Use of Human urine in Agriculture

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Objectives of Investigation

1. To study the effect of application of human urine on growth and yield of crops and economics of cultivation

2. To develop protocol on frequency and quantity of application of human urine for selected crops (Radish, French bean, Maize and banana).
### Nutrient composition of ALW

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.6-7.5</td>
</tr>
<tr>
<td>Nitrogen (%)</td>
<td>0.26-1.2</td>
</tr>
<tr>
<td>Phosphorus (%)</td>
<td>0.14-0.16</td>
</tr>
<tr>
<td>Potassium (%)</td>
<td>0.14-0.18</td>
</tr>
<tr>
<td>Ca meq/l</td>
<td>8.5-9.5</td>
</tr>
<tr>
<td>Ca+Mg meq/l</td>
<td>3.6-3.8</td>
</tr>
<tr>
<td>Na meq/l</td>
<td>149.5-150.6</td>
</tr>
</tbody>
</table>

**Field experiment**

Test crop: Maize  
Conducted: Nagasandra village, Doddaballapura Taluk, Bangalore  
Farmers name: Prasana  
Human urine collected: specially designed toilet (Ecosan) Swami Vivekanada school, Doddaballapura
Ecosan toilet-Human urine collection

Gents  Girls  Collecting in cans

Field experiment

The store room on the farm used to store ALW collected from school in Doddaballapura.

Methods to avoid loss of nutrients

• To avoid nitrogen loss- Sulphuric acid was added as additive
• Chlorination - To inactivate microorganisms.
• Ozonization - Alternate method
• Storage in cool room / shade place
Application of Human urine (Before sowing the maize seeds)

Application of Human urine  Sowing

Treatmental difference
### Studies on the effect of ALW on maize grain yield (q/ha)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Grain yield (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>39.9</td>
</tr>
<tr>
<td>Chemical fertilizer</td>
<td>79.5</td>
</tr>
<tr>
<td>Human urine</td>
<td>80.5</td>
</tr>
</tbody>
</table>

#### Birds eye view of the maize experiment
Experiment on Banana

Location- Nagasandra, Farmer name- Prakash

- Fertilizer Recommendation – 400:240:500 kg NPK/ha
- ALW-3768 liters/120 plants.
- 153846.15 liters.

General view of the experimental plot before treatment imposition  Two month old banana crop
Seventh month old banana plant

Control plot  Human urine applied plot

Research in progress

Pot culture studies after biosand filtration

Identification of microorganisms through PCR technique
HURDLES

- Collection, Transportation and application to fields.
- Social Taboo - Marketing of produce.

Alternatives
- Creating awareness among people.
- Conversion of urine to dry powder.
- Application through drip irrigation

Other potential uses

- Extraction of phosphorus – the most limiting nutrient.
- Extraction of the enzyme urokinase
- **Research need**
- Long term impact of urine on soil properties.
- Impact on soil / groundwater pollution.
Acknowledgment to

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Thank you