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Trace Metal Contents of Vegetables and Fruits of Hyderabad Retail Market

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Abstract: The heavy metals or trace elements play vital role in the metabolic pathways during the growth and development of plants, when available in adequate concentration. Seasonal fruits and vegetables play a significant role in human nutrition. Food production and its safety is an important aspect of the measure of any nation's growing economy and it is a popular trend to find out the trace metal contents of vegetables and fruits of local markets throughout the world but still data is lacking in developing countries like Pakistan. The trace metals Co, Zn, K, Na, Fe, Mn, Ca, Mg, Cu, Ni were analyzed in 15 vegetables and fruits (okra, guava, banana, potato, chili paper, onion, tomato, mint, mango, ginger, brinjal, bitter gourd, spinach, carrot) available in the markets of Hyderabad city. Vegetables and fruits selected for the study are commonly consumed by all income groups of Hyderabad city. Mineral contents were determined using Atomic Absorption Spectrometry (AAS). Co was analyzed 0.1038-0.126 mg/100 gm, Zn was 0.44-0.55 mg/100 gm, K 2.3-38.5 mg/100 gm, Na was 1.5-2. Mn was 0.0526-0.1435 mg/100 gm, Ca 0.3-3.35 mg/100 gm, Mg 1.191-32.0 mg/100 gm while Cu 0.1-1.9 mg/100 gm and Ni 0.05-0.18 mg/100 gm where as Fe was found 1.5-29.0 mg/100 gm among all selected vegetables and fruits.

Key words: Human nutrition, trace metal, fruits atomic absorption spectroscopy

INTRODUCTION

Trace metal: Evaluation of micronutrients and essential trace elements levels of fruits and vegetables is a growing trend in nutritional studies throughout the world. Trace elements do not provide any calorie but they play an important role in the metabolic regulations of the human body. Increased fruit and vegetable consumption can improve the mineral regulation and reduce cardiovascular diseases and certain cancer risks. Minerals can be divided into three groups, major elements, trace elements and ultra trace elements. Major element are Na, K, Ca, Mg, Cl, P, S are necessary more than 50 mg/day. Trace elements Fe, I, Fe, Zn, Se, Cu, Mn, Cr, Mo, Co, Ni are needed less than 50 mg/day. Ultra trace elements are Al, As, Ba, Bi, Br, Cd, Cs, Ge, Hg, Li, Pb, Rb, Sb, Si, Sm, Sn, Sr, Tl, Ti, W are not essentials. Trace minerals consistency of fruits and vegetables depends on different factors e.g. genetic, weather, soil and the harvesting stage of maturity and their supply to the markets. Mineral contents reduced in plants by the climatic conditions due to rain, mist, fog, light and temperature and then further loss takes place due to less suitable storage conditions. If the cultivated soil is deficient in certain trace metals then the cultivated crop would ultimately be deficient for those metals. Trace metals in the body maintain the body PH, osmotic regularity and used as coenzyme which regularize the metabolic reactions.

Copper (Cu): Copper is an essential trace element required for proper health in an appropriate limit. Its high uptake in fruits and vegetables can be harmful for human health and in the same way the lower uptake in human consumption can cause a number of symptoms e.g. growth retardation, skin ailments, gastrointestinal disorders etc. Cu is required as cofactor in different oxidative and reductive enzymes. According to Nair *et al.* (1997) the recommended limit for dietary consumption is up to 10 ppm and average dietary daily requirement for copper is 1-3 mg (Dara, 1993). Cu absorption in human body takes place from intestine and is reached to different other organs, where it is utilized in copper dependent enzyme (Gerbasi *et al*., 2003). Cu ATPas, lysyl oxidase and neuro transmitter. Which express in brain, kidney and lungs etc. Cu absorption can be deficient in human body because of excessive iron and zinc and on contrary excessive copper can cause iron inadequacy. Trace elements are the natural constituents of the soil and due the variation of the atmospheric condition their uptake vary through root to the shoot (Freedman and Hutchinson, 1980). But on the contrary Cu contents do not mobilize and remain stagnant in roots (Bakere *et al*., 1994).

