Nutri Bori- A Popular Traditional Pulse Based Chunk

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ABSTRACT

The main aim of the study was to formulate organoleptic accepted *nutri bori* from locally available highly nutritious chowchow, chives, black gram and spices in different ratios and to study the proximate and sensorial quality. Bori was prepared in rural areas using mostly black gram pulse. The proximate content for protein, carbohydrate, fat and moisture were analysed. The result showed that *Nutri Bori* contained 18.9 % protein, 55.4 % carbohydrate 0.81% fat content and low moisture content (5.6 %) which is one of important factor for increasing shelf life of the product. The sensory quality was assessed by using 9 point hedonic scale and possessed high sensory quality in terms of colour, flavour, texture, taste, appearance and overall acceptability.

Key words: Bori, chow chow, black gram, chives, organoleptic

INTRODUCTION

Nutri Bori is a popular traditional legume based nutri chunk prepared by mixing chow chow, black gram and spices. Chow chow (*Sechium edule*) is an underutilized nutraceutically rich vegetable which is very good for diabetes, heart disease, kidney problem and also helpful in the prevention of cancer. Bori is generally prepared in rural areas using mostly black gram pulses (Swami *et al,* 2005). It is an important source of complimentary proteins which add variety to diet for human population. They contribute as high protein constituent in the vegetarian diet. Being an inexpensive protein source*, bori* can be replaced to meat and play an important role in eradicating protein-energy malnutrition. It is the product of pulses which is also a good source of vitamins, minerals and dietary fibre (Tharanathan and Mahadevamma, 2003). Texture is also one of the most important sensorial quantitative characteristics. The process of *bori* production is carried out under optimal condition, some changes occur in the texture of primary products which affects the quality of *bori*. Asafoetida, jeera, coriander and chives are the common spices used for this preparation. The popular common *bori* prepared by the women entrepreneurs in Manipur are mainly from *besan* and black gram only but the quality, shelf life and nutritional value of these bori were of question. So to increase the nutritional value, shelf life and sensory attribute, an attempt was made to prepare this *Nutri Bori* to increase productivity and to enhance utilization of chow chow and black gram which was an important ingredients of bori. Keeping in view, the present study was taken up with the objectives to find out the proximate value and sensorial acceptability of the *nutri bori*.

MATERIALS AND METHODS

Collection of study materials

Matured, fresh and good quality chow chow and chives were collected from local market Imphal, Manipur.
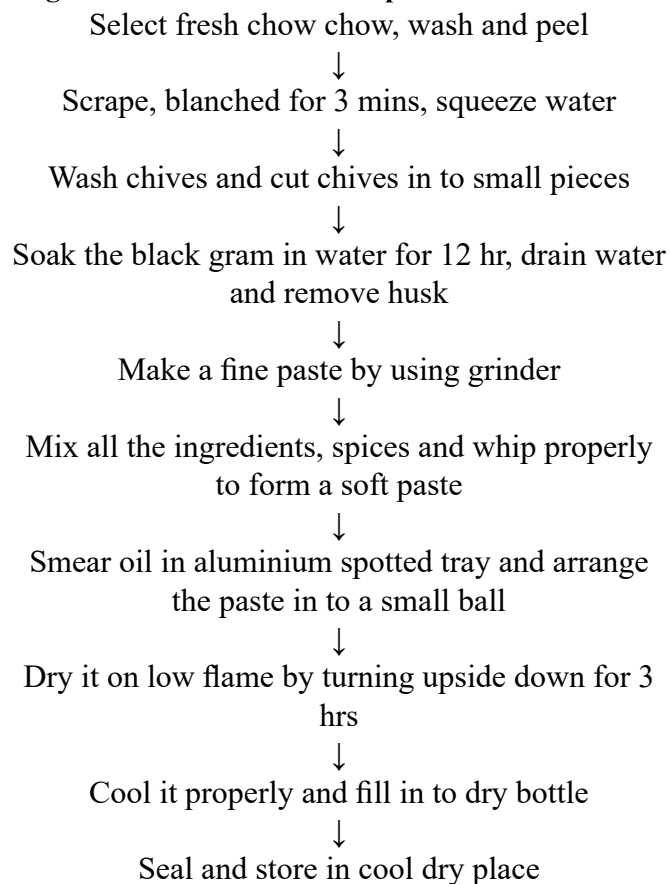
Preparation of Bori

Select fresh chow chow, peel and scrap it, blanched, add preservative, squeeze and keep aside. Soak the black gram in plain water about 12 hr. Drain the excess water, wash properly and remove the husk. Transfer the washed black gram to a grinder and grind it into fine paste. Wash the chives and cut it into fine pieces. Mix the black gram paste with blanched chow chow and spices. For drying prepare a drying tray using aluminum spotted sheet and dry it in a very low flame. Before

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Table 1. Composition of Nutri Bori Prepared with different formulations.

