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Calcium Content of Locally and Commonly Consumed Foods of Kurukshetra, Haryana, India

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Abstract

Calcium in human body performs vital role. Inadequate intake of calcium may lead to serious complications like porous and fragile bones, tooth decay, muscle cramps and in extreme cases osteoporosis. Source of calcium for humans is through diet. Therefore, the present study was undertaken to determine "Calcium content of locally and commonly consumed foods of Kurukshetra (Haryana)". Thirty-four foods from six food groups were analyzed for their calcium content by AAS. Calcium content in different foods ranged from 2.43-1317.37 mg/100g. Nuts and Oilseeds contained the highest (758.43±43mg/100g) while cereals had the lowest (15.28±14.39mg/100g)calcium content. Top five foods for Calcium were Omum (1317.37±40.22), Poppy seeds (1289.13±14.68), Gingelly seeds (1167.67±32.24), cumin seeds (1006.03±47.55) and curry leaves (782.66 ±14.77).

Keywords: Calcium deficiency, calcium content, mineral.

Introduction

Calcium is one of the most important mineral constituent of skeleton system. It plays a vital role in various biological processes like cell adhesiveness, mitosis, blood coagulation, muscle contraction and glandular secretion[1]. Bone stores of calcium can be used to maintain adequate blood calcium levels for short term.

Human body gets calcium through diet. Over a long term, inadequate intake of dietary calcium can result in porous and fragile bones, tooth decay, muscle cramps and irritability. Osteoporosis in adults is one of the most serious complications of chronic calcium deficiency. In India, one out of two women over the age of 45 years is affected by osteoporosis.

Milk is the best but expensive source while Green leafy vegetables are the cheapest natural source of calcium[2]. Cereals and millets also contain some amount of this element. Foods rich in calcium should be consumed for better calcium intake. Keeping in view this fact, the present study has been undertaken to determine "calcium content of locally and commonly consumed foods of Kurukshetra (Haryana)".

Material and Methods

A total of thirty-four different foodstuffs were analyzed including four cereals, six pulses, five fruits, eleven vegetables, six spices and condiments and two nuts and oilseeds. The English and botanical names for studied samples are listed in table – 1.

Food Samples were purchased from the retail market of district Kurukshetra. Cereals, pulses, spices and condiments were sorted out and homogenized for analysis, while fruits and vegetables 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 HNO_3 and 1 part $Hcl0_4$) according to the procedure of Johnson and Ulrich (1959)[3]. 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 double distilled water. Calcium was analyzed using atomic absorption spectrophotometer (Chemito AA203) and data was converted to mg/100g of food. Calcium content (mg/100g) of the studied foods was compared with the reported values with their percentage increase and decrease.

Results and Discussion

Table – 2 reveals the calcium contents (mg/100g) of analyzed foods. In analyzed foods, concentration of calcium ranged from 2.43 to 1317.37 mg/100g. Omum had the highest (1317.37mg/100g) and apple had the lowest (2.43mg/100g) calcium. The top five foods in rank order of higher calcium content were omum (1317.37±40.22), poppy seeds (1289.13 ±14.68), gingelly seeds (1167.67±32.24), cumin seeds (1006.03±47.55) and curry leaves (782.66 ±14.77). Among food groups, Nuts and Oilseeds contained the highest (758.43±43 mg/100g) while cereals had the lowest (15.28±14.39mg/100g)calcium content.

Table – 1
Selected foods analyzed for calcium content with their Botanical names

English name	**Botanical name**
Maize	Zea mays
Rice	Oryza sativa
Rice flakes	Oryza Sativa
Wheat flour	Triticum aestivum
Green gram	Phaseolus aureus Roxb
Soyabean	Glycine max Merr.
Lentil	Lens esculenta
Rajmah	Phaseolus vulgaris
Moth bean	Phaseolus aconitifolius
Bengol gram dhal	Cicer arietinum
Curry leaves	Murraya Koenigii
Amaranth	Amaranthus gangeticus
Spinach	Spincia oleracea
French beans	Phaseolus vulgaris
Lotus stem	Nelumbium nelumbo
Tomato	Lycopersicon esculentum
Onion	Allium cepa
Potato	Solanum tuberosum
Carrot	Daucus carota
Cauliflower	Brassica oleracea
Lady finger	Abelmoschus esculentus
Papaya	Carica papaya
Guava	Psidium Guajava
Banana	Musa paradisiaca
Apple	Malus sylvestris
Raisin	Vitis vinfera
Omum	Trachyspermum ammi
Mango powder	Mangifera indica
Cumin seeds	Cuminum cyminum
Turmeric	Curcuma domestica
Coriander	Corindrum sativum
Poppy seeds	Papaner somniferum
Coconut dry	Cocos nucifera
Gingelly seeds	Sesamum indicum

