Carcinogenic Elements in Green Veggies Grown near Rail Track of Mumbai suburban area – A case study

Vaishali Rajurkar
Department of Chemistry, D.G.ruparel College of Arts, Science and Commerce, Mahim, Mumbai-400016

Abstract: Deadlier chronic may cause due to continuous exposure of heavy metals like As, Pb, Cr, Cd, Sn, Sb ect. The toxicity of such heavy metals are creating more serious environmental problems. They remain in the environment posing threat on human beings and sustaining aquatic biodiversity. Untreated industrial waste water contains such deadlier heavy metals. They may enter in the green veggies grown on such contaminated water and indirectly in human biological system. Pesticides also converted into toxic chemicals. Veggies grown on such sewage water besides the rail track in Mumbai suburban are found to be contaminated with some deadlier heavy metal like Pb, As, Cd, Cr, Sb and Sn. Such veggies cannot be differentiated easily in the market. Avoid spraying of pesticides to avoid the effect of pesticides. Hydroponics is the futuristic way to grow chemical less toxic metal free food, it also make healthy green environment at home.

Keywords: Hydroponics, Carcinogenic elements, Health hazards, pesticides.

INTRODUCTION

Among organic and inorganic contaminants of waste water, heavy metals are getting importance for their non-degradable nature. They accumulate through tropic level and also cause some biological effect. These toxic heavy metals are creating more serious environmental problems[1]. It is also difficult to remove them completely from the environment once they enter into it.

Domestic wate disposal, Industrial wate disposal without treatment are the main sources of toxic metals to enter in sewage water. Different industries unselectively use heavy metals containing fertilizers and pesticides in agriculture resulted in deterioration of water quality rendering serious environmental problems posing threat on human beings and sustaining aquatic biodiversity. Though some of the metals like Cu, Fe, Mn, Ni and Zn are essential as micro nutrients for life processes in plants and microorganisms, while many other metals like Cd, Cr, Pb and As have unknown physiological activity, but they are proved detrimental beyond a certain limit.

The deadlier Chronic effects like ulcerations in the nasal septum leading to perforation, ulcers in the throat and upper airways, skin allergies, and asthmatic reactions etc. due to continuous exposure of Chromium. If continuous exposure of dichromate and chromium pigments may cause bronchogenic cancer[2].

Poisoning by organic lead compounds damages central nervous system, such as insomnia, delirium, cognitive deficits, teumor, hallucinations and convulsions etc. Sometimes may cause headache, abdominal pain, memory loss, kidney failure, reproductive problems and weakness.

Arsenic poisoning shows symptoms like skin changes, such as new warts or lesions, abdominal pain, nausea and vomiting, diarrhea, abnormal heart rhythm, muscle cramps, tingling of fingers and toes

Thus people may face such deadlier diseases. Complete recovery from such disease may possible if exposure of toxic metals are discontinued.

OBJECTIVES

Maharashtra is the third largest state of India. Geographically there are three natural regions of Maharashtra i.e. the plateau, the Sahyadri range and the Konkan coastal strip. The soil and vegetation of Maharashtra are related to the climate and the geological conditions.

The rivers Narmada, Krishna, Godavari, Wardha, Tapi valleys are the sources of water. Variation in soil suited for particular cultivation of cotton, rabi, Kharif cereals, rainfed crops - rice, ragi, jowar, gram, groundnut, sugarcane etc. Mango, banana, guava,

grapes, Cashew, Jackfruit, Jamun are also grown here. The vegetables like potato, onion, chillies, brinjal and tomatoes along with all green leafy vegetables are grown. As of 2022 the population of Maharashtra is projected towards 12.54 crores [source: 2011 census: Population in five year age-group] and the vegetation done in the state is well enough to serve.

