

Research Paper :

Calcium content of common local fruits and vegetables in Haryana

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Received : April, 2011; Accepted : May, 2011

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ABSTRACT

There are a limited number of studies available on the nutritional value of calcium content of fruits and vegetables commonly available and consumed in Haryana. An investigation was thus made into the calcium content of sixteen such fruits and vegetables. The samples were first digested to remove organic constituents, the calcium was then analyzed using Atomic Absorption Spectrophotometry. The results indicated that amaranth (chola), lotus stem, raisins, spinach and curry leaves contained high calcium content. The vegetables were by far richer in calcium content when compared to fruits. Increased consumption of local fruits and vegetables with high calcium would be useful in improving the daily calcium intake.

Saini, Shweta and Davar, Vinti (2011). Calcium content of common local fruits and vegetables in Haryana. *Asian J. Home Sci.*, 6 (1): 81-84.

Key words : Calcium content, Fruits, Vegetables

Calcium is one of the most abundant minerals in the body, available through diet. Ninety nine per cent of body's calcium supply is stored in the bones and teeth where it supports their structure (Weaver and Heaney, 2006). The remaining one per cent of calcium is the most important as it supports the various biological processes (Anonymous, 1997), like muscle contraction blood vessel expansion and contraction, secretion of hormone and enzyme and transmitting impulses throughout the nervous system (Whitney, 1996).

Inadequate intake of dietary calcium from food and supplements for short terms results in hypocalcaemia. Symptoms of hypocalcaemia include numbness and tingling in the fingers muscle cramps, convulsions, lethargy, poor appetite and abnormal heart rhythm (Weaver and Heaney, 2006). But over a long term dietary insufficiency of calcium can lead to porous and fragile bones as well as tooth decay. Rickets, osteomalacia (Albright and Reifstein, 1948) and osteoporosis (Cooper *et al.*, 1992) are the serious complication of calcium deficiency.

Osteoporosis is considered as a serious public health concern, which affects more than two hundred million people worldwide (Nordin, 1960). Calcium is present in both animal and plant foods. Milk is the best but expensive while green leafy vegetables are the cheapest source of calcium (Swaminathan, 2000) For better food selection and estimation of calcium intake, the present study has been undertaken to determine calcium content of common

local fruits and vegetables in Haryana.

EXPERIMENTAL PROCEDURE

A total of sixteen fruits and vegetables were analyzed including five fruits and eleven vegetables for their calcium content.

For this purpose, food samples were purchased from the retail market of district Kurukshetra, Ambala, Sonapat, Rohtak and Bhiwani. Fruits and vegetables samples were cleaned, washed, sorted out and only edible portion were homogenized for determination of calcium. Samples were analyzed in triplicate in di-acid mixture (4 parts HNO₃ and 1 part HClO₄) according to the procedure of Johnson and Ulrich (1959). For digestion, one gram sample of each food was taken with 20ml of diacid mixture in a 100ml conical flask and was covered by a watch glass to prevent contamination and kept overnight. The samples were digested at low temperature on hot plate. Copious red fumes, produced as reaction initiated and after 40-50 minutes, the fumes of nitric acid were over. The digestion was continued till the liquid finally became colorless. A volume of 50 ml was made on cooling of the digested sample with doubled distilled water. Calcium was analyzed using atomic absorption spectrophotometer (Chemito AA203) and data were converted to mg/100g of food.

The calcium content of the studied fruits and vegetables was compared with the values reported by Gopalan *et al.* (2002), Cunningham *et al.* (2001), Siong

et al. (1989) and Halevy (1957) for these respective fruits and vegetables. The percentage increased/decreased of calcium content in studied vs. reported values of these fruits and vegetables was also calculated (Table 2).

OBSERVATIONS AND ANALYSIS

Table 1 reveals the calcium contents (mg/100g) of analyzed foods. In analyzed foods, concentration of calcium ranged from 2.43 to 782.66 mg/100g. Curry leaves had the highest (782.66mg/100g) and apple had the lowest (2.43mg/100g) calcium content. The top five foods in rank order of higher calcium content were curry leaves (782.66±14.77), lotus stem (354.43 ±25.23), amaranth (192±4.5), raisins (70.13±4.58) and spinach (66 ±2.77). The mean calcium content of vegetables was 147.36±223.68 whereas of fruits was 19.002±25.75.

Table 2 exhibits the calcium content of studied vs. reported foods with per cent increase and decrease of calcium in comparison to the reported values. The average calcium contents of studied food groups were lower than that of values reported by Gopalan *et al.* (2002). In vegetable group, Gopalan *et al.* (2002) found maximum calcium content in curry leaves (830mg/100g) and minimal in potato (10mg/100g), which was 5.70 and 70.7 per cent more than the values of calcium found in current study.

