

# Nutrient Composition and Sensory Evaluation of Cooked Green Beans Vegetables

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**Abstract**—Four types of green beans viz. cluster bean, cowpea bean, french bean and sem bean were used in the present investigation. All the fresh beans were procured from the local market in a single lot. Findings of the study revealed that sem bean had the highest (82.25%) moisture content and that of cluster bean vegetable the lowest (76.45%). Cowpea bean vegetable contained the maximum amount of protein (17.19%) and crude fiber (6.69%) and sem bean vegetable had the minimum protein (12.93%) and crude fiber content (5.54%). There was a non-significant difference in the fat and ash content of beans vegetable prepared from fresh beans. Cluster bean vegetable contained the highest amount of total insoluble and soluble dietary fiber while sem bean vegetable had the lowest amount of total, insoluble and soluble dietary fiber. The calcium and phosphorus contents were higher in sem bean vegetable as compared to vegetable prepared from other beans. Iron content was significantly higher in cluster bean (6.81mg/100g) and cowpea bean vegetable (6.22mg/100g) as compared to french bean (4.33mg/100g) and sem bean vegetable (4.91mg/100g). Zinc and potassium contents were maximum in french bean while minimum in cowpea bean vegetable. Magnesium content was the highest in cowpea bean vegetable (101.51mg/100g) and the lowest in sem bean vegetable.

## 1. INTRODUCTION

Among the vegetables, the *Fabaceae* constitute a broad and very large botanical family, consisting of more than 450 genera and over 12,000 species. Beans, the major constituents of this family, are utilized both for fresh green pods as vegetable and dry seeds as pulse [1]. It is essential from nutritional and marketing view point that the growing pods are harvested at a right stage to optimize the gains with respect to their yield and quality [2]. The vitamins A and C present in green beans are an excellent antioxidant that reduces the amount of free radicals in the body and prevent the building up of plaque in arteries and veins. The green pods are rich source of proteins, minerals and vitamins [3]. Beans are often the main source of protein, and a significant source of minerals for low- income population [4]. Fresh raw green beans are the major vegetable types that consumers purchases for consumption, while processed vegetables in the dried, frozen and canned forms are also available. Frozen beans retain the constituents of the raw material to a higher degree than canned products [5]. Steamed or fried beans are

increasingly being used in salads. There is little attention paid to its nutritive value [6]. Cooking is known to alter sensory attributes and nutritional quality while the consumption of vegetables depends largely on their sensory appeal rather than their nutritional quality [7]. This paper reports the nutritional evaluation of vegetables prepared by using different fresh beans.

## 2. MATERIAL AND METHODS

Fresh samples of green beans viz., cluster bean (*Cyamopsis tetragonaloba*), cowpea bean (*Vigna unguiculata*), french bean (*Phaseolus vulgaris*) and sem bean (*Dolichos lablab*) were cleaned and washed under tap water to remove dirt and dust. The washed beans were spread over filter paper to remove excess water.

For preparation of vegetable green beans (100g), salt ( $\frac{1}{2}$  tsp), onion (30g), tomatoes (30g), red chili powder ( $\frac{1}{2}$  tsp) and oil (10ml) were used. On the basis of mean scores of sensory characteristics (9-point hedonic scale) all the four types of green beans vegetables were organoleptically acceptable. Hence, the beans vegetables, were evaluated for their nutrient composition. All the four types of vegetable, were oven dried to a constant weight at 60°C, ground to a fine powder in an electrical grinder and analyzed for various nutrients. Proximate composition including moisture, protein, fat, ash and crude fiber was determined by standard methods [8]. Total, soluble and insoluble dietary fiber constituents were determined by the enzymatic method given by Furda [9]. Total minerals were determined according to the method of Lindsey and Norwell [10]

## 3. RESULTS AND DISCUSSION

The cluster bean vegetable was 'liked very much' in terms of colour (7.90), appearance (7.80), aroma (7.70), texture (7.60) and overall acceptability (7.68) while the taste was 'liked moderately'. In terms of all the sensory characteristics cowpea bean vegetable was 'liked moderately' except colour which

was 'liked very much'. French bean vegetable was 'liked very much' in terms of all the sensory attributes i. e. colour (7.70), appearance (7.80), aroma (7.80), texture (7.70), taste (7.70) and overall acceptability (7.74). sensory evaluation results shows that sem bean vegetable was 'liked moderately by the judges. Rachna (2006) [11], Chaudhary (2011) [12] and Bajpai (2011) [13] also prepared various products using fresh pods (beans) and reported that all the products were found acceptable to the consumers in terms of their organoleptic characteristics.

