

Title: Temperature and bacterial density in system of Compost Barn for dairy cattle

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Abstract:

Temperature is directly proportional to the biological activity during the process of composting Barn Compost (CB) systems for dairy cattle. Increasing the metabolic rate of the microorganisms increases the temperature within the system. In this work we evaluated the total bacterial density and correlated with temperature measurements in the bed of a CB system. The system was implemented in February 2015 in Charco Farm in the city of Cruzília-MG. Lots with different numbers of cows are separated in the system: 1st lot - 20 cows in the final stage of lactation; 2nd lot - 40 cows with high milk production; 3rd lot - 13 cows during pre-parturition; 4th lot - 41 heifers. Three lines were established to collect CB bed samples: drinker line (LB), the middle line (LM) and feeder line (LC). Temperatures were measured with Extech SDL550 meter in all these sites. Samples were collected at different depths (surface, middle and bottom), on the lines of each lot, in March 2015. All samples were fixed in PFA (final concentration of 2%). The sample processing took place from addition of 550 μ L Tween 0.0001% and filtered distilled water (5 mL). Then the samples were sonicated in the amplitude of 110.7 μ m for 60s and centrifuged at 500 xg speed for 5 min (three times). The supernatant was collected, diluted 10x and filtered on polycarbonate filter (0.2 μ m pore). Filter pieces were cut, stained with DAPI and placed between slide and cover slip with glycerol: PBS solution. The slides were analyzed in an epifluorescence microscope in 10 random fields. The total density of bacteria in the system was $4,5 \pm 3,1 \times 10^9$ cels g^{-1} (overall mean \pm standard deviation). No significant differences in the number of bacteria were found between lots of the system, or between the lines nor depths. The overall average temperature of the compound was $40 \pm 4,9$ °C. However, the surface temperatures were significantly different from the temperatures of other depths. No correlation was found between the density of bacteria and temperature measurements. Bacterial community can still be adapting the system conditions, which is the initial phase of the composting process. Thus, the temperature difference and bacteria can mean that the system has not yet reached its operating stability.

Keywords: Composting, temperature, microorganisms

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