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Preliminary studies on the evaluation of human urine as a source of nutrients for vegetables in the Eastern Cape Province, South Africa

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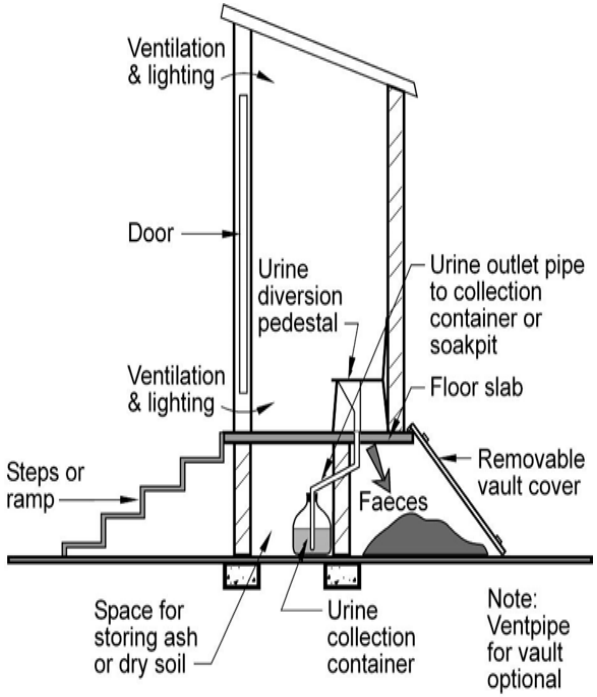
Introduction

- Urine is a valuable source of nutrients that has been used since ancient times to enhance the growth of plants, notably leafy vegetables.
- The nutrients in urine are in ionic form and their plant availability has been found to compare very well with chemical fertilizers.

- Human urine is used to varying extents for crop fertilization in countries like Mexico, Germany, USA, Sweden, Denmark and Zimbabwe.
- There is, however, little or no information on its use in South Africa. This has been partly due to the lack of the appropriate sanitation technology that enables the hygienic separation of urine and faecal matter at source.

This situation has, however, changed with the recent introduction to South Africa of urine diversion (UD) toilets (Fig. 1).



- The UD toilets have created opportunities, not only for introducing safer sanitation in rural and peri-urban areas, but also the possibility of recycling human excreta in areas where these toilets have been installed.
- The present study was therefore carried out to provide preliminary indications of the fertilizer value of human urine in South Africa with the hope that positive results will catalyze the adoption of ecological sanitation.

Materials and Methods

- The soil used was sampled from the plough layer (0-15 cm) at the KwaSomgxada Community garden in Ntselamanzi location, Alice.
- 12 kg-air dried soil sieved through an 8mm sieve was then placed in 10-litre pots for use in the tunnel house trial.
- Urine was collected from male student hostels at the UFH

Treatments

- Urine diluted 1: 3 and applied at 500ml/12kg pot:
- 1. ONCE/week (3.6 g N/pot),
- 2.TWICE/week (6.4 g N/pot) or
- 3.THREE times/week(9.4 g N/pot)
- 4. Recommended N fertilizer for test crop
- 5. Tap water only
- **Test crops**: Spinach and Cabbage transplanted on 12 August 2004.
- Spinach was harvested 3 times:
  - Harvest 1 – 6 wks after transplanting
  - Harvest 2 – 4 wks re-growth
  - Harvest 3 – 4 wks re-growth

Fig. 2: Effects of diluted urine on spinach dry matter yield harvested at three separate occasions.

