The Pharma Innovation Journal 2022; 11(2): 306-309

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 306-309

www.thepharmajournal.com
Received: 03-12-2021
Accepted: 15-01-2022

Tanvi Bansal
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Asha Kawatra
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Veenu Sangwan
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Tanvi Bansal
Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, Haryana, India

Effect of storage on organoleptic, chemical and microbial properties of nutrition bars

Tanvi Bansal, Asha Kawatra and Veenu Sangwan

Abstract
Awareness for healthy lifestyle has led to rise in demand for healthy food items that are easy for preparation and consumption. Considering the busy lifestyle of majority of the population worldwide, convenience has been associated with food items and is popularly referred as "convenient foods". Nutrition bars are one of the most accessible food items that belong to this category and at same time it can fit in the "healthy" criteria if its compositional items are picked cautiously. Keeping this in view two nutrition bars developed utilizing wheat and pearl millet in combination with various other nourishing ingredients were evaluated for their shelf life for assessing its market potential, which is one of most important factor for ready to eat (RTE) foods. The nutrition bars were stored for three months in vacuum packaging at controlled temperature. The bars were evaluated in terms of sensory characteristics, moisture uptake, fat acidity, peroxide value, and microbial count at 15 day intervals for 90 days. Both bars had a good shelf life and were safe for consumption up till three months as found to be organoleptically acceptable and stable for its chemical and microbiological properties.

Keywords: Nutrition bars, ready to eat (RTE) food, pearl millet, shelf life, fat acidity, peroxide value, moisture, sensory characteristics, microbial count

Introduction
The appeal for a healthier life allied with quick and practical ways of eating has led to a constant search for food alternatives that can provide nutrition along with convenience. Eating a healthy and balanced diet is the most effectual and the safest means of avoiding or correcting chronic health disease that are non-communicable but can be fatal, which includes malnutrition, obesity, diabetes, and heart disease [1, 2]. As a result, incorporation of healthy food options in daily diet seems to be a wise decision. Replacing unhealthy snack foods with nutrition bars can contribute in bringing a good change in faulty dietary habits. Although such foods are not recommended as meal replacements but can avoid consumption of empty calories [3]. Having a good shelf life is one the most important characteristics of a successful ready to eat food product [4]. Considering this factor important for market potential and increased demand for nutritious ready to eat (RTE) foods, the present investigation was planned to assess the shelf life of nutrition bars developed using wheat and pearl millet.

Material and Method
Two types of nutrition bars were developed using blanched pearl millet flour and wheat flour as chief ingredients in combination with cocoa other nutritious ingredients including peanuts, soy, dates, and oats. Both the bars i.e. Wheat based nutrition bar (WB) and Pearl millet nutrition bar (PMB) were stored in refrigerator for three months in vacuum packed low density polyethylene (LDPE) pouches and were evaluated for different parameters at regular intervals of 15 days.
Sensory evaluation: Bars were evaluated for their organoleptic characteristics by a panel of 10 semi-trained judges using nine point hedonic rating scale. The average mean score achieved for organopleptic characteristics i.e. color, appearance, aroma, texture and taste was expressed as overall acceptability (OA). Moisture uptake: Standard protocols [5] were used for assessing moisture gain in the bars, the procedure was repeated on every 15th day during three months storage. Chemical constituents: Fat acidity and peroxide value was determined using standard analytical procedures [6]. AOAC, 2000. Microbial count was determined in the bars using the method given by Olunlade *et al.* (2013) [7], employing potato dextrose agar (PDA) for ungal count and nutrient agar (NA) media for bacterial count. The data obtained was statistically analyzed using online software OPSTAT.

The tests applied included completely randomized design one-way ANOVA and paired t-test.

Results and Discussion

Sensory evaluation

Data obtained for sensory characteristics of pearl millet and wheat based nutrition bar depicted that both the bars were rated as 'liked very much' for their overall acceptability on the initial day of storage (Fig. 1). Even though both the bars lied in the same category, higher scores were achieved for PMB i.e. 8.42 as compared to WB having 8.20 as mean score for overall acceptability on zero day which declined to 6.36 for WB and 6.66 for PMB by the 90th day of storage. Mean acceptability scores in regard to colour, appearance, aroma, texture, and taste ranged from 'liked very much' to 'liked slightly' category for both the bars during 90 days of storage. Variations in scores were not remarkable till 45th day of storage whereas significant ($p \leq 0.05$) reduction in scores were observed 60th day onwards for all the sensory characteristics of PMB and WB (Table 1). Even with decline in mean scores for sensory characteristics, both the bars were found to be acceptable for consumption up till 90 days. Studies earlier done on energy bars and snack bars also quoted results in 'liked very much' category for their organoleptic characteristics [4]. Results of the present study were in corroboration by the results quoted by other researchers [8, 9, 10, 11] for the investigations done by them for evaluating shelf life of different cereal and composite bars.

