# ORGANOLEPTIC EVALUATION OF BUCKWHEAT (*Fagopyrum esculentum*) BAR

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**Abstract**

 Buckwheat is one of the unrecognized and underutilized cereal grains which has many functional components. Due to rapid urbanization, life style and diet diversification, the demand for convenience foods is increasing. Consumers look for variety and handy snacks which are nutrient dense and healthy. Buckwheat was utilized in making nutribar due to its health promoting value. A preliminary survey was conducted on nutribars to assess the demand, preference and to know the awareness on the existence of this pseudo cereal. A standard nutribar recipe was formulated with most commonly used ingredients such as oats, almonds, peanuts, rice flakes, sugar and jaggery. Food product development and their acceptability appraisal through organoleptic evaluation were carried out by semi trained and untrained panel comprising of 21 panelists from the Department of Food Science and Nutrition, Mount Carmel College, Bengaluru. A sensory form along with standard written form of instructions were given to panelists and were asked to rate the bars (coded as 101-110) according to a 9-point hedonic scale consisting of preference ratings. Nutribars a popular snack were developed by incorporating varying proportions of buckwheat. All products were moderately acceptable except the product in which 25 % of buckwheat was added which was more acceptable than the standard and other variations which had a mean over all acceptability of 7.7286+0.8. When analyzed statistically, it was also found that there existed a significant difference at 1% level in the overall acceptability among the products formulated. Further, the product was evaluated for its nutritional composition and shelf life. The study therefore recognizes the potential incorporation of buckwheat in the formulation of variety of convenience foods owing to its nutritional composition and organoleptic properties. This nutri rich snack can be given for the children in developmental phase, malnourished children and for the people who are involved in intense energy activity like sports personnel's.

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## 1. Introduction

India is beginning to observe a dramatic change in food supply systems due to rapid urbanization, diet diversification and life style changes [1].The demand for convenience foods is an overarching trend in all countries and among all income population  due to consumer life style changes [2] . In addition to the convenience snacking, consumers being health conscious, they look for new trends in the technology and for the foods which will not only serve the purpose of variety but also provide with good health. It was said that following a healthy diet and minimum amount of physical activity are very important for maintaining an optimum weight and adequate nutritional support is essential to prevent lifestyle diseases [3]. One such convenient food which is a healthy alternative from confectionary and other foods is granola bar which was first introduced in U.S [4]. In recent years, fruit and energy bars were moreinto play due to its functional and energizing properties [5, 6, and 7]. Among these bars; cereal bars are the ones which are easily acceptable due to their balanced nutrition along with convenience factor [8]. Buckwheat belonging to the family Polygonaceae is one such pseudo cereal which is considered as a functional food which is not been used widely. Buckwheat in India is known by various vernacular names such as ogal, phaphar, bresha, kuttu, mittahe and titae. It is introduced into the diet as an alternative crop of renewed interest due to its nutritive and health promoting value. Buckwheat flour may be a valuable and important ingredient in food products, taking into consideration its nutritive value and potential promotion of human health [9]. Out of numerous species of buckwheat, only two are used in the food industry i.e. common buckwheat (*Fagopyrum esculentum)* and tartary buckwheat (*Fagopyrum tataricum*). Buckwheat grains contain numerous bioactive compounds and they are rich in vitamins, especially those of B group. It has higher lysine, copper and magnesium content than wheat flour. The significant contents of rutin, catechins and other polyphenols as well as their potential antioxidant activity are also of great significance. These functional components of buckwheat have health benefits like reducing high blood pressure, lowering cholesterol, controlling blood sugar and preventing cancer risk [10]. Keeping in mind, the need for convenient and healthy snacking and functional properties of buckwheat, it is added into granola bar to make it more nutritious and to better utilize this underutilized cereal grain. Hence a study was undertaken in which nutri bar was formulated along with other common ingredients which was analyzed for its nutritional value and shelf life.  This paper discusses about the organoleptic evaluation of the developed product.

## 2. Research Method

I.        **Procurement of ingredients**

The sample Buckwheat bar is made up of Buckwheat, oats, rice crisps, corn flour, sugar, jaggery, almonds and peanuts.Buckwheat and other ingredients required for making nutribar were selected based on the nutritional composition and regular usageof the products. Buckwheat and rice crisps were procured from online stores, while other ingredients likes oats, jaggery etc were brought from local stores. A standard nutribar was made with oats as a base.  Oats was chosen as a base not only for its adhesive capacity but also because, it has beta glucan and can exhibit cholesterol and glucose lowering effects. A combination of sugar and jaggery was taken in order to provide sweetness to the product and also improve the nutritional quality as jaggery is a good source of iron and helps boost immunity apart from being a good binding agent for holding the ingredients. Corn starch was also used for binding purpose along with sugar and jaggery. Peanuts and almonds, which are sources of protein and healthy mono unsaturated fatty acids respectively, were

added to provide good texture and the crunchiness to the finished product. On the other hand, Buckwheat was incorporated at varying levels starting from 25 per cent and up to 95 per cent based on the literatures reviewed. The quantity of buckwheat was kept at minimum level of 25 % considering the nutritional composition of the end product and also to develop a calorie dense nutria bar.

