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PALATABILITY AND DRY MATTER INTAKE BY SHEEP FED CORN STOVER TREATED WITH DIFFERENT NITROGEN SOURCES

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ABSTRACT

A trial was conducted to measure the dry matter intake by sheep fed basal and basal + corn stover treated with different nitrogen sources. The diets were: 1) basal, 2) basal + untreated corn stover, 3) basal + 3% NH_3-treated stover, 4) basal + 50% poultry litter treated stover, 5) basal + 5.8% urea-treated stover, and 6) basal + 5.8% urea + 10% cattle waste-treated stover. Thirty-six crossbred (1/2 Dorset x ¼ Finn x ¼ Rambouillet) wethers were assigned according to the initial body weight into six equal blocks and the sheep within blocks were randomly allotted to the experimental diets. The animals were kept in individual pens with free access to feed and water. Dry matter intake was higher ($P<0.01$) for sheep fed the basal diet compared to other diets. Intake was higher ($P<0.05$) for sheep fed NH_3- and urea treated corn stover diets, compared to untreated stover. Similarly, the intake was higher ($P<0.01$) for sheep fed 3% NH_3 treated corn stover than urea treated stovers. In conclusion, ammonia treatment of corn stover was more effective in enhancing the dry matter intake by sheep than those fed urea or poultry litter-treated diets. Addition of cattle waste in urea treated stover tended to improve the palatability of corn stover over urea treatment alone, but the difference was non significant. Similarly, the treatment of corn stover with poultry litter did not improve dry matter intake or palatability compared to untreated control.

Key words: Corn stover, ammonia, urea, cattle waste, dry matter intake, palatability.

INTRODUCTION

Low quality roughages including straws, stoves, husks and other crop by-products make up a major portion of animal feeds in many developing countries, including Pakistan. Expensive concentrates and milling by-products are forcing farmers to rely more upon crop by-products as sources of energy. Performance of animals fed crop residues is limited by poor intake, low nitrogen contents, and poor digestibility (Peterson *et al*., 1981). Chemical treatment has been used to improve the feeding value of crop residues (Waller, 1976). Among chemicals, ammonia and urea have received considerable attention (Sundstol *et al*., 1978), because these chemicals make the treated material more pliable by solubilizing the hemicelluloses fractions, thus improving the dry matter (DM) digestibility and daily DM intake (Saenger *et al*., 1982). The purpose of the present study was to determine the palatability of corn stover treated with ammonia, poultry litter, urea and urea plus cattle waste when fed to sheep.

MATERIALS AND METHODS

Treatment of corn stover

Corn stover was baled after the grain was harvested by a mechanical picker-sheller. The bales were stored in an open shed until the time of ensiling. The treatments applied to the stover were: 1) none, 2) 3% ammonia from aqueous NH_4OH, 3) 50% poultry litter, 4) 5.8% urea, and 5) 5.8% urea + 10% cattle waste. The poultry litter with wood shavings as a base was obtained from the Poultry Science Department, Virginia Polytechnic Institute & State University, Virginia, USA. Cattle waste, collected from the concrete floor after cattle stayed overnight, was added as a source of urease. The stover was chopped to a length of about 5 cm and mixed with other ingredients in a horizontal mixer for about 10 minutes. Sufficient amount of water was added into each mixture to raise the moisture level to 50%. For ammonia treatment, the aqueous NH_4OH was directly sprayed on stover from a nozzled garden cane.

Ensiling

After mixing, each mixture was packed in 210 Kg metal drums double lined with polyethylene bags of 0.08 mm thickness. Packing was done by trampling to ensure maximum exclusion of air. The polyethylene bags were sealed individually. The drums were stored outside covered with black polyethylene sheet to avoid exposure to rain and stored for 60 days. The silages thus prepared were used in the palatability trial.

Palatability trial

Thirty six cross-bred (1/2 Dorset x ¼ Finn x ¼ Rambouillet) wethers, weighing 37 Kg on an average, were included in the study. These animals were blocked

according to their body weight and were randomly allotted within blocks to the six experimental diets. The diets fed to wethers were: 1) basal, 2) basal + untreated corn stover, 3) basal + 3% ammonia-treated stover, 4) basal + 50% poultry litter treated stover, 5) basal + 5.8% urea-treated stover, and 6) basal + 5.8% urea + 10% cattle waste-treated stover. The basal diet was composed of 50% orchardgrass (*Dactylis glomerata*) hay, 34% ground corn, 10% soybean meal (SBM) and 6% sugarcane (*Saccharum officinarum* L.) molasses. The basal diet and silages were mixed in 1:1 ratio on DM basis at the time of each feeding, and supplemented with 20g dicalcium phosphate and 5g iodized salt.

The experimental animals were kept in individual pens (measuring 1.2 x 1.2 m) in an open shed. The pens were bedded with sawdust. Water was provided *ad libitum* and fresh feed was given to animals twice daily at 0700 h and 1900 h. The trial consisted of an adaptation period during which feed offered was increased until all animals refused some feed, followed by a 10-day preliminary period and a 7-day measurement period. During the measurement period, refusals were collected daily, weighed and dried at 60^0C in a forced draft oven.

