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Effect of Calcium Hydroxide Treatment on Switch Grass

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Cover Page Footnote

This trial was made possible by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30411 and Iowa State University Armstrong and Beef Nutrition Research Farms.

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Summary and Implications

Fully mature switch grass responds favorably in terms of rumen digestibility to an alkali treatment of calcium hydroxide.

Introduction

Treatment of corn stalks with a strong alkali such as calcium hydroxide improves the digestibility of the stalk fiber substantially and allows cattle consuming this product to glean more usable calories from the treated feed in most situations. The current interest to use switch grass as a biofuel may give some individuals interest in growing this forage, but in the case where the biofuel market cannot make immediate use of this material, an alternative market may be needed. Cattle feed could provide one outlet, however the switch grass used for biofuels currently is quite mature and the rankness of this forage may hinder its use in cattle rations. Since cornstalk consistency, after grain harvest seems to have similar characteristics to the switch

grass, it was proposed that alkali treatment which improves the digestibility of the cornstalk may also work to improve the digestibility of the switch grass.

Material and Methods

Round bales of Iowa State University Armstrong Research Farm corn stalks and Nebraska grown switch grass were ground into a particle size used for feeding fattening cattle. Each type of forage material was mixed with water in order that the dry matter content of the mix was at 60% dry and 40% moisture. One fourth of each forage material was placed in barrels as-is for one week, one fourth was placed in barrels as-is for four weeks, one fourth of each material was placed in barrels with an alkali treatment for one week and one fourth was placed in barrels with an alkali treatment for 4 weeks. After the allotted one or four week treatment time, the barrels were emptied and the samples were taken, dried, ground (1mm screen), weighed, placed into Dacron bags and set into rumen cannulated steers for 24, 36 and 48 hours. After the rumen incubation time was complete the samples were once again dried and weighed. The disappearance of the forage material was measured.

The alkali treatment was done by mixing finely ground calcium hydroxide with the moistened forage at a rate of seven percent of the forage dry matter. The barrels used were 50 gallon drums and on top of the forage in each barrel a black bag filled with water was used to seal out air. Four replications were done for each treatment. The initial feed analysis of the corn stalks and switch grass are shown in Table 1.

Table 1. Initial Feed Analysis Values of Mature Corn Stalks and Mature Switch Grass

	% Dry Matter	% Cr. Protein	% NDF	% ADF	% Ca	% P
Corn Stalk	80.6	4.7	79.9	54.9	0.54	0.08
Switch Grass	89.2	2.4	79.5	50.0	0.20	0.13

Results

Forage materials were abbreviated as follows in this result summary: CS = untreated corn stalks, CS-T = alkali treated corn stalks, SG = untreated switch grass, SG-T = alkali treated switch grass.

Figure 1 provides a summary of the rumen dry matter digestibility of the one week alkali treated and untreated corn stalks and switchgrass. Treatment provides a significant improvement in rumen digestibility, $P < 0.001$ as does the rumen incubation time, $P < 0.001$. There is also a significant interaction between treatment and hour, $P < 0.001$. Figure 2 provides a summary of the rumen dry matter digestibility of the four week alkali treated and untreated corn stalks and switchgrass. The results as in the

one week trial are similar in that the treatment provides a significant improvement in rumen digestibility, $P < 0.001$ as does the rumen incubation time, $P < 0.001$. There is also a significant interaction between treatment and hour, $P < 0.001$ as noticed in the one week run. Figure 3 provides a summary of ruminal dry matter digestion of untreated and treated corn stalks and switch grass as affected by duration of chemical treatment. In this case, there was not strong evidence that the extended time was needed to improve digestibility: treatment x week: $P \geq 0.54$. Standard Error Mean: CS = 2.2, CS-T = 4.6, SG = 1.3, SG-T = 3.0

