Nutrients and Carotenoids Content of Green Leafy Vegetables (GLVs) of Bangladesh

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Abstract

Green leafy vegetables (GLVs) have been analysed for their content of proximate nutrients and carotenoids. Proximate nutrients were estimated for twenty-seven and carotenoids for fourteen varieties of vegetables. Moisture ranged between 75.31±5.08% for Dheki shak and 92.61±0.71% for Pui shak. Amongst vegetables studied Nune shak contained lowest (1.08±0.30%), while Mula shak contained highest (6.31±4.09%) amount of protein. Fat content ranged between 0.33±0.11% for Pui shak and 1.93±0.32% for Data shak. Carotenoid content was found to be highest in Lal shak (9.38±0.60mg%) and lowest in Dheki shak (3.30±0.80mg%). Most of the popularly consumed GLVs were found to be rich in carotenoids.

Key Words: Proximate nutrients, Carotenoids, Green leafy vegetables

Introduction

There is a worldwide call to develop a National Food Composition Database. The food composition table currently used in Bangladesh is nearly forty year old and most of the values were collected from other countries, where people have different culture, food habit, soil condition, weather etc. Unfortunately, Bangladesh does not have food composition tables of its own. Although, segmented works dealing with the estimation of nutritive values of the local food are being carried out, no systematic study has so far been launched yet in Bangladesh. Moreover with the improvement of the agriculture technology, HYV (high yielding variety) foods have replaced some of our traditional foods, the nutritive values of which are yet to be determined. In order to provide for a wide coverage of local and high yielding

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varieties, different methods of cultivation, preparation and even cooking, a proper updated Food Composition Database or Table is of prime importance for the people of Bangladesh. Toward this end, we investigated the proximate nutrients and carotenoid contents of most popularly consumed Green Leafy Vegetables (GLVs) of Bangladesh.

Materials and Methods

Twenty-seven green leafy vegetables were selected for this study. The samples were procurred during October through March from farmer's fields and the major local wholesale markets where vegetables from different parts of the country are brought for sale. Proximate nutrient content was estimated for twenty-seven GLVs, and total carotenoids for fourteen varieties of these vegetables. Triplicate analyses were performed for each sample collected at different time.

The moisture content in the GLVs was determined by heating and subsequent cooling at constant weight. The protein content was estimated by Kjeldahl method as described in AOAC[1]. Fat content was determined by solvent extraction (chloroform:methanol 2:1 mixture) followed by gravimetry[2].

Total carotenoids was estimated by solvent extraction followed by spectrophotometric determination as decribed in AOAC[3]. The total carotenoids in the GLV was isolated from its n-hexane extract by passing it through a glass column (2.5x40 cm) with a sintered glass disk holding a 15 cm bed of an adsorbent of alumina and sodium sulphate. Eluted yellow band containing carotenoids was diluted and read in a spectrophotometer (UV-1201, UV-VIS, Shimadzu, Kyoto, Japan) at 450nm. Amount of carotenoids was calculated from its standard calibration graph.

Results and Discussion

Proximate nutrients are described in table 1. Moisture ranged from 75.31±5.08g% for Dheki shak to 92.61±0.71g% for Pui shak. Nune shak contained lowest (1.08±0.30g%), while Mula shak contained highest (6.31±4.09g%) amount of protein. Fat content ranged between 0.33±0.11g% for Pui shak and 1.93±0.32g% for Data shak. Notably winter GLVs were found to have relatively higher amount of moisture and fat, but lower amount of protein, compared with the summer vegetables (not shown). Despite a slight difference, the values for the proximate nutrients in these GLVs compare well with data reported in previous studies[4-8].

