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NUTRIENT CONTENT AND SENSORY EVALUATION OF DHOKLA PREPARED INCORPORATING GREEN BEANS POWDER

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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 beans were dried, made into fine powder and supplemented at 5 percent and 10 per cent level in the preparation of *dhokla*. The dhokla prepared without using beans powder served as control. The organoleptic evaluation showed that dhokla prepared incorporating five per cent beans powder were more acceptable as compared to the one containing ten per cent beans powder. The nutritional analysis revealed that the protein content of control *dhokla* was 15.60 per cent which increased significantly upto 17.21 per cent with incorporation of fresh beans powder. The crude fiber and ash content in *dhokla* supplemented with green beans had increased significantly as compared to control *dhokla*. Total dietary fiber content ranged from 18.75 to 19.64 per cent in supplemented *dhokla* whereas control *dhokla* contained 17.60 per cent total dietary fiber. The results of the study indicated that calcium content ranged from 58.71 to 62.67 mg/100g in supplemented *dhokla*, whereas control *dhokla* had 57.11mg/100g calcium. Sem bean dhokla contained the highest phosphorus (297.07 mg/100g) while cowpea bean had the lowest (293.99 mg/100g) phosphorus content. The addition of the fresh beans powder to *dhokla* improved iron, manganese, zinc and magnesium content significantly. Total potassium content was the highest in french bean *dhokla* (610.73 mg/100g) followed by cluster bean *dhokla* (603.16 mg/100g), sem bean *dhokla* (591.40 mg/100g) and cowpea bean *dhokla* (583.11mg /100g).

Keywords: Fresh beans, Organoleptic, *Dhokla*, Proximate, Dietary fiber, Mineral content.

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 (Yamaguchi *et al.,* 1997). 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 *dhokla* prepared by incorporating different fresh beans powder.

MATERIAL 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. All washed beans were chopped and dried in hot air oven at 60±5°C for 78 h. The dried beans were ground in an electric grinder (Cyclotec M/s Tecator, (Hoganas, Sweden) to fine powder. The dried powders were kept in air tight containers at room temperature for incorporation in *dhokla*.

For preparation of *dhokla* , semolina (75g), *bengal* gram flour (75g), curd (75g), eno (5g), lemon juice (8g) , beans powder (5g) and spices were used. All the four types

of *dhokla* along with control *dhokla*, 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

The protein content of control *dhokla* was 15.60 per cent which increased significantly ($p \leq 0.05$) upto 17.21 per cent with incorporation of fresh beans powder. All the four types of *dhokla* supplemented with cluster bean, cowpea bean, french bean and sem bean powder differed non-significantly ($p \leq 0.05$) among themselves. The protein content increased significantly in the products containing beans powder because fresh beans (Table 4.1) are excellent source of protein. In earlier studies similar results were reported by Singh (1999), Dahiya (2004), Vandana (2004), Singh (2006) and Gallegos-Infante (2010) in the value added products. It is evident from the Table 1 that crude fiber content of *dhokla* supplemented with fresh beans powder had increased (2.59 to 2.73%) significantly ($p \leq 0.05$) as compared to control *dhokla* (2.53%). Ash content of control *dhokla* was 2.09 per cent which increased from 2.21 to 2.38 per cent in the *dhokla* prepared using beans powder. French bean powder *dhokla* had maximum amount of ash (2.38%). Similar increasing trend in ash content after addition of beans powder was reported by Rachna (2006), Singh *et al.* (2009) and Gallegos-Infante (2010). A narrow and non significant ($p \leq 0.05$) difference was observed in moisture and fat content of control *dhokla* (60.72 and 5.17%) and the *dhokla* prepared from fresh beans powder (61.23 to 62.71 and 5.50 to 6.00%, respectively).

Table 1: Proximate composition of *dhokla* containing fresh beans powder (% dry weight basis)

Type of *dhokla*	Moisture	Crude protein	Fat	Crude fiber	Ash
Control	60.72±1.10	15.60±0.17	5.17±0.17	2.53±0.03	2.09±0.02
Cluster bean	61.23±0.43	16.58±0.29	5.50±0.29	2.73±0.01	2.31±0.02
Cowpea bean	61.54±0.19	17.21±0.15	5.83±0.44	2.70±0.01	2.21±0.03
French bean	62.06±0.28	17.06±0.06	6.00±0.50	2.64±0.01	2.38±0.04
Sem bean	62.71±0.94	16.63±0.44	6.00±0.50	2.59±0.02	2.26±0.03
CD ($P \leq 0.05$)	NS	0.95	NS	0.06	0.10

Values are mean ± SE of three independent determinations
Figures in parantheses indicate per cent decrease (-) or increase (+) over control values.

