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Studies on development and utilization of lima bean/double beans (*Phaseolus Vulgaris*.) for preparation of extruded sev

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Abstract
The aim is to prepare Sev using Lima Beans, Double Beans or Eye Beans as a nutritional point of view and to provide convenience to the consumer. "Sev" is one of the popular Indian traditional deep fat fried snack food Traditionally, it is prepared from Bengal gram flour (besan) with additives such as salt, spices, and sodium bicarbonate; various other additives are also added to impart crispy and crunchy texture organoleptic appeal and to increase the physical condition of the fried product. Nutritional point of view we used eye beans. Lima bean/double Beans (*Phaseolus Vulgaris*.) is bushy annual herb belongs to family Fabaceae (*Leguminosae*). It is locally known as Pavta. It is mainly cultivated for its fresh and dry seeds. The nutritional value of dried raw seeds (per 100 g) is- water 11.6 g, protein 19.1 g, dietary fibre 19.4 g, carbohydrate52.9 g, fat 1.7 g. Minerals- Ca 85 mg, Mg 190 mg, P 320 mg, Fe 5.9 mg, Zn 2.8 mg, carotene trace, thiamine 0.45 mg, riboflavin 0.13 mg, niacin 2.5 mg, vitamin B6 0.51 mg. Prepared product selected by sensory evaluation and the chemical properties of Double Beans Sev were found to be Moisture content was found to be 6.42±0.02%,Ash content 2.42±0.43%, protein content 18.21±0.02%,fat content 19.25±0.41%,carbohydrate 61.22±0.11%and the energy value is 463.57Kcal respectively. According to sensory evaluation the sample T3 best and good consumer acceptance. Prepared Sev store room temperature at 45 days and more acceptable for consumer satisfaction.

Keywords: Limba beans, deep fat fried, sev, nutritional value, sensory evaluation, storage etc

Introduction

Ready to eat snacks & namkeen are generally considered as take away food and usually preferred as hunger quencher & are eaten whenever the consumer are hungry. The Sev snack preparation is mainly composed of Bengal gram flour & enrich by gram flour. Indian snack food industry comprises of many Indian as well as MNCs. The Indian food snack food market is of 400,000 the order tones. This wide range of products is categorized under potato/Banana chips, namkeen and Fun Foods. (Shukla S. et.al, 2013) [11]

"Sev" is one of the popular Indian traditional deep fat fried snack food Traditionally, it is prepared from Bengal gram flour (besan) with additives such as salt, spices, and sodium bicarbonate; various other additives are also added to impart crispy and crunchy texture organoleptic appeal and to increase the physical condition of the fried product. The appeal and consumption of snack food are increasing once daily; consequently, there is a need to increase the production of more nutritious and cost-effective snacks. Sev is essentially small pieces of crunchy noodles. It is a popular variety of Indian snack food. Sev can be made with whole Bengal gram flour and rice flour mix at home and stored for weeks in airtight containers. Sev is a popular extruded, fried snack in India made from chickpea (Cicer arietinum L.) flour dough containing pepper, cumin, and ajowan as a flavorant (optional) and is relished for its texture and aroma. It is an established snack food in various part of our country, high cost of raw material, i.e. Bengal gram flour contributes towards the final cost of the furnished product, which limits its marketing. (Surendra Kumar Patel *et al*., 2019) [24].

Phaseolus lunatus L. variety *King of Garden* (Pole) belongs to family Fabaceae. It is also called as lima bean, butter bean, double bean etc. which predominantly a self-fertilizing plant. Lima bean seeds and pods are rich in proteins and vitamins. It is an ancient crop which is widely distributed in the tropical countries like India. It is most drought resistant crop that can grow in diverse environmental condition. Most of varieties are twining habit and few are bushy, prostrate or semi-erect in habit. Leaves are trifoliate and flowers are white to yellow and borne on loose racemes. Pods are flat or inflated, linear or broad, up to 9 cm long. Seeds are long and oval to kidney shaped, but in most cultivars the seeds are quite flat and in some spherical. Lima beans came originally from Central and South America. In India, lima bean crop is mostly cultivated in Karnataka, Tamil Nadu and Maharashtra. It is widely used as a seed legume and vegetable (Kalyani R Gunjal and A.D. More, 2019) [27].

