

Plant growth and microbiological safety of plants irrigated with greywater

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Introduction

- Domestic wastewater
 - Toilet waste (black water)
 - Non-toilet waste (greywater)
- In low-income dense peri-urban and rural communities served by on-site sanitation
 - Toilet waste contained and treated on-site
 - Greywater not addressed

- Greywater represents an environmental problem
 - Unpleasant odours
 - Health hazards
 - Soil erosion
 - Pollution of surface water by runoff
 - Mosquito breeding
- Peri-urban, informal and rural settlements are associated with low income, low food security
- Greywater re-use simultaneously addresses environmental and social needs
 - Pilot trials by eThekweni successful and accepted by communities

Aim

- Semi field greywater irrigation trials conducted to investigate:
 - Effect of greywater on plant growth
 - Microbiological safety of produce

Experimental design

- Eight households were selected from nearby community based on
 - Number per household
 - Age
 - Gender
 - Washing application (bathing, laundry *etc.*)
- Three treatments
 - Tap water (negative control)
 - Nutrient solution (positive control)
 - Greywater (experimental treatment)
- Both leafy (above ground) and root (below ground) crops were selected
 - 25 replicates per treatment
 - Above ground - spinach and green pepper
 - Below ground - potatoes and madumbes



Plant growth monitoring

- Weekly measurements taken of
 - Stem height and diameter
 - Number of leaves
 - Leaf area
 - Number of fruits
- Fresh weights at harvest

Microbiological analysis

- Conducted on both surface and interior of plants at harvest for:
 - *E. coli*
 - Total coliforms
 - *Staphylococcus* spp.
 - Coliphage
 - *Ascaris* spp.

