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INVESTIGATION OF NPK IN FERTILIZED AND UNFERTILIZED VEGETABLES

Farah Deeba*, M. Tahir Butt, Khalid Iqubal ,Tahira Shafiq
Center for environmental Protection Studies, PCSIR Labs complex Ferozepur Road Lahore.

Abstract: Contents of selected minerals and moisture in Ridge Gourd, Gourd and Brinjal vegetables, collected from house and market of different localities, were determined. In house vegetables from kitchen garden of PCSIR colony the moisture contents were high (90%) as compared to market vegetables of TajBagh, Railway workshop Mandy and Singpura Lahore Mandy was 87%, 86.5% and 87.5% respectively. Regarding nitrogen, nitrate, nitrite, phosphate, sodium and potassium was high in market vegetables as compared to house samples due to the accumulation of nutrients in soil and crop.

Keywords: Fertilizers, vegetables, Nitrate, Phosphate.

Introduction

Fruits and vegetables play a significant role in human nutrition, especially as sources of carbohydrates, vitamins, minerals and dietary fiber, folacin, riboflavin, zinc, calcium, potassium and phosphorous. The correct balance of available essential nutrients and the nutritional value substantially influences the plant nutritional contents. Vitamins and micronutrients in food are important for health and human development but the deficiency of constituents is a major problem.Vegetables production in Pakistan presents special fertilizer problems because a fertilizer is relatively cheap in relation to value of the crop; farmers tend to apply much fertilizer due to nutrient deficiencies. (NDFC, 1997)

The plant nutrients nitrogen, phosphorous and potassium, Sulpher, calcium and magnesium have to be applied in large quantities, which are required in substantial amounts. These nutrients are constituents of many plant components such as protein, nucleic acids and chlorophyll are essential for processes such as energy transfer, maintenance of internal pressure and enzymes action. Several other elements are required in small or trace quantities and are referred to as micronutrients or trace elements. The deficiency of any one nutrient can effect the development and growth of the plant.

This means that the nutrients supply of each crop is affected by the fertilizers. Over use of fertilizers is not only wasteful, but also damaging to both crop quality and the environment.

Efficient use means matching of the supply of nutrients to those required by the crops. Nitrate is a natural component of most foods especially vegetables. There are several factors affecting NO_3- uptake and accumulation in vegetables tissue e.g. genetic, environmental and agricultural factors. (Senhalatha, Reddy N, Bhatt.G. 2001). But nitrogen fertilizers are the major factor that influence nitrate content in vegetables (Santmaria, 2006).

Nitrate and nitrite accumulation in vegetables is of concern because nitrate and nitrite in food can be metabolized to carcinogenic N- nitroso compound when these react with amines and amides (Sugimara et al, 1970). Nitrite has ability

1-For Proof and Correspondence: **Farah Deeba**

to react with hemoglobin to nitrate and met hemoglobin, which is incapable of binding and carrying oxygen. Apart all this excessive intake of minerals resulted from the excessive use of fertilizers in vegetables can cause health problems such as kidney damage and osteoporosis. Phosphorous can be found in the environment most commonly as phosphate. It is much important for human body but too much use can cause health problem like nitrate such as kidney damage and osteoporosis. Phosphate deficiency occurs due to the excessive use of medicine. (ATSDR, 2001)

On the other hand, where daily intake of potassium required is 3500 mg, its excessive intake can seriously affect the heart leading failure as in Centers for Disease Control and Prevention. 1996. Interim report.

The objective of this study was only to compare the nutrients concentrations in house garden and market samples. This study will show the quality of vegetables with reference to source. The vegetables grown in PCSIR kitchen garden were grown with the fresh water while other samples of vegetables were grown with mixed water river and sewage water.These vegetables are brought into Lahore vegetable market from different small cities and villages to fulfill the requirements of Lahore city having population about 100 million.

Materials and Methods

The vegetables under study were collected in 2005, from different point and sources. From each source three samples of each vegetable i.e Ridge Gourd, Gourd and Bringal were collected and these samples were made composite samples. From four different locations samples were collected. First location was kitchen garden of PCSIR colony which contains no fertilizer during entire growth period, all these vegetables grown in PCSIR kitchen garden were irrigated with fresh water while other three-sample locations contained fertilizers. Second location was market of TajBagh; third location was Railway workshop Mandy (i) and fourth was Singpura Lahore Mandy (ii). During sampling every precautionary measure was adopted such as mask, gloves, labeling, and follow the Standard method (2005).

All the results were conducted in PCSIR Labs. Lahore. We had collected three samples of each vegetable from each location and finally collect thirty-six samples of all vegetables were made twelve composite samples. The composite sample was dried in oven at 60 C^{o}. After drying the sample was ground by mechanical way and the analysis of each composite sample was done in triplicate and mean results were reported. The material was dried in a forced draft oven (Model $_{O}$V-440, Gallenkamp, England) at $60C^{0}$ to a constant weight. The nutrient concentration of N (NO_{3-} ,NO_{2-}), P_2O_5, K^+ and Na^+ in Ridge Gourd, Gourd and Bringal were analyzed according to AOAC methods (AOAC,2005).

Results and Discussion

There are two main patterns of vegetables production in Pakistan, one is intensive vegetables production and second is combined vegetables / cereals cropping system. Beside this vegetables are also grown in kitchen gardens (Buribaeva, 1999).

