

Stacking Effects on Nitrogen Fractions in Broiler Litter with and without Alum



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Introduction



Georgia is the largest broiler producer in the USA, generating enormous quantities of broiler litter (mixture of chicken excreta and bedding material), which is land applied as fertilizer.

Adding alum $[(Al_2(SO_4)_3)]$ to broiler litter is recommended to reduce NH_3 emissions in chicken houses and to minimize P in runoff. Prior to application, litter is also commonly stacked.

This study aimed to examine the changes of the different nitrogen fractions in broiler litter with or without alum during stacking.

Materials and Methods



Broiler litter with or without alum (20% by litter weight) was mixed in a feed mixer and stacked in individual wooden bins (1.2 x 1.2 x 1.2 m)..

Each treatment was replicated four times and arranged in a completely randomized design.



After filling, the bins were transported to a stack house where they were monitored for up to 112 days.

Results

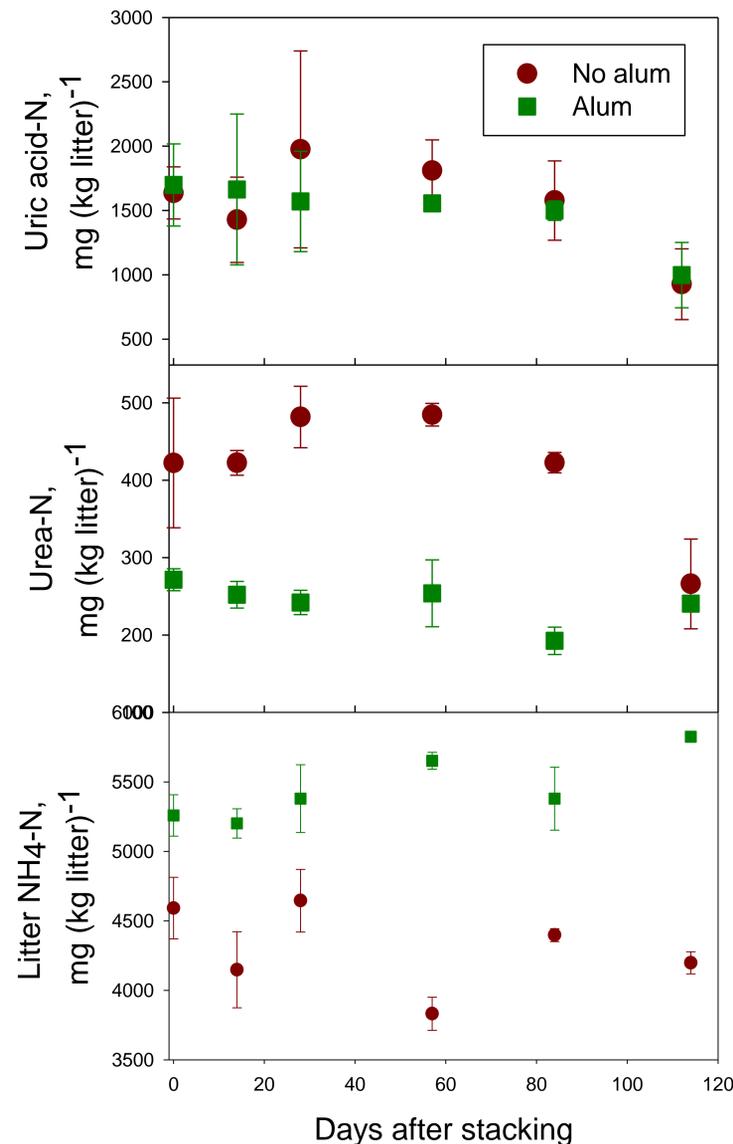


Fig.1. Fractions of N in the litter stack. Adding alum to broiler litter had no effect on the uric acid N (p value = 0.72) but decreased the urea N (p value <0.0001). during stacking, except on 112th day. It also led to greater NH_4-N throughout the study period (p value <0.01).