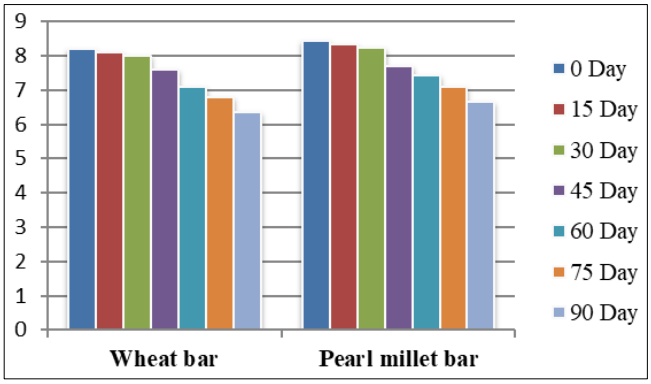


Fig 1: Effect of storage on overall acceptability of nutrition bars

Tab1e 1: Effect of storage period on organoleptic characteristics of nutrition bars

Organoleptic characteristics	Storage (Days)							CD ($p \leq 0.05$)
	0	15	30	45	60	75	90	
Colour								
Wheat bar	8.10±0.18	8.00±0.21	7.90±0.23	7.50±0.42	7.30±0.15	6.90±0.23	6.40±0.22	0.61
Pearl millet bar	8.50±0.22	8.40±0.27	8.30±0.26	7.60±0.48	7.20±0.33	6.90±0.28	6.60±0.16	0.85
t-value ($p \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	
Appearance								
Wheat bar	8.10±0.18	8.00±0.21	7.90±0.23	7.50±0.42	6.90±0.23	6.80±0.25	6.40±0.22	0.65
Pearl millet bar	8.50±0.22	8.40±0.27	8.30±0.26	7.60±0.48	7.60±0.40	7.10±0.35	6.80±0.25	0.93
t-value ($p \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	
Aroma								
Wheat bar	8.20±0.13	8.10±0.18	8.00±0.21	7.60±0.40	6.70±0.21	6.70±0.21	6.40±0.22	0.81
Pearl millet bar	8.00±0.26	8.00±0.26	7.90±0.23	7.30±0.42	7.30±0.34	7.00±0.30	6.70±0.21	0.57
t-value ($p \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	
Texture								
Wheat bar	8.30±0.15	8.20±0.20	8.10±0.23	7.90±0.45	7.40±0.31	7.00±0.30	6.70±0.21	0.74
Pearl millet bar	8.60±0.16	8.50±0.22	8.40±0.22	8.20±0.36	8.10±0.31	7.50±0.37	7.00±0.26	0.80
t-value ($p \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	
Taste								
Wheat bar	8.30±0.15	8.20±0.20	8.10±0.23	7.60±0.45	6.90±0.36	6.60±0.22	6.10±0.23	0.75
Pearl millet bar	8.60±0.17	8.30±0.21	8.20±0.20	7.70±0.45	7.20±0.31	6.90±0.31	6.40±0.31	0.80
t-value ($p \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	

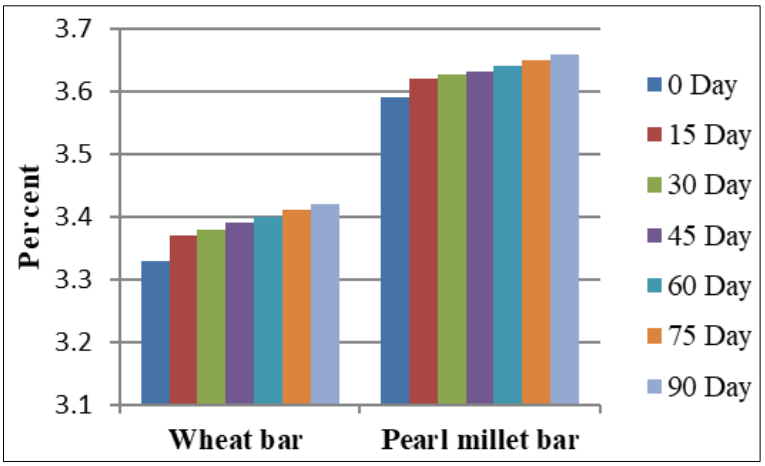
Values are mean ± SE of ten independent observations
NS: Non-significant

