

## DETERMINATION OF ZINC IN DIETARIES

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### ABSTRACT

Zinc is an essential indispensable ubiquitous for many of the body's process. The performance and functions of zinc important, with triggering over 100 differing internal enzymes regulating genetic activities. It is also required for the proper growth and sexual maturation and is therefore needed in the pregnant and lactating women. Zinc is also crucial in each cell of our body particularly in the nucleus having approximately 100,000 genes. Genes will provide instructions for the cells. For reading the genetic instructions zinc is indispensable. When Diets do not contain zinc in rich, the instructions get misread, or not read which cause the genes mis-transcriptions, ultimately causes the abnormalities in growth, in protein building and synthesis. So we must ensure enough zinc in our diet, preferably from zinc supplements. Zinc concentrations in drinking water of Nellore town (collected from different areas) have been reported by Sreevaniet al<sup>1</sup>. In view of the above specifications of zinc, in the present investigation a spectrophotometric method developed by the authors<sup>2</sup> has been applied for the determination of zinc in different dietaries like toasted wheat germ, roasted pumpkin seeds, water melon seeds, coco powder and peanuts. Di-amino di-hydroxy pyrimidine [DADHP] forms the ripe mango color complex at pH-6 in acetic acid and sodium acetate buffer in the presence of pyridinium chloride as salting out agent. The maximum absorbance is observed at 480nm. The statistical data evaluated reveals the sensitivity and accuracy of the method.

**Keywords:** Di-amino, di-hydroxy, pyrimidine, dietaries, seeds, spectrophotometer.

### INTRODUCTION

In chemical stand point of view the biotic, abiotics have two components. Organic component is the chief constituent comprise of 90%, remaining 10% being the inorganic component. It is relatively small amount but most important to maintain the vital activities. It has been proved there are 29 elements in biotics, broadly in two groups, dispensable and indispensable. Indispensable includes the macro and micro elements. All these are compulsory supplied in day to day dietaries. Diet rich in zinc is necessary for maintaining health. Zinc contributes to many aspects our general health. It contributes to quality of eyesight, taste, smell, hair and skin. It is also linked to the production of testosterone in men and the lessening of PMS (Post menopausal) symptoms in women. It even boosts the health of pre-natal babies as a necessary component of healthy birth weight. But, perhaps the most

widely known benefits of proper zinc intake is a fortified immune system. Zinc aids in the building of 100 different enzymes, and helps protect the body against sickness and decay. Here are natural food sources i.e., Nuts and Seeds that add zinc to our diet.

Almonds, peanuts, pine nuts, , wheat germ , water melon seeds, coco powder, , roasted cashews, green peas, seism seeds, shiitake mushrooms, green leaves and sunflower seeds are viable vegetarian options for keeping our zinc levels at a healthy high. Even more so, pumpkin seeds have one of the highest concentrations of zinc available in a non-meat food. All these foods have less fat and cholesterol than many meats. You may need to eat more to obtain equal benefits of animal-based zinc. You may also want to consider taking zinc supplements if your diet is primarily vegetarian.

The International Programme on Chemical Safety (IPCS), established in 1980, is a joint venture of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), and the World Health Organization (WHO). The overall objectives of the IPCS about the values of zinc in Dietary references vary according to the dietary pattern of the country, assumptions on the bioavailability of dietary zinc, and age, sex and physiological status. Dietary reference values range from 3.3 to 5.6 mg/day for infants aged 0–12 months, 3.8 to 10.0 mg/day for children aged 1–10 years, and 8.7 to 15 mg/day for adolescents aged 11–18 years. Adult values range from 6.7 to 15 mg/day for those aged 19–50 years, 7.3 to 15 mg/day during pregnancy, assuming diets of moderate zinc availability, and 11.7 to 19 mg/day during lactation, depending on the stage

In the present investigation the spectrophotometric method developed by the authors using an heterocyclic compound diamino and dihydroxy-pyrimidine as chelating agent<sup>2</sup> for the quantification of Zinc in viable vegetarian options

