RESEARCH ARTICLE

FORMULATION AND DEVELOPMENT OF CLUSTER BEAN PRODUCTS

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ARTICLE INFO	ABSTRACT
	Cluster bean or guar (*Cyamopsis tetragonaloba*) is a deep rooted, summer annual legume. It belongs to the tribe Galagae (Indigoferae) of the Leguminosae family. The crop is mainly grown in the dry habitats of Rajasthan, Haryana, Gujarat and Punjab and to a limited extent in Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. Developing products from cluster bean is another way of consuming it, especially, for those not liking the taste of cluster bean and reason being that cluster bean is a perishable vegetable leading to a loss in procuring it. Formulation and development of cluster bean products were made (Cluster bean vermicelli and cluster bean jelly). Organoleptic evaluation of the developed products was conducted by 20 semi-trained panel members. Results revealed that no significant difference was found among the variations and sensory attributes of vermicelli upama. Control sample of jelly was found to achieve the highest sensory scores in all the sensory characteristics except taste. CBJ-II achieved highest score in taste characteristic (7.95) when compared to the three variations. Lowest score in aroma was found to be lowest in CBJ-I. Overall acceptability score was lowest in CBJ-I and CBJ-III. However, when compared only the three variations, CBJ-II achieved higher scores than the other two variations (CBJ-I and CBJ-III). There was no significant difference seen in aroma. It can be concluded that, cluster bean was able to be made into different products and were accepted by the panel members.

INTRODUCTION

Cluster bean or guar (*Cyamopsis tetragonaloba*) is a deep rooted, summer annual legume. It belongs to the tribe Galagae (Indigoferae) of the Leguminosae family. The crop is mainly grown in the dry habitats of Rajasthan, Haryana, Gujarat and Punjab and to a limited extent in Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala (Pabal 2013). It is generally 50-100 cm tall and bears 4 to 10 branches. However, non branch type-varieties have main stem only, which is heavily clustered with pods. Root nodules contain nitrogen-fixing bacteria and incorporation of crop residues improves soil fertility and productivity. Traditionally, guar plant was mainly used as a green manure and soil conserving cover crop. It is consumed as a vegetable and snacks by human beings (Saini 2014). Developing products from cluster bean is another way of consuming it, especially, for those not liking the taste of cluster bean and reason being that cluster bean is a perishable vegetable leading to a loss in procuring it.

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Transforming fresh vegetable cluster bean into ready to cook or ready to eat food is an art to save time, energy, increase the nutritional contents and also extend the shelf life. Therefore, value addition of cluster bean or any vegetable is necessary, important and should be encouraged to do so. However, just development of products is not enough. Acceptability of food products is another criterion in knowing if the food products are in the level that they can be consumed or not. Hence, an evaluation known as organoleptic evaluation is necessary in giving the green signal on the acceptability of the developed food products. The objective of the present study was to develop cluster bean products and conduct organoleptic evaluation of the developed products.

MATERIALS AND METHODS

Procurement of ingredients

Vegetable cluster bean and other ingredients were procured from the departmental store. Cluster bean and mint were washed, chopped and blanched. The other ingredients (soya bean, Bengal gram, green gram) were soaked. The blanched vegetables and soaked grams were then dried in hot air oven

(60$^{\text{O}}$C for 8hrs). It was then powdered and stored in a food grade container. The formulation of cluster bean products (cluster bean vermicelli and cluster bean jelly) were given in Table 1 and 2.

Table 1. Formulation of cluster bean vermicelli

Ingredients	CBV-I (g)	CBV-II (g)	CBV-III (g)
Wheat flour (refined)	85	45	45
Semolina	-	40	40
Soyaflour	10	-	-
Green gram flour	-	10	-
Bengal gram flour	-	-	10
Cluster bean powder	3.5	3.5	3.5
Mint powder	1.5	1.5	1.5
Total	100	100	100

CBV-I – Cluster Bean Vermicelli- I
CBV-II- Cluster Bean Vermicelli- II
CBV-III- Cluster Bean Vermicelli- III

Table 2. Formulation of cluster bean jelly

Ingredients	Control (g)	CBJ-I (g)	CBJ-II (g)	CBJ-III (g)
Cluster bean powder	-	10	20	30
Sugar	-	50	50	50
Gelatin	-	10	10	10
Citric acid	-	2	2	2
Pineapple essence	-	One drop	One drop	One drop
Water	-	220	270	320
Total	-	292	352	412

Control- Pineapple Jelly
CBJ-I- Cluster Bean Jelly- I
CBJ-II- Cluster Bean Jelly- II
CBJ-III- Cluster Bean Jelly- III

