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A Case Study :

Waste water utilization in vegetable cultivation-pros and cons

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Increasing industrialization and urbanization in India has brought in its wake a major problem *i.e.* of safe disposal of waste water which includes sewage, industrial effluents and liquid dairy wastes. Reuse of waste water in agriculture is expected to increase dramatically in future as new water sources become increasingly scarce and expensive to develop and as groundwater is being depleted rapidly. However, indiscriminate use of waste water for irrigating agricultural crops cannot be allowed, because effluents originating from different sources are certain to have different composition. The manurial ingredients of waste water effectively aid the healthy development of crops. Waste water is rich in plant nutrients in the vicinity of large centers of population, where the demand of farm products like fruits and vegetables, makes waste water utilization more important.

Physiological and biochemical basis of plants under effluent irrigation :

High osmotic pressure that results due to high salt concentration in the effluent might be the major cause for a rapid decrease in germination. The delay in seed germination in concentrated effluent might be due to inhibition of enzyme activity. Presence of heavy metals in waste water might also have caused retardation in chlorophyll synthesis or it might be due to changes in the endogenous cytokinin in leaves. The decline in N, P and K may be due to the inability of the plant to absorb the nutrients from the effluent treated soil. This may be due to the accumulation of heavy metals in the roots which may prevent the uptake of these nutrients by the plants.

Cadmium delays growth, inhibits photosynthesis and induces or inhibits distinct enzymes and alters stomatal function. Higher concentrations of cadmium in the soil reduce the zinc uptake. Cadmium content was more in roots. Zinc content was more in shoots. Cadmium uptake is inversely related to soil organic matter content. Nickel inhibits the root growth. Mercury and Cobalt affect the germination in cluster bean. Higher level of copper inhibits root growth, root elongation in apical zone. Higher levels of zinc interfere iron involving enzymatic functions. Cobalt reduced the germination and seedling growth by plugging of sieve tubes, increased deposition of callose and inhibition of ethylene production. Cadmium inhibits the root growth, respiration and mitochondrial transport. Mercury interact with -SH, -S-S group of proteins and inhibiting enzyme synthesis. Chromium affects mineralization of nitrogen. Chromium induces mutations in soil micro organism, which may affect organic matter decomposition. Increasing levels of biological oxygen demand inhibit the soil and root aeration, thus adversely affecting the plant growth. Leafy vegetable crops are more sensitive to heavy metals than the grasses. Use of raw sewage water as a source of irrigation will cause metal accumulation in soils to such an extent that they may lead to toxicity in plants.

Sewage water :

Paulraj and Sree Ramulu (1994) reported that increasing levels of sludge application (5, 10, 15 and 20 t/ha) though increased the heavy metal content in the soil but did not have any detrimental effect on plants. Rather crops (Okra, Amaranthus, Tomato) grown on sludge treated soil showed stimulated plant growth on sludge contained appreciable amounts of major nutrients and its