Vegetables production in all above sources showed the nutritional variation in respect of nitrate, phosphate, sodium, potassium concentration and moisture as described in given table 1. Analysis of moisture from different samples of different sources shows the great

variation. The average range of moisture in samples collected from kitchen ranged 90- 93%, whereas it was 87-90%, 86.5-91.2%, and 87.3-92.4% in market, Mandy i and Mandy ii, respectively. This is due to moisture loss during transportation from sources of production to the source of supply. In all samples, total kjeldhal nitrogen values vary depending upon the sources of production. The nitrogen concentration in kitchen samples was less as it ranged 3.29-3.4% and was maximum in Mandy ii with 3.1 –3.9%. It appears that nitrogen content in vegetables has direct relation with the dissolved nutrients in the soil, which is mostly highly filled due to the supply of nitrogen fertilizers by farmers.

Vegetables from different sources showed variation in nitrate and nitrite profile. Average nitrate concentration in kitchen samples was low 2.3 –2.75% as compared with Mandy i (2.8 –3.2%) and market (2.95 –3.1%). This verifies that nitrate accumulation in the plants increases when nitrogen fertilization led to an increased nitrate contents in vegetables (Custic et al., 1994). Accumulation is genetically controlled and is modified by environment, fertilizers management and crop production parameters (Fatianos and Zarogiannis, 1999). Analysis of nitrate nitrogen content in different vegetables samples showed that most of the samples collected from kitchen had less amount of nitrate as compared with other sources.

In all samples nitrite was in relatively less amount than nitrate. This is in accordance with the previous work done by (Hunt and Turner1994 and Aworh et al., 1980), which showed that nitrite concentration in vegetables is usually very low as compared with nitrate. Nitrate contents in vegetables above the permissible limits resulted in the determinable effect on health, as well as on the plant growth. Too much nitrogen result in poor root growth of plant Leaves may roll and deformed. They are more susceptible to disease. (Pavlista et al 1997). In human too much nitrogen intake are carcinogenic and cause blue baby syndrome (Walker, 1990 and Knobelosh et al., 2000).

The phosphate contents also varied among different vegetables samples. The average concentration of phosphate was minimum in kitchen samples than was 0.8 % and was maximum in Mandy ii sample (2.15%) due to apply of phosphate fertilizers by farmers. The phosphate fertilizers by concentration in soil increases and up take of nutrient is proportional to the dissolved salts in the soil.

The increase of phosphate in soil as well as phosphate fertilization influenced significantly the dry matter yield and the up take of phosphate (Karon, Rabikowska, 1994).The daily intake recommended dose of phosphate is 700mg per day. The common side effects of over dose of phosphorous called hyperphosphalemia that calcifies the non skeletal tissues most commonly the kidney. (Vitamin and health supplement guide 2005-6).

Analysis of K^+, Na^+ indicates that variables in concentration collected from the different sources, which in turn may be dependent upon the soil profile and fertilizer used. As the K^+ concentration in the Kitchen garden was low as compared with other sources of vegetables and maximum concentration of K^+ was in Mandy ii and similar results of Na^+ were shown in given table1.

The recommended dose of sodium and potassium are 1200mg to 1500mg and 4-7g per day respectively. An increased

level of potassium in blood causes the reduced renal function and abnormal breakdown of protein and severs infection. Similarly too much sodium will contribute to high blood pressure and congestive heart attack. From the above results of different nutrients in samples showed the variation with respect to the location and impact of different factors that were involved in the vegetation. Nitrogen, nitrate, nitrite, phosphate, sodium and potassium were high in market vegetables as compared to garden samples due to the accumulation of nutrients in soil and crop by the addition of fertilizes.

Table 1: Analysis of Vegetables Collected from Different Sources

Sources	**Vegetable name**	**Moisture (%)**	**N** (%)	**NO_3** (%)	**NO_2** (%)	**P** (%)	**Na (%)**	**K (%)**
Kitchen garden	Ridge Gourd	90	3.4	2.3	0.4	0.8	15	1.5
Market		87	3.6	2.95	0.45	0.9	25	2.5
Mandi I	"	86.5	3.5	3.1	0.56	1.75	28	1.9
Mandi II	"	87.3	3.1	3.3	0.69	2.15	22	3.0
Kitchen garden	Gourd	92	3.35	2.5	0.65	1.4	10	2.0
Market	"	88.5	3.9	3.1	1.2	1.5	19	2.9
MandiI	"	89.3	3.7	2.8	0.68	1.9	25	2.8
Mandi II	"	91.5	3.6	2.7	0.98	2.0	27	3.0
Kitchen garden	Brinjal	93	2.29	2.75	0.73	1.5	20	1.9
Market	"	90	2.8	2.97	0.92	1.3	30	3.1
Mandi I	"	91.2	3.4	3.2	1.3	2.0	29	2.6
Mandi II	"	92.4	3.9	3.05	1.3	1.2	32.2	2.6

Recommendations:

1. Vegetables should be grown with fresh water or treated wastewater which is inline with NEQS.

2. The control of sodium and potassium in vegetables will help the high blood pressure patients to control their disease which will reduce the medication cost for these patients.

Conclusion:

The quality of vegetables grown with fresh water is healthier than grown with wastewater.

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