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Standardization, development and organoleptic evaluation of nutri bar supplemented with barley (*Hordeum vulgare*)

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Abstract

In this study the standardization and development of Nutri bar supplemented with barley flour were investigated. The formulation was carried out using barley flour, germinated barley flour and barley roti powder in preparation of nutri bar viz., T1, T2 and T3 containing 25% barley flour, germinated barley flour and barley roti powder respectively. Prepared Nutri bar were evaluated for organoleptic properties with respects to colour, flavor, texture, taste and overall acceptability using 9 point hedonic scale. The results revealed that nutri bar prepared with supplementation of 25% barley roti powder (T3) achieved highest score (i.e. 8.5) and was superior over the rest of samples. As barley is highly nutritious and is richest source of β -glucan and minerals had found better suitability in supplementation and nutritional enrichment of nutri bar.

Keywords: Barley, Germination, Nutri bar, jaggery, sensory evaluation

Introduction

Energy bars are supplemental bars containing cereals and other high energy foods targeted at people who require quick energy but do not have time for a meal. They are different from energy drinks, which contain caffeine whereas bars provide food energy.

Different processing techniques cereal grains constitute a major source of energy and nutrients in the world. The benefits of cereals to human health are the subject of extensive research and epidemiological studies, which have linked whole grain intake to the prevention of metabolic syndrome, obesity, and associated chronic diseases such as cardiovascular disease and two types of diabetes. The health benefits of cereals are primarily caused by their phytochemicals including phenolic acids, flavonoids, vitamins, fiber, and minerals, which act together to combat oxidative stress, inflammation, hyperglycaemia, and carcinogenesis (Poutanen, 2012; Wang, Wu, & Shyu, 2013) [1, 2].

The various barley (*Hordeum vulgare*) cultivars, hull-less barley has recently been receiving considerable research attention concerning the development of functional food, as it is an excellent source of both soluble and insoluble fibre. The total β -glucan content of hull-less barley is higher than that of hulled barley genotypes; whereas the insoluble dietary fibre content is lower (Xue *et al.*, 1997; Blandino *et al.*, 2015) [3, 4]. It is considered as one of the most important cereals worldwide owing to its multiple uses as human food, animal feed, and substrate for malting. Approximately 65% of cultivated barley is used for animal feed, 33% for malting, whereas only 2% is used directly for human consumption (Sullivan *et al.*, 2013) [5].

The health benefits of barley are mainly due to the β -glucan and phenolic compounds. Among cereals, barley has one of the highest levels (up to 6%) of β -glucan, a water soluble polysaccharide nutritionally classified as soluble dietary fiber (Newman *et al.*, 1989) [6]. It is now regarded as an important functional ingredient to lower plasma cholesterol, reduce glycemic response and promote weight management (Izydorczyk & Dexter, 2008) [7]. According to Health Canada and the US Food and Drug Administration, consuming at least 3 grams per day of barley beta-glucan or 0.75 grams per serving of soluble fiber can lower levels of blood cholesterol, a risk factor for cardiovascular diseases (Khoury *et al.*, 2012) [8]. Meanwhile, several studies prove the positive health-related effects of β -glucan from barley and oat. These studies provide the basis for already approved health claims related to the reduction of cholesterol levels and glycemic response (Schlörmann and Gleis, 2017) [9].

Jaggery or ‘Gur’ is a pure, wholesome, traditional, unrefined, whole sugar made by the concentration of sugarcane juice without the use of any preservatives. Jaggery is one of the ancient sweetening agents known to man and is an integral part of the rural diet in many countries (Mandal *et al.*, 2006)^[10]. Jaggery may be light golden, dark golden, light brown in colour (Sharon *et al.*, 2013)^[11]. Compared to 99.9% sucrose content of sugar, Jaggery contains 70–85% sucrose, 10–15% reducing sugar, 1–2% minerals like calcium, iron and phosphorous, vitamin A and B, protein and fats (Rao and Narayana, 1999)^[12]. Groundnut also beneficial because it contains 44 to 56% oil and 22 to 30% protein on a dry seed basis and is a rich source of minerals (P, Ca, Mg and K) and Vitamins (E, K and B group) (savage and Keenan, 1994)^[13]. The nutritional importance of peanuts is due to the energy and growth supplementing constituents present in them. These include carbohydrates, lipids, proteins, vitamins, minerals, some organic acids and purines.

