

Sodium Bisulfate (PLT) as a Litter Treatment

The detrimental effects of ammonia in poultry production have been known for years. Numerous laboratory and field studies have shown how ammonia affects bird health and performance. Continued exposure to ammonia levels in the poultry house as low as 10 parts per million (ppm) can damage the bird's respiratory system and allow infectious agents to become established, leading to declining flock health and performance. In addition, body weight, feed efficiency, and condemnation rate will be poorer in birds exposed to levels of ammonia that exceed 25 ppm.

The volatilization of ammonia has been attributed to microbial decomposition of nitrogenous compounds, principally uric acid, in poultry house litter. Litter pH plays an important role in ammonia volatilization. Once formed, free ammonia will be in one of two forms: as the uncharged form of NH_3 , or the ammonium ion (NH_4^+), depending on the pH of the litter. Ammonia concentration tends to increase with increasing pH. Ammonia release remains small when litter pH is below 7, but can be substantial when litter pH is above 8. Uric acid decomposition is most favored under alkaline ($\text{pH} > 7$) conditions. Uricase, the enzyme that catalyzes uric acid breakdown, has maximum activity at a pH of 9 with uric acid decreasing linearly for more acid or alkaline pH values. One principal ureolytic bacterium, *Bacillus pasteurii*, cannot grow at neutral pH, but thrives in litter above 8.5. Typically, litter pH in a broiler house ranges between 9 and 10. The combination of these factors contributes to ammonia formation and volatilization within the poultry house environment.

One primary question for poultry growers is "What is the best litter treatment?" Unfortunately, this most frequently asked question has no general answer, and the difficulties in addressing this question may be complicated and numerous. There has never been an

experimental study evaluating the various litter treatment products under various management conditions. Litter moisture, brooding and lighting programs, ambient temperature, strain type, ventilation management, litter management, and disease challenge are only a few of the variables that can impact product selection, efficacy, and potential return on investment.

In the selection of a litter treatment product, one must identify the goals for application. Litter treatments may be cost-effective and justifiable under one or more of the following situations:

- High fuel prices
- Extremely cold weather
- Short layout periods
- Persistent disease challenges
- Severe vaccination reactions
- Reduced ammonia-related stress
- Prolonged litter reuse
- Increased bird density
- Needed marginal management or housing situations

Litter treatments may be used to enhance the composition of the litter as a fertilizer or as part of a best management practice to reduce food-borne pathogens. Ammonia-reducing litter treatments offer a potentially better in-house environment for both birds and growers. They may also play an increasing role in reducing ammonia and odor emissions from poultry facilities. In recent years, the reasons for using a litter treatment and any potential benefits from its use have expanded to include improvements in performance and environmental concerns. Although different litter treatments vary in their ability to control ammonia, each offers a unique set of characteristics that need to be considered in selecting the appropriate product to meet an individual's needs. The litter treatment that offers the best return on investment will depend on the user's ability to select the product that best meets the overall goals of his application.

Poultry Litter Treatment (PLT) is a dry granular additive used extensively by the poultry industry for poultry house ammonia control, litter acidification, on-farm HACCP programs for pathogen reduction,

and in the prevention of many bacterial or stress-related poultry conditions. PLT is a unique blend of sodium bisulfate and other ingredients and is considered a nonhazardous and nontoxic substance classified as GRAS (Generally Regarded as Safe) and a food-grade substance. PLT eliminates ammonia by converting litter ammonium to ammonium sulfate, lowering litter pH to acidify litter, and providing potent ionic effects that enhance acidification. PLT was the first nonhazardous and nontoxic litter treatment used in an overall total litter management program.

Experiments and field tests using PLT resulted in the following:

- Decreased fuel usage
- Decreased house ammonia levels
- Decreased litter pH levels
- Improved performance
- Reduced bacterial populations of *Salmonella* and *Campylobacter*
- Lowered darkling beetle populations

Ammonia (NH_3) produced from poultry manure by the breakdown of uric acid can be inhibited if converted to NH_4^+ (ammonium), which can be accomplished by lowering litter pH. Sodium bisulfate, commonly referred to as PLT, is an acid that produces hydrogen ions (H^+) when it dissolves, and 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 simply a water-soluble fertilizer. Because of these reactions, the amount of ammonia emitted from the litter will be reduced, which will increase the nitrogen (N) content of the litter. The use of PLT in broiler litter management can impact performance and environmental concerns.

A rate of 50 pounds of PLT per 1,000 square feet of floor space is the typical recommendation for the treatment of broiler litter. For most broiler

houses, this will equal 800 to 1,000 pounds of PLT per house for each grow-out. A rate of 50 pounds per 1,000 square feet will control ammonia production and reduce the growth of microorganisms in the litter. 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 may be recommended where high ammonia conditions prevail, due to increased litter age or short down times. PLT can also be safely applied with birds in the house to address specific disease or management issues that occur post-placement.

Before PLT application, the broiler house needs to be de-caked or rototilled. Afterward, PLT can be broadcast at the chosen level using a cyclone spreader. During application, gloves, a long-sleeved shirt, and long pants 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 dust inhalation.

Research has demonstrated cost savings to the poultry producer from the use of PLT. Cost savings can be realized due to a reduction in heating and ventilation costs and improvements in performance. PLT treatment of litter will increase the nitrogen content of the litter, creating a more valuable source of fertilizer.

Summary

- Using sodium bisulfate (PLT) as a litter amendment can effectively reduce in-house ammonia volatilization and improve performance.
- A rate of 50 pounds per 1,000 square feet will provide ammonia control and pathogen reduction.
- PLT does not negatively impact the fertilizer or feeding value of litter.
- Wear protective gloves, a long-sleeved shirt, long pants, goggles, and a mask when applying PLT.



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