Preparation of cluster bean vermicelli

Cluster bean vermicelli was prepared through extrusion machine by mixing all the dried powdered ingredients together. Extruded vermicelli was dried again to remove the moisture and stored in a polythene cover for further use. Soup was developed into four variations. The vermicelli was used 30 g for cooking. Vermicelli was roasted in little amount of oil and removed from the pan. Oil was added to the pan and heated. Chopped onions were added to it and fried till golden brown. Water was, next, poured on a pan of 200ml, allowed to boil. Roasted vermicelli was then added to it and kept for cooking for few minutes till the water evaporated and vermicelli attained softness. When it was prepared, cooked vermicelli was transferred to a plate and kept for organoleptic evaluation. Cluster bean soup was prepared by boiling the powdered cluster bean for five to ten minutes and then was strained. The liquid was filtered to get the smooth consistency. The filtrate was then boiled again. Seasonings like powdered mint, garlic, pepper, ginger and salt were added to the boiling liquid. It was boiled for five minutes then removed from the flame transferred to a bowl for sensory analysis (Parischa and Rebello, 1982).

Preparation of cluster bean jelly

Cluster bean powder was boiled for 5 to 10 minutes. It was then strained to separate the residue and the filtrate (while filtering more amount of water was needed to be added when more quantity of cluster bean powder was boiled). The residue was discarded and the liquid was used. It was heated in low flame, sugar was added and boiled till dissolved.

Table 3. Sensory scores for cluster bean vermicelli upama

Treatments	Appearance	Texture	Color	Flavor	Taste	Overall acceptability
CBV-I	6.90	7.00	6.85	6.95	7.20	6.90
CBV-II	6.95	6.70	6.50	6.55	6.85	6.50
CBV-III	6.45	6.65	6.45	6.75	6.25	6.50
F value	NS	NS	NS	NS	NS	NS
SEm±	0.26	0.27	0.86	0.83	0.35	0.321
CD at 5%	-	-	-	-		-

CBV-I – Cluster Bean Vermicelli- I
CBV-II- Cluster Bean Vermicelli- II
CBV-III- Cluster Bean Vermicelli- III
N.S.- Non significant

Table 4. Sensory scores of cluster bean jelly (n=20)

Treatments	Appearance	Consistency	Color	Flavor	Taste	Overall acceptability
Control	8.25	8.10	8.25	7.85	7.85	8.05
CBJ-I	7.55	7.45	7.55	7.20	7.00	7.20
CBJ-II	7.80	7.85	7.70	7.55	7.95	7.95
CBJ-III	6.95	7.20	7.15	7.30	7.25	7.20
F-value	*	*	*	NS	*	*
SEm ±	0.80	0.84	0.80	0.69	0.72	0.71
CD at 5 %	0.56	0.58	0.56	-	0.53	0.53

Control- Pineapple Jelly
CBJ-I: Cluster Bean Jelly-I (10%),
CBJ-II: Cluster Bean Jelly-II (20%),
CBJ-III: Cluster Bean Jelly-III (30%),
*Significant at 5 per cent, NS- Not Significant

Citric acid and gelatin was added to a boiling liquid, allowed to blend by stirring. When some particles were found to remain on the surface, liquid was again strained in jelly cups and pineapple essence was added and the final product was kept in refrigerator to solidify. Control sample was the market sample and it was compared with the three variations (Anitha 2015*)*.

Organoleptic evaluation of the developed products

Products were evaluated by a panel of 20 semi-trained members using a 9-point Hedonic scale(9 – Like extremely, 8 – Like very much, 7 – Like moderately, 6 – Like slightly, 5 – Neither like nor dislike, 4 – Dislike slightly, 3 – Dislike moderately, 2 – Dislike very much and 1 – Dislike extremely) (Avantina 2010). Sensory quality characteristics to be evaluated were appearance, texture, color, flavor, taste and overall acceptability.

Statistical analysis

Data were analyzed using one-way analysis of variance (ANOVA) procedure in a randomized complete design.

RESULTS

Formulation of cluster bean products

From Table 2, it was observed that as the quantity of cluster bean powder was increased, the amount of water was needed to increase.

Organoleptic evaluation of cluster bean products

Sensory scores of cluster bean vermicelli upama: Table 3 depicted the sensory scores of cluster bean vermicelli. There were no significant differences found among the variations and the characteristics. However, CBV-I had better scores in all the sensory characteristics (Texture – 7.00, Color- 6.85, Flavor- 6.95, Taste- 7.20 and Overall acceptability- 6.90). CBV-III had the lowest score in Appearance (6.45), Texture (6.65), Color (6.45), Taste (6.25).