Nickel (Ni): Ni plays its role as a coenzyme in different enzymes. Lower content of Ni in vegetables and fruits sources can lead to increased blood sugar level, hypertension and deficient growth in human but on the other hand the increased uptake of Ni in fruits and vegetables can reduced the blood glucose level, difficulty in breathing, nausea etc. According to ATSDR (1999) the acceptable range of Ni daily intake is 3-7 mg/day. Ni is

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one of the essential element which is present in the environment in trace amount as well as it is considered as indispensable for number of metabolic reactions in living beings (Brown *et al*., 1987). It is the important component of the urease enzyme as coenzyme which hydrolyze the urea to ammonia and carbon dioxide. It is reported that the plant growth can be effected if Ni is accumulated above 50 µg/g. Ni is absorbed in plant through root cap as well as Ni uptake depends upon environmental factors e.g. temperature, air, PH etc. Ni absorption is increased as the phosphate contents are increasing. It is reported that Ni uptake in plant is usually 0.1% of the dry weight of the plant. Ni is usually accumulated in vegetative part of the plant body and it is mobile through the plant structure, translocated and concentrated in the leaves but after ageningness of the leaves it is moved to the seeds for accumulation (Cataldo, *et al*., 1978). It is also reported that Ni and other metal absorption is some time can effected by fertilizers.

Zinc (Zn): Zn is reported as a coenzyme for over 200 enzymes involved in immunity, new cells growth, acid base regulation etc. Lack of sufficient amount of Zn results in reduced activity of related enzymes e.g. carbonic anhydrase (Blumberg, 1997; Stephanie Strachan, 2010). According to Chinies preventive Medicine Zn higher permissiveness for plants is 20 mg/kg (Chinese Department of Preventive Medicine, 1995). Where as WHO has established the tolerance limit of fruits and vegetables as 100 mg/kg. It is reported that Zn concentration in fruits and vegetables is as follows Green peper>Spinach>Mint>Brinjal etc. Data related to Zn toxicity is very rare (Barone *et al*., 1998; Gyorffy and Chan, 1992). Zn toxicity symptoms can be gastric disturbance, cardiac arythmia etc. (Salgueiro *et al*., 2000). Zn uptake in fruits and vegetables is increased due to increased heavy metal contaminated soil (Long *et al*., 2003). Zn is one of the less toxic metals and is essential for proper maintenance of body functions e.g. immune system, proper brain functioning and is vital for the development of fetal growth. According to a study the daily intake limit is up to 15 mg/day (ATSDR, 1994) while higher uptake of Zn can lead to muscle cramps, kidney damages and digestive problems. The reported limit of Zn for human uptake is up to 150 ppm. Trace elements are the natural constituents of the soil and due the variation of the atmospheric condition their plant uptake varies through root to the shoot (Freedman and Hutchinson, 1980). It is reported that Zn is more actively mobilize than Cu from roots to shoots (Barrg and Clark, 1998).

Iron (Fe): Fe is also a necessary metal and is core component of the red blood cells, its deficiency can cause anemia. According to a study, Fe is found in two oxidative states ferrous and ferric, through the intestinal track only ferrous state is absorbed and ferric state is reduced by the food constitutients (ATSDR, 1999). The absorption of ferrous state can be inhibited by the formation of phosphatides. The daily intake limits is 8-11 mg/day. Fe deficiency is a global problem specially in Asian countries (Brown, 2004). It is reported that about 60% of the world population is Fe deficient. Fe is needed in the RBC's formation and hemoglobin. Red blood cells life span is about 110 days. It is reported that in children iron is needed in more quantity with copper binding as it increases the blood volume. In muscles the myoglobin contain iron which provide it the red colour. Green vegetables, fruits, mustard soyabean, liver, kidney, egg yolk are the good sources of Fe. Fe deficiency can leads to anemia but iron shows some psychological symptoms as reduced attentiveness and loss of concentration (Hamilton and Whitemey, 1982).

