GIANT MISCANTHUS GRASS as an Alternative Bedding in Poultry Houses

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EXTENSION

Bedding material is laid down in poultry houses for several reasons: to give the birds a cushion underfoot, to insulate chicks from the cooling effects of the ground, to absorb excess moisture from the droppings and drinkers, and to promote drying by increasing the surface area of the house floor. Poultry bedding material is often incorrectly used synonymously with the term "poultry litter." Poultry litter is defined as the combination of bedding material, excreta, feathers, wasted feed, and wasted water. Any material that will be used for poultry bedding should be absorbent, lightweight, non-toxic, and inexpensive. The ideal bedding material should be readily available or accessible, and it should be able to be used as a soil amendment when it is removed as litter from the poultry houses.

Wood shavings have been the most popular material used for poultry bedding, but in many regions, the supply of wood shavings has fallen due to competition from wood products manufacturing. As the industry continues to expand and competition for the limited resources continues, costs for wood products will likely increase. As a result of the increased cost of wood shavings, poultry companies are employing new strategies for poultry bedding.

One such strategy is to reuse the litter in the houses for several flocks of birds before cleaning out the houses. In this practice, the crust or compacted litter is removed from the houses after each flock of birds and the remaining litter is tilled. Sometimes the litter is windrowed in the houses for up to three days, allowing it to go through a compost-like heat treatment that would potentially reduce the pathogen load before the litter is spread in preparation for the incoming flock of birds. While this is now a common practice, it still does not solve the supply problem of bedding material.

Over the years, a number of different materials have been tested as potential bedding sources. These include rice straw, rice hull, bean straw, sugar cane pulp, composted municipal garbage, broken corn cobb, kenaf core, whole chopped kenaf, oat hulls, sawdust, wheat straw, wheat chips, shredded paper, peanut hulls, hazelnut husk, sand, particle board residue, peat moss, and several others. These potential bedding materials have had varying degrees of success. In Georgia, peanut hulls are widely used as poultry bedding, especially in the southern region of the state where they are readily available.

Giant Miscanthus Grass (GMG) as Poultry Bedding

Giant miscanthus is a perennial grass that will regrow for many years once it is established. It can provide up to 10 tons of biomass per acre.

GMG is considered to be an energy crop. It grows rapidly and has low mineral content and a potentially high biomass yield. It can be harvested dry, baled, and stored under cover. If it is baled for conversion to biofuels, the resulting CO_2 emissions are equal to the amount of CO_2 the plant takes from the atmosphere to grow, so it is considered a greenhouse-gas-neutral bio-plant. The grass can be used as a biomass crop for bioenergy, thermo-conversion to bio-oil as crude for diesel fuel, as feedstock for cellulosic ethanol, and as bedding for livestock. It has excellent water-holding capacity and has been tested as an alternative to pine shavings as poultry bedding.

Figure 1. Field with 9-foot-high mature giant miscanthus grass.

Approximately 65 to 70 tons of pine shavings are required to fill a 50 by 500 square-foot poultry house to a depth of 3 inches. This amount depends on the weight of the shavings and how much sawdust or fine material is in it. Due to its non-toxic nature, lightweight and absorptive qualities, chopped GMG has been tested as a potential poultry bedding alternative, and a similar amount of chopped GMG would be needed for a poultry house of the same size. Prior to its arrival on the poultry farm, the mature dry GMG crop is reaped, chopped, and passed through a 1-inch screen before it is spread inside poultry houses as bedding (Figures 2 and 3).

Suitability Assessment as Poultry Bedding

In order to assess the suitability of chopped GMG as an alternative to pine shavings, several parameters have to be evaluated. The moisture content of the litter at the end of each flock can indicate the potential of the grass to pull liquid from droppings and drinker spills away from the surface. The air quality inside of the poultry houses can be assessed by measuring the ammonia gas concentration inside the houses. The quality of the birds' paws is usually an indicator of the condition of the litter under foot. If the moisture content in the litter is high, it can result in a number of paw problems such as foot pad dermatitis, pododermatitis, foot pad ulcers, and osteomyelitis. This can have a negative impact on bird welfare and health as birds suffer from pain and discomfort, resulting in unsteady gait, which may contribute to reduced feed intake and slower weight gain. Paw scores of 0, 1, or 2 are used to determine the degree of damage to the birds' paw. A paw score of 0 indicates no abnormalities or ulcers on the paws of the bird; a paw score of 1 indicates irritation and discoloration but the skin is still intact; and a paw score of 2 indicates discoloration and broken skin between the scales (Figure 4).

Figures 2 and 3. Chopped giant miscanthus (Figure 2) used as bedding in a broiler poultry house (Figure 3).

Figure 4. Paw scores from 0 to 2.

When comparing chopped GMG to pine shavings, no significant differences were observed in paw scores. Only numerical differences were observed in paw quality, where the houses with pine shavings as bedding had a larger number of birds scoring 2 in paw scores (Figure 4).

