Determination of Phosphorus in Some Iraqi Foodstuff and Comparison with the Same International foods

Zena A.M.Al-Jawadi
College of Sciences
University of Mosul – Mosul - Iraq

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Absetract

Chemical analysis of different diet commonly used by population in Iraq to determine the concentration of phosphorus in some vegetable, fruits, dairy products, meat, eggs, and different foods and compared with the international value of the same food.

The differences in concentration of phosphorus in foods could be due to the geographical situation, environment and genetic variation, in addition other factors in soil and nutrition which may influence it. The list of good sources was derived from the same nutritive value of foods tables used to analyze information for recent food consumption surveys.

Finally this study will help the people to select the diet of good sources of phosphorus according to the chemical analysis.

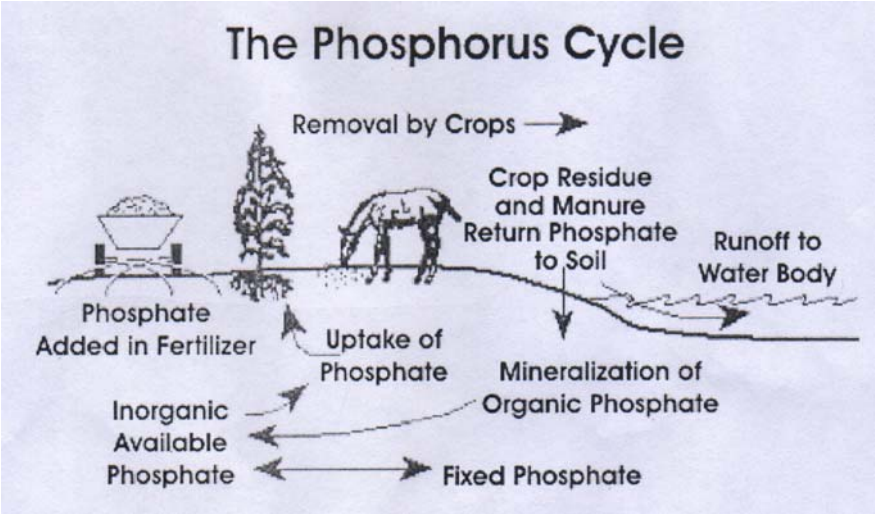
الخلاصة

تم تحليل الأغذية المحلية المتوفرة و المستعملة في العراق لتحديد تركيز عنصر الفسفور في بعض الخضروات والفواكه ومنتجات الألبان واللحوم والبيض وفي بعض الأغذية المتنوعة وبنفس الوقت قورنت النتائج مع التراكيز القياسية العالمية المعتمدة لنفس تلك المواد الغذائيـة وإن سـبب الاختلاف في تركيز عنصر الفسفور قد يعزى إلى الموقع الجغرافي و التغيرات البيئية والجينية بالإضافة إلى عوامل أخرى في التربة كاستخدام الأسمدة التي قد تؤثر ،بالإضافة إلـى أن قـوائم الأغذية التي حصلنا عليها مشتقة من حجوم طبيعية اختيرت للقياس لتعطي معلومات عن الأغذيـة الجيدة ذات المصدر الجيد للفسفور التي أجريت عليها الدراسة .

أخيرا هذه الدراسة سوف تساعد على إعطاء توصيات غذائية عامة للأشخاص في اختيـار المصدر الغذائي الجيد للفسفور استناداً إلى التحليل الكيميائي.

Introduction

Minerals are inorganic chemical elements necessary for growth, development and health. Needing small but steady supplies, minerals ensure that the body functions properly. One of the most important jobs for minerals is building the basic body structure. Bones[1].Phosphorus is an important element for many essential processes in the body. In combination with calcium it is necessary for the formation of bones and teeth. Phosphorus is also involved in the metabolism of fat, carbohydrate and protein, and in the effective utilization of many of the B-group vitamins, and in energy metabolism.[1,2]



Phosphorus is very widely distributed in both plant and animal foods. Because of its widespread occurrence, it is unlikely that you will have any dietary deficiency. But you could become deficient if you used large amounts of antacids for a long time. Also, people with faulty kidneys could have a deficiency of phosphorus.[3,4]