Table – 2
Calcium content of locally and commonly consumed foods of Kurukshetra

Food name	Mean calcium content (mg/100g)
Cereals	
Maize	11.46±2.16
Rice	7.9±1.04
Rice flakes	14.96±1.35
Wheat flour	42.1±1.63
Mean 15.28±14.39	
Pulses	
Green gram	66.46±1.82
soybean	222.2±1.66
Lentil	67.13±1.61
Rajmah	242.5±6.16
Moth bean	193.13±2.44
Bengol gram	182.2±3.77
Mean 162.27±70.24	
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±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±25.75	
Spices &Condiment	
Omum	1317.37±40.22
Mango powder	150.47±3.43
Cumin seeds	1006.03±47.55
Turmeric	131.26±3.84
Coriander	496.93±25.09
Poppy seeds	1289.13±14.68
Mean 731.86±497.06	
Nuts &Oilseeds	
Coconut Dry	349.20 ±20.61
Gingelly seeds	1167.67±32.24
Mean 758.43±409.23	

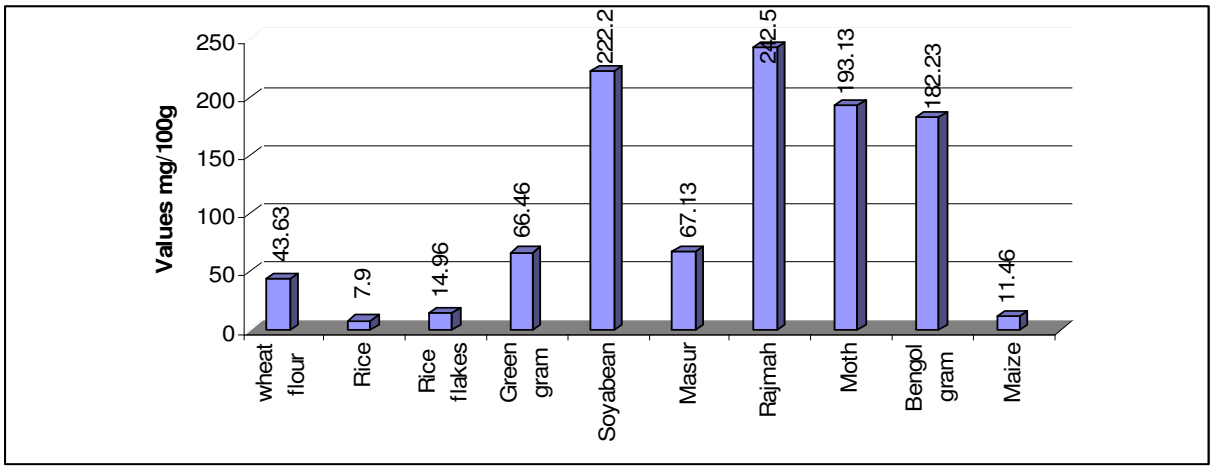

Figure – 1
Calcium content of locally and commonly consumed cereals and pulses of Kurukshetra

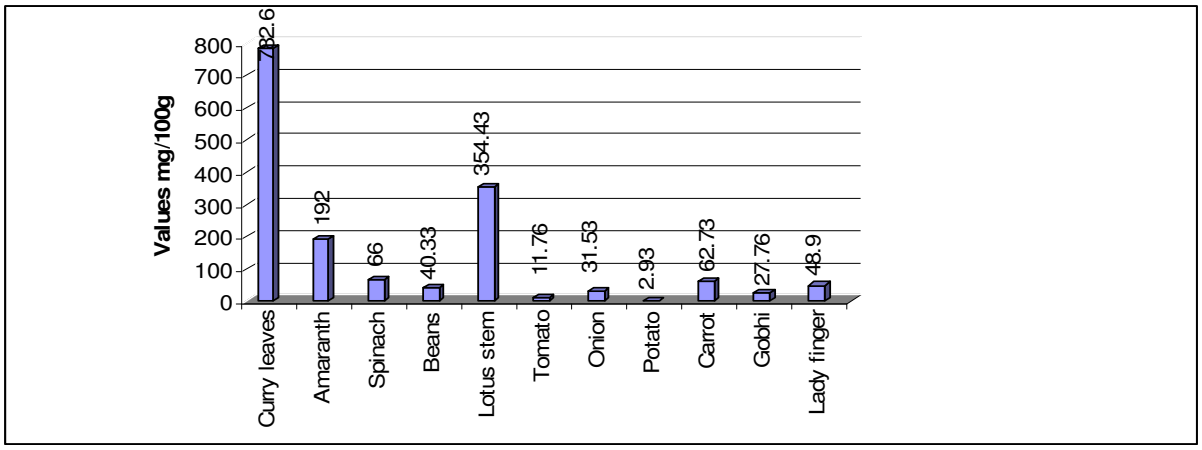

Figure – 2
Calcium content of locally and commonly consumed vegetables of Kurukshetra

