"A different approach for preparing solid nitrogen fertiliser from the urine of public urinals."

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Abstract:

Human urine is rich in valuable plant nutrients and when separately collected, it can be substituted for fertilisers. Organically grown agriculture products are gaining popularity worldwide, satisfying consumers with safer and trusted foods. However, organic agriculture practices provide farmers an alternative, environmentally friendly, sustainable agriculture. Besides, organic crops contain fewer nitrates, nitrites, pesticides, and trace elements than conventional crops. Even though organic systems generally have 20% lower yield than conventionally produced crops. Therefore, ongoing research looks forward to different organic sources that are plentiful and available at a little-to-no cost. "Human urine" is one of them, and has been gaining popularity as a raw material for organic cultivation. In this study, the pH of the collected urine sample was set at 8.5. This pH was most effective for decreasing the odor of the urine sample without losing nutrients. This deodorised urine sample was passed through the dryer and held for 10 min. Then water in the urine was evaporated. The condensed water was used to clean toilets or wash hands.

Introduction:

Despite significantly higher fertilizer prices across the globe throughout 2021, global nitrogen fertilizer demand appears to be set to increase in 2022.[1] Nitrogen supplies continue to be tight with various supply issues, but the price of nutrients could begin to fall in the second half of the year as supply returns. Global nitrogen fertiliser consumption amounted to some 108 million metric tons in 2019.[2] China was the largest consumer of nitrogen fertiliser that year, with more than 24 million metric tons. It was followed by India and the United States, with 19.1 and 11.7 million metric tons, respectively.[3]

The food we eat today is not farmed sustainably. Most fertilisers are either made by transforming nitrogen in the air into ammonia. [11] This single nitrogen fertilizer takes 2% of the world's energy and depends heavily on fossil fuels, or by mining finite resources, like phosphate rock.[4]

A solution to this problem could be much closer than people realise. [12] Most of the nutrients we consume in food are passed into our urine because our bodies already have enough.

[5] But instead of being recaptured, these nutrients are flushed, diluted, and sent to wastewater treatment plants where they're scrubbed out, leaving effluents that can be safely released into the environment.[6]

The most nutrient-rich part of wastewater is human urine, which is less than 1% of the total volume but contains 80% nitrogen and 50% phosphorus. [7] This project aims to recycle this urine into valuable and sustainable farmland fertilizer. [8] The urine is mostly water, farmers would have to spread 15,000kg of it just to fertilise a hectare of land.[9] If there was a way to remove the water and extract just the nutrients, farmers would only need to apply 400kg of it for the same effect. So we undertake this project. [10]

Objectives:

- Collection of urine samples from public urinals.
- Deodorize urine by changing the pH.
- Drying of deodorised urine.

Material and Methods:

Collection of urine samples:

The public urine sample was collected in a one-litre capacity plastic bottle. This urine bottle was brought into the laboratory.

Deodorisation of urine:

The ammonical odor of the collected public urine is minimised by changing the pH to alkaline. A 0.1% calcium or magnesium hydroxide solution was added to the urine sample. These alkalising agents made the urine alkaline.

Drying of deodorised urine:

This alkaline urine sample was dried in the laboratory using a simple drying procedure. Any water in the urine evaporates, leaving only nutrients. The evaporated water is condensed and can be reused to flush toilets or wash hands.

Results and discussion:

The pH of the collected urine sample was set at 8.5. This pH was most effective for decreasing the odor of the urine sample without losing nutrients. This deodorised urine sample was passed through the dryer and held for 10 min. Then water in the urine was evaporated. The condensed water was used to clean toilets or wash hands.

Conclusions:

This method is natural and effective for the production of nitrogen-containing fertiliser. We can conclude that urine from public urinals is used to make solid nitrogen fertiliser. This method of solid nitrogen fertiliser is cost-effective. We can store this natural solid nitrogen fertiliser for a long time, which is a significant storage limitation of liquid urine storage.

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