The phosphorus cycle is much simpler than the nitrogen cycle because phosphorus lacks an atmospheric connection and is less subject to biological transformation[5].phosphorus is elements that originate in the soil and cannot be created by living things, such as plants and animals. Yet plants, animals and humans need minerals in order to be healthy. Plants absorb minerals from the soil, and animals get their minerals from the plants or other animals they eat. Phosphorus in the human diet come directly from plants, such as fruits and vegetables, or indirectly from animal sources. phosphorus may also be present in your drinking water, but this depends

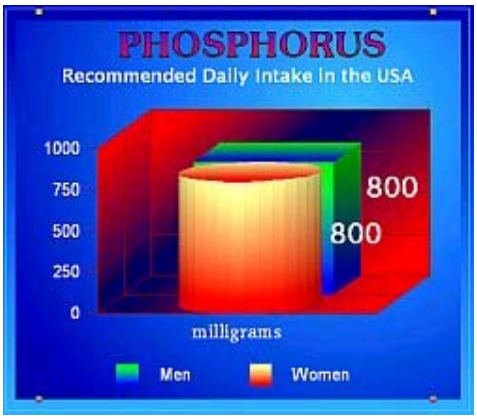
on where you live, and what kind of water you drink (bottled, tap) [6,7].A number of research studies are currently underway to decrease the amount of P in livestock manure, primarily through enzymes and animal ration modifications that make phosphorous in the feed more available (and usable) by the animal. This means that less phosphorus must be fed to ensure an adequate amount for the animal and, as a result, less phosphorous is excreted in the manure.[5,8]

Phosphorus Intake

In the U.S.A. the allowance for adults is 900 milligrams per day. Pregnant and lactating women, and children during years of rapid growth (10 to 18 years) should have a higher intake of 1250 milligrams per day.[2] The recommended dietary intakes of phosphorus are as follows:

- 0 to 6 months: 100 mg/day
- 7 to 12 months: 275 mg/day
- 1 to 3 years: 460 mg/day
- 4 to 8 years: 500 mg/day
- 9 to 18 years: 1250 mg
- Adults: 900 mg/day
- Pregnant or lactating women:
  Younger than 18: 1250 mg/day
  Older than 18: 700 mg/day

Phosphorus RDI:



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Diet collection:

Foodstuff used in this study were collected from local products of Mosul, while milk powder, tea, coffee and cacao collected from local market (imported products), and all compared with the International foods depending on Pennington, Pennington and Chrch.[9,10]

Phosphorus in food is measured by atomic absorption spectrometry (PyeUnicam Ltd, England, 1984), digest 1gm or 1ml of each food sample with 10ml of 1:1 concentrated nitric acid and 5ml of concentrated perchloric acid for 24h. Dilute to 100ml. Read phosphorus by atomic absorption.

Preparation of standard curve :

Dissolve 4.3940gm of potassium dihydrogen orthophosphate, dried at 105ċ, in 250ml of deionized water. Dilute to 1 litter in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption. [11]

Result and Discussion

The fruits-and-vegetables group includes all vegetables and fruits. Most vegetables are an important source of minerals. Vegetables also help to meet the body's need for minerals such as phosphorus, because plants are excellent sources of phosphorus[9,12,13,14], in Table(1) the results shown onion, pumpkin, lettuce, radish, beans, beet, spinach, cauliflower, cabbage, carrot, orange, banana and lemon are a good source of phosphorus and this results corresponding with the studies of Worthigton, Walker and Hedstrom[15,16,17], and also in Table(1) the average value of phosphorus in vegetable and fruits which are commonly used by our population and it compared with the international same food[9,10]. It was found that the average of phosphorus in vegetable is higher than in fruits and this correspond to Pennington, Church and Jackson.[10,18], and average value of phosphorus in vegetable and fruits in the local food is lower than that in vegetable and fruits in the international food, because the mineral content of the soil varies according to the location in which the plant was grown.[6]

Table(1):Comparison of phosphorus in vegetable and fruits in Iraqi foods and International foods.

