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Zinc content of commonly consumed foods of Kurukshetra district of Haryana

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ABSTRACT

Zinc contents of foods are directly related to the soil zinc content. Hence, in the present study, 24 locally grown and consumed and 12 locally consumed but not grown food samples were analyzed for their zinc levels using flame Atomic Absorption Spectrophotometry. Zinc concentrations varied from 0.06mg/100g in grapes to 6.04mg/100g in gingelly seeds. Foods rich in zinc were gingelly seeds (6.04mg/100g), Chickpea (3.55mg/100g), chashewnut (3.10mg/100g), soybean (2.97 mg/100g) and lentil (2.88mg/100g). Foods low in zinc, were grapes (0.06mg/100g), banana (0.10/100g), cucumber (0.12mg/100g), guava (0.13mg/100g), and carrot (0.18mg/100g). Among locally grown and consumed foods, highest zinc was in Chickpea (3.55mg/100g) and lowest was in grapes (0.06mg/100g) where as gingelly seed (6.04mg/100g) was the richest source and cumin seed was the lowest source of zinc in locally consumed but not grown foods.

Key words : Zinc, Foods

INTRODUCTION

Zinc is an essential micronutrient responsible for the normal functioning of plants and animals. It is one of the most commonly occurring trace elements found in nature. In the process of metabolism, zinc is required for various enzymatic and biochemical reactions. Overall, zinc plays a major role in cell growth, cell division and cell differentiation. It also improves immune system, vision, fertility, protein synthesis and other metabolic activities. In particular, zinc has been recognized as a cofactor of both DNA and RNA polymerases, as well as associated with variety of hormonal activities, including thymic hormones, glucagon, insulin growth hormone and sex hormones. Furthermore, zinc is required for normal brain development, antiviral, antibacterial, antifungal, and anticancer properties and has also been found to maintain normal levels of vitamin A in serum. Zinc content of foods is directly related to the amount of zinc in the soil where they were cultivated. According to an estimate, about 54 per cent soils in Haryana are deficient in zinc (Gupta and Dahiya, 2003).

Therefore, present research work was undertaken

with the objective to know the zinc content of locally grown and consumed and locally consumed but not grown foods of Kurukshetra district.

MATERIALS AND METHODS

Locally grown and consumed (Table 1) as well as locally consumed but not grown (Table 2) food samples were taken for the analysis of their zinc levels. Locally grown and consumed food samples were bought directly from the farmers. Locally consumed but not grown food samples *i.e.* dry fruits, spices and condiments and foods like sugar, salt, refined oil, tea and coffee were bought from retail shops. Vegetables and fruits were washed, cleaned and dried in the folds of Whatman filter paper. Cereals, legumes, dry fruits and spices and condiments were cleaned and then grounded. One g sample of each food was placed in a 100 ml volumetric flask and digested in di-acid mixture of nitric acid and perchloric acid in ratio of 4:1 according to the procedure of Johnson and Ulrich (1959). The samples were kept overnight in the digestion medium, thereafter digestion was carried out in triplicate on hot plates at 80°C until the contents were cleared.

Table 1 : Commonly grown and consumed foods of Kurukshetra district

Foods	Botanical names
Cereals	
Wheat flour (refined)	<i>Triticum aestivum</i>
Wheat flour (whole)	<i>Triticum aestivum</i>
Rice	<i>Oryza sativa</i>
Maize	<i>Zea mays</i>
Legumes	
(Chickpea (whole)	<i>Cicer arietinum</i>
Black dal (whole)	<i>Phaseolus mungo</i>
Green dal (whole)	<i>Vigna radiata</i>
Red gram	<i>Betula verrucosa var.carelica</i>
Soyabean	<i>Glycine max</i>
Rajmah	<i>Phaseolus vulgares L.</i>
Lentil	<i>Lens esculenta</i>
Vegetables	
Bean	<i>Phaseolus vulgaris</i>
Carrot	<i>Daucus carota</i>
Onion	<i>Allium cepa</i>
Tomato	<i>Lycopersicum sculentum</i>
Potato	<i>Solanum tuberosum</i>
Cucumber	<i>Cucumis sativus</i>
Cauliflower	<i>Brassica oleracea var. botrytis</i>
Cabbage	<i>Brassica oleracea</i>
Sweet potato	<i>Ipomea batata</i>
Fruits	
Banana	<i>Musa paradisica</i>
Pomegranate	<i>Punica granatum</i>
Grapes	<i>Vitis vinifera</i>
Guava	<i>Psidium guajava</i>
Mango	<i>Mangifera indica</i>

