On-farm assessment of switchgrass bedding

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Primary Audience: Farm Managers, Researchers, Growers

SUMMARY

Grasses, including native switchgrass (SG), can be grown on marginal land and can produce large amounts of biomass. As these grasses are perennials, they can be used as buffers to help prevent nutrients from entering watersheds, and, once established, are productive for long periods of time. Chopped SG possesses the necessary qualities needed to be a good alternative bedding: it is lightweight, highly absorbent, dries quickly, and can be used as a fertilizer. While research has demonstrated that SG is a viable alternative bedding material in pen trials, no research has reported on the long-term viability of this bedding alternative in commercial houses during multiple grow-outs. The objective of this study is to evaluate the feasibility of using SG as an alternative bedding material in commercial production houses over consecutive flocks.

Three farms were used to run comparisons of pine shaving (PS) vs. SG. No significant differences in bird wt. (PS 3.87 kg, SG 3.83 kg), feed conversion (PS 2.01, SG 1.98), livability, (PS 94.31%, SG 94.81%) or foot pad quality (PS = 0.775416, SG = 0.84658) were found. Additionally, no difference in the number of Darkling beetles (*Alphitobius diaperinus [panzer]*) was observed. These results suggest that in areas where SG grows well, it can be used as an alternative source of poultry bedding for commercial growers.

Key words: Poultry, Bedding, Switchgrass

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DESCRIPTION OF PROBLEM

Bedding is an important component used in the raising of poultry. It is important for several reasons, including insulation of chicks from the ground, dilution of fecal material, absorption of excess moisture, promotion of drying fecal material (due to its increased surface area), and provision of a cushion for broiler's breast muscle and feet [1]. The properties of good bedding are: lightweight with a medium particle size, highly absorbent, able to dry rapidly, soft and compressible, low thermal conductivity, inexpensive, useful as a fertilizer, free of herbicide, and free of mold [2]. Traditionally, pine shavings (PS) have been the bedding of choice because of performance, availability, and cost [3]. However, the cost of pine shavings continues to rise, and the availability of shavings is decreasing in some poultry-producing areas.

Grasses, such as switchgrass, can produce a large amount of biomass and can be grown on marginal land. As these grasses are perennials, they can be used as buffers to help prevent nutrients from entering the watershed, and once established, are productive for long periods of

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time [4]. Switchgrass, when chopped, possesses many of the necessary qualities needed to be a good alternative bedding because it becomes lightweight, highly absorbent, able to dry rapidly, soft and compressible, has low thermal conductivity, is inexpensive, and can be used as a fertilizer. While there is some research demonstrating that switchgrass is a viable alternative bedding material in pen trials, [5, 6], no research has been done to look at its long-term viability in commercial production houses. The objective of this field study was to evaluate the feasibility of using switchgrass (SG) as an alternative bedding material in commercial production houses that have multiple flocks between clean-outs.

MATERIALS AND METHODS

Trial 1

The first trial had two houses (42 × 500 ft.) on the same farm. Each house was divided in half, with SG placed on one end and PS on the other. The bedding material was placed in opposite ends in the second house to remove any variable caused by location in the houses. Two flocks were monitored for growth performance; birds were placed at the same density and each half of the house was maintained as a separate flock. After the second flock, management at the integrator changed, and the study was dropped by the integrator.

Trial 2

The second farm had three houses (60 × 500 ft.). SG was placed in two houses, while the third was bedded with PS. The SG birds and the PS birds were maintained as separate flocks so that production data (weight, feed conversion and mortality) could be collected. Production performance was monitored for three flocks, after which time the grower changed caretakers.

Trial 3

The third trial had eight houses: four houses were 40 × 400 ft. and four houses were 40 × 500 ft. SG was placed in four houses and PS in 4 houses; bedding was alternated so that even-numbered houses had PS and odd-numbered houses had SG, and each house was maintained as a separate flock by the integrator so that production performance could be calculated. Every effort was made to place SG and PS at the same depth in the houses; however, it was noticed that the SG litter depth (7.29 cm) was significantly greater than that of the PS (5.28 cm). This can be partly explained by the compaction of the PS, which tends to "fluff up" or expand when placed in houses then compacts once activities begin, while SG does not "fluff" in this manner. To determine the depth of the bedding, measurements were taken at 21 locations in each house.