Sample	Composition
T1	1kg black gram paste+ asafoetida 5gm+jeera 5gm+5gm mix spices
T2	900g black gram paste+100g chow chow treated with 5g asafoetida+ jeera 6g+6g coriander seed powder +15g chives
T3	800g black gram paste+200g chow chow chow treated with 5g asafoetida+7g jeera +7g coriander seed powder+15g chives
T4	700g black gram paste+300m chow chow chow treated with 5g asafoetida+ jeera 8 g+8g coriander seed powder+15g chives
T5	600g black gram paste+400g chow chow treated with10g asafoetida+ jeera 10g+10g coriander seed powder +20g chives

putting the bori the tray was smeared with cooking oil. When the tray is ready, add small amount of paste into the tray and dry it for 3 hr. For proper drying put the bori upside down and continue the process till properly dried When cooled, fill in the sterilized packaging material and seal properly to maintain the proper moisture label.

Fig 1: Flow Chart for the Preparation of *Nutri Bori*

Select fresh chow chow, wash and peel
↓
Scrape, blanched for 3 mins, squeeze water
↓
Wash chives and cut chives in to small pieces
↓
Soak the black gram in water for 12 hr, drain water and remove husk
↓
Make a fine paste by using grinder
↓
Mix all the ingredients, spices and whip properly to form a soft paste
↓
Smear oil in aluminium spotted tray and arrange the paste in to a small ball
↓
Dry it on low flame by turning upside down for 3 hrs
↓
Cool it properly and fill in to dry bottle
↓
Seal and store in cool dry place

Proximate composition

Moisture content was measured using automatic moisture analyzer (Shimadzu, Japan), crude protein (Method no. 955.04) and fat (Method No. 2003. (05) contents were determined according to AOAC methods (2005). Total carbohydrate was determined by anthrone method (Sadasivam and Manickam, 1992).

Sensory evaluation

Sensory evaluation was carried out by cooking bori with vegetables for all the differently treated nutri bori after 3 days maturation period. 40 semi-trained panelists evaluated the sensory attributes nutri bori curry. Panelists were familiar with product sensory evaluation; most having trained on preparation of *bori*. The attributes evaluated were colour, aroma, taste, texture, appearance and overall acceptability. For each sample (bori curry), panelists scored their liking of these characteristics using the nine points Hedonic scale as described by Joshi, 2006. Average scores for each parameter are reported. The scores represented 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5 = neither like nor dislike, 6 = like slightly, 7 = like moderately, 8 = like very much and 9 = like extremely.

Data analysis and visualization

Means of three replicates and standard deviations of the means were calculated for all the sensory parameters. Statistical analysis was

Table 2. Mean score for performance of colour, flavour, texture, taste and overall acceptability of various sample of *nutri bori*.

Sample Code	Colour	Flavour	Taste	Appearance	Texture	Overall Acceptability
T1	6.5c	6.8b	6.7d	6.9d	6.6c	6.8bc
T2	7.2ab	7.0a	7.1bc	7.3bc	7.2ab	7.1bc
T3	7.4ab	7. 2a	7.3b	7.5bc	7.4ab	7.3bc
T4	7.6a	7. 4a	7.5b	7.8b	7.7a	7.6b
T5	8.0a	7.6a	8.2a	8.3a	7.8a	8.1a

Values in the same column followed by different letters are significantly different at p < 0.05 according to Duncan's multiple-range test for separation of means (Values are means of three replicates)

performed by Windows-based SPSS version 22.0. Differences were separated using post-hoc tests with multiple comparisons of means of sensory parameters using Duncan's Multiple Range Test. Pearson's correlation coefficient analysis was performed to evaluate relationships between the sensory parameters under investigations using the same statistical package. The 5% probability level is regarded as statistically significant. Pearson's correlation coefficient analysis and cluster analysis were computed to identify the relationship between the sensory parameters. Cluster analysis (CA) helps in grouping objects (cases) into classes (clusters) on the basis of similarities within a class and dissimilarities between different classes. The results of CA help in interpreting the data and indicate patterns of clustering.

RESULTS AND DISCUSSION

Proximate analysis was done at ICAR, Research Complex for NEH Region Manipur Centre. The protein and carbohydrate content of the present study was 18.9 and 55.5g per 100 g of sample. The fat content was 0.81g per 100g. As the fat content was very low and protein high, these nutri bori can be used as a nutrient supplement for vegetarian population and also for malnourished people. The moisture content was also very low which indicates that the shelf life of the product can be extended up to one without any deterioration.