Calcium (Ca): Ca is known in human nutrition for the development and growth of skeletal e.g. Bones teeth as well as coenzyme in metabolic regulations of biomolecules. Most of the Ca is stored in the bones and the rest of the remaining is utilized in the multiple functioning as in nerve excitation and muscles contraction. Regular intake of Ca in combination with phosphorous and vitamin D is necessary for the balance of daily loss of calcium. Ca deficiency in plants is very rare but the areas where the weather is hot and humid and the soil is acidic or saline Ca uptake in plants is reduced. Vegetables and fruits, cereals, dairy products, cereals are the rich sources of calcium. The absorption of the Ca is involved with the binding of vitamin D and phosphorous in 1:2:1. Vegetables food can produced oxalates in the body and inhibit the Ca absorption and Ca deficiency is comes out in the loss of Ca deposits in bones. Ca deposit is also influenced by gastric acidity due to bile, dietary cellulose; hemicellulose or fat uptake. Ca is an essential component in the growth of fruits and vegetables. It control the membrane structure, membrane permeability and provide the stability to the cell (Han *et al*., 2003).

Magnesium (Mg): Insufficiency of Mg in fruits and vegetables is seen through out the world, specially the areas where the soil is acidic (Metson, 1974). Mg is found in divalent cation state and leached out in the soil solution, it can not strongly bound, specially in coarse textured soil so, Mg deficiency takes place. Mg play an important role in nervous system stability, muscles contraction as activator of alkaline phosphatase as well as it is used alternative to calcium in the body (Cowan, 2002; Cowan, 1995). The daily recommended allowances for Mg are 320-420 gm/day (Institute of Medicine, 1999). Diet lack in calcium in children can impair the growth. Mg play an important role in protein

synthesis. Green leafy vegetables, fruits, cereals, legumes, sea foods are the richest sources of Mg (Welsh *et al*., 1992). About 60% of is found is the skeletal muscles and reduced intake of Mg is compensated by skeletal muscles so the risk of osteoporosis is increased (Rude, 1998). It has been studied that Mg deficiency directly reduce the cell formation, another study have been shown the reduced osteoblasts formation in bones in Mg deficiency (Wang *et al*., 1999; Freudenheim *et al*., 1986).

Cobalt (Co): Co is an indispensable element and is scattered in the atmosphere about 0.001%. It is found in bivalent as well as trivalent state. Vegetables and fruits contains 0.009 mg/kg (ATSDR, 1999). Co is usually contribute with vitamin B12 and its deficiency effect on the vitamin B12 consistency in the body. Co deficiency is rare in human but cattle are seen effected with symptoms like anemia. The daily recommended range of Co in human diet is 0.005 mg/day (ATSDR, 2004). Co deficiency also have an additional role in producing anoxia and injuring the heart muscles (Carson *et al*., 1986). An animal study on Co shown that protein deficiency mainly tryptophan can cause Co toxicity in the body (COMA, 1991). Co intakes >30 mg/day can cause digestive and skin disorders in humans. Study on the dietary supplement for Co is still not clear as the insufficient data is reported (Pedigo *et al*., 1988).

Manganese (Mn): Mn is one of the important essential element required in carbohydrates metabolism as well as an antioxidant in superoxide dimutases enzymes It is required in very little quantity an d its deficiency is rarely occur. Mn toxicity is reported in alcholia and liver diseases (Stephanie Strachan, 2009). The reported daily intake limit is 2-5 mg/day. Excessive Mn uptake in vegetables and fruits can be due to environmental factors which lead to poor growth, anemia etc. (Hurley and Keen, 1989). Manganese is stored in liver, skin, bones, kidney etc. Human body consists of 12-20 mg of Mn. Fruits and vegetables and whole grains and cereals are the good sources of Mn. The daily dietary intake of Mn is 2.0-5.0 mg in adults (Namlk and Yavuz, 2006). It is reported that Mn absorption is decreased due the ingestion of vegetables which contains large amount of fiber and phytates (US EPA, 1993). The individual deficient in iron can have increase Mn absorption (Mena *et al*., 1974). The reported daily intake for Mn is 1.8-2.3 mg/day (Institute of Medicine, 2001).