II.     **Processing of the raw ingredients:**

Ingredients like peanuts and almonds were dry roasted in a tava initially and were pounded in a pestle and motor to get coarse granules. The sugar and the jaggery were caramelized separately to which corn flour was added in dilutions to avoid lump formation. Later, all the dry roasted ingredients were mixed with caramelized mixture and spread in a butter coated baking tray in order to avoid stickiness and breakage. It was then allowed to freeze for 15-20 minutes for the mixture to set into required shape and then cut into bars of equal size.



**Fig 1: Standard Nutribar**

III.    **Panel Selection:** Food product development and their acceptability appraisal through organoleptic evaluation were carried out by semi trained and untrained panel comprising of 21 panelists from the Department of Food Science and Nutrition, Mount Carmel College, Bengaluru. Nutribars including the control and the experimental variations were coded randomly from 101 to 110 to avoid preassumption of sensory attributes. Initially history of the panelists like their diet pattern, taste of preference along with experience in sensory evaluation was noticed. Sensory panel screening and evaluation are the two important factors before performing sensory evaluation. These preliminary steps were performed and data was collected about the panelists in order to evaluate the correct outcomes of sensory evaluation by avoiding errors. The effective evaluation of the product depends on the discriminative, descriptive and affective analysis of the panelists. The sensitiveness towards various products will reveal the effectiveness in sensory evaluation. The mission of this to differentiate the products based on the consumers liking or preference levels [11].

IV.    **Outcome measures:** A sensory form along with standard written form of instructions were given to panelists and were asked to rate the bars according to a 9-point hedonic scale consisting of preference ratings varying from like extremely

to dislike extremely to assess their preference and liking. Evaluation of taste, flavor, color, texture, appearance, mouth feel and overall acceptability were made in the scale. For every sample, the panelists were asked to rinse their mouth with water at room temperature to avoid particular taste or aroma of one product.

V.  **Quality control:** Quality control is a mandatory procedure in any product development, in order to fulfill the quality requirements of the consumer.High quality is not an added value; it is an essential basic requirement [12]. The products quality is maintained by educating and making panelists about the basic needs. The health status of the panelists is an important factor to be considered. Poor health status will have negative impact on the outcomes of sensory evaluation. Therefore, it is very important that the selected panelists are fit and healthy. The panelists enrolled for the sensory evaluation were made sure that they are healthy and free from any diseases. The selected panels were asked to avoid eating, drinking, smoking or chewing gum for 30 minutes before testing. This will interfere with the taste and other attributes while evaluating the developed products. The products displayed for the evaluation were made sure that the panels evaluate in the given order in order to avoid previous assumptions.

During the sensory evaluation it was assured that the environment and area where it was performed was isolated and an aroma free environment was maintained. Each panelist was allotted separated area. The objective was to ensure to avoid distraction and personal choices. The panel group was made sure that they will interact with other participants only after the completion of sensory evaluation. The panelist's were motivated to be confident about their evaluation. The information regarding individual's likes and dislikes and personal prejudices was made aware to the panelists before evaluation the product. Finally, the environment should be free from odor.

## 3. Results and Analysis

On organoleptic evaluation, all products with Buckwheat incorporated were found to be satisfactory at different variations along with the standard sample without buckwheat added to it. Although the scores of standard product were more acceptable when compared to the experimental ones, it was observed that, the product with 25 per cent of Buckwheat has maximum acceptability in terms of taste, texture, overall acceptability and other attributes. It was noticed that, the rating for the products with increased proportion of buckwheat had inverse result in the organoleptic acceptability.

Table 1concluded that, the acceptable percentage of buckwheat in various food products is up to 95 per cent, the maximum acceptance in buckwheat bar was only 25 per cent with regard to taste, texture, appearance, flavor and overall acceptability when compared to other products with a mean over all acceptability of $7.7286 \pm 0.8$. When analyzed statistically, it was also found that there existed a significant difference at 1 per cent level in the overall acceptability among the products formulated. The nutribar which was highly acceptable was superior in terms of all the attributes like taste, color, texture, flavor and overall acceptability. On statistical analysis, the mean value of the color was $7.8 \pm 1.03$, taste having $7.7619 \pm 0.99$ mean value, flavor and appearance of $7.809 \pm 1.0$ and $7.66 \pm 1.1$ respectively. While $7.619 \pm 1.02$ and $7.8095 \pm 1.03$ were the mean values of texture and mouth feel. Thus, the developed product with 25 per cent buckwheat had overall acceptability with respect to all organoleptic characteristics.