Table 2 depicts that total dietary fiber content ranged from 18.75 to 19.64 per cent in supplemented *dhokla* whereas control *dhokla* contained 17.60 per cent total dietary fiber. All the four types of *dhokla* supplemented with beans powder differed non significantly ($p \leq 0.05$) among themselves for total dietary fiber. Incorporation of fresh beans powder to the control *dhokla* increased insoluble dietary fiber value significantly ($p \leq 0.05$). Cluster bean *dhokla* (13.98%) contained maximum amount of insoluble dietary fiber followed by cowpea bean (13.88%), french bean (13.58%) and sem bean *dhokla* (13.27%). It was observed (Table 2) that incorporation of beans powder to the dhokla did not bring any significant change in the soluble dietary fiber content. Almost similar results of total, insoluble and soluble dietary fiber content in products prepared incorporating *Moringa oleifera* pods powder were observed by Rachna (2006). Similar results were depicted by Nazni and Durgacevi, (2014).

Table 2: Dietary fiber content of *dhokla* containing fresh beans powder (% dry weight basis)

Type of *dhokla*	Total dietary fiber	Insoluble dietary fiber	Soluble dietary fiber
Control	17.60±0.44	12.48±0.32	5.12±0.15
Cluster bean	19.64±0.13	13.98±0.15	5.75±0.05
Cowpea bean	19.34±0.25	13.88±0.16	5.69±0.27
French bean	19.17±0.29	13.58±0.12	5.59±0.21
Sem bean	18.75±0.24	13.27±0.31	5.48±0.11
CD($P \leq 0.05$)	0.92	0.73	NS

Values are mean ± SE of three independent determinations
Figures in parantheses indicate per cent decrease (-) or increase (+) over control values.

It is revealed from the Table 3 that all the four types of *dhokla* supplemented with fresh beans powder i.e. cluster bean, cowpea bean, french bean and sem bean contained 60.49, 58.80, 58.71 and 62.67 mg/100g calcium. Control *dhokla* had 264.94 mg /100g of phosphorus content. Sem bean dhokla contained the highest phosphorus (297.07 mg/100g) while cowpea bean had the lowest (293.99 mg/100g) phosphorus content. French bean (297.06mg/100g) and sem bean *dhokla* (297.07mg/100g) did not differ significantly from each other in phosphorus but contained significantly ($p \leq 0.05$) higher phosphorus content as compared to cluster bean (295.72mg/100g) and cowpea bean *dhokla* (293.99mg/100g). It was found that iron and zinc content in supplemented *dhokla* ranged from 6.00 to 6.41 and 2.83 to 3.11mg/100g while control *dhokla* contained 5.31 and 2.40mg/100g of iron and zinc,

respectively. It is evident from the table that *dhokla* prepared incorporating green beans i.e. cluster bean, cowpea bean, french bean and sem bean had 78.25, 81.16, 77.47 and 77.06 mg/100g of magnesium, respectively. *Dhokla* prepared using four types of beans powder did not differ significantly ($P \leq 0.05$) among themselves for their magnesium content. Total manganese content in the *dhokla* prepared by supplementation varied from 2.42 (cowpea bean) to 2.62 (sem bean) mg/100g while control *dhokla* had 2.00mg/100g of manganese. All the four types of beans *dhokla* differed significantly ($p \leq 0.05$) from control *dhokla* for manganese content. Total potassium content was the highest in french bean *dhokla* (610.73 mg/100g) followed by cluster bean *dhokla* (603.16 mg/100g), sem bean *dhokla* (591.40 mg/100g) and cowpea bean *dhokla* (583.11mg /100g). Similar, increasing trend in mineral content was observed by Rachna (2006) and Singh *et al.* (2009) in value added products prepared using *Moringa oleifera* pods and amaranth leaves powder, respectively. Nazni and Shalini, (2010) developed fermented food using sorghum bicolor l. moench

Table 3: Mineral content of *dhokla* containing fresh beans powder (mg/100g, dry weight basis)

Type of *dhokla*	Calcium	Phosphorus	Iron	Zinc	Magnesium	Manganese	Potassium
Control	57.11± 0.53	264.94± 0.19	5.31± 0.11	2.40± 0.01	78.53± 1.98	2.00± 0.07	512.87± 2.20
Cluster bean	60.49± 0.61	295.72± 0.43	6.40± 0.88	2.90± 0.13	85.33± 0.75	2.49± 0.07	603.16± 8.37
Cowpea bean	58.80± 0.36	293.99± 0.40	6.21± 0.07	2.83± 0.08	86.40± 0.88	2.43± 0.03	583.11± 6.16
French bean	58.71± 0.32	297.06± 0.54	6.04± 1.14	3.11± 0.09	83.37± 0.22	2.58± 0.05	610.73± 11.17
Sem bean	62.67± 0.26	297.07± 0.53	6.00± 0.08	3.01± 0.12	83.06± 1.05	2.62± 0.05	591.40± 10.98
CD ($P \leq 0.05$)	1.39	1.40	0.40	0.31	3.62	0.18	27.02

Values are mean ± SE of three independent determinations
Figures in parantheses indicate per cent decrease (-) / or increase (+) over control values.

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. During off season, they can be dried and incorporated in *dhokla* (into other snacks also) to the extent of five percent in the powder form so as to increase the protein, dietary fiber and mineral content of the products.

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