Nutrient solution



Greywater



Tap water



Nutrient solution



Greywater

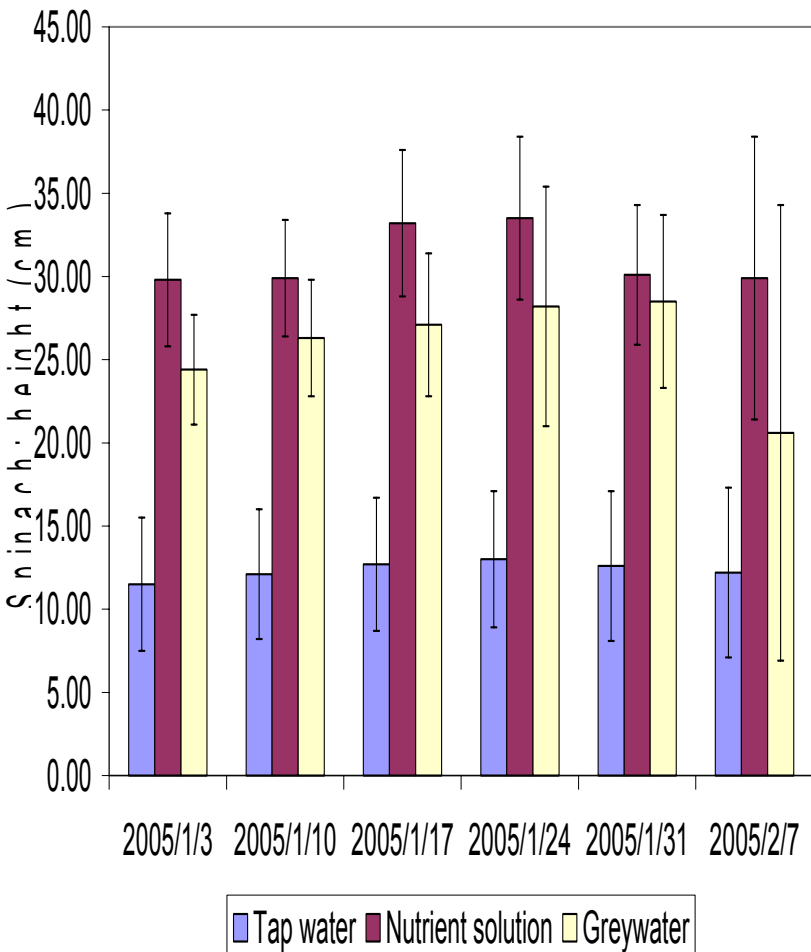


Tap water

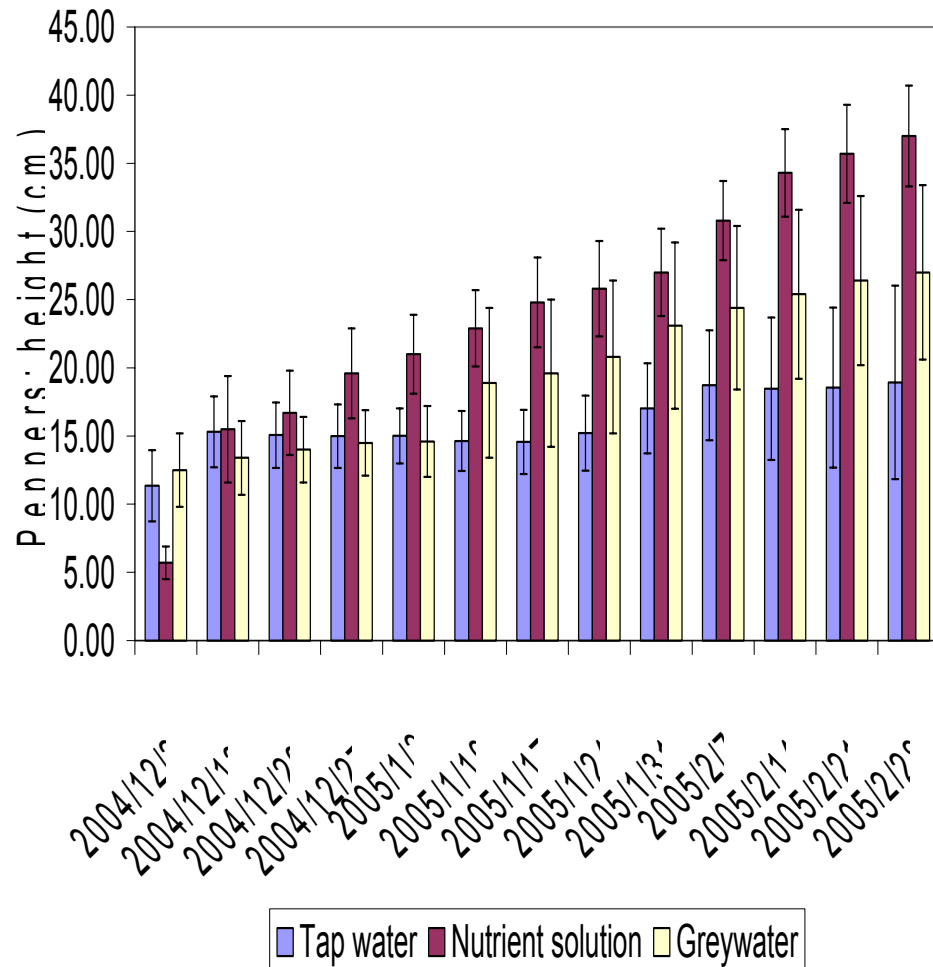


Stem heights

Spinach

