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Development And Nutritional Evaluation of B--Carotene Rich Products Using Beet Leaf (*Palak*) And Carrot

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Abstract

The use of locally available low cost foodstuffs has been suggested as economically viable measure for product development. An increased intake of β-carotene rich food in habitual diet may be preferred to massive synthetic vitamin A dosage and it is better to consume vitamin A rich vegetables such as beet leaf (BL), drumstick leaves, amaranth leaves, coriander, mint, carrot, tomato and yellow-fleshed fruits like papaya and mango. β-Carotene rich products were prepared utilizing locally available vegetables (fresh/dried) namely beet leaf (Beta vulgaris) (Palak) and carrot (Daucus carota). The products were evaluated for their quality. For selecting the acceptable products for further study, the products prepared using two levels (10% and 20%) of vegetable or its powder were evaluated organoleptically. The moisture, protein, and fiber contents of supplemented products were significantly higher as compared to those of controls. β-Carotene was maximum in beet leaf powder supplemented biscuit (3.3 mg/100 g) followed by carrot powder supplemented biscuit (1.7-2.9 mg/100 g), carrot halwa (1.5 mg/100 g) and beet leaf Pakora (1.3 mg/100 g). All the products had significantly higher values for Ca, Fe, Mg, Zn and P as compared to control products.

Keywords: Beet leaf (*Palak*), Carrot, Biscuit, *Halwa*, *Pakora*, Quality

The use of locally available low cost foodstuffs has been suggested as economically viable measure for product development. An increased intake of β-carotene rich food in habitual diet may be preferred to massive synthetic vitamin A dosage and it is better to consume vitamin A rich vegetables such as beet leaf (BL), drumstick leaves, amaranth leaves, coriander, mint, carrot, tomato and yellow-fleshed fruits like papaya and mango. There is a need to supplement

these green leafy vegetables and yellow-fleshed fruits in various recipes to make them popular and to introduce these nutritious recipes in intervention programme.

The freshly prepared *Matthis* supplemented with moth bean, BL and fenugreek was moderately desirable by the panel of 10 judges for their colour, appearance, flavour, texture and taste but addition of more amaranth powder brought down the scores of *Mathi* with respect to appearance, color, texture, taste and overall acceptability in comparison to control. Incorporation of dehydrated green at 8 and 12% levels lowered the scores of all the attributes of the product. However, 4% green incorporated product was found to be similar to control in terms of texture, taste and overall quality although significant differences were seen in appearance and color.

Biscuits and *Shakarpara* prepared by using 10 g of dried cauliflower leaves powder in 100 g of wheat flour were organoleptically acceptable (Jood et al 2002). Four types of *Chapati* were prepared by incorporation of carrot powder at a level of 0, 10, 20 and 30% in wheat flour, and were tested for taste, colour, texture and overall acceptability by a sensory evaluation. Texture of chapaties containing carrot powder below 20% were rated better than the samples with carrot powder 20%. *Matar* prepared by the incorporation of 5% leaves powder of 3 varieties of amaranth and Matar without leaf powder (control) were 'liked moderately' for all sensory characteristics. Composition of '*Sags*' prepared by blending different varieties of mustard leaves was analyzed and found that moisture content ranged from 82.0 to 84.7%, protein 10.9 to 17.5%, fat 33.0 to 34.9%, crude fibre 9.4 to 12.5% and total ash 14.4 to19.5%, respectively (Kalra et al 1990).

Materials and methods

Beet leaf (*Beta vulgaris*) (*Palak*), and carrot (*Daucus carota*) were obtained in a single lot local market. Beet leaves (BL) were separated from their stalk and washed under running tap. Carrot was peeled, washed and made into shreds. Then the leaves and carrot shreds were blanched for 10-15 sec at 85^0C. The leaves were dried in oven at 40±5°C, whereas, carrot shreds were dried at 50±5°C. The dried leaves of BL as well as carrot shreds were ground in mixer and grinder to make a fine powder. The recipes for the preparation of products from BL and carrot powder were prepared using 10 and 20% of powders and sensorily acceptable recipes were

selected for evaluation of chemical composition.

Beet leaf biscuit: Creamed ghee (10 g), sugar (30 g), milk (30 ml), refined flour (Control= 100 g, sample I= 90 g, sample II= 80 g), *ajwain* (2.5 g), salt (1.5g), baking powder (2.5 g) and dried BL (Control= 0 g, I=10 g, II=20 g) were mixed to obtain dough. The dough was rolled and cut into biscuit's shape with help of cutter, and baked at 150^0C for 15-20 min.

Beet leaf Pakora: Washed and chopped BL (100 g), onion (30 g), green chilies (2 g), coriander leaves (20 g) were mixed with Bengal gram flour (100 g) and water to obtain thick paste. Small balls from the mixture were made and deep-fried until golden brown to obtain *Pakora*.

