

Keywords: *Millet products, RTC, RTE, FSSAI, organic and regular.*

I. INTRODUCTION

Among rain fed crops, millet as a group figure prominently. India is the largest producer of millets, which are often referred to as coarse cereals. However, realizing the nutrient composition of these grains they are now considered as "nurtricereals". The mean annual planting area of small millets is around 3.5 million hectors of which finger millet accounts for 50 per cent of the area and 2/3rd of the total production (4). Sorghum (Sorghum bicolor), pearl millet (Pennisetum glaucum) and a group of six small millets together constitute the millets family. The group of small millets is represented by finger millet (Panicum sumatrense), kodo millet (Paspalum scrobiculatum), foxtail millet (Setaria italic), and proso millet (Panicum miliaceum) little millet (Panicum sumatrens) and barnyard millet (Echinochloa frumentacea). These crops, known by different names in local languages have traditionally been the vital component of dry farming system in India supporting millions of poor and food insecure people.

Food influences the health of a population to a great degree; therefore, the control of food quality is an important activity of food industry and is legislatively regulated. Food has to fulfill all quality requirements. High quality products can be produced only from high quality raw materials. The quality of products is further influenced by the technological procedures used. Quality depends not only on the technological procedure itself, but also on the total hygienic situation of the manufacturing surroundings (2).

Evaluation is an important part to measure the quality of the product. Food quality and safety are important consumer requirements. The quality of food products, in conformity with consumer requirements, is determined by sensory attributes, chemical composition, and shelf life, and by packaging and labeling. Moisture is important in food quality, preservation and resistance to deterioration. Ash refers to the inorganic residue remaining after either ignition or complete oxidation of organic matter in food stuff. Determination of ash is useful for detecting low grade products. Ash insoluble in dilute hydrochloric acid measures the amount of silica present, especially as sand.

The millet grains offer many opportunities for diversified utilization and in adding value. With proper suitable processing such as milling, popping and other technologies, it is possible to develop many diversified value added products using different millets. Nowadays, different types of processed millet food are available in Bengaluru city branded and without branding. Hence, the present study has been

taken up to evaluate the market samples of millet products based on FSSAI standards.

II. METHODS AND MATERIALS

Hundred Millet products were collected from different shops in Bangalore city. Care was taken to collect only fresh samples. The collected samples were separated in to ready to cook (RTC) and ready to eat (RTE) products and further divided in to organic and regular products based on the commitment made on the label. Standards for cereals and pulses and their products are laid down in section 2.4 of food safety and standards regulations (1) which includes standards for food grains, their milled products and processed products. These standards were used as base to check the quality of market samples. All the selected millet products were analyzed for moisture content, total ash content ash insoluble in dilute acid.

III. RESULTS AND DISCUSSION

According to the FSSAI standard (1), moisture content of millet products should not be more than 13%. The results showed out hundred collected millet products from market, all most all the products (N- 97) were within the limit of the FSSAI standard. Seventy five products had <10% of moisture, 20 products had 10 – 12% and 11 products had 12 – 13%. Statistically there was non-significant difference between RTC and RTE products in moisture content (Table 1).

The ash content of millet products was determined and compared with FSSAI standard manual (2016). According to FSSAI standard the total ash content of millet product should not be more than 1.75% on dry basis. The results showed that the average ash content of RTC millet products in both organic and regular was higher when compared to standard limit. In RTE millet products the average ash content of organic products was within standard limit, but in regular products the ash content was exceed standard limit. It was observed that the average ash content of RTC was 2.28% in organic and 5.66% in regular, but in RTE millet products it was 0.71% in organic and 2.89% in regular. However, statistically there was non- significant difference between RTC and RTE as well as between organic and regular products in ash contents (Table 2).