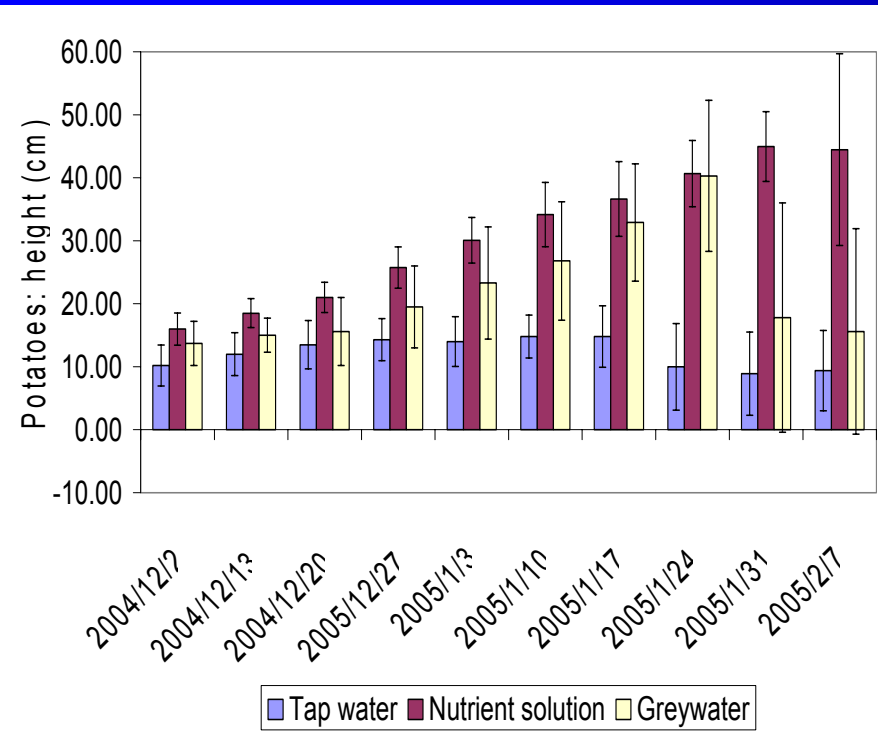


Pepper

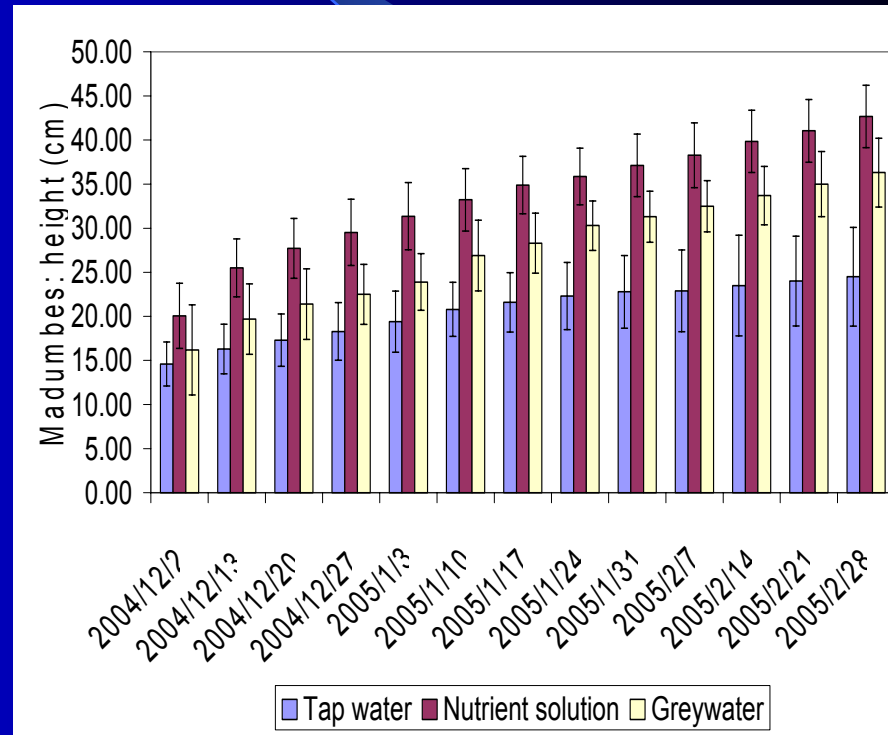


Stem heights

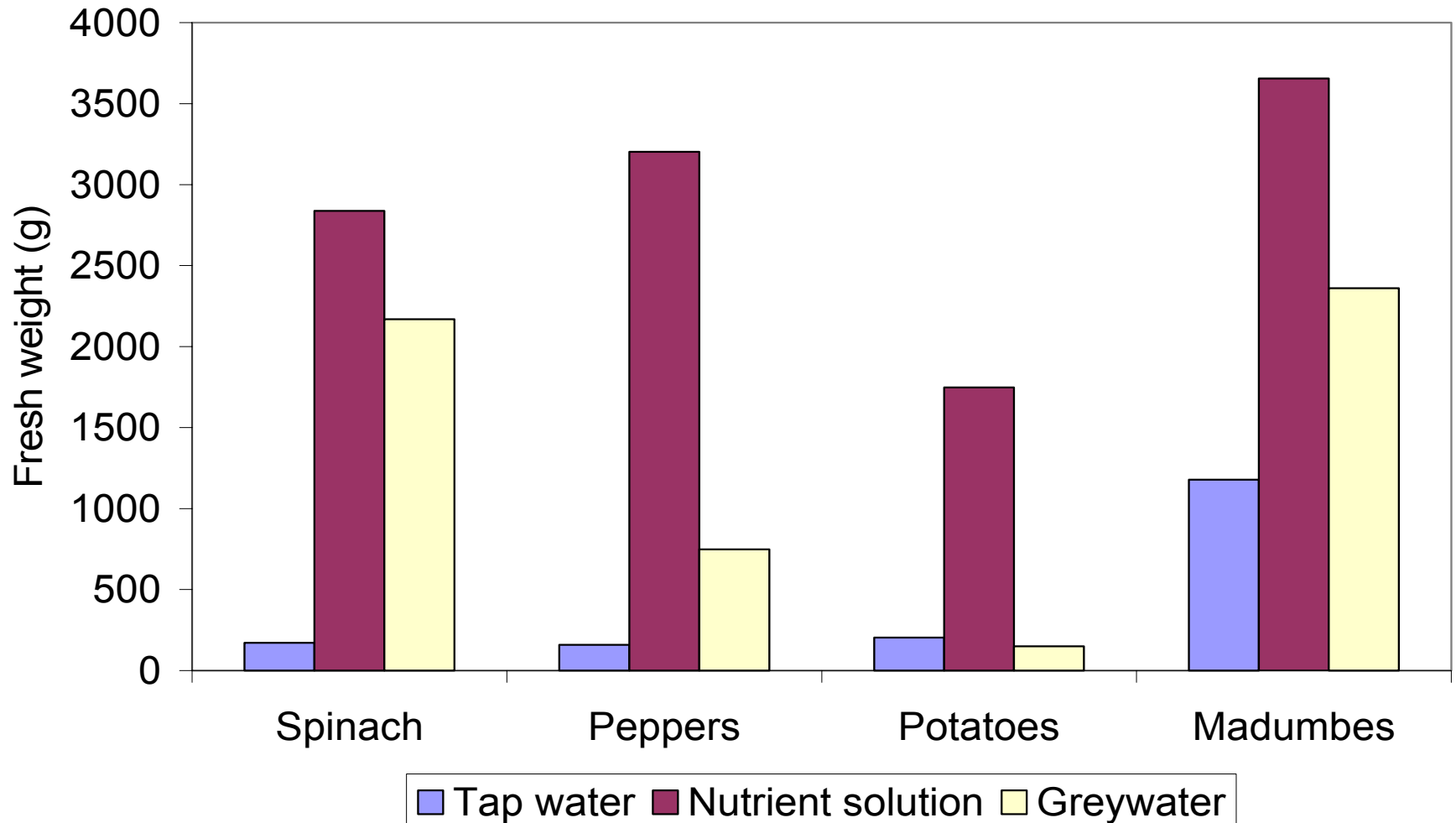
Potatoes



Madumbes

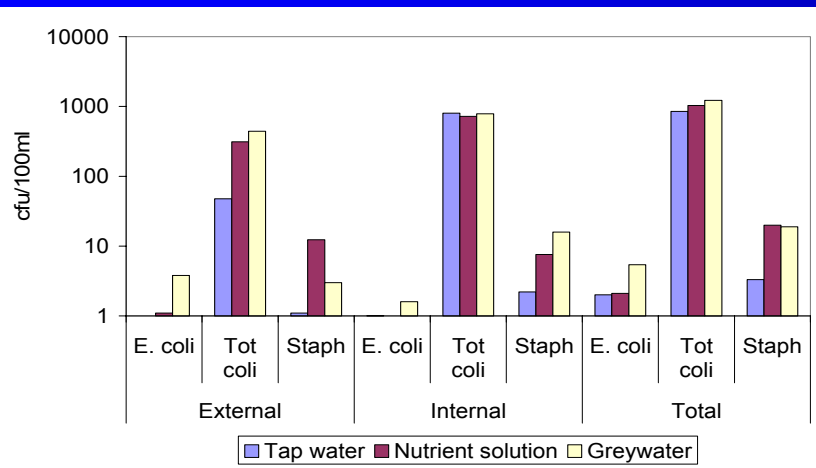