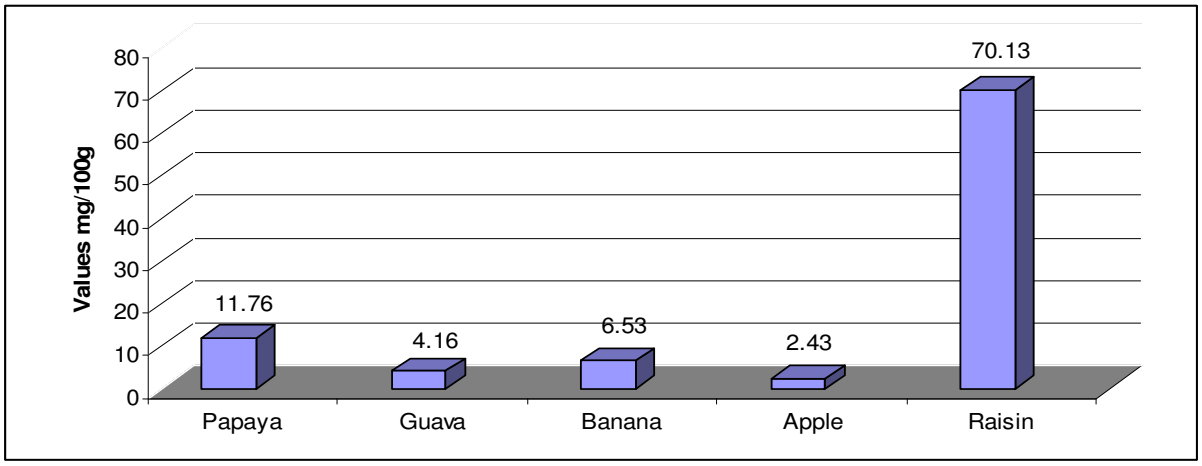

Figure – 3
Calcium content of locally and commonly consumed fruits of Kurukshetra

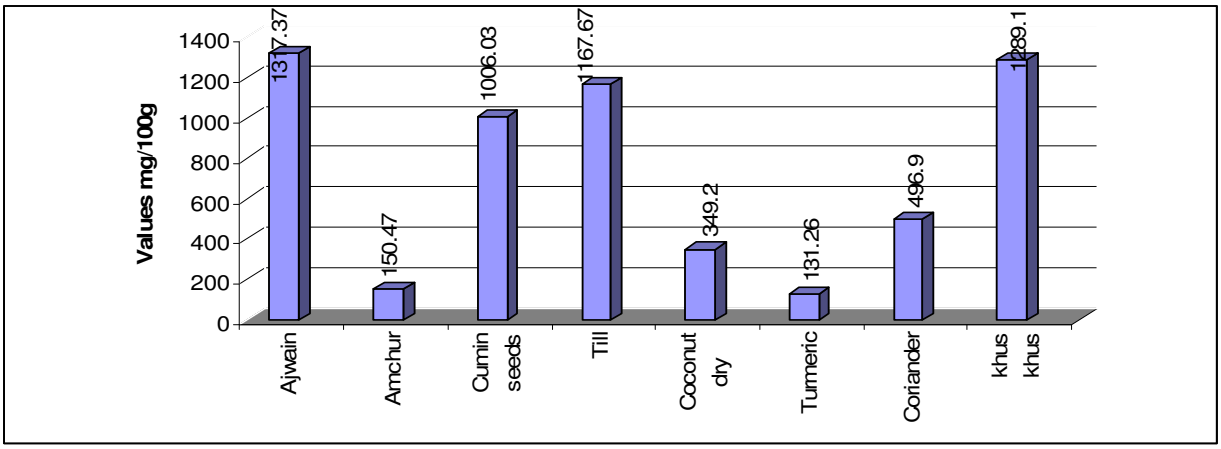

Figure – 4
Calcium content of locally and commonly consumed condiments and spices of Kurukshetra