Maharashtra is one of the most industrialised in India. The state's capital, Mumbai is India's financial commercial capital. The state has played a significant role in the country's social and political life and is widely considered a leader in terms of agricultural and industrial production, trade, transport, and education. Such developed city have Mumbai Suburban Railway called local trains or popularly known as locals which consists of 390 kilometers of rail network in Mumbai and its suburban areas. Besides rail track domestic sewage water stream is flowing. All domestic and small scale industrial waste water without treatment is flowing through this stream. Water is more contaminated with all types of organic and inorganic contaminants like trace elements etc. sediments are also observed at the bottom of this dirty sewage water. Besides local train track sufficient place is available to grow vegetables but there is no any fresh water availability nearby. So vegetables are grown with the waste water from besides sewage water stream. These vegetables are the brought to the market to sell and people will not be able to make the difference.

PROCEDURE

Sediment contamination and vegetables grown besides rail track near Kurla station of Mumbai suburban have been collected thrice in a year during monsoon (Month-June), summer (Month-October) and winter (Month-February) season.

Sediments and vegetables are tested for presence heavy elements contents qualitatively by the following test[3]-

Test	observation	Inference
test for Pb, Cd, As, Sb, Sn		
Sediments or vegetable extract +few drops of conc. HCl and pass H_2S gas for few seconds	black precipitate brown precipitate yellow precipitate orange precipitate	Pb^{2+} present Sn^{2+} present Cd^{2+} or As^{2+} present Sb^{3+} present
dissolve above black ppt in $4NHNO_3$ and boil add 0.5gm solid CH_3COONH_4+ 0.5cm^3 CH_3COOH+1cm^3 H_2O, boil strongly and centrifuge with 4N HNO_3, 2drops of this solution +2-3 drops of 5% K_2CrO_4	yellow precipitate	Pb^{2+} confirmed
2 drops of Sediments or vegetable extract + 2 drops of water + 5 drops of 0.25%ferrous Iodide reagent	silky red precipitate	Cd^{2+} confirmed
2 drops of Sediments or vegetable extract + 2drops of 2% NaNO2 sol. + 0.5 cm3 0.01% Rhodium B-reagent	violet colour or precipitate	Sb^{3+} confirmed
2 drops of Sediments or vegetable extract + a drop of o.25% cacotheline reagent	violet precipitate	Sn^{2+} confirmed
2 drops of Sediments or vegetable extract + 4N sulphuric acid till acidic, cool + a drop o 20 vol H2O2 + 0.5 cm3 of 1%Ether butanol mixture shake well	blue organic layer	Cr^{3+} confirmed
2 drops of Sediments or vegetable extract + diphenyl carbazide	violet spot	$Cr3^{+}$ confirmed
2 drops of Sediments or vegetable extract + 5 drops of 5%K2CrO4 sol + 4N NH4OH till alkaline	yellow precipitate	Sr^{2+} confirmed

Quality Control/Assurance: Sediment and vegetable samples were collected with plastic-made implements to avoid contamination. Samples were kept in polythene bags that were free from heavy metals and organics and well covered while transporting from field to the laboratory to avoid contamination from the environment.

Vegetables were washed with 50% alcoholic solution and extract had been made in 80% alcoholic solution only. Analytical grade reagents were used for all analyses. All glassware used were soaked in appropriate dilute acids overnight and washed with teepol and rinsed with deionised water before use.

Results and discussion: There are many small-scale industries are located near to Kurla area of Mumbai. The industries like small chemical, leather, dyes and pigments, drugs industries etc. these industries have lot of chemical exhaust. These industries excrete this exhaust treatment in the drainage. Contaminated drainage water with chemical, non-chemical, domestic exhaust flowing besides rail track. After some days of flowing water sediments due to molecular mass settled at the bottom and sediments seen. Such sediments and dirty water give birth to microorganisms and flies.

Sediments collected trice in a year in the morning from only one place near to Kurla railway station in the first week of June, October and February. This sediment is insoluble in water, alcohol and acetone. Its acid solution is tested qualitatively for trace elements. The results are tabulated in the table 1. All samples of sediments and vegetable samples shows presence of Pb, Cd, As and Cr ions qualitatively. In June 2018, Ocober 2018 and February 2019 sediment samples shows presence of stannous ions qualitatively.