**Table 1: Mean scores of sensory characteristics of beans vegetable**

Type of vegetable	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
Cluster bean vegetable	7.90±0.23	7.80±0.20	7.70±0.30	7.60±0.31	7.40±0.34	7.68±0.23
Cowpea bean vegetable	7.60±0.22	7.20±0.29	7.30±0.21	7.50±0.17	7.40±0.22	7.40±0.15
French bean vegetable	7.70±0.30	7.80±0.29	7.80±0.25	7.70±0.30	7.70±0.30	7.74±0.27
Sem bean vegetable	7.30±0.26	7.30±0.26	7.20±0.25	7.30±0.33	7.40±0.31	7.30±0.26

The perusal of the data in the Table 2 indicated that beans vegetable prepared using sem bean had significantly ( $P \leq 0.05$ ) higher (82.25%) moisture content as compared to french bean vegetable (77.34%), cowpea bean vegetable (76.93%) and cluster bean vegetable. Cowpea bean vegetable contained significantly higher (17.19%) amount of crude protein as compared to cluster bean vegetable (12.93%), french bean vegetable (14.29%) and sem bean vegetable (12.67%). It was observed that fiber content of cluster bean, cowpea bean and french bean vegetable was significantly ( $p \leq 0.05$ ) higher than sem bean vegetable. However, values of protein content found are consistent to those reported by Rachna (2006) [11] in *Moringa oleifera* products and Chaudhary (2011) [12] in snap peas products. A non-significant difference was observed in the fat content of the products prepared from different types of beans. This is possible due to the fact that all the fresh beans contained almost similar amount of fat (Table 1). These results are consistent to those reported by Rachna (2006) [11], Bajpai (2011) [13] and Chaudhary (2011) [12].

**Table 2: Proximate composition of cooked green beans vegetable (% dry weight basis)**

Type of vegetables	Moisture	Crude protein	Fat	Crude fiber	Ash
Cluster bean	76.45±0.72	12.93±0.38	13.50±0.67	6.60±0.03	7.29±0.29
Cowpea bean	76.93±0.17	17.19±0.63	13.33±0.33	6.69±0.12	6.85±0.10
French bean	77.34±0.57	14.29±0.29	13.50±0.76	6.41±0.22	7.16±0.10
Sem bean	82.25±0.72	12.67±0.42	13.67±0.17	5.54±0.08	6.70±0.04
CD ( $P < 0.05$ )	1.96	1.49	NS	0.45	NS

Values are mean ± SE of three independent determinations

It was observed (Table 2) that cluster bean vegetable contained maximum (37.34 %) amount of total dietary fiber whereas sem bean vegetable the minimum (26.89 %). Cluster bean vegetable had significantly ( $P \leq 0.05$ ) higher (24.52 %) insoluble dietary fiber content compared to cowpea bean vegetable (19.93%), french bean vegetable (18.24%) and sem bean vegetable (17.93%). Soluble dietary fiber content was similar in cluster bean vegetable (12.77%), cowpea bean vegetable (11.15%) and french bean vegetable (11.51%) but all these three types of vegetable had significantly ( $P \leq 0.05$ ) higher soluble dietary fibre as compared to sem bean vegetable (8.53%). However, the values of total, insoluble and soluble dietary fiber obtained in present investigation are in close agreement with those reported by Rachna (2006) [11] in various products of *Moringa oleifera* pods. Almost similar results of total, insoluble and soluble dietary fiber content in products prepared using snap pea pods were observed by Chaudhary [12].

**Table 3: Dietary fiber content of cooked green beans vegetable (% dry weight basis)**

Type of vegetables	Total dietary fiber	Insoluble dietary fiber	Soluble dietary fiber
Cluster bean	37.31±0.49	24.54±0.51	12.77±0.62
Cowpea bean	31.08±0.44	19.93±0.71	11.15±0.43
French bean	29.75±0.75	18.24±0.40	11.51±0.68
Sem bean	26.46±0.44	17.93±0.10	8.53±0.11
CD ( $P < 0.05$ )	1.81	1.60	1.68

Values are mean ± SE of three independent determinations

It was noticed from the data that sem bean vegetable contained the maximum (135.81 mg/100g) amount of calcium while french bean vegetable contained the minimum (51.03 mg/100g) amount. Total calcium content of cowpea bean vegetable was 58.38 mg/100g and that of cluster bean vegetable was 101.88 mg/100g. All the four types of bean vegetable differed significantly ( $p \leq 0.05$ ) among themselves for their calcium content.