Table 1. Nutrient contents (g/100g)* of green leafy vegetables (GLVs)

GLVs English/Local name	Moisture	Protein	Fat
Indian spinach/Pui shak	92.61±0.71	3.07±0.10	0.33±0.11
Spinach/Palong shak	90.68±2.72	3.13±0.28	0.67±0.35
Red amaranth/Lal shak	88.78±3.25	5.86±0.56	0.32±0.19
Amaranth/Data shak	91.35±0.43	1.99±0.73	1.93±0.32
Bottle gourd/Lau shak	89.90±4.20	2.61±0.23	0.63±0.19
Pimpkin/Misti kumra shak	90.87±1.43	2.71±0.33	0.40±0.19
Water bind weed/Kolmee shak	84.40±2.88	1.97±0.57	0.94±.078
Green arum/Shobus kachu shak	82.42±4.07	4.47±0.27	0.94±0.08
Radish/Mula shak	89.25±1.88	6.31±4.09	0.87±.0.04
Cabbage/Badha kopi	92.48±2.01	2.04±0.26	0.34±0.07
Sweet potato/Misti aloo shak	84.93±0.47	4.14±0.86	1.12±0.36
Kheshari/Kheshari shak	89.53±1.66	4.88±0.71	1.33±0.22
Mustard/Sharisha shak	89.81±1.45	4.05±0.20	0.97±0.15
Water cress/Helencha shak	86.99±1.55	2.16±0.2	0.58±0.49
Coriander/Dhane pata	88.81±2.80	3.35±0.50	0.58±0.026
Plant coriander/Belati dhane	81.70±2.76	3.17±0.65	0.61±0.09
Mint/Pudina pata	89.14±3.54	3.03±0.44	0.32±0.23
Thankuni/Thankuni pata	85.72±4.17	2.30±0.29	0.51±0.42
Lambs quarter/Bathua shak	86.93±3.21	4.19±0.48	0.81±0.21
Lettuce/Lettuce pata	89.17±1.98	2.02±0.45	0.53±0.15
Dima/Dima shak	89.94±1.85	1.77±0.41	1.28±0.39
Farn/Dheki shak	75.31±5.08	1.47±0.49	0.85±0.24
Pea/Motor shak	89.22±1.50	4.79±1.03	1.77±0.39
Potato/Gol aloo shak	85.09±3.53	3.61±0.51	1.48±0.38
Angtae/Angta data	86.01±3.31	4.52±0.47	1.54±0.37
Purslane/Nune shak	91.74±1.74	1.08±0.30	0.48±0.08
Jute/Pat shak	89.41±2.14	2.05±0.06	0.19±0.04

*Values were expressed as mean±sd. Each value was mean of triplicate analyses.

Table 2. Total carotenoids in green leafy vegetables (GLVs)

GLVs English/Local name	Total carotenoids (mg/100g)
Indian spinach/Pui shak	6.19±0.50
Red amaranth/Lal shak	9.38±0.60
Amaranth/Data shak	8.78±0.40
Pimpkin/Misti kumra shak	4.19±0.55
Water bind weed/Kolmee shak	7.47±0.45
Black arum/Kala kachu shak	8.39±0.60
Radish/Mula shak	7.84±0.35
Sweet potato/Misti aloo shak	4.53±0.60
Water cress/Helencha shak	6.36±0.55
Coriander/Dhane pata	4.74±0.35
Mint/Pudina pata	6.06±0.30
Farn/Dheki shak	3.30±0.80
Jute/Pat shak	4.79+0.70
Thankuni/Thankuni pata	7.19±0.25

Total carotenoid was found to be highest in Lal shak (9.38±0.60mg%) and lowest in Deki shak (3.30±0.80mg%). It is to be noted that most of the GLVs studied are rich in carotenoids. It was observed that total carotenoids value for most of the GLVs under study corresponded well to the β-carotene values reported for these vegetables[5,8-10]. This consistency between total carotenoid and β-carotene values accounts for the fact that most of the carotenoids have absorbance maxima very close to 450nm, which is considered to be specific for β-carotene. In spectrophotometric determination of β-carotene, it is hard to minimise the contribution from other carotenoids[11]. Therefore, all the β-carotene values in recent studies is treated as the total carotenoids for the GLVs.

Conclusion

This study shows that the GLVs are rich source of carotenoids. As vitamin A deficiency is of public health significance, regular intake of carotenoids rich GLVs

could reduce or even eliminate this vitamin A deficiency problem. In addition that, the data obtained in this study could be used to update our Food Composition Table.

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