Table 1: Moisture Contents of Selected Millet Products Available in the Market

Moisture contents	Ready – to – cook			Ready – to – eat		
	N	%	Mean ± SD	N	%	Mean ± SD
<10%	29	55.76	7.19± 2.02	46	77.08	4.41± 0.01
10 – 12%	14	27	11.11 ±0.44	0	0	0
12 – 13%	8	15.3	12.42 ±0.24	0	0	0
>13%	1	2	13	2	4.16	52.41± 39.40
t- value	0.488 NS					

NS = Non- significant
***The permitted limit of FSSAI for moisture content of millet products is 13%**

Table 2: The Average Total Ash Content of Millet Products

Type of Products	Organic		Regular		t- value
	N	Mean ±SD	N	Mean ±SD	
Ready - to – cook	36	2.28±0 .02	16	5.66±0 .09	0.09 NS
Ready - to - eat	10	0.71±0 .06	38	2.89±0 .08	0.25 NS
t- value	0.28 NS				

NS= Non- significant
***The permitted limit of FSSAI for ash content of millet products is 1.75%**

In different types of RTC millet products (52 products); the ash content of flours in organic category was within standard limit as compared to regular products except rava and sawai had less ash content in both organic and regular as compared to standard limit, but some types of RTC millet products such as dosa mix, malt, popped mix, infant food and nutri mix had more ash content in both organic and regular as compared to standard limit (Table 3)

Among the different types of RTE millet products (48), only a few products, such as snacks (deep fried) and finger millet bar, had exceeded the ash content when compared with standard limit, but other types of RTE millet products under both organic and regular had less ash content as compared to standard limit (Table 4).

Table 3: The Average Ash Content of Different RTC Millet Products

Type of Product	Organic (%)	Regular (%)
	Mean ±SD	Mean ±SD
Flour	0.57±0.05	2.67±0.04
Rava	0.98±0.01	1.21±0.03
Malt (ragi malt)	-	1.91±0.01
Popped mix (Harittu)	2.93±0.32	5.08±0.2
Infant food	2.10±0.04	3.39±1.02
Nutrimix	3.14±0.01	3.2±0.2
Sawai	1.33±0.03	1.45±0.01
Dosamix	2.93±0.1	3.45±0.05
Mean ±SD	2.49±1.05	2.79±1.27

Table 4: The Average Ash Content of Different RTE Millet Products

	Organic	Regular (%)

Type of Product	(%)	
	Mean ±SD	Mean ±SD
Cookies	0.64±0.01	0.97±0.02
Biscuits	1.00±0.02	1.09±0.01
Rusk	1.17±0.01	1.34±0.04
Snacks (Deep Fried)	1.93±0.04	2.43±0.1
Bar (Finger millet bar)	-	1.99±0.5
Chocolate	0.52±0.02	0.72±0.05
Crispy (Extruded)	-	1.24±0.03
Finger millet ambli	-	24.70±1.2
Mean ±SD	0.52±0.5	4.31±8.26

Those millet products that had exceeded ash content compared to standard limit may be due to the fact that- during improper processing and packaging, some foreign substances got mixed with the products. Most of these products were collected from local shops and also didn't have FSSAI mandatory standard.

Table 5: Ash Insoluble in Dilute HCl of Millet Products

Type of Products	Organic (%)		Regular (%)		t-value
	N	Mean ±SD	N	Mean ±SD	
Ready – to – cook	36	0.11±0.07	16	0.58±1.76	0.214 ^{NS}
Ready - to - eat	10	0.04±0.01	38	0.05±0.02	0.20 ^{NS}
t- value	0.14 ^{NS}				

NS= Non- significant

***The permitted limit of FSSAI for ash insoluble in dilute HCl content of millet products is 0.5%**

Ash in- soluble in dilute HCl shows the amount of silicates that is present in food products. Ash in- soluble in dilute HCl content of hundred collected millet products were determined and compared with the standard limit. According to FSSAI standard manual (16), ash insoluble in dilute HCl should not be more than 0.5% on dry basis. The average ash insoluble in dilute HCl content of RTC millet products showed that, RTC millet products had more ash insoluble in dilute HCl in the regular category as compared to standard limit, but in organic category the ash insoluble in dilute HCl content was within the standard limit when compared with the FSSAI standard.