Total phosphorus content of vegetable prepared using four types of beans varied from 243.55 to 251.46 mg/100g, the highest being in sem bean vegetable (251.46 mg/100g) followed by cluster bean vegetable (248.55mg/100g), cowpea bean vegetable (246.37 mg /100g) and french bean vegetable (243.55 mg/100g). The data presented in Table 3 indicated that vegetable prepared using cluster bean, cowpea bean, french bean and sem bean contained 6.81, 6.22, 4.33 and 4.91mg/100g of iron content, respectively. Iron content was significantly ( $P \leq 0.05$ ) higher in cluster bean vegetable and cowpea bean vegetable as compared to french bean vegetable and sem bean vegetable. Cluster bean vegetable and cowpea bean vegetable contained similar almost (3.87 and 3.18 mg/100g, respectively) amount of zinc content and a non-significant ( $p \leq 0.05$ ) difference was observed between them. Similarly french bean vegetable and sem bean vegetable contained similar zinc content (6.02 and 6.02 mg/100g, respectively) and significantly ( $p \leq 0.05$ ) higher amount than that of cluster bean vegetable and cowpea bean vegetable. Total magnesium content of vegetables prepared using fresh beans ranged from 61.19 to 101.51 mg/100g. Cowpea bean vegetable contained significantly ( $P \leq 0.05$ ) higher (101.51 mg/100g) amount of magnesium as compared to cluster bean vegetable (93.61 mg/100g), french bean vegetable (73.81 mg/100g) and sem bean vegetable (61.19 mg/100g). Data presented in the Table 4 further revealed that french bean vegetable had the maximum (953.06 mg/100g) potassium content, followed by cluster bean vegetable (945.84 mg/100g), sem bean vegetable (928.79 mg/100g) and cowpea bean vegetable (919.41 mg/100g). Rachna (2006) [11] reported 10.53mg/100g iron in pods vegetable prepared using *Moringa oleifera*. Punia *et al.* (2008) [3] reported 14.02 to 29.59 and 1.44 to 1.68 mg/100g of calcium and iron (fresh weight basis), respectively in potato beans vegetable prepared using cluster beans, cowpea beans and french beans. Chaudhary (2011) [12] reported 75.19 to 76.96 mg/100g of magnesium in snap peas vegetable.

**Table 4: Mineral content of cooked green beans vegetables (mg/100g, dry weight basis)**

Type of vegetable	Calcium	Phosphorus	Iron	Zinc	Magnesium	Manganese	Potassium
Cluster bean	101.88 ± 2.24	248.55 ± 0.96	6.81 ± 0.24	3.87 ± 0.30	93.61 ± 0.78	1.39 ± 0.23	945.84 ± 0.95
Cowpea bean	58.38 ± 0.97	246.37 ± 0.44	6.22 ± 0.07	3.18 ± 0.05	101.51 ± 1.89	1.23 ± 0.28	919.41 ± 1.94
French bean	51.03 ± 1.12	243.55 ± 0.39	4.30 ± 0.23	6.02 ± 0.20	73.83 ± 0.24	1.60 ± 0.41	953.06 ± 3.16
Sem bean	135.81 ± 2.99	251.46 ± 0.41	4.91 ± 0.35	6.02 ± 0.23	61.19 ± 0.19	1.53 ± 0.35	928.79 ± 0.37

CD (P<0.05)	6.66	1.98	1.01	0.71	3.42	NS	6.36
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Values are mean ± SE of three independent determinations

Similar, increasing trend in mineral content was observed by Rachna [11] and Singh *et al.* [14] in products prepared using *Moringa oleifera* pods and amaranth leaves, respectively.

#### 4. CONCLUSION

From the present study, it may be concluded that fresh beans are very good source of protein, dietary fiber and minerals specially calcium, iron, magnesium and potassium. In all seasons, they can be included in diet in vegetable form so as to increase the protein, dietary fiber and mineral content of the meals. These green beans should be used in circular menu in diet.

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