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Nutritional evaluation of products prepared from fresh beans

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Abstract: The objective of this study was to determine the nutritional composition of products prepared from fresh beans. Four types of fresh beans powder viz. cluster bean (*Cyamposis tetragonaloba*), cowpea bean (*Vigna unguiculata*), french bean (*Phaseolus vulgaris*) and sem bean (*Dolichhos lablab*) were used for dry vegetable preparation. Moisture content of beans vegetable prepared using fresh beans ranged from 76.49 to 82.25 per cent. The cowpea bean vegetable had the highest (17.19%) and sem bean vegetable had the lowest (12.67%) amount of crude protein. Crude fiber content was found to be highest in cowpea bean vegetable (6.69%) followed by cluster bean vegetable (6.60%), french bean vegetable (6.41%) and sem bean vegetable (5.54%). Among the four types of beans vegetables, total, insoluble and soluble dietary fiber content was found to be highest in cluster bean vegetable and the lowest in sem bean vegetable. Sem bean vegetable contained the maximum (135.81 mg/100g and 251.46 mg/100g) amount of calcium and phosphorus while french bean vegetable contained the minimum (51.03 mg/100gand 243.55 mg/100g) amount. 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. Cowpea bean vegetable contained the maximum (101.51mg/100g) while sem bean contained minimum (61.19mg/100g) amount of magnesium. It was observed that all the four types of beans vegetable differed significantly ($p \leq 0.05$) among themselves for their potassium content. Earlier studies were conducted on raw seeds or pods of beans but information on cooked beans was scanty. This study explains about the effect of cooking on different nutritional components of fresh beans pods.

Keywords: Beans, Crude protein, Dietary fiber, Iron, Potassium

INTRODUCTION

Among the vegetables, the *Fabaceae* constitute a broad and very large botanical family, consisting of more than 751 genera and over 19,000 species. Beans, the major constituents of this family, are utilized both for fresh green pods as vegetable and dry seeds as pulse (Christenhunz and Byng, 2016). 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 (Saxena *et al*., 2010). 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 (Punia *et al*., 2008). Beans are often the main source of protein, and a significant source of minerals for low-income population (Laparra *et al.,* 2009). 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 (Kmiecik *et al.,* 2007). Steamed or fried beans are increasingly being used in salads. There is little attention paid to its nutritive value (Deol and Bains, 2010). 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 (Kala and Prakash, 2006). This paper reports the nutritional evaluation of biscuits prepared by incorporating different fresh beans powder.

MATERIALS AND METHODS

Fresh samples of green beans viz., cluster bean (*Cyamposis tetragonaloba*), cowpea bean (*Vigna unguiculata*), french bean (*Phaseolus vulgaris*) and sem bean (*Dolichhos 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 and cut into small pieces. For preparation of dry beans vegetables, fresh beans (100g), tomato (30g), onion (30g), oil (10g), salt (to taste), cumin seeds (1g), garlic and ginger paste (1/2 tsp), red chilli powder (1/2 tsp) and garam masala (1/4 tsp) were used. The mean scores of sensory characteristics were analysed using 9 -point hedonic scale (Ranganna, 1986).

The dry vegetables prepared using fresh beans were evaluated for their nutrient composition. All the four types of vegetables 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 (AOAC, 2000). Total, soluble and insoluble dietary fiber constituents were determined by the enzymatic method given by Furda (1981). Total minerals were determined according to the method of Lindsey and Norwell (1969).

RESULTS AND DISCUSSION

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%). The values of protein content found are consistent to those reported by Rachna (2006) in *Moringa oleifera* products, Chaudhary (2011) in snap peas products and Rani *et al.* (2013) in *pulao* containing fresh beans. The vegetable prepared using various fresh green beans showed a very narrow variation in the fat and ash content. The values of fat content of the products obtained in the present study are comparable to the values reported by Rachna (2006) and Chaudhary (2011) in the products prepared using *Moringa oleifera* and snap peas, respectively. Crude fiber content was found to be highest in cowpea bean vegetable (6.69%) followed by cluster bean vegetable (6.60%), french bean vegetable (6.41%) and sem bean vegetable (5.54%). These results are consistent to those reported by Rachna (2006), Bajpai (2011), Chaudhary (2011) and Rani *et al.,* (2014).

It was observed 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

Table 1. Proximate composition of beans vegetable (g/100g dry weight basis).

Type of vegetables	Moisture (g/100g)	Crude protein (g/100g)	Fat (g/100g)	Crude fiber (g/100g)	Ash (g/100g)
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 ($P \leq 0.05$)	1.96	1.49	NS	0.45	NS

Values are mean ± SE of three independent determinations

Table 2. Dietary fiber content of fresh beans vegetable (mg/100g, dry weight basis).

Type of vegetables	Total dietary fiber (g/100g)	Insoluble dietary fiber (g/100g)	Soluble dietary fiber (g/100g)
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($P \leq 0.05$)	1.81	1.60	1.68

Values are mean ± SE of three independent determinations

Table 3. Mineral content of fresh beans vegetable (mg/100g, dry weight basis).

Type of vegetable	Calcium (mg/100g)	Phosphorous (mg/100g)	Iron (mg/100g)	Zinc (mg/100g)	Magnesium (mg/100g)	Manganese (mg/100g)	Potassium (mg/100g)
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 ($P \leq 0.05$)	6.66	1.98	1.01	0.71	3.42	NS	6.36

Values are mean ± SE of three independent determinations

sem bean vegetable (8.53%). The values of total, insoluble and soluble dietary fiber obtained in present investigation are in close agreement with those reported by Rachna (2006) in various products of *Moringa oleifera* pods.

The data revealed 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 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.

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). A non-significant ($p \leq 0.05$) difference was observed in the zinc and manganese content of the beans vegetable. The 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/100). Rachna (2006) reported 10.53mg/100g iron in pods vegetable prepared using *Moringa oleifera*. Punia *et al.* (2008) 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) reported 75.19 to 76.96 mg/100g of magnesium in snap peas vegetable.

Conclusion

Green beans are very good source of protein (12.67 per cent to 17.19 per cent), dietary fiber (37.31 per cent to 26.46 per cent) and minerals specially calcium (51.03mg/100g to135.81mg/100g), iron (4.30 mg/100g to 6.81 mg/100g), zinc (3.18 mg/100g to 6.02 mg/100g) and potassium (919.41 mg/100g to 953.79 mg/100g). Cowpea bean vegetable contained highest (17.19%) amount of crude protein. The cluster bean vegetable contained maximum amount of total dietary fiber (37.34 %), insoluble dietary fiber (24.54%) and soluble dietary fiber (12.77%) whereas sem bean vegetable the minimum amount of total dietary fiber (26.89 %), insoluble dietary fiber (17.93%) and soluble dietary fiber (8.53%), respectively. The sem bean vegetable contained the highest (135.81 mg/100g) amount of calcium, phosphorus (251.46 mg/100g) and zinc (6.02mg/100g). The maximum amount of iron, magnesium and potassium was determined in cluster bean vegetable (6.81mg/100g), cowpea bean vegetable (101.51mg/100) and french bean vegetable (9.53.79mg/100g), respectively. During the season, green beans can be used as fresh pods for making various recipes so as to increase the protein, dietary fibre and mineral content of the products. Combination of different green beans should be used so as to gain maximum nutritional benefit.

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