Figure 1. One Week Treatment – Digestibility

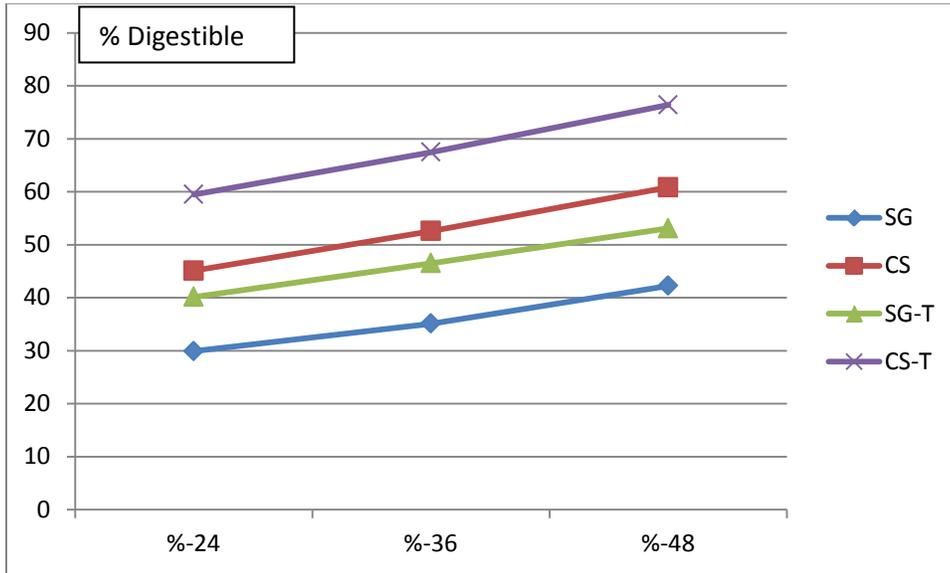


Figure 2. Four Week Treatment – Digestibility

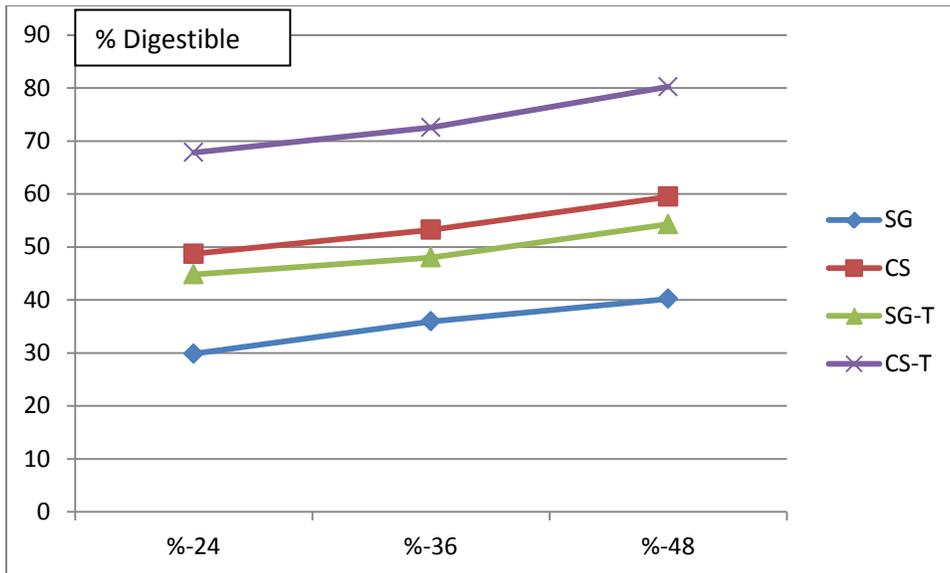
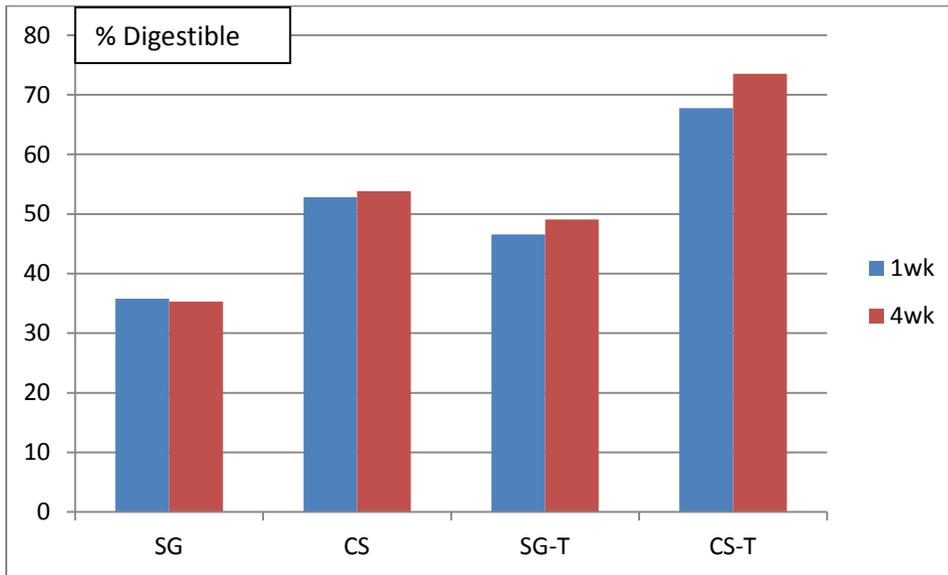


Figure 3. One vs. Four Week Treatment (average of incubation time)



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