Sodium (Na): Na is also one of the essential element required in an appropriate amount in daily diet to regulate the blood pressure and in nervous system for transmitting signaling pathway of the body as well as stabilize the water in our cells. Lower level of Na can result in confusion, seizures etc. Na is an important extracellular cation and stabilize the extracellular fluid and is regulated by the kidney which is influenced by hormonal and neural stimulation. Increased level of the Na in the body usually response by expanding the space for the extracellular fluid and induce thirst. The Na daily recommended range in developing countries is between 2400-5175 mg/day (Sagnella *et al*., 1989). Trace metal exposure is considered toxic, the living organism exposure to metal ion in the body tissue is reported a healthy condition even with slight higher contents, cell protects its environment against toxic metal by metal binding protein as metallothioneins, toxic effect of trace metal depends upon the capacity to inhibit the enzyme as Na K ATP as which is considered due to increased cellular levels of Na, K, Ca (Cherian and Chan, 1993). Na as essential macro element, has physiological effect in human and animal cellular and metabolic mechanism. The increased level of Na contents has direct link to the high blood pressure (Janos Vetter, 2000). Vegetables and fruits diet consists of much Na salt quantity as our body required, it freely penetrates in body fluids. After renal filtration excessive amount is excreted from the body, the required amount of Na is reserved and reutilized through blood circulation. Na and K concentration responsible in maintenance of total body fluid needed in acid base equilibrium as well as for the osmotic regulation of the body.

Potassium (K): K is one of the essential element of human diet, play important in vital cellular mechanism, as cofactor it catalysis the conversion of the ADP to ATP, excitability of the nerve. K absorbs in the body through the jejunum where it transported to the liver and other body tissues. Besides other vital body function K have an important role in carbohydrates and protein metabolic reaction. It is required in very less amount, KCL salts can easily be replaced by NACL and its deficiency is very rare. The richest sources of K are oranges, banana, dried fruits, potatoes etc. K deficiency can leads to lack in fluid transportation control in cellular environment. K uptake in plant body depends upon the soil transport level which can deficits due to limited moisture in soil and plant uptake of K can be reduced as well as clay soil have high fixing capability of K, so much of the K contents remain bond to clay and plant uptake is reduced. Where as calcareous soil is reported having higher amount of Ca which inhibit the K uptake in plants, sandy soil have very little transporting power for K ion as sandy soil have lower cat ion substituting capability, so vegetables and fruits cultivated in these types of soils can show lower uptake of K. According to Institute of Medicine of the National Academies of Science and food and nutrition board 2004-2006 potassium daily recommended amount for adult is 4700 mg/day (Viarengo *et al*., 1996). K deficiency can lead different metabolic diseases as K deficiency can create

resistance in different cells from e.g. fat cells muscle cells etc from insulin and shows lower HDL, increased serum glycerides, obesity that further develop arthrosclerosis and lower blood supply to the vital organs and increase the chances of strokes. It is reported that increased K intake by 120 meq/day can stable blood pressure and reduces the stroke risks (Otten *et al*., 2006).