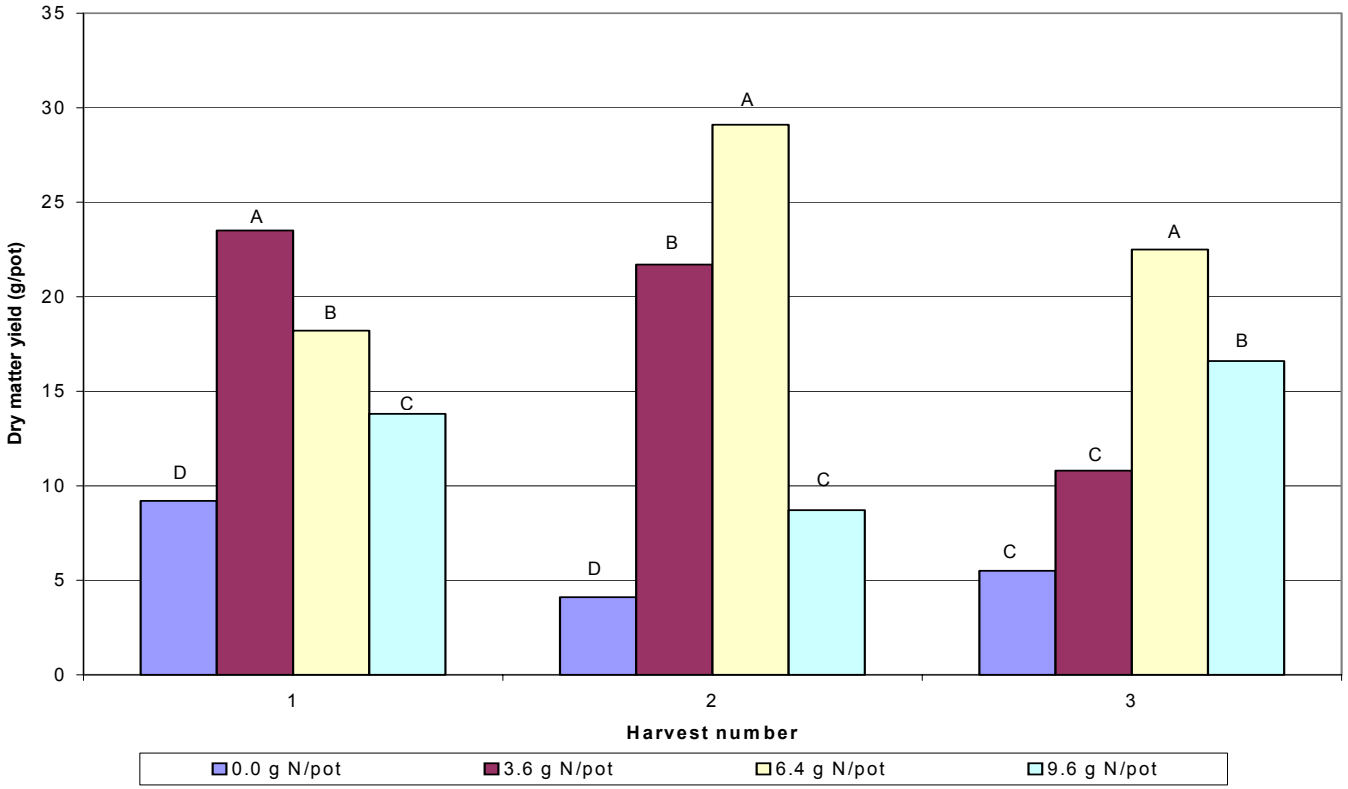


Fig. 3: Effects of diluted human urine application on the combined dry matter yield of spinach (3 harvests) and that of cabbage.