From the table 2, it was evident that color, flavor, texture, appearance and mouth feel was significantly correlated at 1% level. It can be concluded that all the sensory attributes were correlated leading to overall acceptability.

Table 3 which shows theSensory attributes between standard and the developed variations, statistically interpreted that the different attributes are dependent on each other for the final outcome of the food product being developed. It also depicts thatrespect to color, flavor, appearance, taste, texture, mouth feel and overall acceptability attributes, there was significant difference observed at 1% level in all the samples with F value as 3.071, 7.807, 3.647, 11.878, 8.347, 11.508, and 10.270 respectively.

The most favorable color, flavor, appearance, taste, texture, mouth feel and over all acceptability attributes among the variations was the bar with 25 per cent of Buckwheat, with mean value and standard deviation ranging between 7.6-7.8 and 0.8-1.1 respectively.

## 4. Conclusion

The scores of the variation with 25 per cent of buckwheat had maximum acceptability with respect to all organoleptic properties like taste, texture, appearance, mouth feel and overall acceptability. It was also concluded from the study that the maximum acceptance of buckwheat in developing a nutribar was only 25 per cent. An inverse relation was found between the increased proportion of buckwheat among different variations and the organoleptic acceptability of the products by the semi trained panel members. The studies also prove that it can help in lowering cholesterol, neuroprotection, anticancer, anti-inflammatory, antidiabetic and antihypertensive effects. In addition, it also has been reported to possess prebiotic and antioxidant properties which help in prevention of various health diseases [13]. The study therefore recognizes the potential incorporation of buckwheat in the formulation of variety of convenience foods owing to its nutritional composition and organoleptic properties.

## References

[1].Pingali, P., & Khwaja, Y. (2004). Globalisation of Indian diets and the transformation of food supply systems. *Indian Journal of Agricultural Marketing*, *18*(1).

[2]. Hollinger, F. and J. Staatz (2015). Agricultural Growth in West Africa: Market and Policy Drivers. Rome: FAO

[3]. Daily news and analysis, Sep.2016. High prevalence of lifestyle disorders making Indians diet conscious:

Survey.

[4]. Agbaje R, Hassan CZ, Arifin N, Rahman AA. 2014. Sensory preference and mineral contents of cereal bars made from glutinous rice flakes and Sunnah foods. J Environ Sci Tox Food Technol 8(12):26–31.

[5]. Katz F. 1999. "How nutritious?" meets "how convenient?" Food Technol 53:44–50.

[6]. Izzo M, Niness K. 2001. Formulating nutrition bars with inulin and oligofructose. Cereal Foods World 46:102–6.

[7]. Pfluger K. 2002. Handbuch Produktentwicklung Lebensmittelinnovationen. Behr's Verlag, Hamburg, Germany.

[8]. Dutcosky SD,GrossmannMVE,SilvaRSSF,WElschAK.2006.Combined sensory optimization of a prebiotic cereal products in multi component mixture experiments. FoodChem98:630– 8.

[9]. Christa, K., & Soral-Śmietana, M. (2008). Buckwheat grains and buckwheat products–nutritional and prophylactic value of their components–a review. *Czech Journal of Food Science*, *26*(3), 153-162.

[10]. Kumar, R., bhayana, S., & kapoor, S. (2015). The role of functional foods for healthy life: current perspectives. *Int j pharm bio sci*, *6*, 429-443.

[11]. Stone H., Sidel JL. 2004. Sensory Evaluation Practices. 3rd ed. San Diego, CA. Elsevier Academic Press.

[12]. Manghani, K. (2011). Quality assurance: Importance of systems and standard operating procedures. *Perspectives in Clinical Research*, *2*(1), 34–37.

[13]. Giménez-Bastida, J. A., Piskuła, M. K., & Zieliński, H. (2015). Recent advances in processing and development of buckwheat derived bakery and non-bakery products–a review. *Pol. J. Food Nutr. Sci*, *65*, 9-20.

