

Design and Development of a Double Layered Compost Biofilter for Ammonia Odour Filtration in Broiler Farms

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Odour emission from deep litter broiler farming is a serious health and environmental issue that may hinder the widespread application of broiler farming in urban areas. Biofiltration with organic biofilters has been identified as affordable technology for odour filtration. In this study, a prototype composite biofilter having 400 mm diameter, 75 mm thick wet and dry matured compost layers were fabricated using steel and polyvinyl chloride pipes. The odorous gases from a broiler unit at Livestock Field Station, University of Peradeniya, having 12 m² space and 200 birds was filtered through the developed biofilter for two weeks. The odorous gas containing 2.8 ppm of Ammonia was sent through the filter at a rate of 1.5 m³ min⁻¹ while maintaining the moisture contents of the beds at 30% and 40%. The biofilter system was operated continuously while evaluating the performance through measuring ammonia concentration in inflow, outflow and between layers. The results revealed that, Ammonia removal efficiency was 99% during 14 days of experiment period. The volatile solids and C/N ratio of bed media were gradually declined due to higher microbial activity in wet filter layer. Furthermore, a sensory evaluation was done by using 30 individuals to estimate the effectiveness of the treatment and found that odour intensity of outlet air is significantly lower ($p < 0.05$) than that of inlet air. Thus, it was concluded that the compost based double-layer biofilter system is an effective and economical technique for odour removal from the broiler farms.

Keywords: Biofiltration, Broiler farms, Compost, Odour