

Compare Methods to Prepare and Analyze Animal Manure for in vitro Manure Ammonia Emission Study

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Preparation process for manure nitrogen (N) content analysis can cause loss of N (in the form of ammonia; NH₃). Mahimai et al. (1990) compared NH₃ loss when drying poultry, sheep and horse manure, dairy and pig slurry with different methods and they found freeze drying was the best method to reduce N loss. However, Jacobs et al. (2011) found that there was no difference in NH₃ loss between freeze drying, 50 °C and 100 °C oven drying methods when preparing poultry manure. Further, Stevens et al. (1989) found that when acidifying dairy manure, the NH₃ loss was smaller when the pH was below 4.5 compared to higher pH. However, there have been limited study was conducted to examine whether acidifying manure before drying can reduce N loss. Therefore, the objective of this study was to compare different drying methods and with/without acidification to prepare dairy cattle and poultry manure to reduce N and NH₃ loss.

In this study, two types of manures (poultry and dairy cattle) with four manure preparation methods were compared, resulting in eight treatment groups in total. Each treatment group comprised 4 replications. Treatment A: acidify manure to pH 4.5 then oven drying it at 65 °C. Treatment B: add acid on the top of -20 °C frozen manure prior to thaw the manure at room temperature for 2 h. Followed by mixing the acid with manure to reduce pH 4.5 prior to 65 °C oven drying. Treatment C: freeze drying manure at -20 °C. Treatment D: mix acid with fresh manure and freeze it at -20 °C before freeze drying. All samples were analyzed for total N and ammonia-N. The data was analyzed by one-way ANOVA.

Table 1. Total N% and ammonia-N% of dried manure subjected to four sample preparation methods.

	Treatment A	Treatment B	Treatment C	Treatment D	LSD	P
Total N% of dry poultry manure (w/w)	3.3	3.3	3.1	3.5	0.52	0.55
Total N% of dry dairy cattle manure (w/w)	3.2	3.4	3.7	4.0	0.09	0.00
Ammonia-N% of dry poultry manure (w/w)	0.2	0.3	0.2	0.3	0.03	0.00
Ammonia-N% of dry dairy cattle manure (w/w)	0.1	0.4	0.1	0.4	0.13	0.00

Treatment D had the highest total N% of both poultry and dairy manure compared with other treatments. Total N% of dried poultry manure was not different among treatments (P=0.55). For the dairy manure, freeze drying could preserve more N than 65°C oven drying (P<0.05). Adding acid might reduce ammonia-N% and lead to treatment D had the highest ammonia-N% of both poultry and dairy manure. For poultry manure, there was no difference in ammonia-N% of treatment A and B. For dairy manure, ammonia-N% of treatment B and D were higher than treatment A and C. In conclusion, acidifying before freeze drying dairy cattle and poultry manure was the best manure preparation method to reduce both total-N and ammonia-N loss.

Reference

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