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RESEARCH ARTICLE

CONCENTRATION OF LEAD AND CADMIUM IN COMMON VEGETABLES CONSUMED BANGALORE AND THE HEALTH EFFECTS.

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Abstract

Toxic compounds are immensely dangerous for the human body especially when it enters through the primary food chain directly from the soil to the water and then directly into the vegetables consumed by majority of the residents. Bangalore being one of greatest metropolitan cities in Bangalore is subjected to increase in population, thus increasing the stress and wastage accumulation in its water bodies. These toxic elements present in the waste water are used for irrigation and with a survey done the majority of the vegetables consumed on a weekly basis are capsicum, carrots and lemon. Due to the high absorption capacity of lead and cadmium along with the adverse effects imposed by the metals on human health, the need to understand the toxicity in the food chain of Bangalore is analyzed.

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Introduction:-

Bangalore is a growing metropolitan city with a population of 8.52 million for a city of only 741km². Situated at a height of 3000ft from ground level, this results in no source of water body other than the lakes and Vrushabhavati river present on the plateau but due to the exponential increase in population, there is dire need to convert the lakes into residential areas and usage of the river as a sewage disposal method, not only blocking the water sources but also increasing the demand on food.

Bringing in another factor caused due to the increase in residents is the improper treatment of wastes before sent for processing and the irregular discard of the waste into the remaining water bodies and into the soil.

Lacking a source of water, there is a situation that entails the use of waste water from toxic lakes such as Varthur and Ulsoor Lake and Vrushabhavathi River for the growth of vegetables being grown for human consumption.

As compared to the 51 healthy lakes that existed around the time of 1985, there are only 17 lakes present today. Finally, this rise in demand versus produce is causing an increased amount of burden on the soil due to which there is improper growth of the plants, attributing to pollution too and sudden change in the rain forecasts. Further stress would only cause the life in Bangalore less in quality that is needed for a normal and healthy life, soon making Bangalore unlivable.

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MATERIALS AND METHODS:-**A. Survey and statistics**

Areas such as Kengeri , Varthur, Indiranagar and Malleswaram were selected, where around 100 families were surveyed as to the most bought vegetables in the household based on a weekly time period. The most widely bought vegetables were found to be capsicum, carrots and lemons which were further collected and tested.

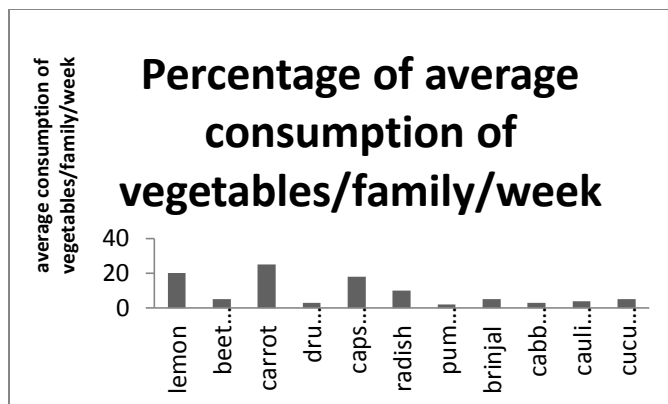


Fig 1:- Statistical graph of survey conducted depicting weekly consumption of vegetables

B. Collection of vegetables

Known quantity of vegetables, each containing 500 grams were picked directly from the farms surrounding the lakes of Kengeri and Varthur in the district of Bangalore. The vegetables were selected at random from the farms of the particular areas.



Fig 2:- Collection of sample from Varthur farms

C. Estimation of lead in vegetables

Vegetable samples obtained were cut into small pieces, removed off their inside core and dried in direct sunlight for 2 days and correspondingly in a hot air oven for 5 hours at 100 degrees Celsius. The sample was ground into a fine

powder and 50 g of the powdered sample was dissolved in 30 ml of diluted Nitric acid which was in the ratio of 5:3 with respect to water and conc. Nitric acid.

The standard solutions were prepared using different concentrations of lead along with a blank reagent to map the concentration of lead in the sample using an Atomic Absorption Spectroscopy.

D. Estimation of cadmium content in vegetables

The estimation of cadmium content in the vegetable samples proceeded with digesting the powdered samples in a solution of aqua regia. For every 50g of powdered sample, 30 ml of solution was utilized to completely dissolve the sample.

To obtain the standard solutions, different known concentrations of cadmium was analyzed using spectroscopy which helps map the concentration by graphical methodology.

HEALTH EFFECTS

Cadmium, a by-product of zinc production is a metal that naturally occurs in the environment. Obtained largely from plant based consumable products, which has no safe margin for minimum cadmium exposure, since once absorbed, cadmium is efficiently retained in the body in the proximal tubular cells. Cadmium has a continuous toxic effect causing bone mineralization and affecting renal and dopaminergic systems in children. In the case of parental exposure, the cadmium could pass through the placenta and accumulate in the fetal tissues affecting the birth weight and size of the new born babies.

Lead is a cumulative toxin which accumulates in the blood stream over the time and is particularly harmful to young children and can affect multiple body systems. In growing children, there are cases of low IQ, attention deficit, anemia, hyperactivity all of which can affect the growth of future generations.

RESULTS AND DISCUSSIONS:-

E. Cadmium

Cadmium is a highly toxic which can disrupt biological system by passing along the food chain and getting absorbed into the kidney, lungs and liver. The sample of cadmium was tested in the three most common vegetables utilized by the residents around the toxic water bodies which were found to be capsicum, lemon and carrot. The general margin of cadmium content which is permissible in the human body is 0.2 ppm. The concentration of cadmium found in the samples can be seen in table (1).

sample for cadmium conc.	concentration in ppm
carrots (varthur)	0.7
carrots (kengeri)	0.5
lemon (kengeri)	0.3
capsicum (kengeri)	0.6

Table 1: concentration of cadmium content in samples

F. Lead

The current study reports that lead concentrations of <0.1 ppm to .07 ppm were observed in the different samples. Lead being a significantly toxic compound when accumulates in the body causes problems relating to the central nervous system which can hamper with the normal functioning of the brain in children. The calculated concentration can be seen in the table (2).

sample for lead	concentration in ppm
carrots (varthur)	0.1
carrots (kengeri)	0.1
lemon (kengeri)	0.7
capsicum (kengeri)	0.1

Table 2: Concentration of lead content in samples

CONCLUSION:-

Based on the results of the present studies, the amounts of lead and cadmium content were measured in the vegetables commonly and frequently consumed which is a result of accumulation of heavy metals in the water which percolates into the soil and is passed into the plant tissues which is finally consumed by the human body.

In the present study, the amount of lead and cadmium in the vegetables is higher than the needed limit which is found in the samples. The proof that the increase in the industrial and domestic wastes that are streamed into the water bodies have a direct impact in the cumulative accumulation in the plants can also be seen in the variety of health effects that is observed in patients today.

The growing population is not only acting as a negative factor in this particular scenario but is also a catalyst for the increase in the utilization of the toxic water for agricultural purposes.

With the increase in stress on the land having a directly proportional stress on the water bodies which are on a decline due to the commercialization, the quality of water is decreasing simultaneously reducing the quality of the food that is being consumed. This increase in toxicity causes immense health effects which in turn reduced the quality of health. When every component essential for a good and healthy survival is on a downward spiral, the living conditions in Bangalore are definitely not suitable to uphold the population it is burdened by.

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