Mysore J. Agric. Sci., 51 (4) : 856-859, 2017

Analysis of Commercially Processed Millet Products

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ABSTRACT

This study was taken up to assess the quality of commercially available and processed millet products. Millet products were collected from selected shops in Bengaluru city with sample size of 100 including organic and regular products. The results showed that the average moisture content of 97 products were within standard limit of FSSAI standards (<13%) and remaining three products; one product from RTC and two products from RTE were exceeding standard moisture content. There was no significant difference between RTC and RTE millet products in moisture content and also statistically non-significant difference was found between organic and regular RTC as well as RTE products in moisture content. Microbial analysis results showed that *Salmonella* sp. and *E. coli* were absent in all the three products, whereas *Coliform* was present in all the three products. According to FSSAI regulation, the *Coliform* should be absent in 0.1 gm of products. However, the *Coliform* count showed a greater number of colonies when compared with standard limit.

Keywords: Millet products, ready to cook products, ready to eat products, organic and regular products

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'. 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.

Though regular consumption of millet in general is on gradual decline, it is still consumed as staple food regularly among millet growers and small income families. Rice from decorticated little millet and foxtail millet, roti and mudde from finger millet are the most common staple foods consumed regularly. Preparation of millet products during festivals are strictly followed by rural communities and thus have preserved the traditional culture and significance of millet used in their regular diet. Rural consumers are more familiar with traditional products of millets only.

In recent years there has been increasing recognition for importance of millets and different types of processed millet products are available these days in urban general stores and super markets. Exclusive organic shops are also selling processed organic products because people are becoming more conscious about their health and prefer to buy healthier processed foods.

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 Safety and Standard Authority of India (FSSAI) has laid down the standards for cereals and pulses and their products in Section 2.4 of Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2013. These include standards for food grains, their milled products and processed product.

Now a days, different types of processed millet food (branded and without branding) are available in Bengaluru city. Hence, the present study has been taken up to analyse the quality of the millet processed products available in the market with the objective to study the moisture and microbial content of selected commercial millet products available in Bengaluru city.

MATERIAL AND METHODS

Five to ten shops based on the availability from each category were randomly selected from Bengaluru. Different types of processed products available in these shops were purchased. Sample size

was restricted to 100 products. Care was taken to collect only fresh samples that were from 0 to 5th day based on the date of manufacture printed on the cover. All the products were divided in to organic and regular products based on the commitment made on the label. These products were further classified in to ready to cook (RTC) and ready to eat (RTE) products and stored in freezer (-18^0 C) for further analysis.

Standards for cereals and pulses and their products are laid down in Section 2.4 of Food Safety and Standards Regulations. These include standards for food grains, their milled products and processed products (FSSAI, 2013). All the selected millet products were analysed for moisture content and compared with FASSI standards. Those millet products which had more than 13 per cent moisture content were referred to a microbial study. In the microbial study, tests were conducted to detect *Salmonella* sp., *E. coli* and *Coliforms*. According to Microbial Food Safety – Indian Regulations (Prakash Madhulika and Chinmay Dwivedi, 2001) *Salmonella* sp. should be absent in 25g, *E. coli* and *Coliform* should be absent in 0.1g of product. Bismuth sulphite agar was used for *Salmonella* sp. and EMB agar was used for *E. coli* and *Coliforms*.

All the collected samples were studied for packaging materials used such as LDPE (Low Density Poly Ethylene), HDPE (High Density Poly Ethylene), the cartons, silver foil, metalized silver coating etc.

Results and Discussion

The results revealed that 52 products were in the form of RTC and 48 products were in the form of RTE. Out of 52 RTC millet products; 36 products were in the form of organic products and 16 products were in the form of regular. However, from the 48 RTE millet products; 10 products were organic and 38 products were regular products. Hence, out of a total of one hundred millet products in both RTC and RTE, about 46 products were in organic category and 54 products were regular products. Most of RTC millet products were organic (69.23%) as compared to regular (30.76%). In RTE millet products, most of them were regular (79.16%) as compared to organic category (20.83). Significant difference at 5 per cent level was found between RTC and RTE millet products that were available in the market (Table I).