Materials and Methods

Raw materials like barley, jaggery, groundnuts, sesame, almond and liquid glucose etc. and packaging materials were procured from the local market of Parbhani. The formulation and investigation were conducted in the department of food chemistry and nutrition, college of food technology, VNMKV, Parbhani

Methods

Preparation of groundnuts split

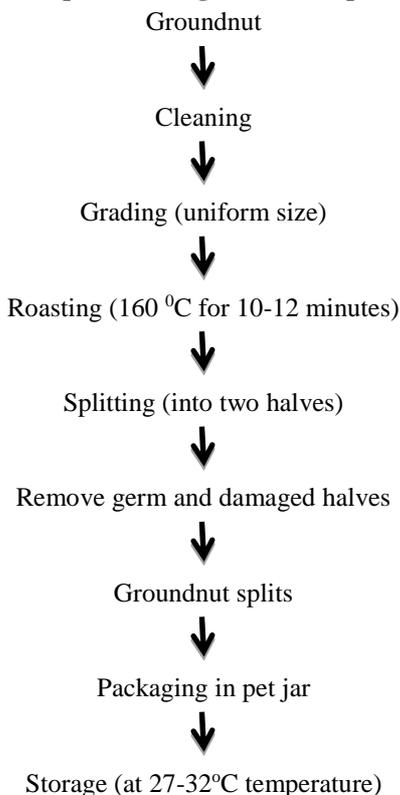


Fig 1: Flow sheet for the preparation of groundnut splits

Preparation of barley flour