Live bird weight, feed conversion, and livability were determined by the company at the processing plant for all three farms. Ross 708 were placed at a density of one birds per 0.95 sqft. Evaluation of the bedding started in early spring and continued into the summer and fall. Both types of bedding were managed in the same manner between flocks. As the farms were contracted to different integrators, there may have been some differences in the feed between the farms. Additionally, on the third farm, foot pads were evaluated based on the size of foot pad lesions present using the 3-point scale described in McCrea et al. [7]. Foot pads were evaluated at the farm during the week prior to processing.

To determine if the SG litter would create a weed problem for farmers using the litter as fertilizer, samples of the litter taken after the second flock were sent to a nursery to check for seed germination.

Adult and larval beetle counts were determined after the second and fourth flocks in the third trial. Beetle traps were constructed and placed within the house using the method described by Hess et al. (2008) [8]. Traps were placed in the poultry houses 10 days before the flock was processed. Traps were picked up three days later, placed in resealable plastic bags, and refrigerated prior to counting. No attempt to separate larval instars was made; small and large larvae were counted together.

Data were subjected to ANOVA procedures using JMP (SAS Institute Inc., Cary, NC), with significance determined between means with a *P*-value of less than 0.05. Beetle data were log transformed to allow for statistical analysis of data with substantial variation between tubes.

Table 1. The effect of litter type on the production parameters of large broilers. These are the combined results of eight flocks of roasters from three separate trials.

	Weight (kg)	Feed Conversion	Livability (%)
Pine Shavings	3.87	2.01	94.31
Switchgrass	3.83	1.98	94.81
SEM	0.054	0.015	0.442
P-value	0.628	0.178	0.430

The beetle results are shown as actual numbers, not as transformed numbers.

RESULTS AND DISCUSSION

The first challenge was to find an acceptable method of processing the SG into a suitable form of bedding material. Initially, SG was processed using a tub chopper, which resulted in a product that lacked uniformity and contained pieces that were up to six inches long. Later, a rotochopper was used, which produced a more uniform product and tended to split the SG lengthwise in the process (Photo). SG tended to be more difficult to level in the house with a tractor blade. This problem was overcome by using a rotary rake, which was very effective at leveling the SG shavings. It was also more effective at leveling the PS.

A total of eight flocks were evaluated over the course of the three trials, two from the first trial and three from the second and third trials. All farms produced roasters, with the flocks averaging 58 d of age at the time of processing.

The type of bedding had no effect on the weight performance of the birds (Table 1). PS birds had a mean weight of 3.87 kg while the mean for the SG birds was 3.83 kg. The results for feed conversion and mortality also showed no difference based on bedding type. Paw quality (Figure 1), evaluated during Trial 3, was also not significantly different between the two types of litter PS = 0.775416, SG = 0.84658. The statistical analysis indicated a strong trend toward significance between litter types and paw quality, therefore additional research in this area is needed in order to further define the relationship. These results are similar to those reported by Davis et al. (2015) [6], and show that the use of SG did not negatively affect the production parameters of the roasters.

There was no significant difference in adult beetle or larvae numbers between the two types of litter used in this study (Figure 2). However, the statistical analysis again indicated strong trends toward significance, and therefore additional research in this area is needed to further define the relationship between the litter material and insect numbers. This indicates that the manner in which pine shavings are currently managed for the reduction of beetle numbers could also be applicable when using switchgrass.

No seeds were germinated from litter collected after two flocks from two of the farms, indicating that farms using SG litter as fertilizer will not create a weed problem after land application.

Photo 1. Photo of processed SG.