Table – 3
Calcium content (mg/100g) of studied Vs. reported foods and their percentage increase and decrease

Food name	Calcium content (mg/100g)					Percent (%) value of Calcium							
	Studied value	Reported value*				Increased#*				Decreased**			
	S	A	B	C	D	S/A	S/B	S/C	S/D	S/A	S/B	S/C	S/D
Maize	11.46	10	-	-	9	14.6	-	-	27.3	-	-	-	-
Rice	7.9	10	-	-	-	-	-	-	-	21	-	-	-
Rice flakes	14.96	20	-	-	-	-	-	-	-	25.2	-	-	-
Wheat flour	42.1	48	-	45.5	-	-	-	-	-	12.29	-	7.47	-
Green gram	66.46	75	-	-	-	-	-	-	-	11.38	-	-	-
Soybean	222.2	240	-	-	-	-	-	-	-	7.41	-	-	-
lentil	67.13	69	-	-	-	-	-	-	-	2.71	-	-	-
Rajmah	242.5	260	-	-	-	-	-	-	-	6.73	-	-	-
Moth bean	193.13	202	-	-	-	-	-	-	-	4.39	-	-	-
Bengol gram	182.2	202	-	-	-	-	-	-	-	4.80	-	-	-
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	-	3.97	63.7
Apple	2.43	10	4	-	9	-	-	-	-	75.7	39.25	-	73
Raisin	70.13	87	-	-	-	-	-	-	-	19.3	-	-	-
Omum	1317.37	1525	-	-	-	-	-	-	-	13.6	-	-	-
Mango powder	150.47	180	-	-	-	-	-	-	-	16.40	-	-	-
Cumin seeds	1006.03	1080	-	816.8	-	-	23.16	-	-	6.84	-	-	-
Turmeric	131.26	150	-	-	-	-	-	-	-	12.4	-	-	-
Coriander	496.93	630	-	-	-	-	-	-	-	21.12	-	-	-
Poppy seeds	1289.13	1584	-	-	-	-	-	-	-	18.61	-	-	-
Coconut dry	349.20	400	-	-	-	-	-	-	-	12.7	-	-	-
Gingelly seeds	1167.67	1450	-	-	-	-	-	-	-	19.47	-	-	-

* Reported value by A): Gopalan et al., 2002, B) Cunningham et al., 2001, C) Siong et al., 1989, D) Halevy. 1957
** Increased/ Decrease = Studied value - Reported value / Reported value X 100

Table – 3 exhibits the calcium content of studied vs. reported foods with percent increase and decrease of calcium in comparison to the reported values. The average calcium content of studied food groups were lower than that of values reported by Gopalan et al.[4] except for maize. The calcium concentration of maize in current study was 11.46mg/100g which was 27.3 per cent more than the value given by Gopalan et al.[4]. In cereal and pulses group of studied samples the mean calcium content was maximal in rajmah (242.5mg/100g) and minimal in rice (7.9mg/100g).Similar results were found by Gopalan et al.[4] with maximal calcium content in rajmah i.e. 260mg/100g and minimal in rice and maize i.e. 10 mg/100g each. In vegetable group, Gopalan et al.[4] 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. 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.[4] for these respective fruits. Amongst the present studied nuts and oilseeds and spices and condiments group the percentage decrease in mean calcium content was found maximal in coriander (21.12 per cent) and minimal in cumin seeds (6.84 per cent) in contrast to values reported by Gopalan et al.[4]

Cunningham et al.[5] reported mean calcium content in food samples like beans, tomato, onion, potato, carrot, banana and apple. All the food samples studied by him contained higher 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 was studied in samples of cumin seeds (23.16) and banana (30.6) in present study with contrast to the values of calcium given by Siong et al.[6]. In a study, Halvey et al 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[7].

The difference in calcium content 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[8]. Soil conditions including fertilizer application and storage and marketing conditions also influence mineral contents of vegetables and fruits[9]. The plant state of maturation, genetic variance and enviournmental factors were also the possible explanation for discrepancies observed.

Conclusion

Thirty-four foods samples were analyzed for their calcium content. The values per 100g of fresh edible portion were tabulated. The determined calcium content in present study was lower than those previous published studies. Omum had highest while apple had the lowest calcium content. Among food groups: nuts and oilseeds had highest calcium content followed by spices and condiments, pulses, vegetables, fruits and cereals respectively. Knowledge of Calcium content in foods and diets allow a better food selection and estimation of calcium intake thereby improving mineral nutrition.

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