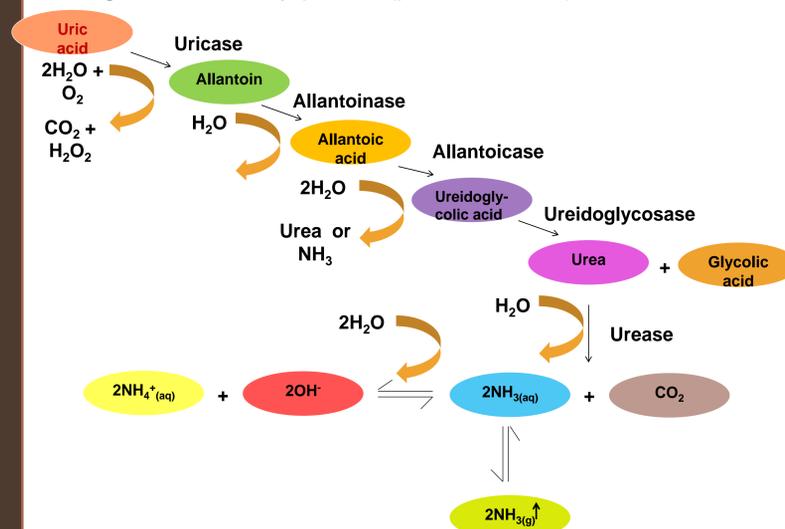


Fig.2. Simplified breakdown of uric acid to urea to NH_3 (Vogels and Van der Drift, 1976 as briefly summarized by Nahm, 2003).

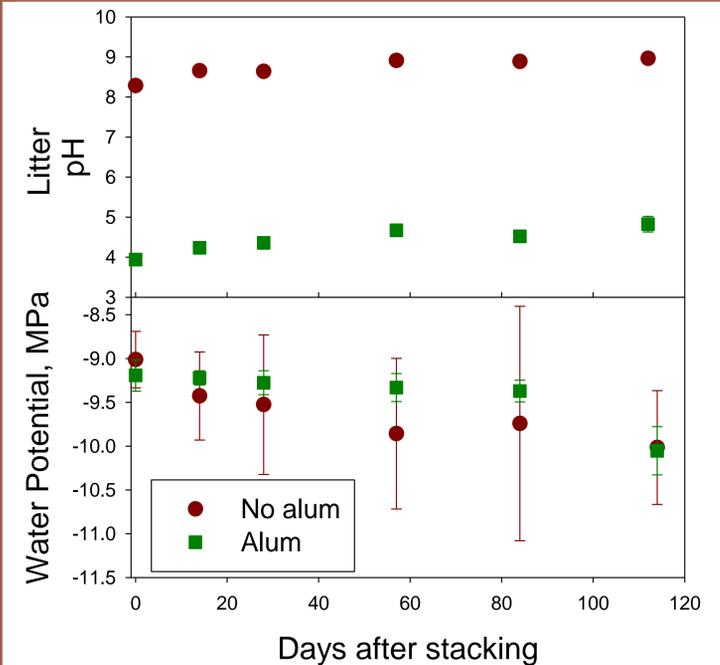


Fig.3. Litter pH and water potential of the stacked litter. With alum, broiler litter maintained an acidic pH during stacking (p value <0.0001). Broiler litter with alum remained just as dry as the unamended litter when averaged over time (p value = 0.07) but had gained more moisture on day 57 and 84 (p value < 0.02).

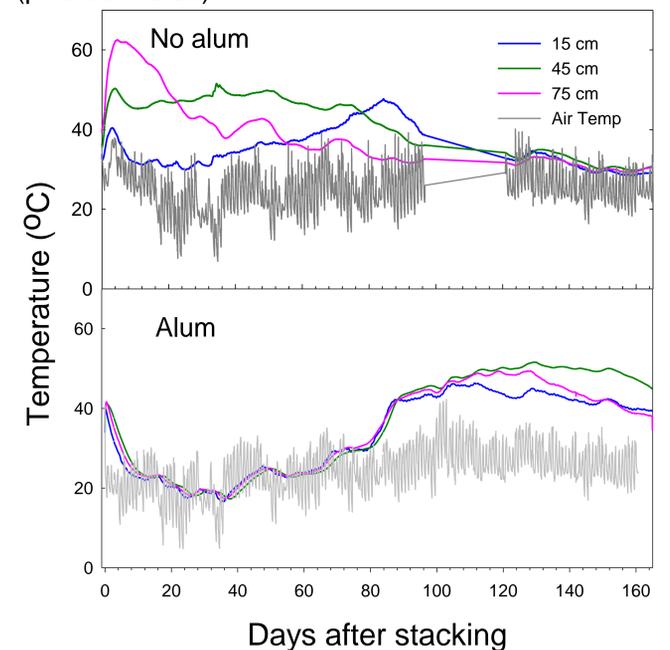


Fig.4. Temperature in the untreated litter increased immediately after stacking whereas in the alum-treated litter temperature increased after 80 days of stacking.

Conclusions

- Alum does not change the uric acid N fraction in the broiler litter during stacking but generally decreases the urea N.
- Broiler litter with alum has greater NH_4-N compared to the unamended broiler litter within the stacking period monitored.

References

- Vogels, G.D. and C. Van der Drift. 1976. Degradation of purines and pyrimidines by microorganisms. *Bacteriol. Rev.* 40(2):403-468.
- Nahm, K.H. 2003. Evaluation of nitrogen content in poultry manure. *World's Poultry Sci. Jour.* 59:77-88.