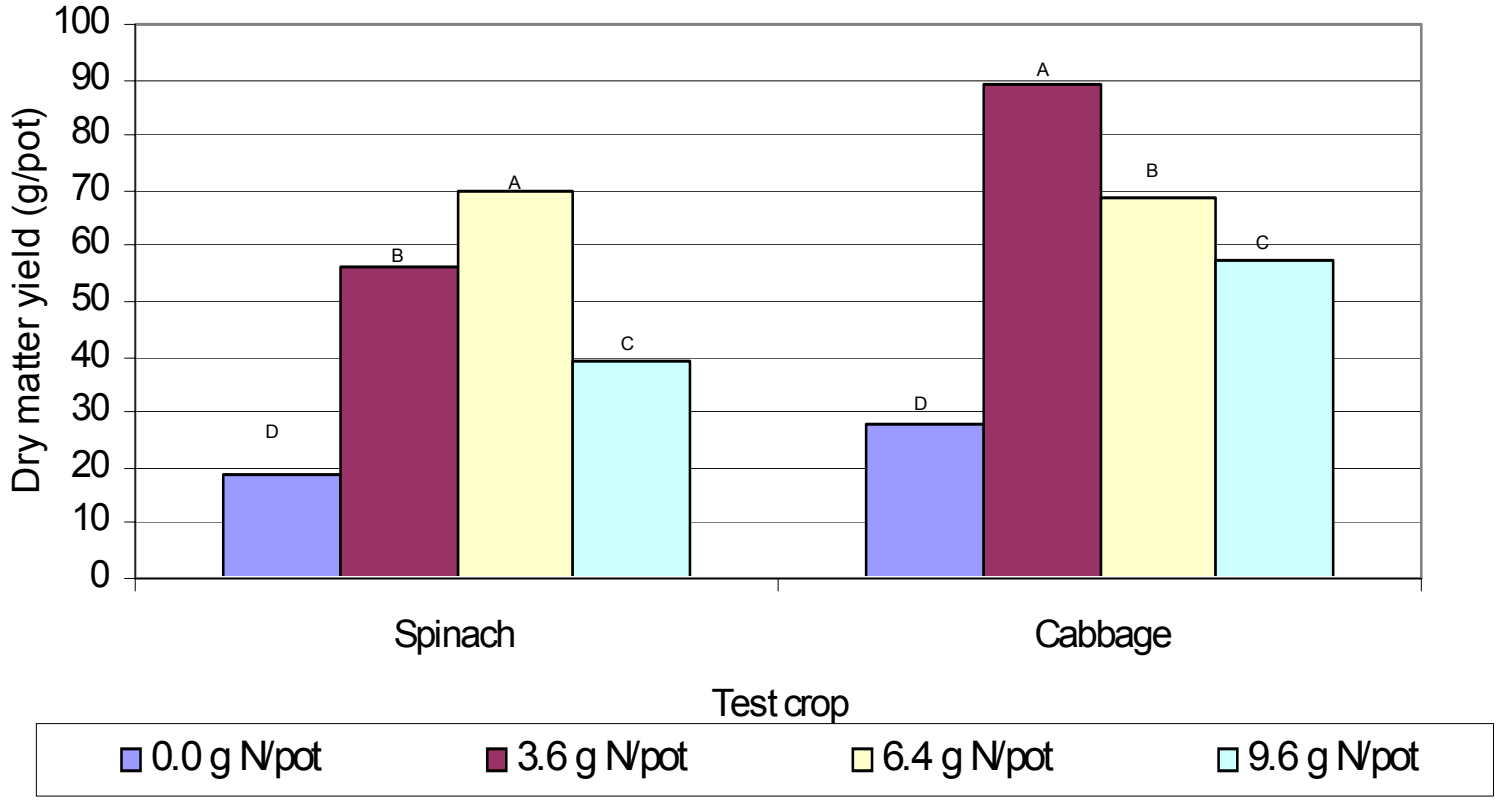


Plate 1: Effects of human urine application on spinach growth

Plate 2: Effects of diluted human urine on cabbage growth

Fig. 4: Effects of diluted human urine application on the tissue N concentration of spinach harvested at three different occasions.

