

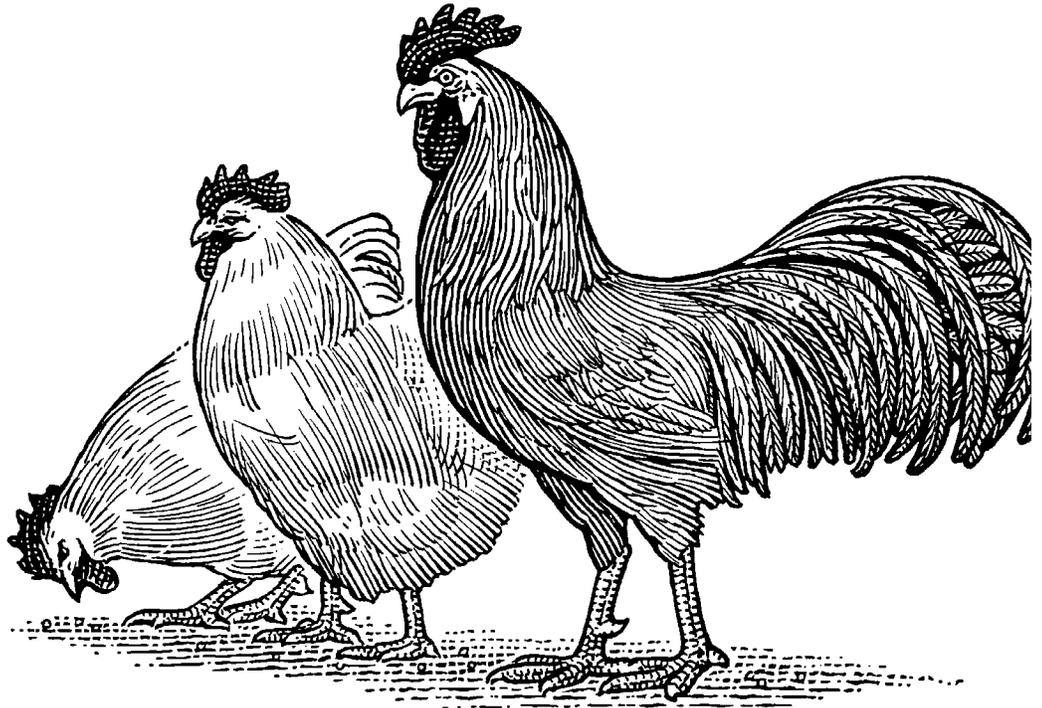
# Aluminum Sulfate as a Litter Treatment

Poultry producers have been using aluminum sulfate, commonly referred to as alum, to improve poultry production and reduce negative effects of litter on the environment. Research has shown that alum applications to poultry litter control ammonia volatilization and reduce phosphorus runoff from land fertilized with litter.

The breakdown of uric acid in poultry manure produces the gas ammonia ( $\text{NH}_3$ ). The gaseous emission of  $\text{NH}_3$  can be inhibited if converted to  $\text{NH}_4^+$  (ammonium). This can be accomplished by lowering litter pH. Alum is an acid that produces hydrogen ions ( $\text{H}^+$ ) when it dissolves. The hydrogen ions produced by this reaction will attach to ammonia to form ammonium, which further reacts with sulfate ions to form ammonium sulfate— $(\text{NH}_4)_2\text{SO}_4$ . Ammonium sulfate is a water-soluble fertilizer. As a result of these reactions, the amount of ammonia emitted from the litter will be reduced, which will increase the nitrogen (N) content of the litter. Alum addition to the litter will also result in the precipitation of soluble phosphorus and thus reduce phosphorus runoff. The use of alum in broiler litter management can potentially impact performance and environmental concerns.

Benefits of using alum as a litter treatment include the following:

- Decreases house ammonia levels
- Reduces energy usage
- Improves bird performance
- Precipitates soluble phosphorus
- Reduces phosphorus and heavy metal runoff
- Imposes a drying effect that reduces litter moisture



For best results, alum should be applied to the litter between flocks, starting after the first flock but before the second flock. Application should be made before each subsequent flock. This will give maximum control of ammonia when the birds are young and most sensitive to atmospheric ammonia. Higher rates will control ammonia for longer periods as well as tie up additional phosphorus.

A rate of 50 to 200 pounds of alum per 1,000 square feet of floor space is the typical recommendation for the treatment of broiler litter. For most broiler houses, this will equate to 1 to 2 tons of alum per house for each grow-out. A lower rate of 50 lbs/1,000 ft<sup>2</sup> will control ammonia during the first few weeks of a grow-out. It also has a limited effect on reducing the soluble phosphorus in the litter. At the rate of 200 lbs/1,000 ft<sup>2</sup>, ammonia levels and soluble phosphorus levels will be significantly reduced. Rate selection for an individual's operation will be dependent on current management practices and needs based on such factors as ventilation control and litter moisture levels. Higher

rates are recommended where high ammonia conditions prevail.

Before alum application, the broiler house needs to be de-caked or rototilled. Alum then can be broadcast at the chosen level using a de-caker or drop spreader. Before birds are placed in the house, alum spills or concentrated areas should be raked into the litter to prevent consumption by the young birds. During application, gloves should be worn to prevent skin irritation and burns. Goggles should be worn for eye protection and a dust mask should be worn to prevent inhalation of the alum dust.

Research has demonstrated cost savings to the poultry producer from the use of alum. These cost savings are realized in reduced heating and ventilation costs and improvements in performance. Alum treatment of litter will increase the nitrogen content of the litter, creating a more valuable source of fertilizer. A major environmental benefit of treating litter with alum is the reduction in soluble phosphorus and trace minerals such as copper and zinc. Restrictions on phosphorus application rates will

occur in the future. Alum is a useful tool for the poultry producer to ensure the success and longevity of the operation.

Using alum-treated litter as a fertilizer has no effect on aluminum uptake by plants. Aluminum is one of the most common elements found in soil. It ranges from 1 to 10 percent of the soil. Alum-treated litter will not significantly increase soil aluminum content.

### **Summary**

- The use of alum as a litter amendment can effectively reduce in-house ammonia volatilization and improve performance.
- Between 50 and 200 lbs/1,000 ft<sup>2</sup> of alum will provide ammonia control and soluble phosphorus reduction.
- Alum does not negatively impact the fertilizer value of litter.
- Wear protective gloves, goggles, and a mask when applying alum.



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