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THE EFFECT OF THE SLURRY ADDITIVE NH3RELIEF COMPARED TO SULFURIC ACID ON THE NITROGEN UPTAKE OF WINTER WHEAT

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Introduction

To prevent eutrophication of non-agricultural ecosystems, indirect N_2O emissions, particulate matter formation, and soil acidification, the agricultural NH_3 emissions have to be reduced [1][2][3]. By decreasing NH_3 emissions, the N fertilising effect and N use efficiency of the slurry might also be improved.

The product **NH3relief** is a NH_3 sorbent based on carboxylic acid derivatives.
In a field trial, this sorbent was used as a slurry additive to improve the N fertilization effect of the treated slurry and was compared with the effect of sulfuric acid.

Materials and Methods

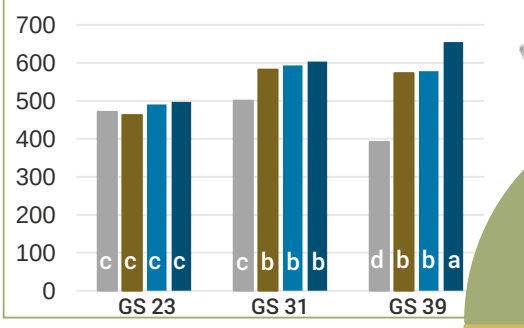
In the field trial (block design, 4 replicates), the winter wheat was fertilised two times using fattening pig slurry with a trailing hose system. The following 4 treatments were applied

1. **Control without fertilizer**,
2. **Slurry without additive**,
3. **Slurry + NH3relief** (24 L m^{-3}), and
4. **Slurry + sulfuric acid** (6 L m^{-3}, pH 5.2).

At three growth stages **YARA N-Tester** measurements were recorded, plant samples taken and their **N concentrations** analysed. At harvest, **grain yield** and **N concentration** were determined.

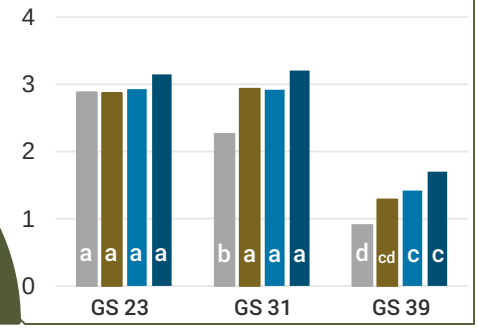
YARA N-Tester value

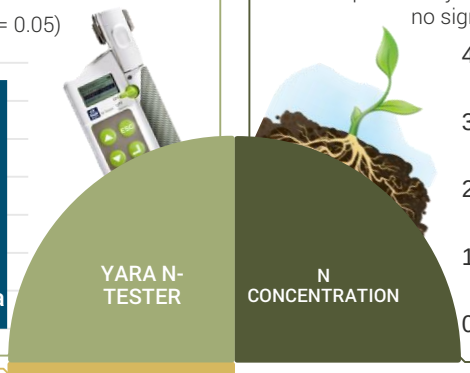
At three growth stages; n = 4; same letters -> no significant differences (Tukey contrasts, α = 0.05)



N concentration (% dry weight)

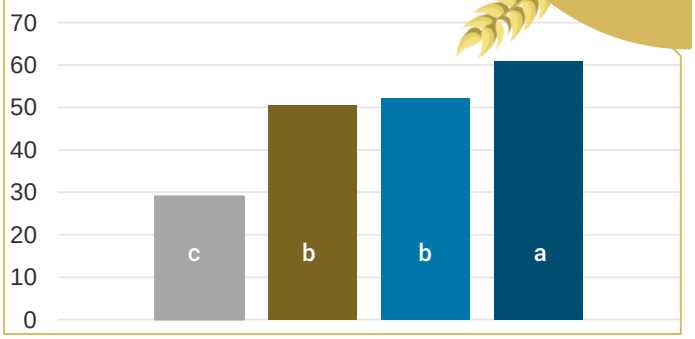
Whole-plant analysis at three growth stages; n = 4; same letters -> no significant differences (Tukey contrasts, α = 0.05)





N removal (kg ha^{-1})

Yield (dry weight) * grain N concentration (% dry weight); n = 4; same letters -> no significant differences (ANOVA; HSD (α = 0.05))



Results

- Significantly lower YARA N-Tester value in response to slurry treated with NH3relief compared to sulfuric acid at GS 39
- Lower (but not significantly) N concentration in the plant material for Slurry + NH3relief compared to Slurry + sulfuric acid treatment at all growth stages
- Significantly lower N removal for Slurry + NH3relief compared to Slurry + sulfuric acid treatment

Discussion

- Probably **lower NH_3 emissions** and thus **higher NH_4^+ supply** due to the use of sulfuric acid and acidification of the slurry
- Most likely **reduced N availability** of the Slurry + NH3relief as NH_4^+ might be bound to the carboxylic acid derivatives and thus not directly available to plants

➔ Further research on the availability of N bound to carboxylic acid derivates is necessary.

REFERENCES

[1] LELIEVELD et al. (2015): The contribution of out-door air pollution sources to premature mortality on a global scale. Nature 525, 367–371.
[2] MOSIER, A. R. (2001): Exchange of gaseous nitrogen compounds between agricultural systems and the atmosphere. Plant and Soil 228, 17–27.
[3] SPIRIG C. and NEFTEL, A. (2006): Ammoniakemissionen aus der Landwirtschaft und Feinstaub. Agrarforschung Schweiz 13, 392–397.

More information on www.hs-osnabrueck.de/de/ammonmind

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