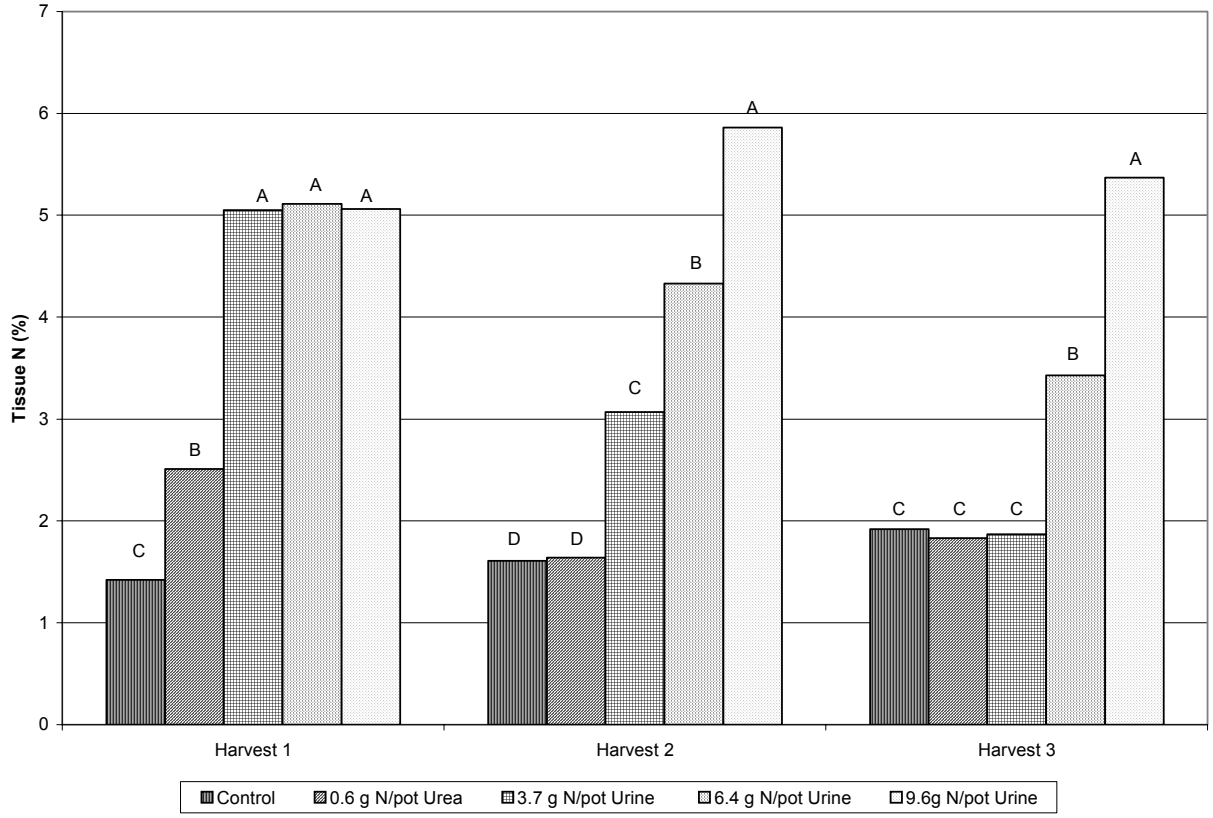


Fig. 5: Effects diluted human urine application on the cabbage tissue N, P, and K concentrations.

