Sward height effect on emission of NH_3 from broiler manure applied to *Dactylis glomerata* L.

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Introduction Ammonia volatilization is a major N loss pathway from land applied manure. Strategies for reduction generally involve injection, incorporation or rapid infiltration of the manure. These techniques are often not available for application on perennial forages. Previous work has shown lower emission when liquid pig manure was applied in bands under a growing crop of winter wheat (Sommer et al. 1997). This potential abatement method has not been examined for solid manures which cannot be injected into grass. The objective of this study was to examine the effect of grass height on NH_3 emission from applied broiler litter.

Materials and methods This field study (4 replicates) was conducted on established orchardgrass (*Dactylis glomerata* L.). Sward canopies were trimmed to 25, 75, 175 or 275mm height above the ground just before manure application; the grass in all plots grew sightly during the two-week measurement period but height differences were maintained. Broiler litter was broadcast at 470 kg N or 100 kg NH_4-N ha^{-1}. Ammonia measurements were made using 0.5×2 m wind tunnels with continuous air flow averaging 1 m sec^{-1} as measured with turbine anemometers, and measurements of air flow in a cross-sectional grid through the tunnels were taken with a hot wire anemometer. Ammonia in air samples collected from the tunnels were trapped in phosphoric acid and analyzed by flow injection. Sampling frequency, starting with 4 times on day 1, declined over the 14-day measurement period after manure application.

Results and discussion For all grass heights, more than half of the emissions occurred in the first 24 h after manure application. This shows the importance of rapid incorporation of manure, where this can be done. In the first day, there was a negative effect of grass height on NH_3 emission, but the effect was small after day 2 (Figure 1). Loss of ammonia-N during the 14-day measurement period totaled 65.3%, 59.6%, 56.0% and 42.8% of applied ammonia-N for the 25, 100, 175 and 275 mm heights, respectively, or 9.1 to 13.9% of applied total N. Only the tallest grass height had a significant effect on ammonia emissions with a reduction of 34% compared to the short grass. These reductions were lower than those reported by Sommer et al. (1997) for liquid hog manure. The difference could be due to relative density and shape of the canopies, and alternative measurement techniques (wind tunnels vs. micromet-mass balance). Emission reduction appeared to be related to the reduced airflow at height of 50-200 mm above ground and possibly to direct ammonia absorption by crop leaves (Sommer et al. 1997). Applying manure under a crop canopy may have additional benefits of reducing odour and runoff and increasing the rate of nutrient uptake (unpublished data). However, delayed manure application may result in reduced yield. Effect on emissions by other crops, crop canopy structures and manure types, and the influence of precipitation, need to be examined.

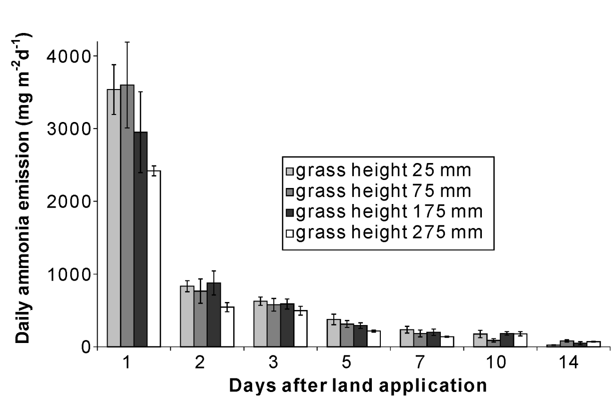

Figure 1 *Daily NH_3 emissions from applied broiler manure as affected by grass height at the time of application.*

Conclusions Grass canopy can be used to reduce ammonia emissions for surface applied broiler manure. While the effect was smaller than reported for swine slurry, there are few methods available for reducing emissions from solid manure applied to grass. Future studies should attempt to optimize the effect.

References

Sommer, S.G., Friis, E., Bach, A., Schjorring, JK. (1997). Ammonia volatilization from pig slurry applied with trail hoses and broadspread to winter wheat: effects of crop development stage microclimate and leaf ammonia absorption. *J. Environmental Quality* 26: 1153-1160.