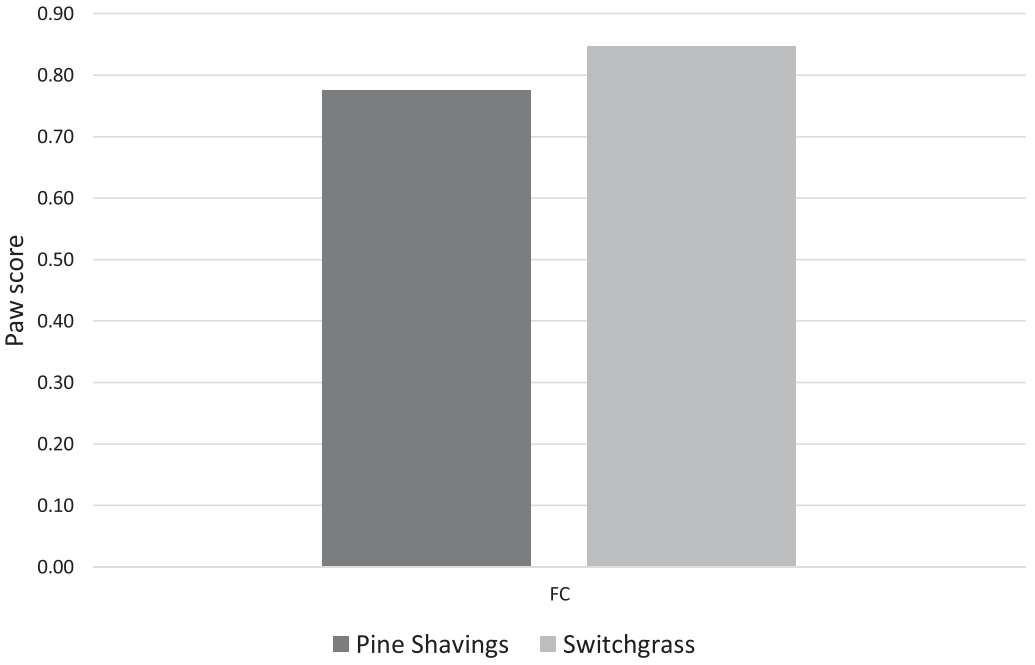

Figure 1. Paw quality in a total of 2,164 foot pads was evaluated during the final week before processing. Feet were scored based on the lesions present: no lesions = 0, minor lesions = 1 (<7.5 mm in diameter), and larger lesions = 2 (>7.5 mm in diameter). $P = 0.0651$.

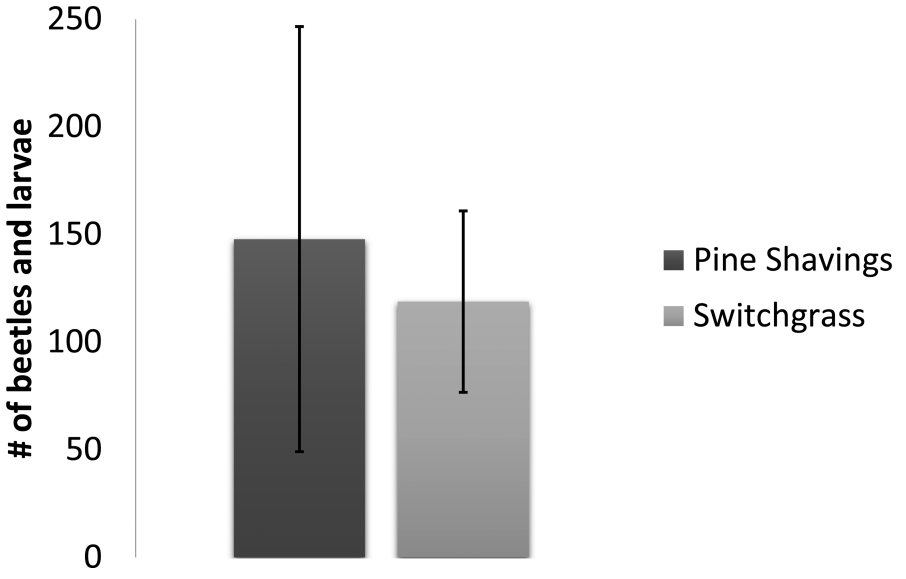

Figure 2. The number of Darkling Beetles, adult and larvae, found in traps set for 3 days during the last week of grow-out. The data was collected after flocks 2 and 4 for Trial 3 and combined. $P = 0.7862$.

These results indicate that SG is an acceptable replacement for PS in areas where SG is available.

CONCLUSIONS AND APPLICATIONS

1. The use of SG as a bedding material in commercial broiler houses did not affect the weight, feed conversion, or mortality of the birds.
2. Because of the difference in SG compared to PS, different management tools, such as the use of a rotary rake, are needed to uniformly level SG in houses.
3. SG can be managed the same as PS between flocks with regard to cake removal and windrow composting.
4. Litter beetle counts in SG houses did not differ significantly from that of PS houses.

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