Yield

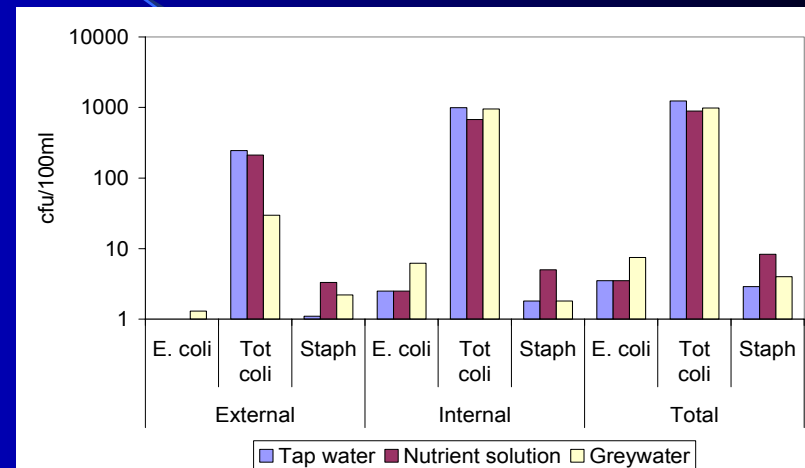


Microbiological Results

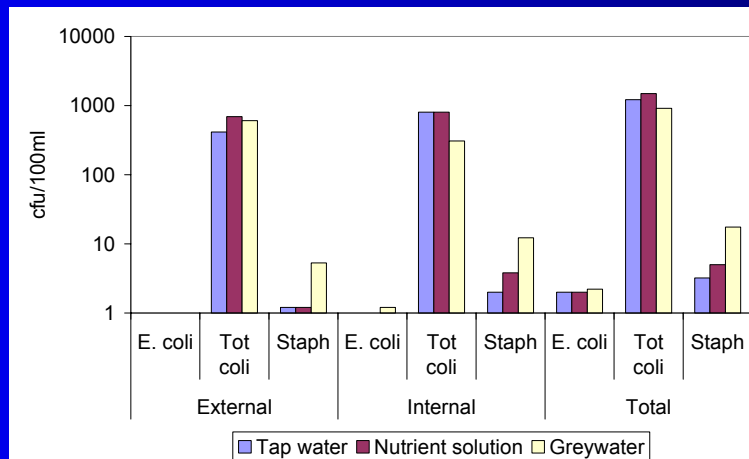
Spinach



Pepper

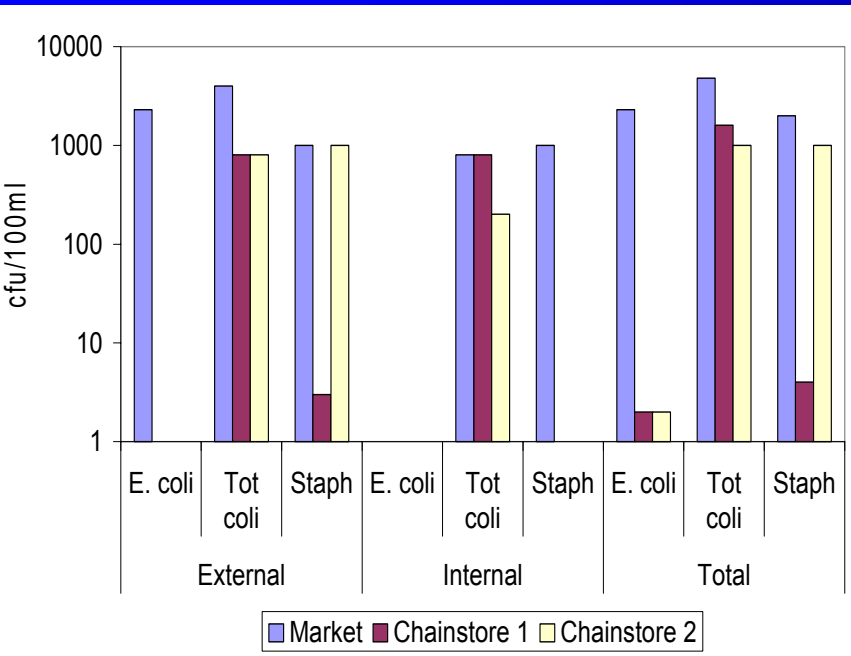


Potatoes