Table 2 : Commonly consumed but not grown foods of Kurukshetra district

Foods	Botanical names
Fruits	
Coconut	<i>Cocos nucifera</i>
Almond	<i>Amygdalus communis var. dulcis</i>
Chashewnut	<i>Anacardium occidentale</i>
Groundnut	<i>Arachis hypogaea</i>
Walnut	<i>Juglans regia</i>
Gingelly seeds	<i>Sesamum indicum</i>
Spices and condiments	
Fenugreek seeds	<i>Trigonella foenum</i>
Turmeric	<i>Curcuma domestica</i>
Poppy seeds	<i>Papaner somniferum</i>
Cumin seeds	<i>Cuminum cyminum</i>
Coriander seeds	<i>Corindrum sativum</i>
Mustard seeds	<i>Brassca juncea</i>

Afterwards, deionised water was added to each sample to bring the volume of digest to 50 ml. The digested solution was analyzed for zinc content by Atomic Absorption Spectrophotometer (ChemitoAA203) in Chemito Instruments Application Lab Karnal. Samples were atomized for zinc determination at a wave length of 214.02 nm, with a slit width of 1.0 nm. using acetylene flame.

RESULTS AND DISCUSSION

Among locally grown and consumed foods, concentration of zinc ranged from 0.5mg/100g (refined wheat flour) to 3.55mg/100g (Chickpea). Mean zinc content was highest in legumes (2.75 ± 0.625 mg/100g) followed by in cereals ($1.37 \pm .560$ mg/100g) and vegetables ($0.25 \pm .101$ mg/100g) and lowest in fruits ($0.23 \pm .212$ mg/100g). In legumes, highest concentration of zinc was present in Cheackpea (3.55mg/100g) and lowest in green dhal (1.67mg/100g). Amongst cereals, maize was the richest (1.93mg/100g) and refined wheat flour was the lowest (0.05mg/100g) source of zinc. In vegetables, maximum zinc was in potato (0.45mg/100g) and minimum was in cucumber (0.12mg/100g). In fruits, pomegranate had the highest (0.64mg/100g) where as grapes had the lowest (0.06mg/100g) zinc content (Table 3).

Among locally consumed but not grown foods, the maximum and minimum zinc content was found in gingelly seeds (6.04mg/100g) and cumin seeds (1.92/100g). Among dry fruits, gingelly seeds had the highest (6.04mg/100g) where as ground nut had the lowest (2.57mg/100g) zinc. In spices and condiments, poppy seed was the richest (2.48mg/100g) and cumin seed was the lowest (1.92mg/100g) source of zinc (Table 4).

Like present study, Gopalan *et al.* (1971) reported maximum zinc content for maize (2.8mg/100g) and minimum for refined wheat flour (0.6mg/100g). However, zinc level was 31 and 16 per cent lower in respective foods of present study than that of values given by Gopalan *et al.* (1971) (Table 5). Contrary to the study of Gopalan *et al.* (1971) concentration of zinc in maize was 93 per cent greater than that of the value given by Noel *et al.* (2001).

Like cereals, in legumes, value of zinc was also found less than that of the values of zinc given by Gopalan *et al.* (1971). In current study, percentage difference in zinc was found to be highest (45 per cent) in lobia and lowest (7 per cent) in lentil as compare to the study of Gopalan *et al.* (1971) (Table 5).

Gopalan *et al.* (1971) reported high zinc level for beans (0.40mg/100g), carrots (0.36mg/100g), onions (0.41mg/100g), tomatoes (0.41mg/100g), potatoes

Table 3 : Zinc content of commonly grown and consumed foods of district Kurukshetra

Sample	Zn mg/100g
Cereals	
Wheat flour (Refined)	0.05±.016
Wheat flour	1.79±.016
Rice	1.28±.009
Maize	1.93±.008
Total	1.37±.560
Pulses	
Chickpea (whole)	3.55±.008
Lobia	2.52±.017
Black dal (whole)	1.95±.029
Green dal (whole)	1.67±.024
Red gram	1.97±.012
Soybean	2.97±.076
Rajmah	2.51±.097
Lentil	2.88±.062
Total	2.75±.0625
Vegetables	
Bean	0.40±.002
Carrot	0.18±.012
Onion	0.22±.016
Tomato	0.20±.017
Potato	0.45±.005
Cucumber	0.12±.008
Cauliflower	0.30±.012
Cabbage	0.25±.009
Sweet potato	0.20±.012
Total	0.25±.101
Fruits	
Banana	0.10±.016
Pomegranate	0.64±.002
Grapes	0.06±.012
Guava	0.13±.012
Mango	0.23±.012
Total	0.23±.212

Table 4 : Zinc content of commonly consumed but not grown foods of kurukshetra district (mg/100g)

Sample	Zn mg/100g
Dry fruits	
Coconut	2.74±.013
Almond	2.75±.008
Chashewnut	3.10±.012
Groundnut	2.57±.017
Walnut	2.90±.012
Gingelly seeds	6.04±.012
Total	3.35±.121
Spices and condiments	
Fenugreek seeds	2.33±.008
Turmeric	2.19±.016
Poppy seeds	2.48±.076
Cumin seeds	1.92±.039
Coriander seeds	2.42±.012
Mustard seeds	2.46±.016
Total	2.30±.196

(0.53mg/100g), cucumber (0.23mg/100g), cauliflower (0.40mg/100g), cabbage (0.30mg/100g) and sweet potatoes (0.20mg/100g) that that of the values in present study. Values for zinc were 4, 50, 46, 51, 45, 25, 16, and 13 per cent lower in the respective vegetables than that of the values given by Gopalan *et al.* (1971).