Lima bean (*Phaseolus lunatus* L.) is bushy annual herb belongs to family Fabaceae (Leguminosae). It is locally known as pavta. It is mainly cultivated for its fresh and dry seeds. Seeds usually eaten boiled, fried in oil or baked. Lima bean sprouts, young pods, green seeds and leaves are edible and consumed as vegetables. It has been grown as a cover crop and for green manure. Cultivated lima beans has dwarf or bushy habit, with terminal and axillary inflorescence which mature within 90 - 100 days. It is cultivated mainly for its immature and dry seeds. Fresh as well as dry seeds are boiled with maize and rice and used for making special soup or stew. Juice from the leaves is used in nasal instillations against headache. In traditional Asian medicine the seeds and leaves are valued for their astringent qualities and used as a diet against fever. The vines, leaves and empty

pods left after the harvest can serve as fodder, and can be made into hay or silage (Baudoin, 2006) [26].

The nutritional value of dried Limba Beans (per 100 g) is-water 11.6 g, protein 19.1 g, dietary fibre 19.4 g, carbohydrate 52.9 g, fat 1.7 g. Minerals- Ca 85 mg, Mg 190 mg, P 320 mg, Fe 5.9 mg, Zn 2.8 mg, carotene trace, thiamin 0.45 mg, riboflavin 0.13 mg, niacin 2.5 mg, vitamin B6 0.51 mg and ascorbic acid trace) reported the value of essential amino-acid (per 100 g raw lima beans) is-tryptophan 180 mg, lysine 1440 mg, methionine 280 mg, phenylalanine 1160 mg, threonine 800 mg, valine 980 mg, leucine 1560 mg and isoleucine 950 mg (Holland *et al*., 1991 and Paul *et al*, 1980).

Aim to prepare Eye Bean/Double Beans Sev as a nutritional point of view and to provide convenience to the consumer in that we used ingredient like Eye Bean flour rich in protein and varies micronutrients thus provides high amount of energy to the body. Sev with Eye Bean flour provide balanced nutrition and hence it helps in preparing a good and healthy snack. Sev is nutritionally rich as well as wholesome.

Materials and Methods

Procurement of Raw Material

Raw materials required during present investigation were procured from local market of Saralgaon such as Eye Bean Flour, Salt, Red Chilli Powder, Ginger and Garlic Past, Asafoetida, etc. Most of the chemicals and equipments used in this investigation were of analytical grade which are obtained from College of Food Technology Saralgaon, Thane

Physical Properties of Sev

The colour and shape of Sev was determined by visual observations, Thickness of Sev was measured by vernier calliper. The weight of Sev was measured on analytical weighing balance.

Chemical Properties of Sev

Proximate composition such as moisture, ash, crude fat, crude protein and crude fibre of all the Ingredients and Sev was determined according to the procedures given in AOAC (2000). For moisture determination samples were dried in oven at 130ºC for 60 minutes. For ash determination samples were placed in muffle furnace at 550ºC to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using Hexane. For fibre determination, samples were treated with 1.25% Sulphuric acid and Sodium Hydroxide solution. After filtration of digested material it was washed with hot water and then ignited. By calculating loss of weight after ignition, crude fibre contents were determined. Protein contents were determined by using Kjeldahl's unit.

Sensory Evaluation of Sev

Prepared product were evaluated for sensory characteristics in terms of appearance, color, flavour, after taste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'. The obtained results were recorded in sensory score card.

Statistical Analysis of Sev

The analysis of variance of the data obtained was done by using completely randomized design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of $p<0.005$ level S.E and C.D. at 5 percent level is mentioned wherever required.

Formulation of Sev

Sev prepared with incorporation varying levels of Double Beans (Phaseolus Lunatus L.) Flour and Bengal Gram Flour were investigated. The formulation was made by varying levels *viz*., 60g: 30g, 70g: 20g, and 90g: 00g percent respectively. In all the formulated sample T3 sample selected for preparation of Sev that contain 90g Double Beans and 10gm other ingredients. Sensory evaluation done to select the formulated sample for further study. Well and experience panels gives the score to formulated sample in that the T3 gives best score and more acceptance than other sample.

Flowsheet for Preparation of Sev

Selection of raw material
↓
Cleaning and Weighing of ingredients
↓
Mixing
(Double bean flour, Red chilli powder, salt, ginger, garlic paste and Asafoetida)
↓
Dough making
↓
Kneading (3-5 min)
↓
Extruding
↓
Frying
↓
Cooling and Packing

Results and Discussion

Physical and Chemical Properties of Raw Materials

Table 1: Physical Properties of Eye Bean

Parameter	Units	Parameter	Units
Moisture	10.82±0.02	Thousand Grain Mass	245.4g
Length	9.15 to 10.45mm±0.03	Bulk Density	602.48kg-m3
Width	6.67 to 7.31mm±0.11	Color	Milky white
Thickness	6.01 to 6.55mm±0.08		

The results of physical properties of Eye Bean showed Colour Milky white, Moisture (10.82to31.76%), Length (9.15 to 10.45mm), Width (6.67 to 7.31mm), Thickness (6.01 to 6.55mm), Thousand Grain Mass(245.4g) and Bulk Density(602.48kg-m3) Respectively.

