

Potential utilisation of reclaimed water for vegetable production

T.J. Piggott , F.G. Kaddous and K.J. Stubbs

Department of Agriculture, Vegetable Research Station, Frankston, Vic. 3199.

Much of the early work with untreated waste water in agriculture was designed for disposal purposes. Most studies showed that yields from untreated waste water compared favourably with moderate rates of fertiliser applied in the conventional manner although in light soils supplementary nitrogen and potassium was essential. Lack of irrigation water and increasing costs of fertilisers has generated interest in the use of waste water for irrigation and as a source of plant nutrients.

Modern sewerage purification plants process raw sewerage to a final effluent referred to here as reclaimed water. Reclaimed water has potential as a source of irrigation water in agriculture. However, amongst other things, reclaimed water contains less nutrients than untreated waste water and it is therefore necessary to balance the nutrients with inorganic fertilisers to meet individual crop requirements.

The aims of this study are to determine the effects of reclaimed water and inorganic fertilisers on vegetable yield and quality; and to measure the concentration and uptake of N.P.K. and heavy metals in edible vegetable tissues and their accumulation in the soil.

An experiment was conducted at the Vegetable Research Station, Frankston, Victoria in a loamy sand in the winter of 1978, to study the effects of irrigating lettuce, cv. Imperial D, with reclaimed water. Five irrigation/fertiliser treatments were applied; these were:

- Bore water and required crop fertilisers;
- reclaimed water and required crop fertilisers;
- bore water plus fertilisers, replaced by reclaimed water after the last fertiliser side-dressing;
- reclaimed water plus balanced fertilisers replaced by bore water after the last fertiliser side-dressing; and
- reclaimed water plus balanced fertilisers for crop requirements.

Marketable yields were recorded and the uptake of N.P.K. and seven heavy metals (Pd; Cd; Fe; Cu; Cr; Ni; Zn) by the lettuce leaves and their accumulation in the soil were measured.

No differences in yields were found between the treatments. Although the irrigation precipitation ratio was unusually low (0.22), the reclaimed water saved 0.78 MR ha⁻¹ of bore water for other purposes and \$15.55 ha⁻¹ in fertiliser costs. Lettuce plants recovered N.P.K. more effectively from the reclaimed water than from the inorganic fertilisers or fowl manure. The uptake of N.P.K. and heavy metals by lettuce leaves or their concentration in the soil did not differ significantly between the treatments.

In a following summer crop of carrots, cv. Western Red. marketable yields from the reclaimed water treatments were 12 percent higher than the control, all carrots being of excellent quality. 2.73 Mk ha⁻¹ of bore water was saved for other purposes and the reclaimed water supplied 75 percent of the crop's requirement for N, 25% of the P and 45 percent of the K, a saving of \$78.25 ha⁻¹.

Further experiments are continuing with crops of cabbage and celery.