TOXICITY STUDY USING PINE SAWDUST AS A ROUGHAGE REPLACEMENT IN CATTLE RATIONS[1]

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INTRODUCTION

Sawdust is one of the many cellulose-containing waste materials which presents a pollution problem during its disposal. High lignification and insolubility prevent rapid decomposition by the usual natural processes. Lignin content also inhibits digestion by the ruminant microflora by encrusting the cellulose fibers. Other components may be toxic to either the micro-organisms or the animal itself. These problems have been studied to a greater extent with hardwood sawdust, but little information is available concerning the more highly lignified softwoods such as pine.

The purpose of this study was to ascertain what difficulties would be encountered in feeding pine sawdust at levels which would provide a method of pollution control and still provide an economical ration component for ruminant feeding. Toxicity and intake were predicted to be the more immediate facets for study.

MATERIALS AND METHODS

Twelve Hereford heifer calves averaging 477 lbs. were randomly allotted to three pens of four calves each at the Newell, South Dakota, substation. Experimental treatments consisted of 5 or 10% sawdust as a replacement for dehydrated alfalfa meal in pelleted rations as shown in table 1. Soybean oil meal was used to replace corn to maintain the sawdust rations at a comparable level of protein (13.1% crude protein) with the basal ration. The basal ration was calculated to contain approximately 64% TDN and 9.5% digestible protein. Animals, fed twice a day, received a total daily feed of 14 lbs. This level was increased as they gained weight. Animals were weighed monthly and rate of gain calculated for each animal. Fecal samples were analyzed for fiber and lignin by the method of Van Soest (1) and for cellulose by the method of Crampton and Maynard (2). *In vitro* dry matter digestibility of all rations was determined by the method of Tilley and Terry (3).

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RESULTS AND DISCUSSION

No toxicity symptoms were observed after over 90 days of feeding of either the 5 or 10% sawdust rations. No intake problems were encountered with any of the rations, but it did appear that animals accepted the sawdust rations more readily than the basal ration lot during the initial feeding period. The average daily gain in the early part of the feeding period was lower than should be expected with this type of basal ration since the adaptation period to full feed was extended. After it was obvious that toxicity was not a problem, additional feed was offered until consumption had increased from 14 lbs. per head daily to 20 lbs. per head daily.

Table 1. Ration Composition

Ingredients	Basal (lbs.)	5% Sawdust (lbs.)	10% Sawdust (lbs.)
Dehydrated Alfalfa Meal	1000	900	800
Ground Shelled Corn	900	850	800
Molasses	100	100	100
Sawdust	0	100	200
Soybean Oil Meal	0	50	100
Bentonite	30	30	30
	2030	2030	2030

The average weight of animals at each weigh period with the various rations is shown in figure 1. It would appear that little difference existed in weight gains of animals with or without sawdust. The sawdust rations had a slight advantage up to the final weigh period over the basal ration. Fecal excretion of cellulose increased from 31.4% with the basal ration to 35.3% with the 10% sawdust ration. The lignin content of the feces being 16.3 and 17.3% for the basal and 10% sawdust ration. This reflects the indigestibility of lignin. Pine sawdust was found to be 17.9% lignin on a dry basis. The lignin content of the final basal pelleted ration was approximately 6 percent. Addition of sawdust did not appreciably increase the lignin content of the final pellet, which would suggest that either the alfalfa was of very low quality or that the lignin analysis was inconsistent. This would suggest that lignin would not be a critical factor in determining differences in digestibility between sawdust and basal rations. *In vitro* dry matter digestibility was 70.0, 71.4 and 73.4 for the 0, 5, and 10% sawdust rations, respectively. This would further substantiate the advantage for the sawdust rations as indicated in the *in vivo* feeding trials discussed previously.

It has been proposed by Scott, *et al.* (4) that sawdust might serve either as an economical roughage material with little or no nutritive value in a high concentrate ration or as an energy feed in various rations. The utilization of sawdust as an energy food should be facilitated by any treatment which would lower the lignin content of the sawdust to a level comparable to good quality roughage. It was not the intent of this preliminary toxicity study, however, to provide data which would demonstrate the function of the sawdust component of the experimental rations. The experimental design of future experiments will be such that this and other questions related to the economic aspects of sawdust usage would be answered.

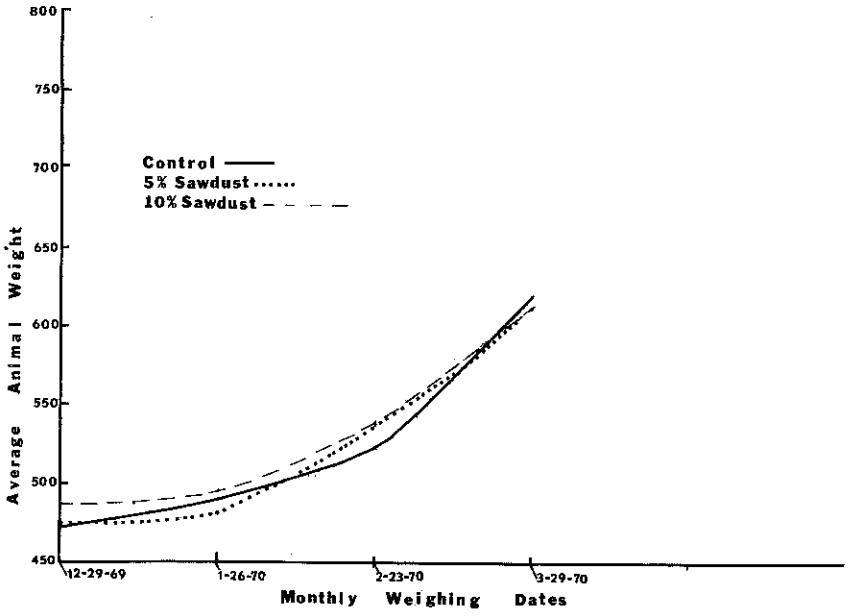

Figure 1. AVERAGE WEIGHTS DURING FEEDING PERIOD

SUMMARY AND CONCLUSIONS

Feeding sawdust at 5 and 10% levels as a replacement for dehydrated alfalfa meal in a 45% corn ration presented no toxicity or intake problems with feeder cattle. Little difference in weight gains could be observed between the basal and sawdust fed cattle during a 90-day feeding period. *In vitro* dry matter digestibility increased from 70.0% at 0% sawdust to 73.4% with 10% sawdust in the ration. It would appear that the use of sawdust in ruminant rations merits additional consideration.

LITERATURE CITED

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