

P&SS Info # 318

Treating Broiler Litter with Alum

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Introduction

The use of alum (aluminum sulfate) in broiler litter management can improve profitability while reducing some of the environmental threats posed by litter.

Research has demonstrated that the use of alum by the poultry industry can significantly improve production. Demonstrations in Tennessee have shown that treating broiler litter between grow-outs with alum can significantly lower ammonia levels in poultry houses. Lower in-house ammonia levels can improve the health and performance of the poultry, as well as protect workers.

An additional, but important, environmental advantage from alum use is the significant reduction in soluble phosphorus and heavy metals in the runoff from land where litter is applied.



Figure 1. Alum applied in broiler house between grow-outs with a drop spreader

How Alum Works

When alum is mixed with broiler litter, it reacts with the moisture in the litter to reduce ammonia volatilization and tie-up the soluble phosphorus. It is not necessary to apply alum to fresh litter. For the best results alum should be applied to 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 than lower rates, as well as tie-up more phosphorus. This is also evidence that pathogens including *E. coli* and *Salmonella* will be reduced (Moore et al., 1998).

Rates

A rate of 100 to 200 lbs. alum per 1,000 square feet is recommended to treat broiler litter. In most Tennessee broiler houses this is between one and two tons of alum per house per grow out. The higher rate (200 lbs. alum per 1,000 square feet) will control both ammonia and significantly reduce soluble phosphorus in the litter. The lower rate (100 lbs. alum per 1,000 square feet) will control ammonia during the first few weeks of a grow-out but have less of an effect on reducing the soluble phosphorus in the litter.

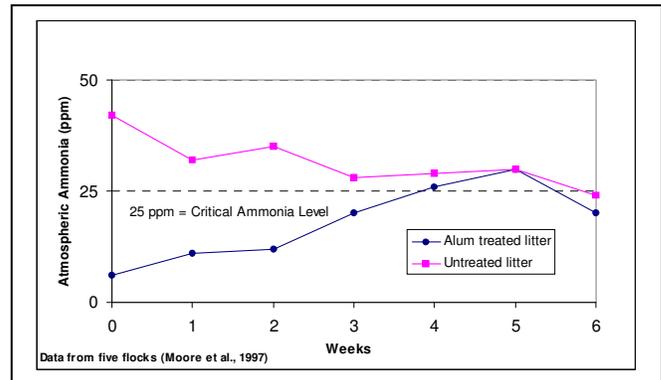


Figure 2. Ammonia levels in alum treated and untreated broiler

Rate selection for your operation will depend on your current building, how well it is currently ventilated and managed and the moisture content of the litter. The higher alum rate is recommended in buildings where there is more ammonia volatilization, typical of litter with more moisture.

Application Methods

There are three steps to take to ensure that alum is applied safely and most effectively in your house:

1. The house must first be de-caked or tilled with rototiller.
2. Alum should be broadcast using a de-caker or drop spreader used to spread fertilizer (Figure 3).
3. Before birds are re-introduced in the house any alum spills or other concentrated areas should be lightly raked into the litter. This is to avoid consumption by the young chicks.



Figure 3. Drop Spreader suitable for spreading alum in a broiler house

Precautions

Alum controls ammonia volatilization by acidifying the litter. It is a dry acid and should be treated with respect. During handling, gloves should be worn to prevent skin irritation or burns. When applying alum it is vital that all personnel wear goggles for eye protection as well as a dust mask to prevent inhalation of alum dust that can be in the air for several minutes after application (Figure 4).

After the alum has been applied, walk through the building and break up any large lumps of alum that may have been left on the surface. Within 4 or 5 weeks after treatment the litter will no longer be acid and no extra precautions are needed for handling litter during clean out.



Figure 4: Workers should use protective wear: goggles, gloves and dust masks, when handling and applying alum

Cost of Alum

For some producers, cost will be a major factor in determining what rates to use. If used correctly the costs of using alum in your operation may be offset by improved productivity and reduced energy costs. Demonstrations in Arkansas have shown a benefit to cost ratio of 1.96 (Moore et al., 1999) using 2 tons of alum per house between grow-outs over six grow-outs.

