



Poultry Litter Amendments

Broiler and turkey litter typically consists of wood shavings, rice hulls, or peanut hulls. Microbes in the litter convert the birds' excreta and spilled feed into ammonium (NH_4^+), which can bind to litter and also dissolve in water. Depending on the moisture content, temperature, and acidity of the litter, a portion of the ammonium will be converted into ammonia (NH_3) gas. Ammonia production is favored by high temperature and high pH (i.e., alkaline conditions).

Ammonia irritates the eyes and respiratory system of birds (and humans) and reduces resistance to infection. High ammonia levels in poultry houses can adversely affect bird performance and health, causing a loss of profits to the grower and integrator. While it has been recommended that ammonia concentration in poultry houses be kept below 25 parts per million (ppm), newer research has indicated that continuous exposure to even 10 ppm can be harmful to the bird's health. Adding litter amendments can reduce ammonia in poultry houses.

There are many types of litter amendments, such as acidifiers, alkaline materials, adsorbers, inhibitors, or microbial treatments. However, only a few have been evaluated and found to be effective in controlled studies. Three acidifiers that are currently in use—Al+Clear,* Poultry Guard, and Poultry Litter Treatment—are compared in Table 1.

Acidifiers create acidic conditions in the litter, reducing conversion of ammonium to ammonia. The acidity also inhibits the activities of bacteria and enzymes that are involved in the formation of ammonia, reducing ammonia production. While some studies have shown acidifiers to be effective in reducing ammonia to less than 25 ppm for 3 to 4 weeks after application, other studies have shown that acidifiers can provide at least partial ammonia control for up to 7 weeks.

Alkaline materials, such as agricultural lime, hydrated or slaked lime, and burnt lime, increase the litter alkalinity and convert more of the ammo-

Using amendments may offer other economic and environmental benefits:

- Reducing ammonia loss will increase the nutrient value of the litter while improving air quality.
- Reducing ammonia production may reduce ventilation needs and, hence, energy costs in houses that have inadequate ventilation.
- Odor complaints from neighbors may be reduced.
- Pathogen and pest levels in the house may be reduced.
- Water quality may improve because the use of alum can reduce the loss of soluble phosphorus and heavy metals in the runoff from land-applied poultry litter.

nium into ammonia gas. It then must be vented to the outdoors, and this can become an environmental problem.

Adsorbers (clinoptilolite and peat) have been tested, and clinoptilolite has shown mixed results. Peat seems too expensive to be practical.

Inhibitors have been tested and also seem too expensive.

Microbial treatments have been marketed as improving the performance of microbes in the litter and thus benefiting poultry performance, but such statements are not published in scientific journals.

Whatever the choice of amendment, the supplier should be contacted for specific information on use. When handling amendments, all safety precautions should be taken, including wearing personal protective equipment.

Using an amendment is no substitute for good in-house management. For detailed information on poultry litter amendments, go to the Web: www.bae.ncsu.edu/programs/extension/publicat/wqwm/animops.html

* Al+ Clear is applied inside a poultry house using a spinner spreader in the photo above. Sprinkling water helps reduce dust levels and activates the amendment.

Photo courtesy of C. Kim, General Chemical Corp.

Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

Table 1. Summary of Commercially Available Acidifier-Type Poultry Litter Amendments

Amendments	Al+Clear	Poultry Guard	Poultry Litter Treatment (PLT)
Manufacturer	General Chemical Corp. genchemcorp.com 1-800-631-8050	Oil Dri Corp. poultryguard.com 1-800-643-3064	Jones Hamilton Co. jones-hamilton.com 1-800-379-2243
Common name; chemical formula	Alum; aluminum sulfate [Al ₂ (SO ₄) ₃ • 14H ₂ O]	Acidified clay; 36% sulfuric acid (H ₂ SO ₄) soaked in a type of clay	PLT; 93% sodium bisulfate (NaHSO ₄)
Type of product	Solid (powder+granules) or liquid	Granules	Granules
Controls ammonia ¹	Yes	Yes	Yes
Potential to neutralize mass of ammonia per 100 lb product ²	17.0 (solid) 8.6 (liquid) ³	12.5	13.3
Improves bird health & performance ¹	Yes	Yes	Yes
Saves energy ¹	Yes	Not evaluated but likely	Yes (company research)
Reduces darkling beetles ¹	Yes	Yes	Yes
Reduces pathogens ¹	Yes	Yes	Yes
Reduces loss of P & soluble metals in runoff ¹	Yes ⁴	Not evaluated	Not evaluated
Manufacturer recommended application rate after each growout (lb/1,000 sq ft)	50-75 75 (litter with more than 5 flocks, short layouts or extremely dry litter)	50 75-100 (litter older than 1 yr, deep litter, shorter layouts)	50-75 75-100 (litter with more than 5 flocks or layouts less than 10 days)
Application timing before placing chicks ⁵	0-7 days depending on litter conditions	0-3 days	1-24 hours
Application method ⁶	Surface-apply on dry litter; mix into top ½ in. and re-level in wet litter	Surface-apply	Surface-apply
OSHA Communication Standard for safety	Hazardous ⁷	Corrosive	Mild irritant ⁸
2005/06 price (per ton) ⁹	\$86 ¹⁰ \$355 ¹¹ \$473 ¹²	\$438-500	\$373 (bulk) \$398 (50 lb bag)

¹ Based on published, scientific research.

² All dry acids require sufficient moisture for activation; with inadequate moisture, ammonia removal will be reduced.

³ 8.7 gallons of liquid equal to 100 lb.

⁴ Heavier application rates (for instance, 275-300 lb/1,000 sq ft) required for substantial (about 70-75%) reduction in P losses in runoff (based on published literature).

⁵ Between growouts on litter on which at least one flock has been raised.

⁶ Drop spreader preferred for solids to get uniform application.

⁷ Hazardous only if quantity greater than 8,700 lb per Material Safety Data Sheet (MSDS).

⁸ Generally regarded as safe (GRAS) as a food additive by FDA.

⁹ Provided for general guidance by manufacturer/supplier; price based on location, volume, and purchase source.

¹⁰ For liquid delivered to Raleigh, NC.

¹¹ For Al+Clear by the truckload, FOB Wilmington, DE.

¹² 50 lb bag, retail.

Prepared by

Sanjay Shah

Assistant Professor and Extension Specialist, Department of Biological and Agricultural Engineering

Philip Westerman

Professor and Extension Specialist, Department of Biological and Agricultural Engineering

James Parsons

Area Poultry Specialized Agent

The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by North Carolina State University, North Carolina A&T State University, or North Carolina Cooperative Extension nor discrimination against similar products or services not mentioned. Individuals who use chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact an agent of North Carolina Cooperative Extension.

120 copies of this public document were printed at a cost of \$4.80 or \$0.04 per copy

Published by

NORTH CAROLINA COOPERATIVE EXTENSION SERVICE