Sensory evaluation

The mean sensory scores of *nutri bori* curry as evaluated by the testing panel are presented inTable.4 and presented in Fig.2. It was seen that T5 scored the highest for colour (8.0), flavour (7.6), taste (8.2), texture (7.8), appearance (8.3) and overall acceptability (8.1), while T1 scored the lowest for all the attributes. It was observed that sensory scores improved with the increase in concentrations of black gram and spices.

Correlation analysis

Results of the Pearson's correlation coefficient analysis (Table 3) revealed the existence of highly significant positive correlation between colour with flavour ($p < 0.01$ and $r = 0.975$), taste ($r = 0.979$), texture ($r = 0.975$), appearance ($r = 0.991$), and overall acceptability, ($r = 0.982$).Similarly, flavour a significant positive correlation with taste ($p < 0.05$ and $r = 0.915$), while it had highly significant positive correlation($p < 0.01$) with texture ($r = 0.946$), appearance ($r = 0.958$), and overall acceptability, ($r = 0.975$).Taste was found to correlate significantly $p < 0.01$) with texture ($r = 0.994$),appearance ($r = 0.980$), and overall acceptability, ($r = 0.926$). Likewise, texture also exhibited a significant positive correlation with ($p < 0.01$) appearance ($r = 0.995$), and overall acceptability, ($r = 0.960$). Appearance and overall acceptability observed a significant positive correlation ($p < 0.01$ and $r = 0.971$). The overall results of correlation analysis indicates

Table 3. Pearson's correlation coefficient (r) matrix between the sensory parameters

	Colour	**Flavour**	**Taste**	**Appearance**	**Texture**	**Overall ac- ceptability**
Colour	1.000	-0.193	0.956	0.972	0.983	0.955
Flavour	-0.193	1.000	0.009	-0.083	-0.336	-0.055
Taste	0.956	0.009	1.000	0.993	0.904	0.993
Appearance	0.972	-0.083	0.993	1.000	0.941	0.998
Texture	0.983	-0.336	0.904	0.941	1.000	0.921
Overall accepta- bility	0.955	-0.055	0.993	0.998	0.921	1.000

The correlation coefficient (r) values are significantly positive at $p < 0.01$ (Boldfaced italics) and $p < 0.05$ (Bold) levels of probability (2-tailed)

that all the sensory parameters were correlated to each other and this implies that the increment in one of the sensory parameters improved the other parameters and vice-versa; Similar finding was reported by Shanta *et al* (2014) who also found correlation between colour, flavour, texture and overall acceptability as if any one of the parameters increases the other parameters also increases and overall acceptability of the product also increases.

Cluster analysis of sensory parameters

To validate the results of correlation analysis cluster analysis was performed to see the affinity and extent of the relationship between the visual parameters. The results of cluster analysis were visualized and showed the formation of two dominant clusters viz., cluster I comprising of taste, appearance and texture and cluster II consisting of colour and acceptability. The most likely reason for the formation of similar clusters in respect of visual parameters is due to the existence of a highly positive and significant correlation between them as evident in correlation.

CONCLUSION

Nutri bori is a popular traditional pulse based chunk mainly used for the preparation of vegetarian dishes as a substitute of meat and fish. It is prepared by mixing nutri rich chow chow, black gram and

spices which is very good for diabetes, heart disease, kidney problem and also helpful in the prevention of cancer. It was found that *nutri bori* have high nutraceutical value which is very good source of protein, carbohydrate and low fat content. It was found that *nutri bori* mixed with vegetable curry have good organoleptic score and among the five treatments T5 was the best treatment for preparation of nutri bori. This study revealed good prospect on the processing of pulses and can be adopted on large scale by the rural youth, women entrepreneurs and farm women in order to increase the nutritional status, to generate income and also for increasing employment opportunities for sustaining livelihood.

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REFERENCES

Enujiugha V(2010). The antioxidant and free radical-scavenging capacity of Phenolics from African loctus bean seeds, Adv in Food Sci 32(2):88- 93.

Jacobs D R Gallahar D D (2004). Whole grain in take and cardiovascular diseases:A review, Current Atherosclerosis reports 6:415-423.

Khandelwal S, Udipi S A, Ghugre P (2010). Polyphenols and tannins in Indian pulses: effect of soaking, germination and pressure cooking, Food Res Int 43:526- 530.

S.B. Swami, S.K, Das and B, Maiti. Moituresorption isotherms of black gram nugget (bori) at varied temperatures. *Journal of Food Engineering 2005:67(4) 471*

Tharanatan RN, Mahadevamma S. Grain legumes-a Boon to human nutrition, *Trends in Food and Science Technology 2003;14:507- 518.*