Table 1: Calcium content of locally and commonly consumed fruits and vegetables of Haryana

Food name	Mean calcium content (Mg/100g)±SD
Vegetables	
Curry leaves	782.66±14.77
Amaranth	192±4.5
Spinach	66±2.77
Beans	40.3±4.1
Lotus stem	354.43±25.23
Tomato	11.76±3.65
Onion	31.53±2.10
Potato	2.93±1.34
Carrot	62.73±5.35
Cauliflower	27.76±1.51
Lady finger	48.9±4.88
Mean	147.36
S.D.	± 223.68
Fruits	
Papaya	11.76±1.15
Guava	4.16±1.45
Banana	6.53±0.68
Apple	2.43±0.65
Raisins	70.13±4.58
Mean	19.002
S.D.	± 25.75

Table 2: Calcium content of studied vs. reported fruits and vegetables with their percentage increase or decrease of calcium in comparison to the reported value

Food name	Calcium content (mg/100g)					Per cent (%) value of calcium							
	Studied value		Reported value			Increased				Decreased			
	S	A	B	C	D	A	B	C	D	A	B	C	D
Curry leaves	782.66	830	-	-	-	-	-	-	-	5.70	-	-	-
Amaranth	192	200	-	-	-	-	-	-	-	4	-	-	-
Spinach	66	73	-	116.2	81	-	-	-	-	9.58	-	43.20	18.51
Beans	40.3	50	52	-	70	-	-	-	-	19.4	22.5	-	42.4
Lotus stem	354.43	405	-	-	-	-	-	-	-	12.4	-	-	-
Tomato	11.76	20	13	-	10	-	-	-	17.6	41.2	9.53	-	-
Onion	31.53	40	41	-	52	-	-	-	-	21.17	23	-	39.36
Potato	2.93	10	3	-	-	-	-	-	-	70.7	2.33	-	-
Carrot	62.73	80	32	-	37	-	96.03	-	69.5	21.58	-	-	-
Cauliflower	27.76	33	23	-	43	-	17.14	-	-	15.87	-	-	35.44
Ladies finger	48.9	66	-	-	-	-	-	-	-	25.90	-	-	-
Papaya	11.76	17	-	-	-	-	-	-	-	30.82	-	-	-
Guava	4.16	10	-	-	49	-	-	-	-	58.4	-	-	91.5
Banana	6.53	17	5	5.7	18	-	30.6	14.56	-	61.58	-	-	63.7
Apple	2.43	10	4	-	9	-	-	-	-	75.7	39.25	-	73
Raisin	70.13	87	-	-	-	-	-	-	-	19.3	-	-	-

A: Gopalan *et al.*, 2002

B: Cunningham *et al.*, 2001

C: Siong *et al.*, 1989

D: Halevy, 1957

The percentage decrease in calcium concentration among samples of papaya, guava, banana, apple and raisin was 30.82, 58.4, 61.58, 75.7, and 19.3 per cent, respectively than the values reported by Gopalan *et al.* (2002) for these respective fruits.

Per cent increase: Studied value-Reported value=Resulted value, Resulted value/Reported value \times 100.

Per cent decrease: Reported value-Studied value=Resulted value, Resulted value/Reported Value \times 100.

Cunningham *et al.* (2001) reported mean calcium content in food samples like beans, tomato, onion, potato, carrot, banana and apple. All the food samples studied by them contained lower percentage of calcium except carrot (96.03 per cent), cauliflower (17.14 per cent) and banana (30.6 per cent) in comparison to the calcium content of respective samples in present study. The percentage increase of calcium content in studied samples of banana was 30.6 per cent with contrast to the values of calcium given by Siong *et al.* (1989). Halevy *et al.* (1957) found more calcium concentration in samples of spinach (18.51per cent), beans (70 per cent), onion (39.36 per cent), cauliflower (35.44 per cent), guava (91.5 per cent), banana (63.7 per cent) and apple (73 per cent) than the values of these foods studied in current study.

The difference in calcium contents of present study might have been attributed by different factors. The change could have been caused by anomalies of measurement of sampling, changes in varieties grown or changes in agricultural practices (Mayer *et al.*, 1957) Soil conditions including fertilizer application and storage and marketing conditions also influence mineral contents of vegetables and fruits (Nordeide *et al.*, 1957). The plant state of maturation, genetic variance and environmental factors were also the possible explanation for discrepancies observed.

Conclusion:

Sixteen fruits and vegetable samples were analyzed for calcium. The values per 100g of fresh edible portion were tabulated. The calcium content of fruits and vegetables determined in present study was lower than those previous published studies. Curry leaves had highest while apple had lowest calcium content in the present study. The mean calcium content of vegetables was found more than that of fruits. Knowledge of calcium content in foods and diets allows a better food selection and estimation of calcium intake thereby, improving mineral nutrition.

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