

# TRACE AND HEAVY METALS COMPOSITION IN CROPS GROWN IN SEWAGE IRRIGATED *PERI* URBAN AREA OF VADODARA, INDIA

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## SUMMARY

In a survey, plant samples of crops grown under sewage irrigated fields of *peri* urban area nearby Vadodara city were collected to know the composition of trace elements and also for assessment of the contamination of heavy metals in relation to tube well water irrigated fields of adjoining areas. The analytical results revealed that the total contents of trace elements (Fe, Mn, Zn, Cu) in leafy vegetables were higher than creeper and fruit vegetables in sewage irrigated soils. Among different crops, marigold showed higher accumulation of heavy metals (Pb, Ni and Co) followed by tobacco, drumstick, vegetables, weeds, pulse, cereals and fodder crops plants in sewage irrigated soil. The Pb was more accumulated in spinach and lucerne in sewage and tube well irrigated soils, respectively. The leafy vegetables grown on sewage irrigated soils also contained more Pb amongst different vegetables. The findings of the results emphasize the contamination of plant system in sewage irrigated *peri* urban areas, especially with heavy metals viz., Pb, Ni and Co.

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**I**n different parts of the country, the menace of a rapidly increasing population, the wanton growths of industries and increasing urbanization have created major problems with the disposal of sewage and industrial effluents. The disposal of wastes is a matter of serious concern because along with some essential plant nutrients, wastes also contain potentially toxic heavy metals such as Pb, Ni, Cd and Cr (Kausal *et al.*, 1993). A limiting factor in the long term application of sewage effluent to agricultural land is the accumulation heavy metals in the soil which may lead to increased uptake of heavy metals by crops resulting into their entry in food chain (Anderson and Nilsson, 1972; Tadesse *et al.*, 1991). Therefore, the survey work carried out to assess the trace element content and contamination of heavy metals in crops grown in sewage irrigated *Peri* urban area of Vadodara city of middle Gujarat.

## MATERIALS AND METHODS

In investigation, plant samples of edible and shoot part of crops were collected from sewage water (SW) irrigated fields, which received treated and untreated sewage since last three decades. At the same time, plant samples from tube well water (TW) irrigated fields of nearby area were also collected. The average trace and heavy metals content in SW soils were Fe- 11.3, Mn- 8.5, Zn- 3.7, Cu- 2.0, Cd- 0.033, Co- 0.323, Cr- 0.032, Ni- 0.537 and Pb- 0.978 mg kg<sup>-1</sup> soil, while Fe- 6.10, Mn- 7.1, Zn- 1.4, Cu- 1.5, Cd - 0.029, Co- 0.193, Cr- 0.032, Ni- 0.276 and Pb- 0.695 mg kg<sup>-1</sup> soil in case of TW soils. Altogether, 122 plant samples of which thirty eight (38) samples of edible part of

vegetables and eighty four (84) samples of above ground part (leaf stem) of different groups of crops were collected from both the fields. The samples were washed with single and double distilled water in a sequence and air-dried and then oven dried at 70°C temperature in a hot air oven and preserved for further analysis. Dried samples were ground in a stainless steel blade wiley mill and digested in diacid mixture (HNO<sub>3</sub>: HClO<sub>4</sub> – 2:1). The acid extract was used for analysis of total trace and heavy metals using Atomic Absorption Spectrophotometer (PE 3110).

## RESULTS AND DISCUSSION

The plant samples of the standing crops from sewage and tube well water irrigated fields were collected to know the effect of sewage irrigation practices on trace and heavy metal contents of different plants. The data on trace and heavy metal content of different plants are presented in Tables 1 to 4:

### *Trace elements :*

The analytical results of plant samples were categorized under different groups of crop viz., cereals, oilseeds, vegetables, fodder and others to know the accumulation of trace metals by crops. The data presented in Table 1 indicated that the total content of trace elements in edible part of different vegetables were higher in leafy vegetables than creeper and fruit vegetables. Among the leafy vegetables, the mean content of Fe, Mn, Zn and Cu in spinach leaf was 595.0, 9.8, 7.8 and 2.9 µg g<sup>-1</sup> in the case of SW soil, while in case of TW soil, the content was 300, 5.5, 3.1 and 1.0 µg g<sup>-1</sup>, respectively (Table 1). Among the different groups of