Values of zinc by Gopalan *et al.* (1971) for banana, pomegranate, grapes, guava, and for mango were 0.10mg/100g, 0.82mg/100g, 0.10mg/100g, 0.16mg/100g and 0.27mg/100g in fruits, respectively. These values were also higher than that of values determined in current study for respective foods. The percentage difference was highest (40 per cent) for grapes and lowest (15 per cent) for mango (Table 5).

Among dry fruits, present study indicated lower zinc levels than that of the levels of zinc reported by Gopalan *et al.* (1971). They also found maximum zinc in gingelly seeds (12.20mg/100g) and minimum in walnut (2.32mg/100g), which were 50 and 86 per cent greater in respective foods than that of the values in present study.

In spices and condiments Gopalan *et al.* (1971) found zinc concentration *i.e.* 3.88mg/100g (fenugreek seeds), 2.72mg/100g (turmeric), 4.34mg/100g (poppy seeds), 2.66mg/100g (cumin seeds), 3.26mg/100g (coriander seeds) and 4.80mg/100g (mustard seeds). Among these

Table 5 : Comparison of zinc levels of foods (mg/100g) in present study with other studies

Food name	Measured Zn value	Given Zn value*		Increased Zn value**		Decreased Zn value***	
		A	B	M/A	M/B	m/a	m/b
Wheat flour (r)	0.5	.6	-	-	-	16	-
Wheat flour(w)	1.79	2.2	-	-	-	18	-
Rice	1.28	1.4	-	-	-	14	-
Maize	1.93	2.8	1.0	-	93	31	-
Chickpea	3.55	6.1	-	-	-	42	-
Lobia	2.52	4.6	-	-	-	45	-
Black dal	1.95	3.0	-	-	-	35	-
Green dal	1.67	3.0	-	-	-	44	-
Red dal	1.97	3.1	-	-	-	36	-
Soybean	2.97	3.4	-	-	-	12	-
Rajmah	2.51	4.5	-	-	-	44	-
Lentil	2.88	3.1	-	-	-	7	-
Bean	0.40	0.42	-	-	-	4	-
Carrot	0.18	0.36	-	-	-	50	-
Onion	0.22	0.41	-	-	-	46	-
Tomato	0.20	0.41	-	-	-	51	-
Potato	0.45	0.53	-	-	-	15	-
Cucumber	0.12	0.23	-	-	-	45	-
Cauliflower	0.30	0.40	-	-	-	25	-
Cabbage	0.25	0.30	-	-	-	16	-
Sweet potato	0.20	0.23	-	-	-	13	-
Banana	0.10	0.15	-	-	-	33	-
Pomegranate	0.64	0.82	-	-	-	22	-
Grapes	0.06	0.10	-	-	-	40	-
Guava	0.13	0.16	-	-	-	19	-
Mango	0.23	0.27	-	-	-	15	-
Not grown but commonly consumed foods							
Coconut	2.74	5.0	-	-	-	45	-
Almond	2.75	3.57	-	-	-	23	-
Chashewnut	3.10	5.99	-	-	-	48	-
Ground nut	2.57	3.90	-	-	-	33	-
Walnut	2.30	2.32	-	-	-	86	-
Gingelly seeds	6.04	12.20	-	-	-	50	-
Fenugreek seeds	2.33	3.88	-	-	-	24	-
Turmeric	2.19	2.72	-	-	-	19	-
Poppy seeds	2.48	4.34	-	-	-	43	-
Cumin seeds	1.92	2.66	-	-	-	28	-
Coriander seeds	2.42	3.26	-	-	-	26	-
Mustard seeds	2.46	4.80	-	-	-	49	-

*Given value by- (A) Gopalan *et al.* (1971, B) Noel *et al.* (2001).

**Per cent increased = measured value – given value / given value X 100.

***Per cent decreased =given value – measured value / given value X 100

values poppy seeds had the highest percentage difference (43 per cent) where as turmeric had the lowest (19 per cent).

The variations in zinc content in foods of present study in comparison to other studies might have been attributed to the fact that the zinc content of plants is directly related to the amount of zinc in the soil where they were cultivated, and therefore it is affected by their geographic origin.

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