Literature review: Trace metals or essential elements are necessary for multiple physiological and metabolic reactions involved in maintaining good health (Goldman *et al*., 1999). Copper is needed with addition of Fe for neurovascular system, maintenance of body pigmentation and play an important role in anemia (Erum Zahir *et al*., 2009). Zinc is involved in many enzymatic reaction e.g. RNA polymerases and different hepatic enzymes. Zinc deficiency can disturb Zinc maintenance in human body (Dilek and Ahmet, 2006). A work on trace metals in seasonal vegetables in Turkey found variable concentration in vegetables for trace and heavy metals with order of Cd<Pb<Ni<Cu<Zn, which concluded that vegetables collected from urban areas have higher contents of metals up take than rural areas collection which is reported due to phosphoric fertilizers. Cu uptake were 33.38 µg/g for rural area while it was 49.22 µg/g recorded for urban areas as well as the leafy vegetables showed higher metal uptake than the non leafy vegetables (Queirolo *et al*., 2000). According to another study (WHO, 1982), this is usual situation for vegetables to enhance heavy metals uptake in higher PH level and increased level of organic materials. In this study Zn level was ranged 3.56-259.2 µg/g. Average contents of Zn are lower than the recommended PTWI (WHO) (Ron *et al*., 1984). The Ni uptake of the study was highest 13.45 µg/g in cucumber while lower in tomato. Average reported uptake is with in WHO recommendations. A group of researcher worked on Chinese vegetables and studied moderate levels of Fe in rage of 0.3-1.7 mg/100 g in leafy vegetables while K level recorded higher in leafy vegetables in comparison of Fe and in contrast of vegetables fruit and legumes. Calcium contents were obtained >100 mg/100 g in brassica family than vegetables fruits and legumes. Whereas the Mg level detected higher in Chinese spinach 85 mg/100 g of brassica family than other species (Rajesh *et al*., 2009).

A study done on the soil collected from the cultivated area for trace metals have shown Cu range between 19.3-9.8 µg/g, Zn 83-133 µg/g while 0.6-2.3 µg/g was Cd and 2.9-10.3 µg/g for Pb uptake. These values of metals were higher than the recommended ranges of the control areas, but the uptake of vegetables crop of the area is varied than the cultivated soil, as Zn contents in Okra 29.6-39.2 µg/g, Spinach 30.1-45.5 µg/g, Cauliflower is 38.6-63.3 µg/g. Cu showed 9.5-21.8 µg/g, for okra, spinach with 21.8-12.8, 25.6, while cauliflower with 9.8-24.1 µg/g. Lead showed 0.3-1.2 µg/g uptake in okra, 0.7-1.4 µg/g for spinach, 0.2-1.8 µg/g in cauliflower (Claudia *et al*., 1998). A study have been done on Mexican fruits and vegetables for mineral composition suggested that mineral composition can vary due to difference of species, cultivated soil, climatic situation which includes light intensity influence, rain, mist and foggy atmosphere influence on the mineral loss of plants. The vegetables and fruits uptake of metals also depends on their capability of minerals absorption. It is reported that K and Ca containing fertilizers can reduce Mg uptake in plants (Claudia *et al*., 1998; Noggle and Fritz, 1976). An other study by Peterson (1979) reported that fertilizers and the tissue age both factors also influence in mineral losses (Paivi *et al*., 2007). Trace element assessment in fruits and vegetables shows again variation like previous studies but trace metals comparison with last 30 years data of Finland given the decreased trend of minerals in fruits and vegetables. Trace minerals have shown decreased trend as Mn, Zn, Cu, Al, Pb, Cd, Ni but Fe and Co concentration stayed with no change Se investigated with increased concentration while K was detected significantly lower uptakes in Finnish fruits and vegetables (Jamali *et al*., 2007). A work carried out from 2004-2005 (Midrar-ul-Haq and Riaz, 2005) in Pakistan for assessment of trace metals Cd, Cu, Cr, Ni, Pb and Zn in vegetables and agriculture soil which is irrigated by sewage water and as control same vegetables were grown with fresh water and then both type of sample preparations were evaluated by Flame atomic absorption spectrometer. Trace metal uptakes in vegetables and soils irrigated with sewage water were observed higher than the control sampling, which highlight the harmful impact of metal uptakes of soil and vegetables which irrigated with sewage water for a long period. An other study done fruits in Karachi resulted the metals uptake according to WHO (1997). Trace metals are vital for the growth of plant body but their in appropriate quantity leave ill effects on the plant growth.

MATERIALS AND METHODS

Minerals determination: Fresh samples of vegetables and fruits were air dried for seven days and then oven dried at 45°C to constant weight. They were ground with porcelain mortar and piston to fine particle size and stored in plastic containers for Atomic absorption spectrophotometer analysis. In mineral determination these Ni, Cu, Co, Zn, P, Na, Fe, Mg, Ca and Mn was determined by Atomic absorption spectrophotometer by wet digestion.