One study indicated that houses with pine shavings had a lower moisture content than houses with chopped GMG after one flock. However, the chopped GMG houses had less caking than the pine shavings houses (Figures 5 and 6). Ammonia gas concentrations were invariable between houses that had chopped GMG bedding and those that had pine shavings. Using chopped GMG as poultry bedding has no observed effects on production factors such as bird weight and feed conversion ratio.

GMG maintained its quality better than pine shavings after one flock of birds, with less caking throughout the house (Figures 5 and 6).

Figures 5 and 6. Caking of pine shaving (Figure 5) and caking of GMG (Figure 6).

Poultry litter is a valuable by-product of the poultry industry and is used by crop producers as a soil amendment both for its nutrient quality and humus. After several flocks have been grown on the bedding, the nutrient content of poultry litter is approximately a 3-3-2 grade fertilizer. On a per ton basis, this equates to a total of 60 lb nitrogen, 78 lb phosphate, and 56 lb potassium. From the studies conducted in Georgia, it was observed that there were differences between the GMG and pine shavings bedding in nitrogen content after one flock was grown. The difference between the amounts of phosphorus and potassium in the two bedding materials was small. (Figure 7).

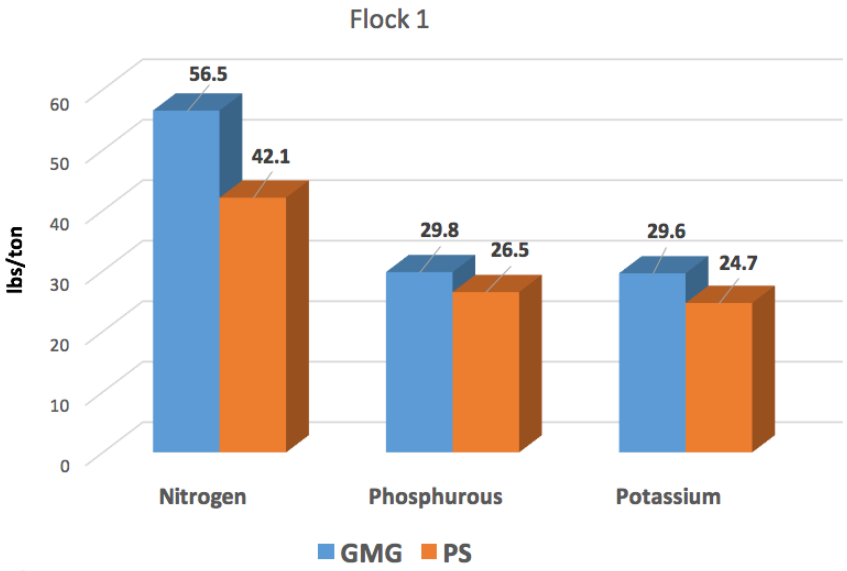

Figure 7. Nutrient content of litter (lb/ton) taken from houses with chopped GMG bedding and pine shavings bedding after one flock of birds.

As the number of flocks raised on the same bedding increased, the amount of each of the nutrients also increased. This trend is expected and was evident in both the GMG and the pine-shavings-based litter (Figure 8), as bird droppings constitute a large part of the nutrient supply.

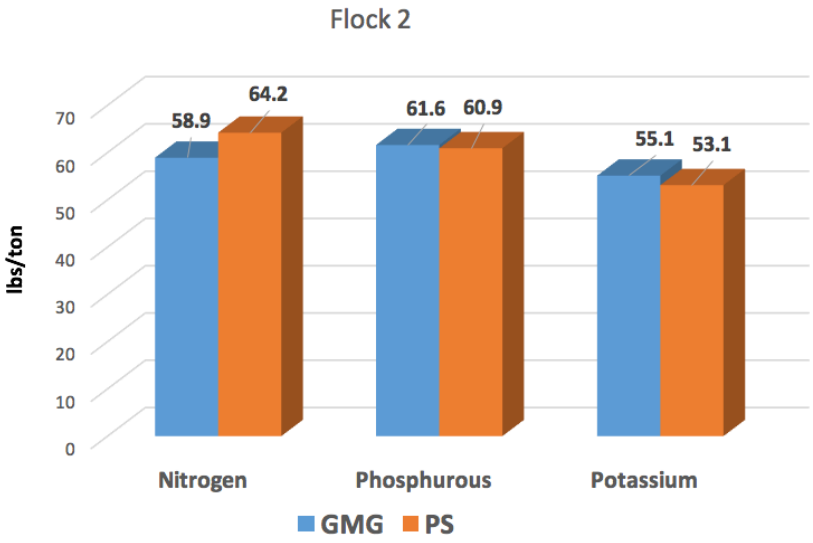

Figure 8. Flock 2 nutrient content of litter (lb/ton) taken from houses with GMG bedding and pine shavings bedding after two flock of birds.

Summary

Based on the results of this study and other reports from other university studies, chopped GMG can be used as a viable poultry bedding material based on the following observed parameters:

- GMG can be grown in most areas and is low maintenance perennial crop.
- Chopped GMG is an absorptive lightweight material.
- The presence of chopped GMG as a bedding material does not affect bird weight nor the feed conversion ratio.
- The litter generated from chopped GMG use has similar nutrient content as that generated from the use of pine shavings.

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