Carrot biscuit: Refined flour (Control= 100 g, sample I= 90 g, sample II= 80 g), *ajwain* (2.5 g), salt (1.5 g), baking powder (2.5 g) and dried carrot powder (Control= 0 g, I=10 g, II= 20 g) were mixed and the dough was rolled and cut into biscuit's shape with help of cutter and baked at 150^0C for 15-20 min.

Carrot Halwa: Washed, scrapped and grated the carrots (100 g) were mixed with boiled milk (200 ml) and cooked uncovered stirring occasionally until milk was completely absorbed and *Halwa* was nearly dry. Sugar (50 g) was added and stirred until it dissolved and cooked again for 5 min to which ghee (15 g) was added and fried for 5 min.

Sensory quality evaluation: The products were evaluated for their colour, appearance, flavour, taste, texture and overall acceptability using a 9-point hedonic scale by a panel of 10 judges from the college of Home Science of the university.

Chemical composition of products: The products were ground in mixer- grinder and dried in oven at 50±5°C to constant weight. Dried samples were packed in polyethylene bags and analyzed. Proximate composition and β-Carotene by column chromatography (AOAC 1995) were estimated. Fe, Mg, Zn, Ca (Lindsey and Norwell 1969) and P (Chen al 1956) were estimated.

*Statistical analysis***:** The experiment was laid out in completely randomized design (Panse and Sukhatme 1961) and results of sensory quality (n=10 panelist) and chemical constituents (n=3) were analyzed by t-test and z-test.

Results and discussion

Sensory quality: For selecting the acceptable products for further study, the

products prepared using two levels (10% and 20%) of vegetable or their powders were evaluated organoleptically. From each product the level having better acceptability was selected for further nutritional evaluation. The results are presented in Table 1. The control BL biscuits received high score of 7.8 in all attributes (T_1). Incorporation of powder at 10% level (I) brought down the scores to about 7 for all sensory attributes. However, the biscuits, prepared by incorporating 20% BL powder (II) were 'slightly desirable' for all sensory characteristics. BL *Pakora* scored 8.0 and rated 'desirable' for colour and 7.7-7.9 rated moderately desirable for appearance, flavour, texture, taste and overall acceptability. The control carrot biscuit scored 7.6-7.9 for different attributes and were 'moderately desirable'. Addition of 10% carrot powder (I) brought down the scores (7.3-7.4). However, biscuits prepared by using 20% carrot powder (II) were better sensorily as compared to 10% incorporated biscuits. Freshly prepared carrot *Halwa* scored 8.0 for colour and rated desirable. Scores were in range of 7.7-7.9 for other attributes.

BL powder biscuit (10%) (I), carrot powder biscuit (20%) (II), BL *Pakora* and Carrot *halwa* were selected for chemical analysis.

Chemical composition: Results are presented in Table 2. The moisture content of control biscuits (without incorporation of BL powder) was 1.6% while it was 1.6-1.8% in supplemented biscuits. BL *Pakora* contained 38.2% moisture content, as it was prepared from fresh leaves. Carrot *Halwa* contained 39.5% moisture. Sampathu et al (1981) also reported 30% moisture in carrot *Halwa*. The protein content of BL biscuits was higher (9.9%) than control ones (9.0%). The protein content of BL *Pakora* was 12.8%. This might be due to incorporation of Bengal gram flour in *Pakora*. The increase in protein content of carrot biscuits (10.3%) was higher as compared to the control biscuits (9.3%). Protein content of carrot *Halwa* was 7.3%. Protein content was 5.6% in carrot *Halwa* as reported by Sampathu *et* al (1981). A significant increase of fat in BL biscuits (19.2%) was observed as compared to control ones. The carrot biscuits also contained significantly higher fat content (19.5%) than that of control ones (18.4%). The fat content of carrot *Halwa* was 23.7%. There was non-significant difference between fibre contents of BL and control biscuits. The fibre content of BL *Pakora* was 4.1%.

The increase in fibre content of supplemented biscuits (1.7%) was significantly higher than the control ones (1.3%). Carrot *Halwa* was rich in fibre (5.6%). The BL biscuits had significantly higher Fe, Mg, Zn and lower P content as compared to control. Fe, Mg and Zn content of beet leaf *Pakora* was 12.4, 134.2 and 5.6 mg/100 g, respectively. The P content decreased significantly after incorporation in biscuits as BL is a poor source of P and BL *Pakora* contained 338.3mg/100 g. The supplemented biscuits contained significantly higher amount of all minerals as compared to their control. Carrot *Halwa* had maximum Ca and P content and values of Fe, Mg and Zn in carrot *Halwa* were 5.1, 96.0 and 1.0 mg/100 g, respectively. The BL biscuit (10% powder) contained more β-carotene compared to the control. It was lower in BL *Pakora* (1.3 mg/100 g). This lower content of β-carotene in *Pakora* might be due to the presence of higher amount of moisture in leaves. The carrot biscuits had significantly higher β-carotene content (2.9 mg/100 g) as compared to the control (1.1 mg/100 g). β-Carotene content in carrot *Halwa* was 1.5 mg/100g. Singh et al (1999) reported 1.9% β-Carotene content in carrot powder biscuit. There was a non-significant difference between ascorbic acid content of control and BL biscuits. The ascorbic acid content of BL *Pakora* was 6.4 mg /100 g. There was a non-significant difference in ascorbic contents of control and carrot biscuits. Ascorbic acid content of carrot *Halwa* was 1.2 mg/100 g.

