24. Importance of Food Waste for Sanitation of Source Separated Faeces by Medium-Scale Composting

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Dry urine diverting toilets are one approach to safe and sustainable sanitation. These toilets collect urine and faeces separately, enabling their nutrients to be recycled in undiluted and small volume concentrations. Plant nutrient recycling has the potential to improve people's nutritional status and reduce poverty through selling of surplus food. However, to improve health, it is essential that the excreta is safely sanitised before being used as fertiliser. Thermophilic composting is one way of sanitising faeces.

Vinnerås *et al* (2003) reached thermophilic and sanitising temperatures (≥50°C) when composting, faeces mixed with food waste in well-insulated reactors. When composting faeces in the medium scale without insulation, temperatures hardly increase more than 10°C above the ambient (Karlsson & Larsson 2000). Previously, we composted a mixture of faeces/ash and food waste in 78 litre reactors insulated with 25 mm styrofoam. Sanitation was achieved in the faeces (F):food waste (FW) by wet weight, F:FW(ww) = 3:1 and 1:1 within 7 and 11 days respectively (Niwagaba *et al,* 2006). This new experiment was set-up, with larger reactors (216 litres) and increased insulation of 75 mm. The objective was to analyse the effect on temperature/time to reach sanitation of increased compost reactor size and more insulation.

Faeces/ash mixture was mixed with food waste and composted in three reactors insulated with 75 mm styrofoam all around. The faeces were collected from school toilets, where generous amounts of ash were used as cover material. To increase the proportion of organic matter, the amount of loose ash was decreased by sieving. The sieved faeces, including sticking ash, toilet paper, etc. were mixed with food waste to give compost substrates containing Faeces:Food Waste in volume ratios of F: FW(v) = 1:0, 1:1 and 1:3. The food waste consisted of mainly beans, rice, banana (matooke), bones and maize meal (posho) collected over a two week period.

The pH of the mixtures was 8.6 – 10. The F:FW(v) = 1:1 and 1:3 composts heated up to 50ºC in less than a day, while the F:FW(v)=1:0 took about a day (Fig. 1). Thus, neither the pH nor the different mixes used seem to have negatively affected the composting process.

When co-composting faeces/ash mixture and food waste in wet volume ratio of 1:1 and 1:3, sanitising temperatures (>50°C) were sustained for over two weeks. *E. coli* was no longer detected in F:FW(v) = 1:1 and 1:3 compost reactors after six days of composting, and after 10 days in the F:FW(v) = 1:0 compost. In the F:FW(v) = 1:3 and 1:1 composts, total coliforms and *Enterococcus* spp. were no longer detected after 12 days and 18 days, respectively, indicating good reduction of intestinal bacteria.

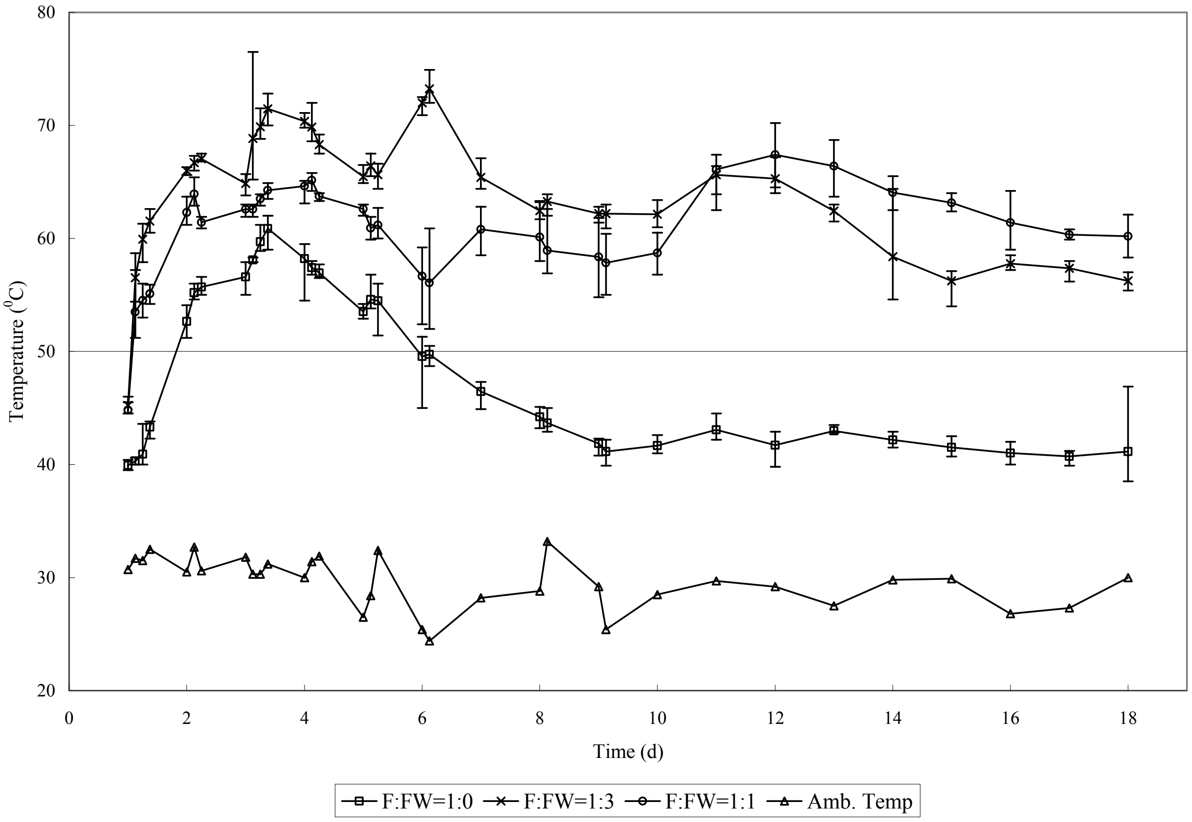

Figure 1: Temperature of the three composting mixtures [Average, maximum and minimum of the temperatures measured in the four corners and in the center are shown]. Maximum differences in temperature were –3.8°C and +7.7°C. On average for all measurements, the maximum temperature was 1.3°C higher than average and the minimum 1.4°C lower. Thus, good insulation (75 mm styrofoam), minimised temperature gradients within the compost.

In the substrate without food waste (F:FW(v)=1:0), high temperatures (>50°C) were sustained for only four days and both total coliforms and *Enterococcus* spp. were still detected after 43 days. Therefore, inclusion of food waste in the substrate is important for maintaining thermophilic temperatures and for attaining safe sanitation of faeces as shown by both mixes (F:FW(v) = 1:3 and 1:1).

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