



# The Power of Pee

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# What is Urine?

- Human liquid waste excreted from kidney through urethra
- People produces 1-1.5 L per day
- Over 95% water with plant nutrients like N, P and K



## Urine

0.05% Ammonia  
0.18% Sulphate  
0.12% Phosphate  
0.6% Chloride  
0.01% Magnesium  
0.015% Calcium  
0.6% Potassium  
0.1% Sodium  
0.1% Creatinine  
0.03% Uric acid  
2% Urea

95% Water

# Why do we need it?

- Organic agriculture fertilizer shortages
- Need for more efficient water use in dry areas due to growing population and climate change
- Water 4.0



## But is it effective?

- Yes
- Study in Finland found Urine just as effective as mineral fertilizer
- Found to be safe

# Benefits

- Closing Nutrient cycle
- Preventing eutrophication
- More sustainable water use



# Vermont case study

- Collected Urine from volunteers
- Jay Bailey volunteered land
- Twice as productive as control
- Done by Rich Earth Institute, in process of lobbying



# Urine treatment

- Urine easier to treat than feces
- hygienisation (storage)
- stabilisation (acidification, nitrification)
- handling of micropollutants  
(electrodialysis, nanofiltration, ozonation)



# Experimental design

- Ohio Wesleyan greenhouse
- Three groups of five tomato plants.
- Control, traditionally fertilized, urine fertilized
- Harvested after five weeks





# Experimental design

- Hypothesis: Urine based fertilizer will boost plant growth and health just as much as traditional fertilizer.
- Will give plants health scores before harvest
- After harvest we will measure the weight of the plants and their fruits and do a blind taste test

# Problems?

- Need for source separation
- Pharmaceuticals
  - Metabolite can be harmful to plants/people
- “Ick factor”
  - Swiss study found vast majority of farmers willing to try it
  - New challenge in US



# Sources

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