There are some empty spaces in between two rail tracks as well as besides rail track. Rail authority giving this place on rent to vegetable growers. Vegetable growers continuously growing vegetables like *Amaranthus tricolor, A. sylvestris, spinacia oleracea, Trigonella foenumgraecum* on this sewage water. Due to continuous growing habitat the soil become infertile. Multiple chemical fertilizers and pesticides are used for growing these vegetables. Vegetables collected trice in a year in the morning from only one place near to Kurla railway station in the first week of June, October and February

Table 1:

Sample	Pb	Cd	As	Cr	Sb	Sn	Sr
June 2024 Sediment sample	√	√	√	√	x	√	x
June 2024Amaranthus tricolor sample	√	√	√	x	x	x	x
June 2024 A. sylvestris sample	√	√	√	x	x	x	x
June 2024spinacia oleracea sample	√	√	√	√	x	x	x
June 2024Trigonella foenumgraecum sample	√	√	√	x	x	x	x
Ocober 2024 Sediment sample	√	√	√	√	x	√	x
October 2024 *Amaranthus tricolor* sample	√	√	√	x	x	√	x
October 2024 *A. sylvestris* sample	√	√	√	x	x	x	x
October 2024 *spinacia oleracea sample*	√	√	√	√	x	√	x
October 2024 *Trigonella foenumgraecum sample*	√	√	x	x	x	x	x
February 2025 Sediment sample	√	√	√	√	x	x	x
February *2025 Amaranthus tricolor* sample	√	√	√	x	x	√	x
February *2025 A. sylvestris* sample	√	√	√	x	x	x	x
February *2025 spinacia oleracea sample*	√	√	√	√	x	x	x
February *2025Trigonella foenumgraecum sample*	√	√	√	x	x	x	x

1gm vegetables crushed grindly and filtered through muslin cloth. Double distilled water had been used as a solvent. The extract made clear by using few drops of conc.HCl and diluted to $10cm^3$ with the help of distilled water. A vegetable extract had been prepared and tested qualitatively for trace elements. *Amaranthus tricolor, A. sylvestris and Trigonella foenumgraecum* shows presence of Pb, Cd and As and *spinacia oleracea* shows presence of Pb, Cd, As as well as Cr contaminant.

CONCLUSION

Sewage water contain harmful bacteria and chemicals they do enter in the vegetables. Pesticides have been

used to grow vegetables. Pesticides have to degrade into harmless chemicals after a certain amount of time has passed since the application. So, growers can't spray them on for a certain amount of time prior to harvesting, so that whatever was sprayed earlier is mostly degraded.

Organic farming, sustainable agriculture and farming on fresh water provide us chemical free food, but in more populated city to sustain the demand 'Hydroponics' is the futuristic, eco-friendly way of growing food, allows you to farm your healthy greens at home, it also provides veggies that are fresh and free from chemicals and harmful pesticides. Hydroponics is a process of growing plants on sand, gravel or liquid with added nutrients but without soil.

This method also gives you the freedom to enhance the nutrient constitution of your greens by altering the chemical composition of the water. Finally, hydroponics enables you to get organic food right at your home by converting your terrace or balcony into a lush garden which feeds your family with pure oxygen.

ACKNOWLEDGEMENT

Author is thankful to Department of Chemistry, D.G.Ruparel college, Mumbai for providing laboratory facility.

REFERENCE

[1] Ravinder Mamtani, 2011, Metals and Diseases: A global primary healthcare porspective, Journal of Toxicology, Volume 2011, Article ID 319136, https://doi.org/10.1155/2011/319136

[2] Mahmood Sadeghi, 2021, Toxic Mechanisms of Five Heavy Metals: Mercury, Lead, Chromium, Cadmium, and Arsenic
Front. Pharmacol., https://doi.org/10.3389/fphar.2021.643972

[3] Vogel's tsextbook of Macro and semimicro qualitative inorgani c analysis, 5th edition, G. Svehla,pg 461