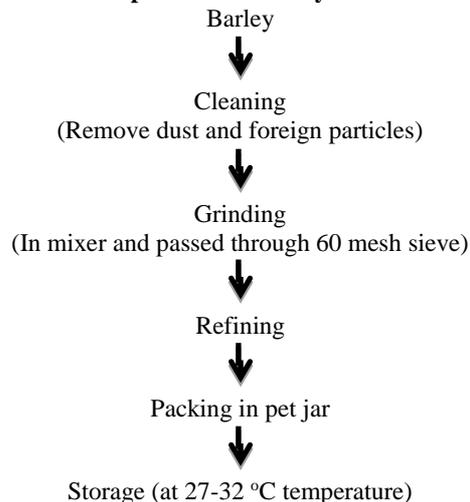


Fig 2: Flow sheet for the preparation of groundnut splits

Preparation of germinated barley flour

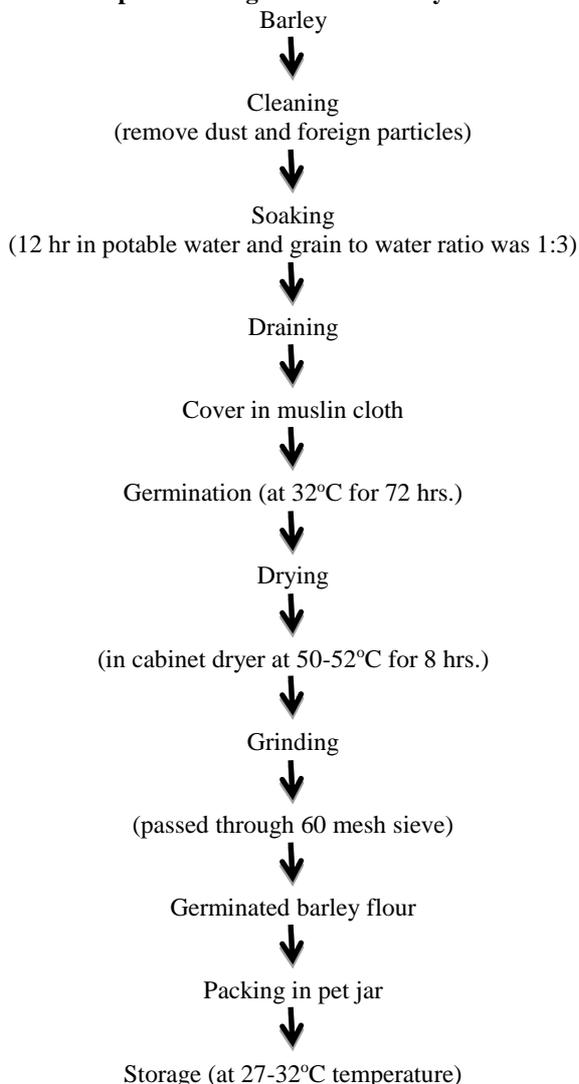


Fig 3: Flow sheet for the preparation of germinated barley flour

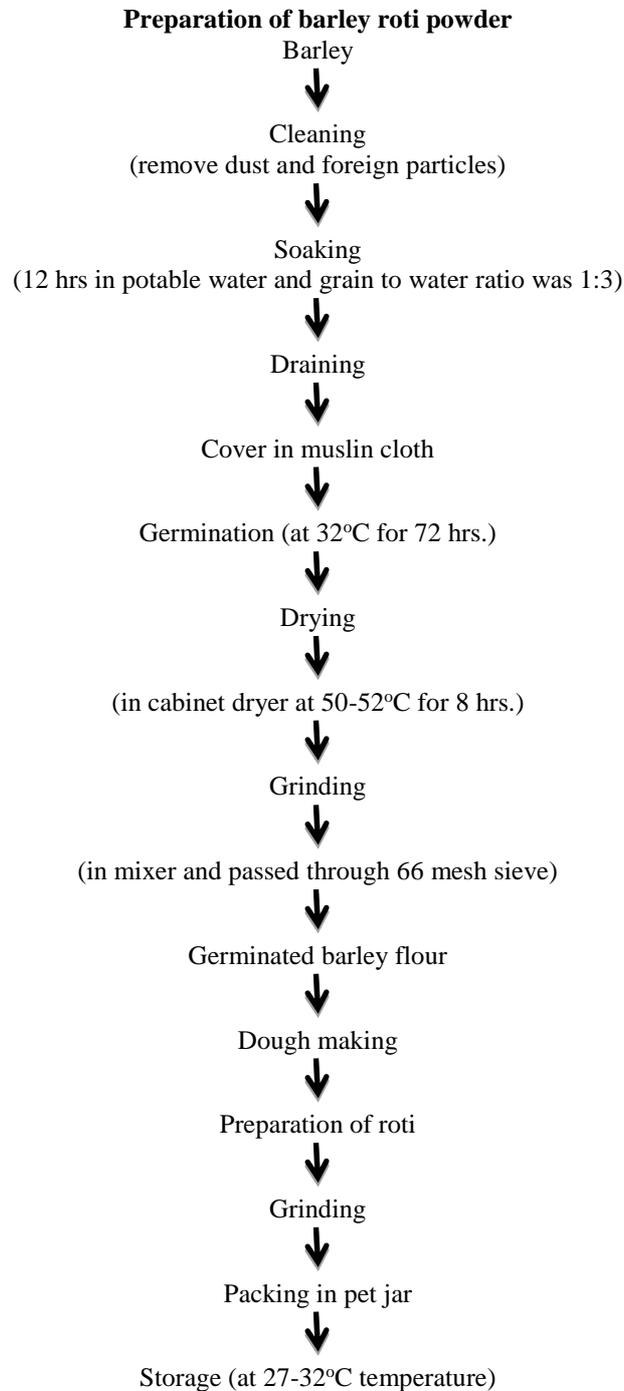


Fig 4: Flow sheet for the preparation of barley roti powder

Formulation of nutri bar

Table 1: Formulation of nutri bar with incorporation of barley flour, germinated barley flour and barley roti powder.

