

## Progression composting and profiling of physico-chemical parameters of green toilet system human solid waste compost as indicators of suitability for use as organic fertilizers

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### Abstract

The exponential rise in human population globally, including Kenya, has posed a major challenge in waste generation, accumulation and disposal. The problem is dire in developing nations in South East Asia and Africa that have no proper systems for recycling and safe use of the high volume of human waste filling open landfills. This has led poor farmers to use raw sewage to irrigate their farms, exposing both the human and animal population to harmful pathogens. This study took advantage of the high volume of human waste being generated to prospect for organic fertilizer for agricultural use. The objective of the study was to determine and compare physico-chemical characteristics of human solid waste compost progressively. Green Toilet System developed by LIXIL was used to destine solid and liquid human wastes to different collection points with negligible or zero interaction. Human solid waste, poultry droppings, cow dung, and goat waste composts of were put piles. All composts were monitored for a duration of six months (183 days). Compost temperature, colour, odour and texture were determined daily for each compost pile at the composting site. Total dissolved solids, electrical conductivity, pH, carbon, total Kjeldahl nitrogen, carbon nitrogen ration, organic matter and moisture content were determined and measured every 21 days. SPSS Version 26 was used for data analysis. One way analysis of variance (ANOVA) was carried out to determine difference between means. Individual means were compared and separated using Duncan's multiple range test with significant level at  $p < 0.05$ . Varying minimum and maximum temperatures of  $21.333^{\circ}\text{C}$  and  $58.333 \pm 0.577^{\circ}\text{C}$  respectively for human solid waste pile were observed. At the end of composting for human solid waste, compost color expressed as hue angle ( $H^{\circ}$ ) was  $75.153 \pm 2.514^{\circ}$ . All composts registered diminishing smell from very strong to very faint, and texture from rough clumps to powdery. There was significant difference between the means of total dissolved solids, pH, Electrical conductivity, carbon nitrogen ratio, organic matter, and moisture of all composts at  $p < 0.05$ . In conclusion, composting, monitoring and analyzing physico-chemical parameters of human solid waste compost over a period of time show results that suggest suitable compost maturity duration.

**Keywords:** population explosion, human solid waste, water borne diseases, Green Toilet System, composting, physico-chemical characteristics.

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