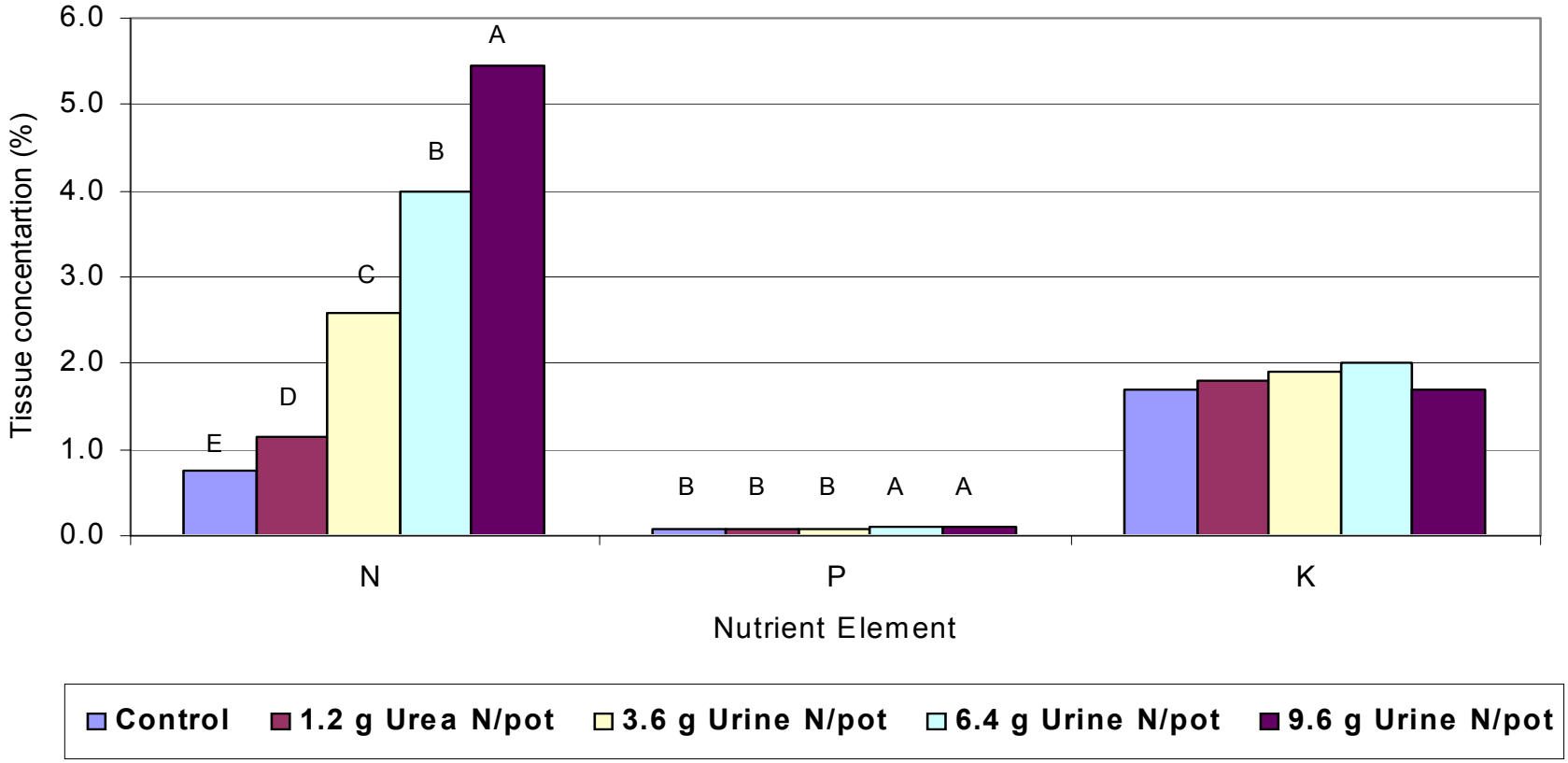


Table 1: Effects of added urine on soil pH and electrical conductivity (EC)

Treatment	Soil pH		Electrical Conductivity (mS/cm)	
	Cabbage	Spinach	Cabbage	Spinach
Control	6.5 a*	6.5 a	1.3 d	2.0 b
0.6 g Urea N/pot	-	6.3 ab		1.8 b
1.2 g Urea N/pot	5.9 bc	-	1.9 d	
3.6 g Urine N/pot	6.1 b	5.7 c	5.8 c	1.4 b
6.4 g Urine N/pot	5.8 bc	5.6 c	10.2 b	1.7 b
9.6 g Urine N/pot	5.7 c	5.9 bc	18.8 a	17.7 a

* Means within each column followed by the same letter are not significantly different at $p < 0.05$.

Fig. 6: Effects of diluted human urine application on cabbage tissue Na concentration.