Conclusion: BL and carrot powder supplemented products contained significantly higher moisture, protein and fibre content as compared to respective controls. β-Carotene was maximum in BL biscuit. All the products had significantly higher values of Ca, Fe, Mg, Zn and P as compared to controls. Hence, it is concluded that these products could be recommended for supplementation in nutrition programs.

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Table 1. Sensory quality of beet Leaf (BL) and carrot products

	Colour	Appearance	Flavour	Texture	Taste	Overall aceptability
BL powder *biscuit*						
Control	7.8±0.13[a]	7.8±0.13[a]	7.8±0.13[a]	7.8±0.13[a]	7.8±0.13[a]	7.8±0.13[a]
I	7.0±0.14[b]	7.0±0.14[b]	7.0±0.14[b]	7.1±0.10[b]	6.9±0.23[b]	7.0±0.14[b]
II	6.1±0.23[c]	6.4±0.22[c]	6.3±0.21[c]	6.5±0.22[c]	6.0±0.33[c]	6.2±0.18[c]
CD	0.51	0.49	0.49	0.46	0.71	0.45
BL *Pakora*	8.0±0.14	7.9±0.10	7.8±0.20	7.7±0.15	7.9±0.15	7.8±0.10
Carrot powder biscuit						
Control	7.8±0.13[a]	7.8±0.13[a]	7.7±0.21[a]	7.9±0.10[a]	7.6±0.16[a]	7.7±0.12[a]
I	7.4±0.16[a]	7.3±0.15[b]	7.3±0.15[a]	7.4±0.16[b]	7.4±0.16[a]	7.3±0.13[b]

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II	7.7±0.15[a]	7.6±0.16[ab]	7.5±0.16[a]	7.7±0.15[ab]	8.0±0.15[a]	7.6±0.09[ab]
CD	0.43	0.43	NS	0.41	NS	0.34
Carrot *halwa*	8.0±0.14	7.9±0.10	7.8±0.20	7.7±0.15	7.9±0.15	7.9±0.10

Control: 100 g refined flour, I: 90 g refined flour 10 g powder, II: 80 g refined flour + 20 g powder. Values with different letters in a column differ significantly ($p \leq 0.05$) (n=10 panelists)

Table 2. Chemical composition of beet leaf (BL) and carrot products

	BL powder biscuit				Carrot powder biscuit			
Parameters	Control	(I)	tcal	BL Pakora	Control	(II)	tcal	Carrot halwa
Moisture, %	1.6±0.01	1.7±0.01	12.5**	38.2±0.24	1.5±0.01	1.6±0.01	17.0**	39.5±0.35
Protein, %	9.0±0.29	9.9±0.29	2.1*	12.8±0.29	9.3±0.29	10.3±0.29	2.6*	7.3±0.29
Fat, %	18.6±0.70	19.2±0.11	4.8*	23.9±0.35	18.4±0.64	19.5±0.06	NS	23.7±0.35
Fibre,%	1.3±0.01	1.3±0.02	NS	4.1±0.02	1.3±0.04	1.7±0.01	8.8**	5.6±0.10
Mineral, mg/100g								
Ca	88.1±0.68	89.4±0.23	NS	217.4±0.60	82.4±0.26	89.7±0.39	15.3**	316.8±0.70
Fe	3.4±0.02	4.2±0.01	33.09**	12.4±0.01	5.4±0.18	6.6±0.06	6.0**	5.1±0.01
Mg	66.1±0.36	73.9±0.21	18.71**	134.2±1.57	68.4±0.34	70.6±0.47	3.7*	96.0±1.44

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Zn	1.9±0.01	1.8±0.01	5.6**	5.6±0.21	2.1±0.04	2.3±0.01	4.5*	1.0±0.02
P	287.1±1.30	267.5±0.26	14.72**	338.3±1.09	284.1±1.00	354.7±2.41	27.0**	217.2±1.32
β-Carotene, mg /100g	1.2±0.03	3.3±0.01	56.79**	1.3±0.01	1.1±0.01	2.9±0.01	73.5**	1.5±0.01
Ascorbic acid, mg/100g	1.3±0.01	1.5±0.17	NS	6.4±0.26	1.2±0.02	1.3±0.02	NS	1.2±0.15

Control: 100 g refined flour, I: 90 g refined flour 10 g powder, II: 80 g refined flour + 20 g powder. Significant at* 5%, ** 1%, NS: Non significant (n=3)