Name	Scientific Name	P(ppm) Iraqi foods	P(ppm) International foods[9,10]
Onion	*Allium cepa*	350	360
Pumpkin	*Cucurbita pepo*	420	440
Parsley	*Apium graveolens*	600	630
Potato	*Solanum tuberosum*	300	530
Tomato	*Lycopersicon excuteutcem*	400	540
Lettuce	*Lacutuca sativa*	220	260
Radish	*Raphanus sativus*	350	310
Beans	*Phaseolus vulgaris*	285	300
Turnip	*Brassica rapa*	230	300
Beet	*Beta vulgaris*	250	280
Spinach	*Spinacia oleracea*	280	330
Cauliflower	*Brassica oleracea*	680	560
Cabbage	*Brassica oleracea*	420	400
Cucumber	*Cucumis sativus*	96	140
Carrot	*Daucus carita*	345	360
Apple	*Pyrus malus*	65	100
Orange	*Citrus aurantium*	192	200
Banana	*Musa paradisiaca*	225	260
Lemon	*Citrus limonum*	139.5	160

In Table(2) the milk group includes milk and cheese. The importance of milk in the diet has long been recognized. Whereas milk contains important amounts of most nutrients that are important for maintaining good health such as phosphorus[19,20,21,22], the results represent the concentration of phosphorus in the milk and milk products which show a higher concentration of phosphorus than in that found in vegetables and fruits and this correspond with Jackson, Spine Center com. and Anderson et al, whose found that the biggest portion of phosphorus in diet comes from milk and milk products because in general, foods high in protein like meat, milk, milk

products and eggs are also naturally high in phosphorus, as cheeses and yogurt, the phosphorus in these foods is usually easily absorbed[18,19,21].

In Whole egg, the phosphorus concentration was (2180ppm), while in yolk phosphorus was higher than in white part as seen in Table(2).

Table(2):Comparison of phosphorus in dairy products and eggs in Iraqi foods and International foods.

Name	P(ppm) Iraqi foods	P(ppm) International foods[9,10]
Sheep yogart	1540	2710
Cow yogart	1230	2160
Milk powder	4340	-------
Taza cheese	1530	-------
Al-Rafidain cheese	4850	-------
Beza cheese	4500	-------
Triple cream	1140	-------
Ona butter	950	-------
Egg (whole)	2180	2200
Egg (yolk)	1600	-------
Egg (whites)	579	-------

In meat the level of phosphorus as shown in Table(3), showed the highest level of phosphorus in chicken meat (2060 ppm) and this correspond to Pennington, Briggs and Calloway[9,23], which found that the chicken meat contains more phosphorus than other types of meat. But all types of meat are best sources of phosphorus as red meat, chicken and fish and this correspond with others studies[9,24], and the average value of phosphorus in meat which are commonly used by our population is lower than that in meats in the international food, because animal wastes contain both organic and inorganic form of phosphorus, the organic form must mineralize to the inorganic form to become available to plant, this occurs as the manure ages and the organic phosphorus hydrolyzes to inorganic forms.[5]

Table(3):Comparison of phosphorus in meat in Iraqi foods and International foods.

Name	P(ppm) Iraqi foods	P(ppm) International foods[9, 23]
Beef	1750	1820
Lamb meat	1800	2080
Chicken	2060	2290
Fish	2000	2100

Other food high in phosphorus include ice-cream, nut, loaf, chocolate, cacao[2], and this corresponding with the results in Table(4), also in Table(4) represents the concentration of phosphorus in miscellaneous food stuff, and the highest level of phosphorus was found in ice-cream (1864 ppm) and correspond with Penington, Briggs and calloway [9,23], who found the concentration of phosphorus in ice-cream was (1990ppm), and this a good source to get the phosphorus[25].However, the differences in concentration of phosphorus in food and it difference in local food and international food are due to the geographical situation, environment and genetic variation , in addition other factors in soil and nutrition which may influence it.

Finally, we can get enough phosphorus by eating a variety of food that contain phosphorus is the best way to get an adequate amount. Healthy individuals who eat a balanced diet rarely need supplements. The list of food will help you to select those of good sources of phosphorus.

Table(4)Comparison of phosphorus in different foods in Iraqi foods and International foods.

Name	P(ppm) Iraqi foods	P(ppm) International foods[9, 23]
Tea	25	50
Cacao	400	400-800
Chocolate	620	800
Orange juice	120	120
Lemon juice	140	155
Pepsi	400	520
Ice-cream	1864	1990
Nut	916	890
Almonds	655	800
White loaf	726	1000
White bread	726	1000

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