Sr. No.	Ingredients (g)	T ₀	T ₁	T ₂	T ₃
1	Barley flour	-	25	-	-
2	Germinated Barley flour	-	-	25	-
3	Barley roti powder	-	-	-	25
4	jaggery	50	50	50	50
5	Peanuts	30	30	30	30
6	sesame	13	13	13	13
7	almond	02	02	02	02
8	cashew	02	02	02	02
9	Liquid glucose	01	01	01	01
10	Baking powder	01	01	01	01
11	Ghee	01	01	01	01

Preparation of nutria bar

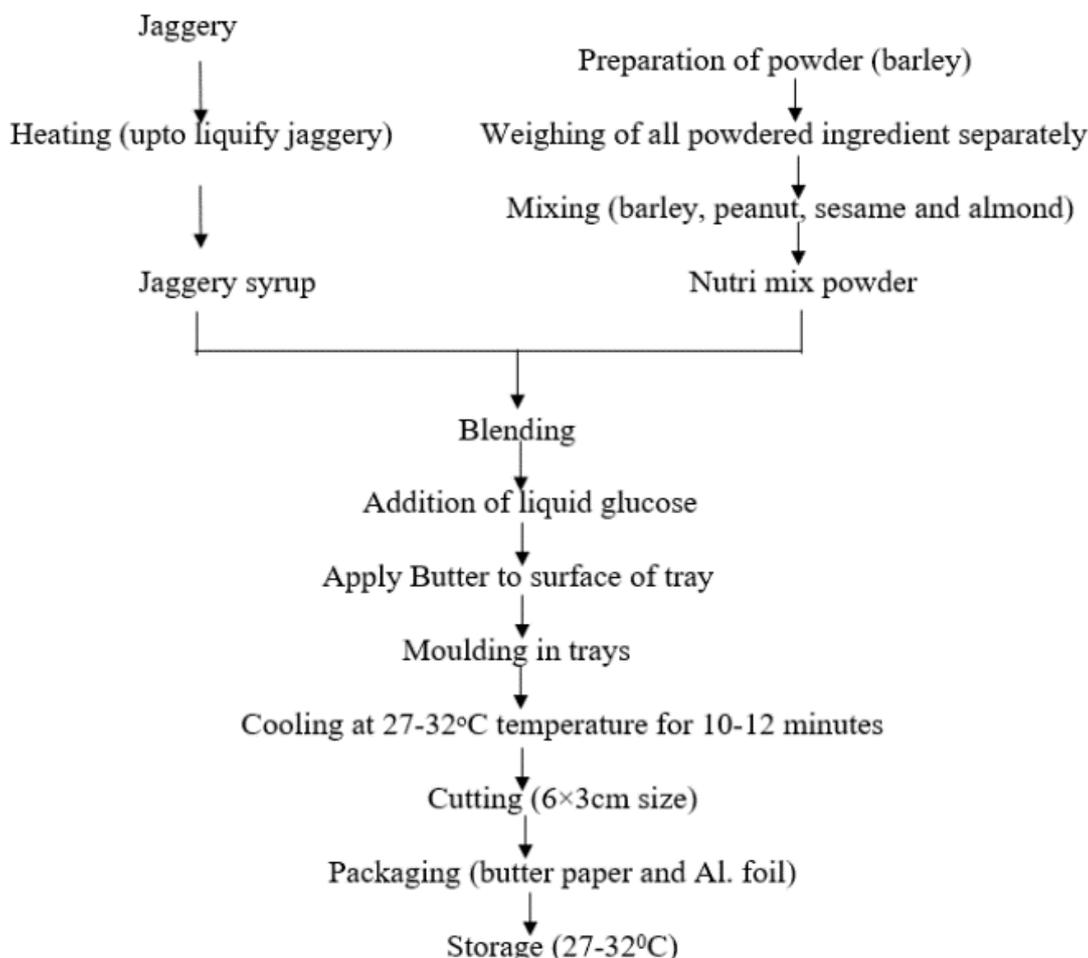


Fig 5: Flow sheet for the preparation of nutri bar

Organoleptic evaluation of nutria bar

Organoleptic evaluation of developed nutri bar will be carried out by judges by using 9 point hedonic scale on the basis of sensory characteristics for different quality attributes such as color, flavour, texture, taste and over all acceptability.

cashew and almonds to achieve a highly acceptable product. It was thus observed from Table 2 that variant T_3 had scored highest in attributes of flavor, texture, taste and overall acceptability. The variant T_3 was accepted well with a total score of 8.5. Overall, the T_3 was acceptable and tasted good.