Table I

Classification of commercially available processed millet products

Type of products	Organic		Regular		Total
	No.	%	No.	%	No.
Ready - to –cook	36	78.26	16	29.63	52
Ready - to - eat	10	21.74	38	70.37	48
Total	46	100	54	100	100
χ^2	22.00 *				

*Significant at 5 per cent level

Out of hundred collected millet products in both RTC and RTE, most of them were available in super markets in compare to local shops and organic shops. Most of the organic products in both RTC and RTE categories were available in organic shops as well as in supermarket. Local shops sold only regular millet products and most of them were RTE products. Significant difference was found between the products (Table II).

Table II

Millet products available in different types of shops

Type of shop	Ready -to-cook		Ready -to-eat		Total
	Organic	Regular	Organic	Regular	
Super markets	14	11	2	22	49
Local shops	7	5	-	16	28
Organic shops	15	-	8	-	23
Total	36	16	10	38	100
χ^2	6.00	*	6.00	*	

*Significant at 5 per cent level

Among ready-to-cook millet products (RTC) in both organic and regular, most of them were in the form of flour (61.11%) as compared to other types of millet products available in market in the form of RTC. There was no malt product available in organic category, but there were infant food and nutria mix which were also malted but named differently (Fig. 1). Most of ready-to-eat millet products were in the form of bakery products. Among bakery products, cookies were most abundantly available followed by biscuits and rusk in both organic and regular category. It was surprising to note that ready-to-eat finger millet ambli (type of kanji) was also available in the market under regular category (Fig. 2).

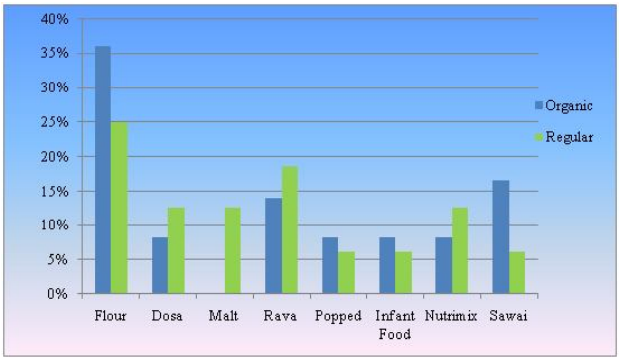

Fig. 1: Types of processed ready - to - cook millet products available in market

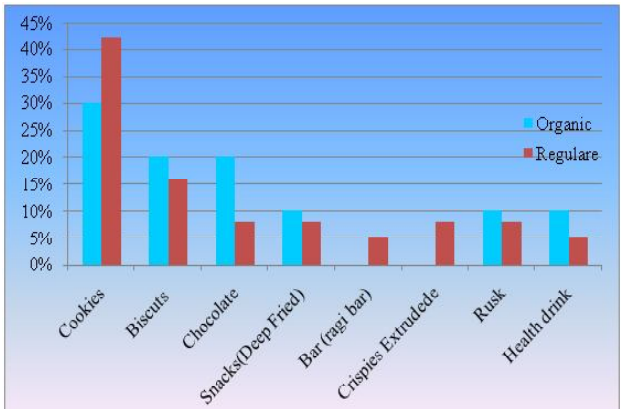

Fig. 2: Types of processed ready - to - eat millet products available in market

Details of labeling on the packaging material of millet products were studied and compared with FSSAI standard for packaging (2011). RTC products were packed using polypropylene and silver foil, where as maximum RTE products were packed in plastic boxes. However, there was significant difference found between packaging materials of millet products at 5 per cent level (Table III). Singh *et al.* (2012) in his study found that metalized polyester was found to be the most suitable for the packaging of millet–wheat composite flours as it could be kept up to 55–65 days under accelerated condition without any significant loss of quality.

TABLE III

Types of packaging materials used for millet products

Packaging materials	Ready -to-cook	Ready -to-eat
Polypropylene	15	14
Paper carton	13	3
Silver foils	18	3
Laminated metalined films	6	10
Hard plastic boxes	0	18
Mean ± SD	10.4 ± 6.53	9.6 ± 5.95
χ^2	15.00 *	

*Significant at 5 per cent level

According to the FSSAI standard (2016), moisture content of millet products should not be more than 13 per cent. The results showed most of the products (N- 97) were within the limit of the FSSAI standard. Seventy five products had <10 per cent of moisture, 20 products had 10-12 per cent and 11 products had 12-13 per cent. Remaining 3 products; one product from RTC and two products from RTE had exceeding moisture content as compared to the standard limit (Fig. 3).

