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Ammonia Capturing Capacity of Biochar and Kaolinite

Perera A.J.S.L., Atapattu N.S.B.M.*

Department of Animal Science, University of Ruhuna, Matara, Sri Lanka
**nsbm@ansci.ruh.ac.lk*

Abstract

Emission of ammonia from poultry litter has numerous negative impacts on poultry, poultry house workers and the environment. When applied as a litter amendment, acidified biochar (ABC) and Kaolinite are reported to lower the emission of ammonia. Apart from reducing ammonia formation, both amendments have a capacity to capture ammonia before being released into the environment. However, capacity of those materials to capture ammonia has not been estimated. The objective of this study was to determine the ammonia capturing capacity of ABC, kaolinite and three different mixtures of them; 75% Kaolinite and 25% ABC, 50% kaolinite and 50% ABC and 25% kaolinite, 75% ABC. Each of the five amendment mixture was tested in five separate completely randomized design experiments. Poultry litter samples were incubated in ten sealed-conical flasks; each fitted with flexible tubes through which emitting ammonia was conveyed to another sealed-flask containing either a known weight of amendment (five replicate flasks) or Styrofoam; control (five replicate flasks). The weight of the amendment or Styrofoam was adjusted to have same volume of material in flasks. A flexible tube originating from the second flask was connected to another sealed-flask containing a boric acid solution so that ammonia that has not been captured by the amendment or Styrofoam in the second flask is captured. A set of tubes originating from each of the ten boric acid flasks were fitted to a vacuum pump.N content, pH, dry matter percentage of the litter before and after the incubation and the amount of N captured by the boric acid were determined. The difference between N released and that captured by the boric acid solution was considered to be captured by the material added to the second flask. Though assumed to have no capacity to capture ammonia, in all five experiments, Styrofoam reported significantly higher ammonia capturing capacity compared to respective amendments. Ammonia capturing capacity of Styrofoam was as high as 1.24g/100g/hr while that of ABC and Kaolinite were 0.40g/100g/hr and 0.14g/100g/hr), respectively. In all five experiments, the percentages of ammonia captured (of the total released during incubation) were not significantly different between tested amendments and the Styrofoam. Percentage capture of ammonia by ABC, Kaolinite and Styrofoam were 91%, 83% and 84%, respectively. The study concludes that acidified biochar, Kaolinite and Styrofoam have capacity to capture ammonia releasing from poultry litter. Further studies are needed to understand the nature of capturing.

Keywords: Ammonia, Biochar, Kaolinite, Litter, Poultry