The sheep were weighed before and at the end of the palatability trail. The average of initial and final weights were used to determine the metabolic size (W. 75) on which DM intake was calculated. Samples from individual diets from each animal were taken at each feeding, put into double thickness polyethylene bags and frozen. At the end of the trial, the samples were composited and subsampled. The DM of feed and refusal samples was determined by drying at 60^0C in a forced draft oven.

Statistical analysis

The data were subjected to analysis of variance by the General Linears Model procedure of SAS (1982). The model included the effects of treatment and replicates. Contrast used to test least squares mean were: 1) basal vs. basal +silage, 2) untreated corn stover silage vs. ammonia, urea and urea + cattle waste-treated stover silage, 3) ammonia treated stover vs. urea and urea + cattle waste-treated stover silage, 4) urea-treated stover silage vs. urea + cattle waste-treated stover silage, and 5) untreated stover silage vs. poultry litter-treated stover silage.

RESULTS

Daily DM intake was higher ($P<0.01$) for sheep fed the basal diet compared to sheep fed corn stover diets, when expressed as g/d or g/unit of metabolic size (Table I). Daily DM intake was improved ($P<0.05$) by ammonia, urea and urea + cattle waste treatments of corn stover compared to untreated corn stover. The enhancement averaged 15%. The ammonia-treated stover diet was consumed in larger ($P<0.01$) amounts than the urea-treated diets. A higher trend of DM intake, when expressed as g/d or g/unit metabolic size, was observed in sheep fed urea + cattle waste-treated diet than those fed urea-treated diet, but the difference was non significant. Adding poultry litter to corn stover tended to increase the DM intake compared to sheep fed untreated stover, but the difference was non significant.

DISCUSSION

The present study was planned to determine the palatability and dry matter intake of corn stover treated with ammonia, poultry litter, urea and urea plus cattle waste when fed to sheep. For this purpose, 36 cross-bred (1/2 Dorset x ¼ Finn x ¼ Rambouillet) wethers were divided into six equal groups and were assigned to the six experimental diets. The diets were: 1) basal, 2) basal + untreated corn stover, 3) basal + 3% ammonia-treated stover, 4) basal + 50% poultry litter treated stover, 5) basal + 5.8% urea-treated stover, and 6) basal + 5.8% urea + 10% cattle waste-treated stover.

The results showed that sheep fed basal diet had the highest dry matter intake, while those fed control diet having 50% basal diet and 50% untreated stover had the lowest dry matter intake. Animals fed diet having 50% basal diet and 50% stover treated with 3% ammonia showed significantly higher dry matter intake compared to animals fed untreated control diet. These results are supported by the findings of Peterson *et al*. (1981), who recorded an increase ($P<0.05$) in dry matter intake by lambs fed on 2 to 4% ammonia-treated corn stalks compared to those fed untreated corn stalks (398 versus 997 g/day). Garret *et al*. (1979) also reported higher ($P<0.05$) dry matter intake when ammoniated corn stover was fed to sheep. Similarly, in cattle, higher daily DM intake was observed for ammonia treated stover compared to control (Saenger *et al*., 1982). However, Ward and Ward (1987) could not find any significant differences in dry matter intake in beef cows fed ammoniated warm season grass hay compared to untreated hay. Tauqir *et al*. (2009) recorded lower dry matter intake in buffaloes fed Jambo grass silage compared to control group fed conventional fodder i.e. Jambo grass.

Animals fed with basal diet mixed with stover treated with 5.8% urea or 5.8% urea + 10% cattle wastage also showed improved dry matter intake compared to untreated control group. However, inclusion of 10% cattle wastage with urea had no beneficial effects on the dry matter intake. Improvement of dry matter intake by urea treatment has also been reported by Doulberg *et al*. (1981) for wheat straw in sheep.

Table 1: Daily dry matter intake by sheep for different experimental diets

Parameter	Basal and corn stover-treated silages (1:1)						
	Basal	**Untreated**	**3% NH_3**	**50% poultry litter**	**5.8% urea**	**5.8% urea + 10% cattle waste**	**SEM**
Dry matter intake (g/day)	1459[a]	936[d]	1232[b]	1002[cd]	1028[c]	1106[c]	81.12
Dry matter intake g/Kg B.Wt.^{75})	90[a]	60[d]	76[b]	64[cd]	66[c]	71[c]	4.93

Values with different superscripts within a row differ significantly (P<0.05).

Harmon *et al*. (1975) showed that the voluntary dry matter intake was highest for silage containing broiler litter than for control and urea silages. Average daily dry matter consumption was 848g for the control silage and 925g for urea treated silage and 1445 and 1464g for silage containing 50 and 30% broiler litter on dry matter basis, respectively. However, these findings could not be confirmed in the present study, as although treatment of corn stover with 50% poultry litter tended to increase the dry matter intake compared to sheep fed untreated stover, but the difference was statistically non significant. Obese *et al*. (2007) reported that syndy-phosphate-33 increased the feed intake in sheep after intravenous injection, while lipopolysaccharides induced suppression in feed intake in sheep.

In conclusion, ammonia treatment of corn stover was more effective in enhancing the dry matter intake by sheep than those fed urea or poultry litter-treated diets. Addition of cattle waste in urea treated stover tended to improve the palatability of corn stover over urea treatment alone, but the difference was non significant. Similarly, the treatment of corn stover with poultry litter did not improve dry matter intake or palatability compared to untreated control.

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