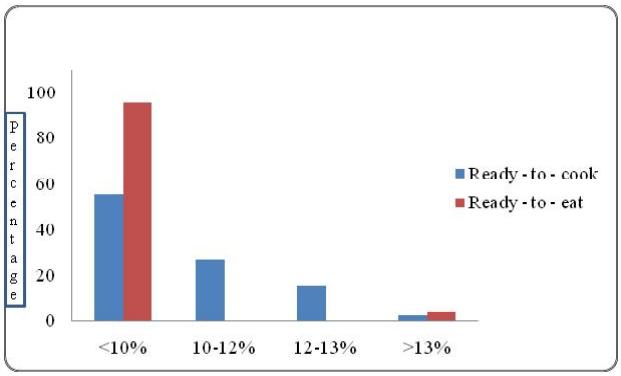

Fig. 3:Average moisture contents of millet products available in the market

Among RTC millet products, little millet rava had higher moisture content compared to the standard limit, but the moisture content of other types of RTC millet products were within the standard limit. The moisture content of RTC millet products from organic category had less moisture when compared to regular products. The average moisture content of different products ranged from 4.98 - 12.55 per cent; least was observed in nutrimix of both organic (4.98%) and regular (5.1%). Moisture content of the infant food was 6.28 in organic, whereas 11.39 in regular food. Statistically there was non-significant difference when compared with standard value (Table IV). Determination of moisture content of RTE millet products showed that, out of 48 RTE millet products, two regular (non-organic) products; finger millet bar and finger millet ambli had exceeded the standard moisture content limit. However, moisture content of other types of RTE millet products in both organic and regular was within the FSSAI standard limit. Statistically there was non-significant

TABLE IV

Average moisture content of different RTC millet products

Type of product	Organic	Regular
	Mean ± SD	Mean ± SD
Flour	6.38 ± 4.24	11.59 ± 0.38
Rava	9.79 ± 0.01	12.55 ± 0.14
Popped mix	8.20 ± 1.01	9.67 ± 1.81
Infant food	6.28 ± 0.01	11.39 ± 0.01
Nutrimix	4.98 ± 0.33	5.1 ± 0.04
Sawai	11.01 ± 0.67	12.2 ± 0.54
Dosamix	10.17 ± 1.84	10.93 ± 0.01
Malt (ragi malt)	-	7.35 ± 0.01
Mean ± SD	8.11 ± 2.29	10.09 ± 2.61

difference between organic and regular on moisture content in RTE millet products when compared with standard values. However, RTE millet products had less moisture content in both regular and organic as compared to RTC millet products (Table V). Due to improper packaging and storage of food products few sampled millets had exceeded the moisture content in both RTC and RTE forms.

TABLE V

Average moisture content of different RTE millet products

Type of product	Organic	Regular
	Mean ± SD	Mean ± SD
Flour	6.38 ± 4.24	11.59 ± 0.38
Cookies	3.93 ± 0.01	5.27 ± 0.01
Biscuits	3.60 ± 0.01	3.82 ± 0.02
Rusk	5.31 ± 0.42	5.46 ± 0.3
Snacks (Deep Fried)	2.5 ± 0.03	2.92 ± 0.04
Bar (Finger millet bar)	-	13.00 ± 0.12
Chocolate	3.10 ± 0.01	3.80 ± 0.02
Crispy (Extruded)	-	5.04 ± 0.13
Finger millet Ambli	-	91.80 ± 0.01
Mean ± SD	3.68 ± 1.05	16.39 ± 30.63

Those millet products which had more than 13 per cent moisture content were referred to a microbial study. The results showed that *Salmonella* sp. and *E. coli* were absent but *Coliform* was present in all three products. The number of *Coliform* colonies was more than the permitted limit in all three products (Table VI). The results indicated that those products were not safe for consumption.

TABLE VI

Population of Salmonella *sp.,* E. coli *and* Coliforms *in selected millet products*

Product name	*Salmonella* sp.	*E.coli*	*Coliforms* (10^2 cfu/g)*
Finger millet bar	Nil	Nil	0.2
Finger millet ambli	Nil	Nil	75
Little millet rava	Nil	Nil	33.3

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

Since regular products had more moisture content (when compared to organic product) and not certified by FSSAI, it is better the consumer to prefer FSSAI certified products because of having safety grantee. Those products that had exceeded moisture content compared to standard limit were contaminated by *Coliforms*, hence are not safe for consumption. Therefore, training might be conducted for small entrepreneurs regarding the maintenance of hygiene during processing and packing.

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(*Received :* May, 2017 *Accepted :* June, 2017)