Wet digestion: 0.5 gm of dried sample was added with 5 ml conc. HNO_3 and placed on the hot plate for 1 h and getting semi dried, again 5 ml of conc. HNO_3 and 2 ml of H_2O_2 was added and again kept on hot plate for 1 h and

after getting semi dried cooled and filtered with the help of watt man filter paper and volume of the residue was made up to 25 ml with 2 N HNO_3 and taken to the Atomic absorption spectrophotometer for above mentioned minerals analysis by using Aluka standards (AOAC, 1990).

RESULTS AND DISCUSSION

Trace metals uptake in fruits and vegetables plants absorbed from the soil of the cultivated area, the atmospheric condition and partly from the irrigated water. In this study trace minerals such as Co, Zn, K, Na, Fe, Mn, Ca, Mg, Cu, Ni were done by atomic absorption spectroscopy in mg/100 gm. Cobalt was found higher in spinach as 0.126 mg/100 gm and lower concentration as 0.1038 mg/100 gm in carrots, cobalt determination in fruits and vegetables was shown significantly high in all types of vegetables. According to a study carried on Cobalt in different foods, Co variation in vegetables and fruits is 0.006-0.009 mg/kg (Leblanc *et al*., 2004) Zn uptake was 0.55 mg/100 gm and 0.44 mg/100 gm as highest uptake in cucumber and ginger and lower in 0.11 mg/100 gm in banana. Zn uptake has been determined in higher amount in fruits and vegetables and root vegetables as seen in Table 1 while leafy vegetables shown slightly lower uptake of Zn. According to the WHO recommendation fruits and vegetables are poor sources of Zn and ranged up to 1 mg/kg and dietary intake for Zn is 14-20 mg/day (FAO, 1973). Potassium is one of the essential element and had maximum level 38.5 mg/100 gm in potato while minimum level was analyzed in guava 2.3 mg/100 gm. In comparison fruits vegetables stem, root vegetables and leafy vegetables, K uptake were higher than leafy vegetables as summarized in Table 1. Sodium determination in seasonal vegetables and fruits was high in okra while mint showed reduced uptake 3.0 mg/100 gm. Iron analysis was determined higher in mint 29.0 mg/100 gm and tomato showed lower 1.5 mg/100 gm. In comparison leafy vegetables shown a significant iron uptake while vegetables fruits and stem, root vegetables have showed variable differences in iron uptake. Iron is one of the essential metals needed in various enzymatic reactions and its daily requirement is ranged 1.5-2.2 mg/day (Food and Nutrition Board, Institute of Medicine. 1997). Manganese contents were determined higher in okra 0.1435 mg/100 gm and mango showed minimum 0.0526 mg/100 gm while comparison showed the higher Mn uptake in leafy, stem and root vegetables as compare to fruit vegetables. Manganese safe limit for daily intake is 2.0-5.0 mg/day for an adult (Belitz, Grosch and Schieberle, 2007) and its recommended range in fruits and vegetables are 0.42-6.64 ppm (NRC, 1989). Calcium uptake in fruits and vegetables was higher in 3.35 mg/100 gm while ginger showed lower Ca contents 0.3 mg/100 gm. Magnesium maximum uptake was found in mint, while lower uptake was found in guava about 1.91 mg/100 gm. In comparison of vegetable type stem and root vegetables and leafy vegetables showed significantly higher values than fruit vegetables. Magnesium daily dietary intake ranged 400-420 mg/day (Pennington *et al*., 1986). In comparison copper higher uptake in vegetables fruits was determined in chili 0.017 mg/100 gm while in stem, root vegetables class onion and carrot had maximum Cu uptake as 0.014 mg/100 gm. Leafy vegetables contained significant Cu uptake in 1.9 mg/100 gm in mint. However in comparison of Cu uptake in all three classes leafy vegetables were higher. In this analysis Cu determination limit varied from 0.1-1.9 mg/100 gm from okra to mint. Copper is an essential element and is vital in many regulatory mechanisms in plant bodies and its recommended uptake limit in plant is 0.0-5.0 mg/kg (Institute of Medicine, 1997). The acceptable range for human intake is up to 10 mg/kg (Yusuf *et al*., 2002) and the daily recommended limit is