## Tables  Table 1: Comparison of Mean sensory attributes

| Buck wheat bar | Color | Flavor | Appearance | Taste | Texture | Mouth Feel | OA |
|---|---|---|---|---|---|---|---|
| Std | 7.90±1.0 | 7.62±0.97 | 7.66±1.0 | 7.8095±0.98 | 7.619±1.16 | 7.7143±1.34 | 7.6857±1.0 |
| V 1 | 7.47±1.2 | 7.428±0.4 | 7±1.4 | 7.4762±1.47 | 7.1429±1.45 | 7.4286±1.32 | 7.3476±1.3 |
| V 2 | 7.8±1.03 | 7.809±1.0 | 7.66±1.1 | 7.7619±0.99 | 7.619±1.02 | 7.8095±1.03 | 7.7286±0.8 |
| V 3 | 7.0±1.34 | 6.905±1.3 | 6.86±1.2 | 6.7619±1.22 | 6.7619±1.37 | 6.6667±1.23 | 6.781±1.12 |
| V 4 | 6.52±1.2 | 5.952±1.2 | 6.14±1.4 | 6±1.64 | 5.6667±1.59 | 6.1429±1.45 | 6.0381±1.1 |
| V 5 | 7.5±0.81 | 7.190±0.8 | 7.38±0.8 | 7.2381±1.13 | 7.2381±1.37 | 7.1429±1.15 | 7.2571±0.8 |
| V 6 | 7.0±1.26 | 6.285±1.4 | 6.95±1.0 | 6.0476±1.39 | 6.1429±1.35 | 6.3333±1.42 | 6.4381±1.1 |
| V 7 | 7.2±1.16 | 5.905±1.4 | 6.85±0.8 | 5.619±1.32 | 5.8095±1.45 | 5.5714±1.53 | 6.119±1.03 |
| V 8 | 6.9±1.16 | 6.048±1.7 | 6.90±1.1 | 5.5714±1.36 | 5.619±1.65 | 5.1905±1.53 | 5.9857±1.1 |
| V 9 | 6.80±1.1 | 5.524±1.7 | 6.47±1.1 | 5.1905±1.36 | 5.2857±1.52 | 5.2381±1.22 | 5.719±1.07 |

## Table 2: Correlation of sensory attributes between standard and variations

| ATTRIBUTES | r value | p value |
|---|---|---|
| Color Vs Taste | .556 | |
| Color Vs Flavor | .565 | |
| Color Vs Appearance | .753 | |
| Color Vs Texture | .536 | |
| Color Vs Mouth feel | .543 | |
| Color Vs Overall acceptability | .733 | |
| Flavor Vs Appearance | .616 | .000** |
| Flavor Vs Taste | .870 | |
| Flavor Vs Texture | 784 | |
| Flavor Vs Mouth feel | .743 | |
| Flavor Vs Overall acceptability | .892 | |
| Appearance Vs Taste | .595 | |
| Appearance Vs Texture | .640 | |

| | |
|---|---|
| Appearance Vs Mouth feel | .591 |
| Appearance Vs Overall acceptability | .779 |
| Taste Vs Texture | .862 |
| Taste Vs Mouth feel | .841 |
| Taste Vs Overall acceptability | .928 |
| Texture Vs Mouth feel | .845 |
| Texture Vs Overall acceptability | .914 |
| Mouth feel Vs Overall acceptability | .896 |

** Significant at 1% level          * Significant at 5% level

**Table 3: Sensory attributes between standard and the developed variations**

| Attributes | | Sum of Squares | Df | Mean Square | F | P value |
|---|---|---|---|---|---|---|
| Color | Between Groups | 36.481 | 9 | 4.053 | **3.071** | **.002** |
| | Within Groups | 264.000 | 200 | 1.320 | | |
| | Total | 300.481 | 209 | | | |
| Flavor | Between Groups | 127.048 | 9 | 14.116 | **7.807** | **.000** |
| | Within Groups | 361.619 | 200 | 1.808 | | |
| | Total | 488.667 | 209 | | | |
| Appearance | Between Groups | 43.981 | 9 | 4.887 | **3.647** | **.000** |
| | Within Groups | 268.000 | 200 | 1.340 | | |
| | Total | 311.981 | 209 | | | |
| Taste | Between Groups | 181.833 | 9 | 20.204 | **11.878** | **.000** |
| | Within Groups | 340.190 | 200 | 1.701 | | |
| | Total | 522.024 | 209 | | | |
| Texture | Between Groups | 148.671 | 9 | 16.519 | **8.347** | **.000** |
| | Within Groups | 395.810 | 200 | 1.979 | | |
| | Total | 544.481 | 209 | | | |
| Mouth feel | Between Groups | 185.048 | 9 | 20.561 | **11.508** | **.000** |
| | Within Groups | 357.333 | 200 | 1.787 | | |
| | Total | 542.381 | 209 | | | |
| Overall acceptability | Between Groups | 106.715 | 9 | 11.857 | **10.270** | **.000** |
| | Within Groups | 230.914 | 200 | 1.155 | | |
| | Total | 337.629 | 209 | | | |

** Significant at 1% level