Table 2: Chemical Properties of Eye Bean

Parameter	Units	Parameter	Units

Energy	336 Kcal	Cholesterol	0 mg
Carbohydrates	60.03 g	Dietary Fiber	10.6 g
Protein	23.52 g		
Total Fat	1.26 g		

The chemical properties of Eye Bean such as protein fat, Fiber, carbohydrates and Energy Value were determined and results obtained Protein 23.52 (g/100gm), Total Fat 1.26 (g/100gm), 60.03 (g/100gm) Total carbohydrates, Fiber 10.6 (g/100gm) and 336 kcal Energy value respectively.

Table 3: Physical Properties of Eye Bean/Double bean Sev

Parameter	Units
Colour	Light yellow
Shape	Cylindrical
Thickness	0.10 cm
Texture	Crunchy

The result of physical properties of sample (T1) Sev show Light yellow colour, Shape is Cylindrical, thickness is 0.10 cm and texture crunchy respectively. All the Physical parameter measure with proper standard with hygienic condition.

Table 4: Chemical Properties Eye Bean/Double bean Sev

Parameter	Units	Parameter	Units
Moisture	6.22±0.02%	Carbohydrates	49.42±0.11%
Fat	17.15±0.41%	Ash	2.32±0.43%
Protein	12.11±0.02%	Energy	376.47Kcal
Ash	2.32±0.43%		

The value of chemical parameter mention that which was analysed by AOAC Method. It was evident That value of Eye Bean/Double Bean Sev ware found to be Moisture content was found to be 6.22±0.02%, Ash content 2.32±0.43%, protein content 12.11±0.02%%, fat content 17.15±0.41%%, carbohydrate 49.42±0.11% and the energy value is 376.47Kcal respectively

Table 5: Sensory Evaluation of Sev

Sample	Colour	Flavour	Taste	Texture	Appearance	Overall Acceptability
T0	7	7	7	7	7	7
T1	07	08	7	7.5	07	7.8
T2	07	08	7.5	08	07	7.5
T3	8.5	09	08	08	09	8.5

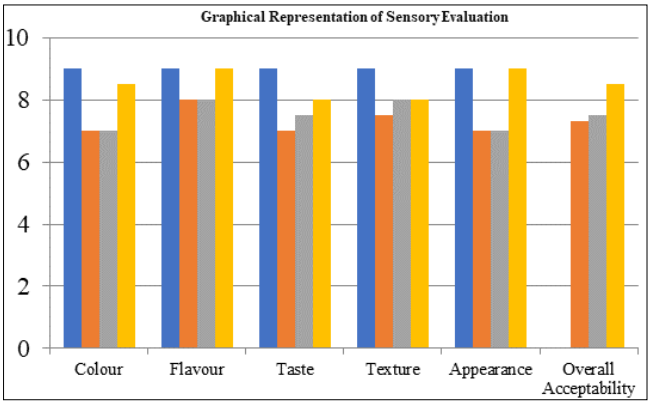

Fig 1: Graphical Representation for Sensory Evaluation of Sev

Graphical representation of Sev shows that sample T3 has highest scores as compared to other samples. The color of T3 sample as per graph is 8.5 point while other sample points are T0(7), T1(07), T2(07). The flavour of sample T3 was acceptable with 9 point while other sample points are T0(7), T1(08), T2(0.8). The taste of sample T3 was selected by 8 points while other samples points are T0(7), T1(7), T2(7.5). The texture of sample T3 was selected by 8 points while other samples points are T0(7), T1(7.5), T2(8). The Appearance of sample T3 was selected by 9 points while other sample points are T0 (9), T1 (7), T2 (7). The Overall Acceptability of Sample T3 was Selected by 8.5 Points While other Sample Points T0 (9), T1 (7.3), T2 (7.5) respectively. Accourding to all the quality attributes the T3 was best in all the parameters and more acceptable than other one.

Conclusion

In the present study finally it is concluded that Eye Bean/Double Bean Sev prepared from Eye Bean Flour has high Nutrition quality and also it is rich in Protein, carbohydrates and some vital minerals such as calcium and iron in proper amount and has great health benefits. The present investigation carried out for information of Sev in which T3 sample found more superior than sample T1 and T2 so, T3 sample is more acceptable on its sensory attributes. Eye Bean/Double Bean Sev can act as a supplementary food and can satisfy the consumer's requirements

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