Table 1: Nutrients composition of fruits and vegetables from 100 gm edible portion

Vegetable/Fruits	Co	Zn	K	Na	Fe	Mn	Ca	Mg	Cu	Ni
	mg/100 gm									
Guava	0.1120	0.28	2.30	5.80	9.2	0.1152	2.20	1.91	0.50	0.040
Mango	0.1038	0.13	8.60	40.00	11.5	0.0526	3.20	3.26	0.90	0.060
Okra	0.1164	1.05	4.55	12.40	8.7	0.1435	2.10	3.23	0.10	0.090
Cucumber	0.1142	0.55	4.65	5.25	4.4	0.1235	1.80	3.92	0.10	0.180
Banana	0.1059	0.11	7.25	3.70	16.3	0.1159	3.20	3.16	0.11	0.060
Bitter gourd	0.1140	0.40	6.40	6.90	11.6	0.1398	2.85	4.26	0.11	0.130
Tomato	0.1127	0.15	3.70	7.35	1.5	0.1003	3.35	4.18	0.13	0.050
Brinjal	0.1078	0.38	8.20	6.60	19.0	0.1287	2.30	3.13	0.90	0.070
Chili pepper	0.1064	0.42	5.55	4.05	3.5	0.1300	3.05	2.36	0.17	0.060
Stem and root vegetables										
Potato	0.1191	0.48	38.50	6.60	1.4	0.1307	2.40	2.91	0.50	0.005
Ginger	0.1073	0.44	5.10	6.60	3.2	0.1207	0.30	2.24	0.80	0.006
Onion	0.1055	0.34	4.60	4.60	7.0	0.1236	2.65	17.05	0.14	0.006
Carrot	0.1035	0.21	3.85	4.90	13.3	0.1270	2.20	29.70	0.14	0.005
Leafy vegetables										
Spinach	0.1260	0.12	2.00	6.00	22.0	0.1430	1.00	13.00	0.50	0.050
Mint	0.1060	0.40	6.00	3.00	29.0	0.1350	3.00	32.00	1.90	0.120

2-3 mg/day. Nickel is one of the toxic metal required for metabolic reactions in the body. The reported safety range is 3-7 mg/kg (Iyaka *et al*., 2005). In this study Ni higher uptake in vegetables fruits type was 0.18 mg/100 gm in cucumber. In stem and roots vegetables maximum content was 0.06 mg/100 gm in ginger and onion. Mint shown higher 0.12 mg/kg of Ni in leafy vegetables. The acceptable limit for Ni is 0.05-5 mg/dl. In our study the selected fruits and vegetables detection limit of Ni was 0.05-0.18 mg/100 gm which is according to the acceptable limits.

Conclusion: Many international and national health agencies are working though out the world for developing new standards, but in developing countries like Pakistan is still lacking in maintaining a standard composition. According to this study minerals were found in comparatively low concentration, such as essential trace elements as Co, Zn, K, Na, Fe, Mn, Ca, Mg, Cu, Ni their contents limits varied sequentially as Co from 0.1035-0.1268 mg/100 gm while cobalt recommended range in fruits and vegetables is 0.006-0.009 mg/kg, Zinc varied from 0.11-1.05 mg/100 gm, K uptake limit was determined 2.3-38.5 mg/100 gm, Na from 3.0-12.4 mg/100 gm, Fe was 1.5-19.0 mg/100 gm while Mn found 0.0526-0.1435 mg/100 gm and its recommended daily intake is 2.0-5.0 mg/day, Ca had 0.3-3.35 mg/100 gm and Mg found 1.91-32.0 mg/100 gm, Cu was 0.1-1.9 mg/100 gm but cu uptake limit in plants is reported 0.0-5.0 mg/kg and the daily intake should be 2-3 mg/day, Ni was 0.04-0.18 mg/100 gm in appropriate concentration, so the selected vegetables and fruits minerals contents are compatible for daily requirement.

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