

Combined effect of sugarcane trash mulch, slurry properties and tropical climatic conditions on ammonia volatilization after pig slurry application

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INTRODUCTION

Context :

→ In Réunion Island, in the tropics, sugarcane is grown on large areas (26 000 ha, 57% of the island's total farmland) and **pig slurry** output is applied on the sugarcane fields (Chabalier et al., 2006).



Plant mulches:

- ✓ tend to increase organic matter content, which usually provides for a high infiltration rate (Findeling et al., 2003)
- ✓ can store significant amounts of water, so reducing the amount of rain reaching the soil, which might influence slurry infiltration and thus **ammonia volatilization**.

Objectives :

- Characterize ammonia volatilization under tropical area
- Explore the effects of a sugarcane trash mulch on volatilization

METHODS / APPROACH

→ Two experiments (● on the map) were carried out : in August-September 2000 and late October 2001, designed to compare **two treatments**: pig slurry application (i) on bare soil, (ii) on sugarcane trash mulch.

→ Field measurement of ammonia volatilization using the **micrometeorological mass balance method** (Misselbrook et al., 2005).

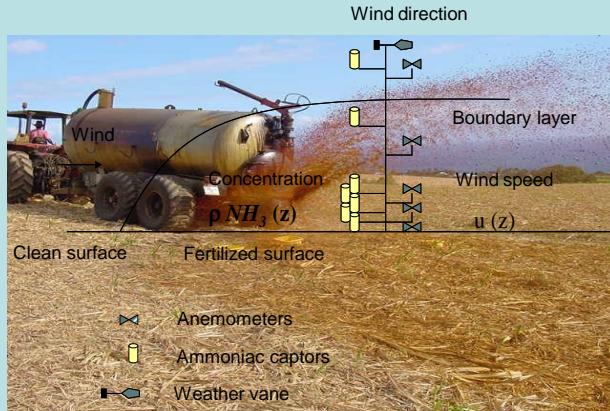


Fig. 1. Field measurement of ammonia volatilization using the micrometeorological mass balance method

RESULTS

- With the **bare soil treatments**, emissions were rather similar: 34% (exp. 1) and 47% (exp. 2) of applied ammoniacal nitrogen
- With the **mulch treatments**, sharply contrasting results were obtained: 10% (exp. 1) and (exp. 2) 108% of applied ammoniacal nitrogen

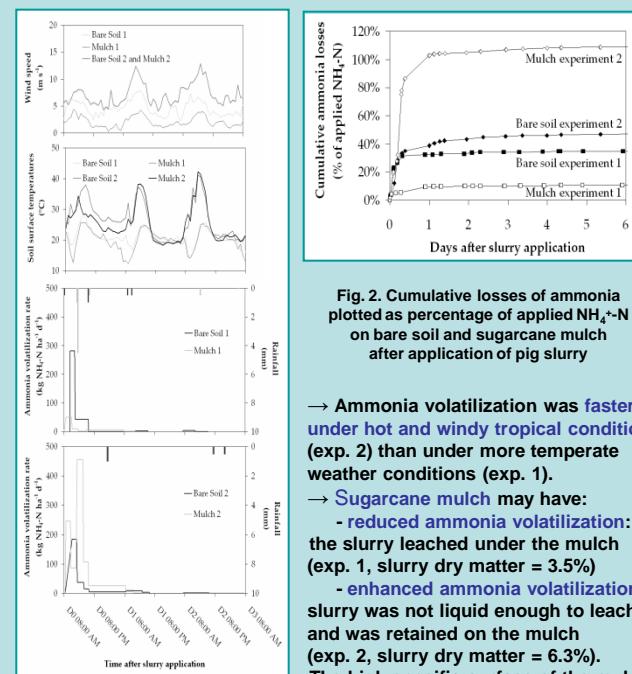


Fig. 2. Cumulative losses of ammonia plotted as percentage of applied $\text{NH}_4^{+}\text{-N}$ on bare soil and sugarcane mulch after application of pig slurry

Fig. 3. Meteorological data and ammonia volatilization on bare soil and sugarcane mulch (3 first days) after the application of pig slurry

→ Ammonia volatilization was **faster** under hot and windy tropical conditions (exp. 2) than under more temperate weather conditions (exp. 1).

→ Sugarcane mulch may have:

- reduced ammonia volatilization: the slurry leached under the mulch (exp. 1, slurry dry matter = 3.5%)
 - enhanced ammonia volatilization: slurry was not liquid enough to leach and was retained on the mulch (exp. 2, slurry dry matter = 6.3%).
- The high specific surface of the mulch of about $40 \text{ cm}^2 \text{ cm}^{-3}$ resulted in a much increased exchange surface between slurry and atmosphere.

CONCLUSIONS

As a conclusion, on bare soil, slurry would be best applied under conditions as cool and windless as possible, and preferably before a rainfall event. In case of slurry application on sugarcane trash mulch, slurries with low dry matter content would be preferable. An efficient method would be to inject the slurry under the mulch.

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