#### Preparation and Determination in Samples

For total zinc analysis, sample preparation involves 100gms of sample is dried in a hot air oven for 24 hrs at constant temperature of 90°C. 2-gms of sample is taken in to a beaker drying at 110 °C followed by acid digestion., and the digestion is performed on a hot plate using 4ml of 1:1HCl and 1:1HNO<sub>3</sub> till to dissolution and evaporated to dryness, latter 50ml of water is added to the residue again evaporated to dryness, further the same was repeated twice. The residue was cooled to lab temperature, few cc of water is added filtered, and filtrate is diluted to 100ml. 2-3 ml aliquots are taken and pH was adjusted to '6' using acetic acid and sodium acetate buffer then complexed with DADHP ligand in the presence of pyridinium chloride as salting out agent. The absorption of the ripen –mango-colour complex was measured at 480nm against the reagent blank. The measured absorbance and amplitude values are compiled with calibration plots (fig.1) and the results are summarized in Table.1

#### ANALYTIC DISCUSSION

For a healthy body it's important to include fundamental nutrients in our diet to ensure proper body functions and digestion. Most digestive problems can be treated with a healthy diet. However, every person needs a special combination of foods, because of varying characteristics and particular ailments.

Since ancient times food was used as a natural remedy to cure diseases. Much of ancestral knowledge has been incorporated into modern medicine, with the precise structure of nutritional therapy. The correct combination of nutrients, vitamins and minerals found in food can provide the necessary balance to support the metabolism and digestive system. Due to use of chemical fertilizers in agriculture, Zinc content of the crops is reduced drastically and so on the animals and humans feeding on it. There is huge population in the world deficient in Zinc

Zinc occurs ubiquitously in environmental and biological samples. Zinc metal does not occur in the natural environment. It is present only in the divalent state Zn (II). Ionic zinc is subjected to solvation and its solubility is  $P^H$  and anion dependent. It is a transitional element and it is able to form complexes with a variety of ligands. Because of the ubiquitous in the environmental, special care is required during the sample preparation and analysis to avoid contamination. Hence DADHP was chosen as ligand at  $p^H$  6 in the presence of pyridinium chloride as salting out agent. Wheat germ is great to sprinkle on top of any food, on salads, rice, or steamed vegetables. Wheat germ provides 12mg (82% RDA) of zinc per 100g serving. Pumpkin and Squash Seeds is popular food in the Middle East and East Asia. Pumpkin and squash seeds contain about 10mg (70% RDA) of zinc per 100g serving. Watermelon seeds are popular in the Middle East and East Asia and they should be in specialty stores catering to those cultures. It is also possible to just eat the seeds raw with the watermelon. You can shell them, or just chew them up whole. Dried watermelon seeds provide 10mg (70% RDA) of zinc per 100g serving. Dark Chocolate and Cocoa Powder is showing more and more health benefits and dark chocolate is coming into vogue. Unsweetened baking chocolate provides 9.6mg (64% RDA) of zinc per 100g serving. Peanuts are a great source of zinc, 100 grams of oil roasted peanuts will provide 6.6mg (44% RDA). The determined values (**Table.1**) reveal, most of the cases in good agreement with the prevalent genuine quantities (RDA) mentioned above and also notified by the United Nations Environment Programme (UNEP). The percentage recoveries explicit the versatility of proposed method, the 3<sup>rd</sup> derivative spectrophotometric measurements are more sensorium than direct and other derivative methods

Asunder from the foods listed above, there are many other ways to get zinc in your diet. If you don't eat any of the foods above, I recommend

supplementing your diet with a supplement. If you decide to take a zinc supplement, then be sure to do your research on the different types of zinc supplements.