Moisture uptake

The values for moisture content were found to be 3.33 per cent and 3.59 per cent for WB and PMB, respectively on zero day storage. The values of moisture noted for both bars at every 15th day were found at par ($p \leq 0.05$) throughout the study showing no statistical variations and values increased to 3.42 per cent for WB and 3.66 per cent for PMB by the 90th day of storage (Fig. 2). The negligible gain in moisture for both the bars might be because of vacuum packaging and storage in refrigerator.

Fat acidity

The stored bars were analyzed for free fatty acids at 0, 15, 30, 45, 60, 75 and 90 days of storage period (Table 2). Fat acidity for PMB was significantly ($p \leq 0.01$) higher than WB on initial day of storage whereas the difference in peroxide value of both the bars was found to be non-significant by the end of storage period. Fat acidity was between 48.23 and 67.81 mg KOH/100g for WB and 51.27 and 69.04 mg KOH/100g for PMB on zero and 90th day of storage. The values for fat acidity of both the bars were noticed to increase significantly on every interval throughout the storage period. Similar pattern of increase in fat acidity during storage was observed by various other investigators who evaluated the storage effect on fat acidity of ready to eat food products [12, 13]. Likewise, increase in fat acidity during storage was observed for cereal bars and composite bars [8, 11].



Values are mean ± SE of three independent observations

Fig 2: Effect of storage period on moisture uptake of nutrition bars

Table 2: Effect of storage period on Fat acidity (mg KOH/100g) of nutrition bars (dry matter basis)

Type of bars	Storage (Days)							CD (p≤0.05)
	0	15	30	45	60	75	90	
Wheat bar	48.23±0.56	50.50±0.92	53.01±0.52	55.33±0.68	59.21±0.68	62.30±0.59	67.81±0.76	2.10
Pearl millet bar	51.27±0.20	53.83±0.41	56.62±0.64	58.33±0.53	61.59±0.42	64.99±0.29	69.04±0.27	1.28
t-value (p≤0.05)	5.10**	3.30*	4.38*	3.47*	2.96*	4.11*	1.54^{NS}	

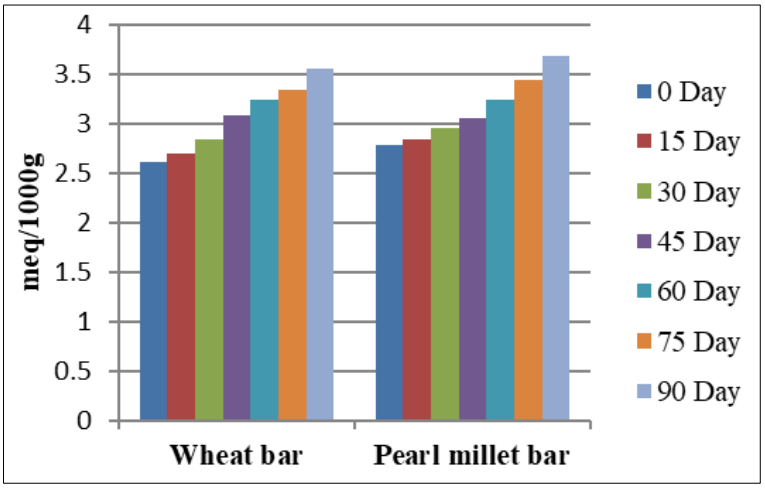
Values are mean ± SE of three independent observations
NS: Non-significant **Highly significant *Significant

Peroxide value

Wheat based nutrition bar did not have any significant ($p \leq 0.05$) difference in peroxide value as compared to pearl millet based nutrition bars (Fig.3). The range for peroxide value of WB was obtained as 2.61-3.56 meq/1000g for zero and 90th day of storage and the values were observed to increase significantly on the 30th day onwards. Whereas peroxide value for PMB ranged from 2.78-3.69 meq/1000g and values started to increase significantly by the 45th day of storage. Slight increase in peroxide value was constant throughout the storage period which was similar to the trend observed earlier for popped pearl millet bar [11].