Sensory scores of cluster bean jelly: Control sample was found to achieve the highest sensory scores in all the sensory characteristics except taste (Table4). CBJ-II achieved highest score in taste characteristic (7.95) when compared to the three variations. Lowest score in aroma was found to be lowest in CBJ-I. Overall acceptability score was lowest in CBJ-I and CBJ-III. However, when compared only the three variations, CBJ-II achieved higher scores than the other two variations (CBJ-I and CBJ-III). There was no significant difference seen in aroma.

DISCUSSION

Formulation of cluster bean products

Cluster bean has a sufficient amount of soluble fibre which is viscous and gel- like in nature (Pande *et al*., 2012). This contributed to the absorption of more water which needed more water to be added during preparation to make up the volume of the product as shown in Table 2.

Organoleptic evaluation of cluster bean products

Sensory scores of cluster bean vermicelli upama: Similar results were seen in the study conducted by Kulkarni *et al*. (2012) in which the sample C1 (90 wheat flour:10 malted ragi), C2 (80 wheat flour:20 malted ragi flour) and C3 (70wheat flour:30 malted ragi flour) had no significant difference when analyzed statistically at 5% level. The sample C3 was liked moderately by panelist but appearance and elasticity of this sample was poor. The lower value of appearance score was due to the increase in intensity of brown color which is contributed from the increased amount of supplemented malted ragi flour. In the present study, browning was also observed on the surface of vermicelli of CBV-III. The sample C13 prepared from 70% wheat flour and 30% malted ragi flour with added gluten, guar gum and vegetable oil was liked very much by all panel members. The increase seen could be due to a compensatory increase in free amino acids and peptides and increase in non-protein nitrogenous constituents. Day *et al*. 2006 has reported that addition of wheat-gluten in noodle improved the visco-elasticity in rehydration. The lower value of texture was due to the decrease in elasticity resulting from the decrease in gluten content. Srinath and Maheshwari (2016) evaluated the formulation, standardization and quality of rice vermicelli prepared from flood affected paddy.

The ratio for rice: sorghum was 100:0, 75:25 and 50:50. The vermicelli was prepared with both normal rice and flood affected rice for which the normal rice was considered as control. Same procedure was followed for the preparation of rice vermicelli for all the above combinations. The mean score for colour was maximum for n1 and f1 (8.2 and 8.0 respectively) and minimum for n3 and f3 (7.7 and 7.7, respectively) for the kheer before storage. The mean score for colour was maximum for n1 (7.9) and minimum for n3 (7.6) for the kheer prepared with normal rice. It was maximum for f1 and f2 (7.7) and minimum for f3 (7.6) in the kheer prepared with flood affected rice after storage for 60 days. Mean score for appearance was maximum for n2 &n3 and f2 & f3 (7.9 and 7.9 respectively) and minimum for n1 and f1 (7.8 and 7.6 respectively) for the kheer before storage the mean score for appearance was maximum for for n2 &n3 and f2 & f3 (7.8 and 7.8 respectively) and minimum for n1 and f1 (7.6 and 7.4 respectively) after storage for 60 days.the mean score for flavour was maximum for n1 and f1 (7.8) and minimum for n3 and f3 (7.2) for the kheer before storage.

Sensory scores of cluster bean jelly: Utomo *et al*. (2014) showed that control sample of jelly had lowest mean score which implied it was least accepted by the panel members. It can be implied from table-4 that, adding 10 percent of cluster bean powder was accepted by the panel members for preparation of jelly since it gave better scores in all the sensory characteristics. When preparing jelly with 30 percent of cluster bean powder, it produced a harder consistency due to increase amount of soluble fiber from cluster bean blending with gelatin. Adding a drop of essence was able to mask the bean and raw flavor of cluster bean powder. Masmoudi *et al*. (2009) prepared jellies with reduced sugar content from date (*Phoenix dactylifera* L.) and lemon (*Citrus limon* L.) by-products.

Sensory evaluation showed that the prepared jellies averaged 4.17–5.47 and 4.59–5.67 for taste and firmness, respectively, in a 7-point hedonic scale consumer acceptance study. The most appreciated jellies were those prepared with the lowest sugar content, with a slight preference for that with a pH of 3.5. Significant differences were not found between scores for the other sensory attributes (color, transparency, brightness, odor and springiness).

Conclusion

Cluster bean was successfully made into different products and the products were accepted by the panel members. Among the three variations of Cluster bean vermicelli, Cluster bean powder with green gram flour was mostly preferred by the panel members as compared to cluster bean with soya bean flour and cluster bean powder with Bengal gram flour. Cluster bean jelly of 20 percent was more accepted by the panel members than the other two variations with 10 percent and 30 percent of cluster bean powder, respectively. Therefore, from the findings it can be said that cluster bean can be consumed in different forms of food.

Acknowledgements

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