Results and discussion

Organoleptic evaluation of nutria bar

The three variants (T_1 , T_2 , and T_3) were made different with varying processing technique of barley, groundnuts, sesame,

Table 2: Organoleptic evaluation of nutri bar

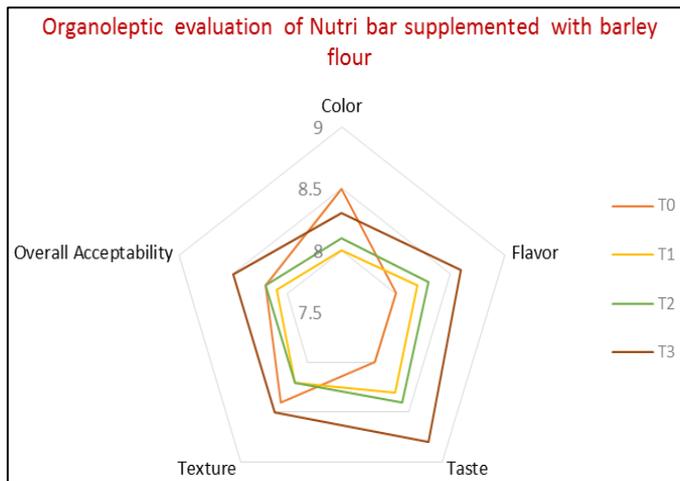
Sr. No.	Formulations	Sensory Score of nutri bar				
		Color	Flavor	Taste	Texture	Overall Acceptability
1.	T_0	8.5	8.0	8.0	8.4	8.2
2.	T_1	8.0	8.2	8.3	8.2	8.1
3.	T_2	8.1	8.3	8.4	8.2	8.2
4.	T_3	8.3	8.6	8.8	8.5	8.5

The color serves as a preliminary parameter for the acceptance of food and indicates the fitness of nutri bar for consumption. The sensory score of colour clearly indicated that nutri bar (T_0) was highest score for colour was 8.5 and lowest score found in the T_1 score (8.0). Sample T_3 was secured the slightly lower i.e. 8.3 than control sample. The color acceptance of different samples was occurring in different order due different treatment given to barley ingredient. Control sample T_0 contained the 50% jaggery and 50% other ingredients only so that the color was most

acceptable but in other samples treated barley flour was incorporated and it was slightly brightened the color of nutri bar.

The color serves as a preliminary parameter for the acceptance of food and indicates the fitness of nutri bar for consumption. The sensory score of colour clearly indicated that nutri bar (T_0) was highest score for colour was 8.5 and lowest score found in the T_1 score (8.0). Sample T_3 was secured the slightly lower i.e. 8.3 than control sample. The color acceptance of different samples was occurring in

different order due different treatment given to barley ingredient. Control sample T₀ contained the 50% jaggery and 50% other ingredients only so that the color was most acceptable but in other samples treated barley flour was incorporated and it was slightly brightened the color of nutri bar.



The taste of T₃ secured the maximum score (8.8) among the panelist, followed by T₂ (8.4) and T₁ (8.4), whereas T₀ secured minimum score (8.0) for taste. Taste of T₃ was found perfect sweet as per acceptance but other samples such as T₂ and T₁ have slightly more sweetness and T₀ was having most sweetness.

Texture is a group of physical characteristics, sensed by mouth feel and touch. The results from table 2 shows that the texture of nutri bar T₃ secured maximum score (8.5) and lowest score found in T₁ and T₂ (8.2). T₃ secured highest score to texture because of T₃ sample contained the germinated barley roti powder which enhance and improve it's texture to more acceptable level.

Overall acceptability is acceptance of panelist regarding the overall sensorial attributes. The experienced panelists of institution scored the overall acceptability of nutri bar incorporated with barley. Nutri bar T₃ secured the maximum score (8.5) and it was cleared from the sensory evaluation that T₃ have maximum acceptability. Overall acceptability of T₁ was lower than other three samples (8.1).

Conclusion

It can be concluded from the results of present finding that the quality nutri bar (T₃) can be prepared by using 25% barley roti powder and other ingredients. As barley is highly nutritious and is richest source of β -glucan and minerals had found better suitability in supplementation and nutritional enrichment of nutri bar. Moreover, the process is techno economically feasible and can be explored on commercial level.

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