Alum can be purchased directly from General Chemical Corporation (1-800-631-8050) or from your local agricultural supplier. Alum currently costs about \$200 to \$250 per ton. It is sold in 50 lbs. sacks, one ton super-sacks or in bulk. As with other commodities savings can be made if the material is supplied in bulk. If you do not apply or incorporate the alum yourself you can expect to pay \$50 to \$100 per house to a custom applicator. In some situations, reduced rates of alum can be used by treating only the brood portion of house, or by applying alum in the key areas such as under the waterers.

Benefits

Research in Arkansas has demonstrated savings to both the producer and poultry integrator from using alum. Major cost savings are due to reductions in ammonia in the broiler house. This can result in significant cost savings due to reduced energy (heating and ventilation) costs, improved feed conversion, increased weight gains and fewer mortalities. Six week old broilers were on average 0.15 lb. heavier in treated houses compared to untreated houses. Feed conversion improved from 2.04 to 1.98 lb. feed per lb. of bird.



Figure 5. Savings in propane use of 10 percent can result from alum use

Other potential savings arise from savings in fertilizer costs from the higher nitrogen contents of the litter, which can equal about 800 lbs. of nitrogen per 100 tons of litter.

A major environmental benefit to treating litter with alum is the reduced risk of soluble phosphorus and heavy metals (zinc and copper) in the runoff and the reduced potential to pollute surface waters adjacent to agricultural fields where poultry litter is land-applied. At this time, controlling phosphorus is voluntary and depends on a person's desire to be a good steward. It is thus difficult to put a dollar value on using alum to limit soluble phosphorus in litter. Restrictions on phosphorus are possible in the future, and alum will be a useful tool for growers to ensure the survival and continued expansion of their industry in watersheds considered to be at risk.



Figure 6. Less soluble phosphorus in runoff from alum treated litter is a major environmental benefit

Effect of Alum on Litter Quality

Alum treatment of litter will increase the nitrogen content of the litter making it a more valuable source of fertilizer material. Alum reduces the amount of soluble phosphorus in the litter. This does not affect the overall quantity of phosphorus in

the litter. The phosphorus in the litter will still be available to plants and less will be lost as soluble phosphorus in runoff.

The use of alum-treated litter as a fertilizer does not affect aluminum uptake by plants, nor does it cause soil acidification. Aluminum is one of the most common elements found in our soils making up between 1 and 10 percent of the soil. At the rates of litter used to fertilize row crops and pastures, the addition of alum treated litter will not significantly increase the soil aluminum content.

Figure 7. Alum does not negatively affect plant nutrient uptake



Cattle and other ruminants have a unique digestive system that allows them to use by-products as sources of dietary nutrients. One by-product which can be used as a cattle feed is broiler litter. Litter should **not** be fed to lactating dairy cows or to cattle within two weeks of slaughter. It is recommended that beef producers avoid feeding alum treated litter to cattle unless relatively low rates of litter (less than 10 percent by weight) are fed. Research indicates that there were no differences in weight gain associated with feeding alum-treated or untreated litter (at 10 percent of the fresh litter weight) to beef cattle. When higher rates of alum treated litter (50:50 litter-corn mix) were used, the mixture containing alum was very unpalatable and dry matter intake was about 50 percent lower compared with mixture containing untreated litter.

Points to Remember

1. Using alum as a litter amendment can dramatically reduce in-house ammonia emissions and improve broiler performance.
2. In most Tennessee broiler houses, between one and two tons of alum per house between grow outs will give excellent ammonia control and soluble phosphorus reduction.
3. Alum does not negatively impact the fertilizer value of broiler litter.
4. Using alum to treat litter is good for the environment by reducing atmospheric ammonia emissions and the quantity of soluble phosphorus in litter.
5. Workers should wear protective gloves, goggles and dust masks when applying alum.

References:

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