Microbial count

No fungal colonies were detected in both the bars during 90 days storage whereas presence of bacterial colonies was found on the 60th day of storage. Values ranged from 3.15-7.80 log cfu/g for WB and 3.70-8.30 log cfu/g for PMB on 60th-90th day of storage (Table 3). The microbial count was within the permissible limits. Both the bars were found to be safe for consumption and were evaluated with shelf life of three months without any negative influence on their microbial characteristics. Previously done study [8] on composite cereal bars also reported microbiologically stable results for bars safely stored up till nine months.



Values are mean ± SE of three independent observations

Fig 3: Effect of storage period on Peroxide value (meq/1000g) of nutrition bars (dry matter basis)

Table 3: Effect of storage on microbial count (log cfu/g) of nutrition bars

Storage (Days)	Fungal count		Bacterial count	
	Wheat bar	Pearl millet bar	Wheat bar	Pearl millet bar
0	ND	ND	ND	ND
15	ND	ND	ND	ND
30	ND	ND	ND	ND
45	ND	ND	ND	ND
60	ND	ND	3.15	3.70
75	ND	ND	4.97	5.35
90	ND	ND	7.80	8.30

Values are mean ± SE of three independent observations
ND: Not-detected

Conclusion

To have a good shelf life is one of the very important factors for the acceptance of ready to eat food products like nutrition bars. The wheat based and pearl millet based nutrition bars evaluated in the present study had a good shelf of three months without any negative influence on their sensory, physical, chemical and microbiological aspects. The developed nutrition bars has a good market potential as they were composed of nutritious ingredients and had a good taste with decent shelf life. The bars can be conveniently prepared at household level and consumed by people of all ages.

References

1. Gutkoski LC, Bonamigo JMA, Teixeira DMF, Pedó I. Desenvolvimento de barras de cereais à base de aveia com alto teor de fibra alimentar. Ciência e Tecnologia de Alimentos. 2007;27(2):355-363. http://dx.doi.org/10.1590/S0101-20612007000200025.
2. Srebernich SM, Goncalves GMS, Ormenese RCSC, Ruffi CRG. Physico-chemical, sensory and nutritional characteristics of cereal bars with addition of acacia gum, inulin and sorbitol. Food Sci. Technol, Campinas. 2016;36(3):555-562.
3. Bansal T, Kawatra A, Sangwan V. Sensorial, Nutritional and Shelf Life Evaluation of Bio-fortified Millet based Cookies Supplemented with Carrot Powder and Sesame. Journal of Dairying, Foods & Home Sciences, 2021. Doi: 10.18805/ajdfr.DR-1696
4. Sun-Waterhouse D, Teoh A, Massarotto C, Wibisono R, Wadhwa S. Comparative analysis of fruit-based functional snack bars. Food Chemistry, 2010;119:1369-1379.
5. AOAC. Officials Methods of Analysis.Association of Official Analytical Chemists. Washington, D.C., U.S.A, 2010.
6. AOAC. Official Methods of Analysis. Association of official analytical chemist. Washington, D.C.Arhaliass, A., Legrand, 2000.
7. Olunlade BA, Adeola AA, Anuoluwapo AO. Microbial profile of maize-pigeon pea biscuit in storage. Fountain J. Nat. Appl. Sci. 2013;2:1-9.
8. Padmashree A, Sharma GK, Srihari KA, Bawa AS. Development of shelf stable protein rich composite cereal bar. Journal of Food Science and Technology. 2011;49(3):335-341. https://doi.org/10.1007/s13197-011-0283-6
9. Verma S, Khetrapaul N, Verma V. Development and Standardisation of Protein Rich Sorghum Based Cereal Bars. International Journal of Current Microbiology and Applied Sciences. 2018;**7(5)**:2842-2849. doi: https://doi.org/10.20546/ijcmas.2018.705.330
10. Sun-Waterhouse D, Teoh A, Massarotto C, Wibisono R, Wadhwa S. Comparative analysis of fruit-based functional snack bars. Food Chemistry. 2010;119:1369-1379.
11. Samuel KS, Peerkhan N. Pearl millet protein bar: nutritional, organoleptic, textural characterization, and in-vitro protein and starch digestibility. Journal of Food Science and Technology. 2020;57:3467-3473. https://doi.org/10.1007/s13197-020-04381-x
12. Johari A. Utilization of processed pearl millet (Pennisetum glaucum) in development of gluten free convenience foods. Ph.D. Thesis, CCSHAU, Hisar, India, 2017.
13. Mamta. Development and Nutritional Evaluation of Pearl Millet (*Pennisetum glaucum*) Based Convenience Foods. Ph.D Thesis, CCSHAU, Hisar, India, 2015.