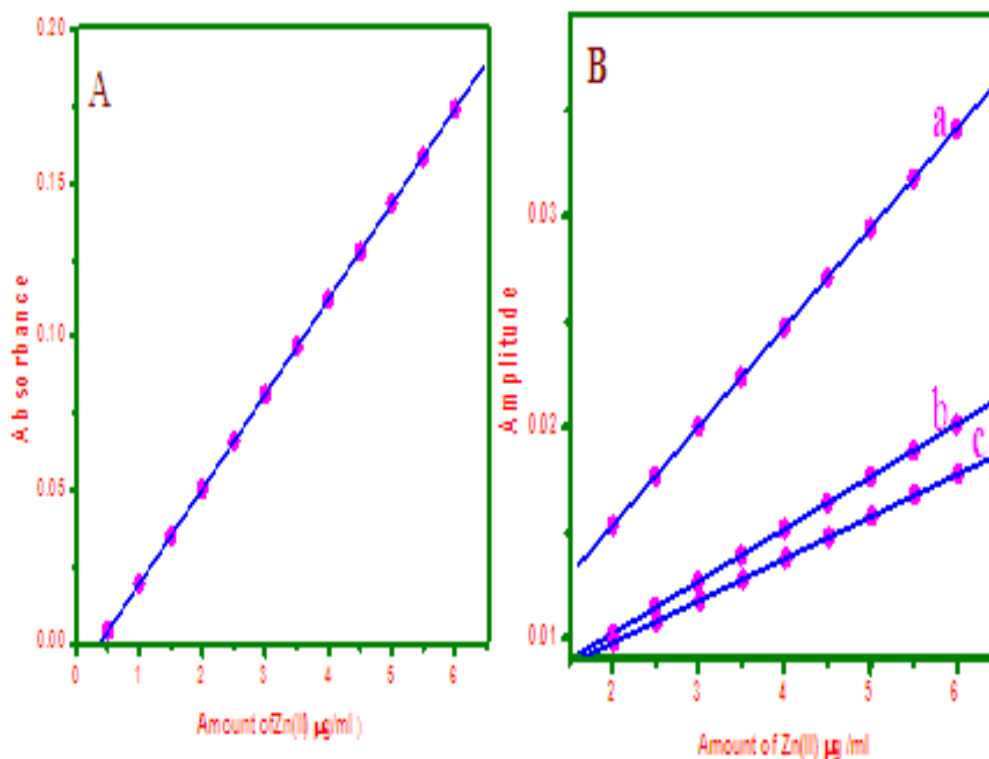
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#### Abbreviations

RDA = recommended daily allowance



**FIG.1.** Calibration curve of Zn(II) obeying the Beer's law (0.5-6.0 µg/ml)  
(A) Direct spectrophotometry (B) (a) First (b) second (c) third Derivative spectrophotometry

Table 1: Determination of Zinc in Dietaries

Dietaries	Certified value µg/g	Found µg/g	Recovery %	RMSEP	REP %	RSD	t – test
Toasted wheat germ	120	120.50	100.41	0.0190	0.1291	0.0791	1.5748
Direct		120.03	100.02	0.0081	0.6917	0.0338	0.3899
1 <sup>st</sup> derivative		119.91	99.99	0.0003	0.0208	0.0013	1.9164
2 <sup>nd</sup> derivative		119.32	99.43	0.0001	0.1809	0.0007	3.5135
Roasted pumpkin seeds	100	103.11	103.11	0.0118	0.2036	0.0286	0.2143
Direct		100.45	100.45	0.0003	0.0248	0.0008	6.5104
1 <sup>st</sup> derivative		98.67	98.67	0.0012	0.0329	0.0031	1.7851
2 <sup>nd</sup> derivative		96.15	96.15	0.0013	0.0286	0.0347	0.7132
Water Mellon	100	84.856	84.85	0.0047	0.0542	0.0110	0.1345
Direct		91.724	91.72	0.0089	0.0217	0.0195	0.2115
1 <sup>st</sup> derivative		92.216	92.21	0.0008	0.0151	0.0018	1.4707
2 <sup>nd</sup> derivative		93.828	93.82	0.0069	0.1961	0.0014	0.3664
Dark chocolate & coco powder	96	89.815	93.55	0.0001	0.0500	0.0003	4.8649
Direct		90.548	94.32	0.0056	0.2369	0.0155	0.3385
1 <sup>st</sup> derivative		93.035	96.91	0.0005	0.0349	0.1551	0.5547
2 <sup>nd</sup> derivative		94.515	98.45	0.0156	0.2217	0.4151	0.0810
Pea nuts	66	52.376	79.35	0.0182	0.0636	0.0580	0.1386
Direct		54.403	82/42	0.0006	0.0704	0.0020	3.2552
1 <sup>st</sup> derivative		59.720	90.48	0.0009	0.0641	0.0013	0.2108
2 <sup>nd</sup> derivative		63.690	96.50	0.0050	0.0444	0.0013	3.1622

Average of five replicate determinations

## REFERENCES

1. Sreevani D, Sivaramaiah S and Ashok Rao K. Spectrophotometric Determination of Zn (II) in Milk, blood serum and in natural water samples. IJ of pharmaceutical and chemical sciences. 2013;2(4):1717-1722.
2. Sreevani D, Ashok Rao K and Sivaramaiah S and Sarasubudhi K. Direct and Derivative Spectrophotometric determination of Zn (II) in pharmaceuticals. Chem SciTrans. 2013;2(2):513-523.