In RTE millet products in both organic and regular forms the average ash insoluble in dilute HCl content was within the standard limit. The exceeding of average ash insoluble content of regular forms of RTC millet products may be because, those products had more amount of silicate mixed with products because of improper processing and packaging. Statistically there was non- significant difference between RTC and RTE and also between organic and regular products in ash insoluble contents (Table 5).

The ash insoluble in HCl content of organic RTC millet products was within the standard limit, but in regular products, a few products such as flours, popped mix (hurittu), infant food and dosa- mix exceeded ash insoluble in HCl as compared to standard limit. However, statistically there was non-significant difference between organic and regular based on RTC millet products in ash insoluble (Table 6).

Determination of ash insoluble in dilute HCl content of RTE millet products showed that all types of RTE millet products in both organic and regular had less ash insoluble in dilute HCl content as compared to standard limit. Statistically there was non- significant difference between organic and regular products based on RTE in ash insoluble in dilute HCl content (Table 7).

Table 6: The Average Ash Insoluble in Dilute HCl of Different RTC Millet Products

Type of Product	Organic (%)	Regular (%)
	Mean ±SD	Mean ±SD
Flour	0.02±0.03	0.20±0.03
Rava	0.04±0.02	0.03±0.05
Malt (ragi malt)	-	0.09±0.01
Popped mix	0.12±0.1	0.54±0.08
Infant food	0.05±0.02	0.7±0.04
Nutrimix	0.09±0.02	0.14±0.02
Sawai	0.05±0.01	0.05±0.03
Dosamix	0.00	0.13±0.1
Mean ±SD	0.06±0.04	0.23±0.25

Table 7: The Average Ash Insoluble in Dilute HCl of RTE Collected Millet Products

Type of Product	Organic (%)	Regular (%)
	Mean ±SD	Mean ±SD
Cookies	0.04±0.01	0.14±0.04
Biscuits	0.05±0.03	0.05±0.02
Rusk	0.05±0.01	0.06±0.01
Snacks (Deep Fried)	0.01±0.01	0.06±0.03
Bar (Finger millet bar)	-	0.08±0.1
Chocolate	0.01±0.05	0.05±0.02

Crispy (Extruded)	-	0.06±0.07
Finger millet Ambli	-	0.04±0.3
Mean ±SD	0.01±0.02	0.07±0.03

Those millet products which had more than 13% moisture content were referred to a microbial study. According to Microbial Food Safety – Indian Regulations (3) Coliform should be absent in 0.1g of product. The results showed that Coliform was present in all three products that had exceeding moisture content such as little millet rava, finger millet bar and finger millet ambli. The number of Coliform colonies was more than the permitted limit in all these three products. It was determined that those products were not safe for consumption (Table 8).

Table 8: Population of Salmonella spp, E. Coli and Coliforms in Selected Millet Products

Sl. No	Product Name	Coliforms (10^2 cfu/g)
1	Finger millet bar	0.2
2	Finger millet ambli	75
3	Little millet rava	33.3

***According Microbial Food Safety – Indian Regulations Coliform should be absent in 0.1 gm of product.**

IV. CONCLUSION

Regular products had more moisture content in compare to organic products and also exceeding ash content compared to standard limit; it means some foreign substances got mixed with millet products intentionally or unintentionally during improper processing and packaging. RTC millet products showed that, they had exceeding silicate which mixed with products during improper processing and packaging. Those products that had exceeding moisture content compared to standard limit were contaminated by Coliforms, were not safe for consumption. Therefore, training is required towards maintenance of hygiene during processing and packing, maintaining nutritional value, ensuring proper packaging of the processed products.

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