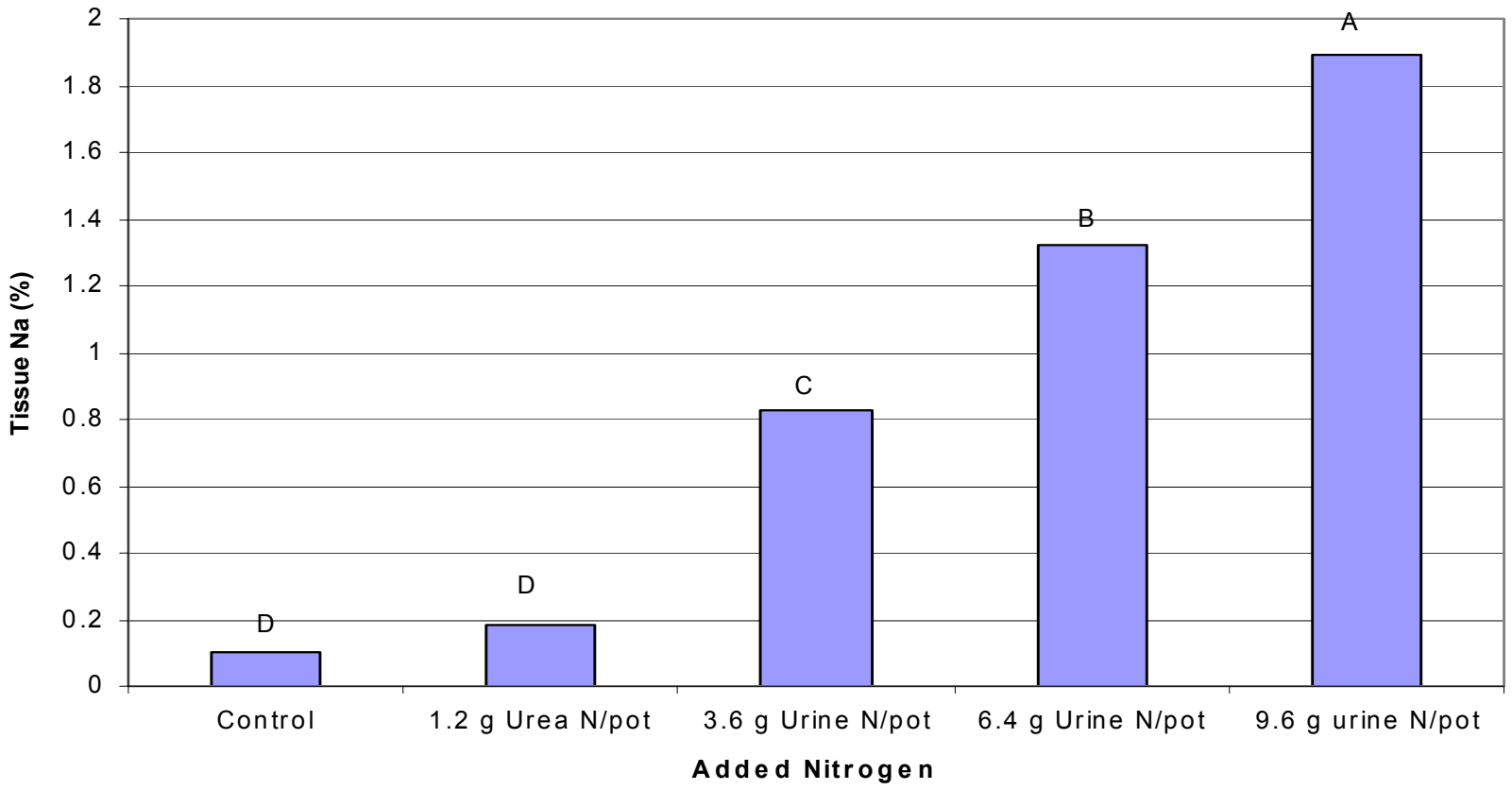
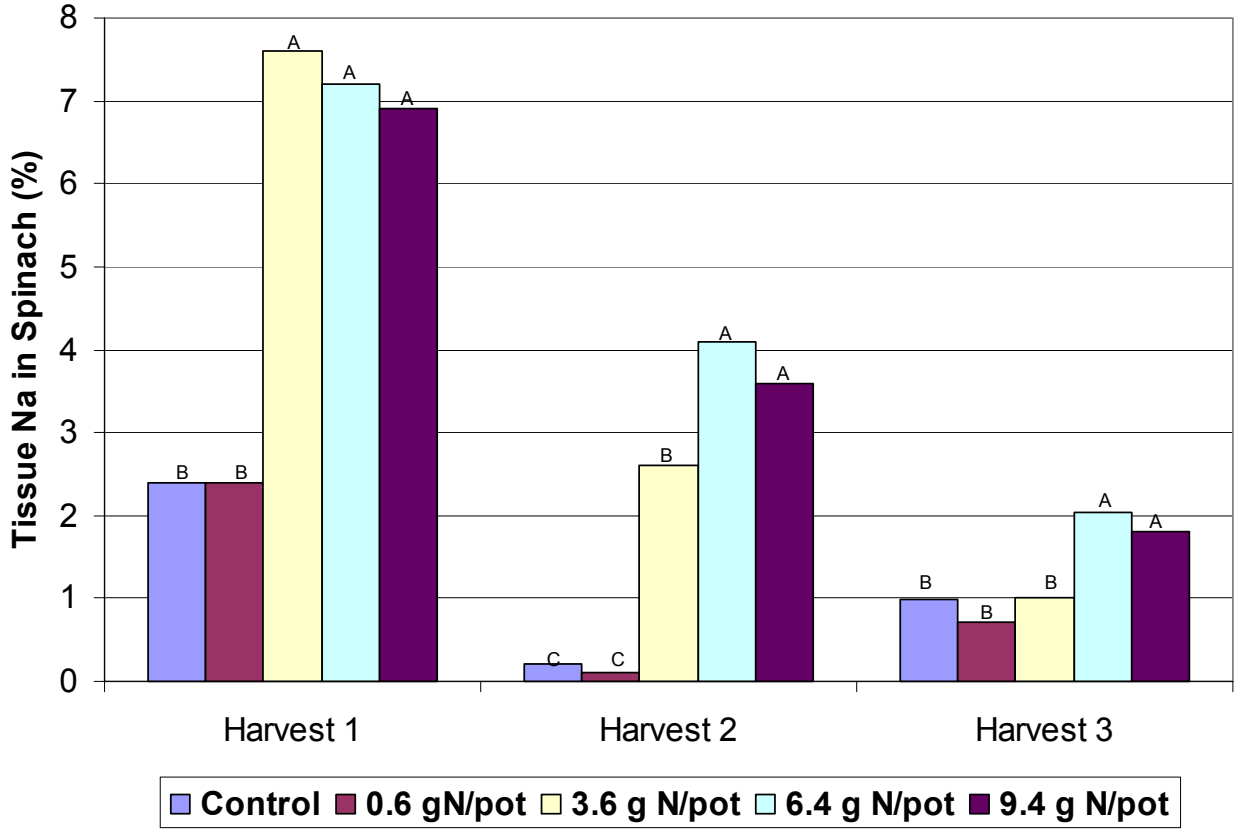


Fig. 7: Effects of diluted human urine on the tissue Na concentration of spinach harvested on three different occasions



CONCLUSIONS

- Diluted urine was found to be a good source of nutrients, especially nitrogen, for spinach and cabbage when applied once a week for about a month.
- Higher rates of application, through more frequent applications, tended to depress yields due to increased salinity in soils which in turn led to rather high levels of sodium in the plant tissues.

CONCLUSIONS cont'd

- The use of human urine should not be recommended for soils that are known to have salinity problems.
- The salinity status of soils that are regularly fertilized with urine should be monitored to guard against salt-build up.
- Field trials should be carried out in areas where the use of urine as fertilizer is envisaged to establish optimum rates of application.