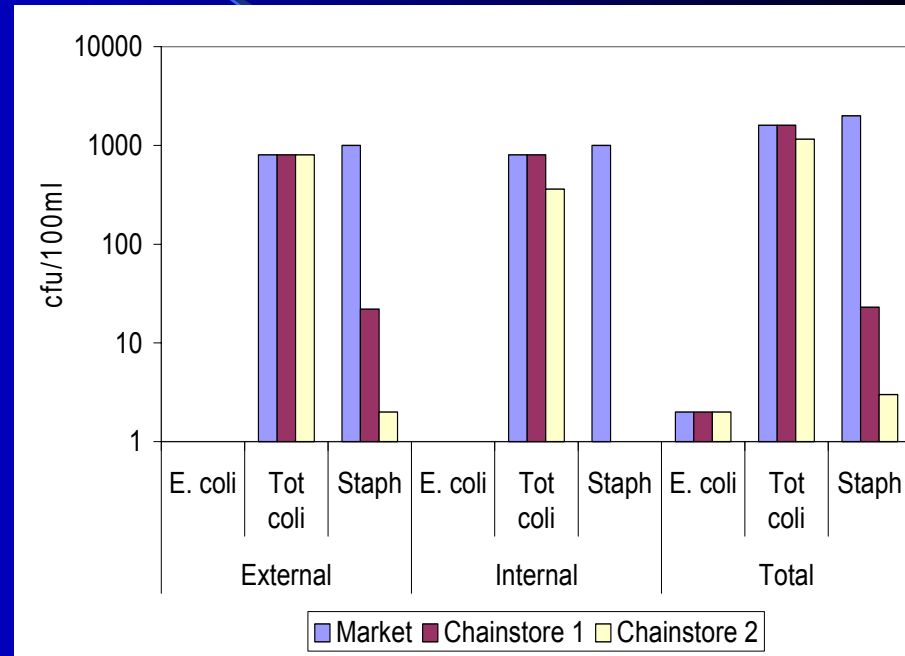


Commercial crops

Spinach



Pepper



Conclusions

- Greywater provided nutrients for both leafy and below-ground plants
- No significant difference in microbial quality of greywater irrigated crops relative to controls and commercial crops
- Greywater represents a potential resource for food production

Acknowledgements

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