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L. D. Kamstra
South Dakota State University

South Dakota State University
Brookings, South Dakota
Department of Animal Science
Agricultural Experiment Station

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L. D. Kamstra and A. L. Slyter

Previous reports discussed toxicity trials with untreated sawdust, indicating no toxicity to ruminants when fed up to 25% of the ration. The low digestibility (7-10%) of softwood sawdust produced from the mills in western South Dakota limits its usage as a major ration component. The objective of this experiment is to demonstrate the usage of ponderosa pine (Pinus ponderosa) sawdust as a nonnutritive roughage component in beef finishing rations.

Materials and Methods

Thirty-six yearling Hereford heifers were randomly allotted to four treatment groups based on the type to be fed. The rations were (1) all concentrate, (2) 15% alfalfa (control), (3) 15% sawdust and (4) 5% alfalfa, 10% sawdust. Ration composition is shown in table 1. All rations were mixed weekly and self-fed in covered bunks on a concrete apron after the animals were brought to full feed. Animals were fed in open dirt lots without shelter in northwest South Dakota during October to February for a period of 126 days. Coarse ponderosa pine sawdust was obtained every 2 to 3 weeks directly from the mill at 30 to 50% moisture with no treatment other than removal of chips larger than one-half inch. Actual sawdust in the ration was adjusted to 80% dry matter to assure uniformity of ration preparation.

Animals were slaughtered at a commercial packing plant and carcass data collected following a 24-hour chill. Subjective carcass parameters were taken by the Federal Grader on duty at the plant. Steaks from the anterior rib region were used for taste panel evaluation for tenderness, flavor and juiciness.

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Table 1. Percentage Composition of Rations

Ingredients	Ration number 1	2	3	4
Corn, cracked, shelled	86	74	67	70
Soybean meal, 44% crude protein[a]	13	10	17	14
Alfalfa hay, coarse ground	--	15	--	5
Pine sawdust, raw untreated[b]	--	--	15	10
Dicalcium phosphate, 24% Ca, 18% P	1	1	1	1
Chemical analysis[c]				
Crude protein, moisture-free basis	18.16	17.95	17.08	17.54
Moisture, as fed basis	17.42	15.52	24.04	20.96
Cellulose, moisture-free basis	5.01	8.62	12.70	11.51
Calculated TDN, moisture-free basis[d]	87.7	82.9	74.2	77.1

[a]13,228 IU of vitamin A added per kilogram of SBOM.
[b]Adjusted to 80% dry matter basis.
[c]Average of four monthly samples.
[d]Values used to calculate TDN were as follows: corn, 89%; soybean meal, 86%; alfalfa hay, 56% and sawdust, 0%.

Results and Discussion

There were no significant differences in total gain and final shrunk weights between animals fed 15% alfalfa plus concentrate or when two-thirds of the alfalfa was replaced with an equal amount of sawdust (table 2). Although animal performance parameters were reduced from the 15% alfalfa ration when the roughage portion was solely from sawdust (15% of total ration), performance appeared more favorable than that of the all-concentrate ration. Hot carcass weights were significantly lower for those animals on the all-concentrate ration compared to the control ration (15% alfalfa).

Little or no differences were apparent between roughage and nonroughage rations with respect to feed required per unit of gain even though daily feed consumption was higher with roughage-containing rations (table 3).

No significant treatment differences were noted for dressing percent, carcass grade, marbling score, fat thickness, fat thickness per kg of carcass, rib eye area, rib eye area per kg of carcass, percent estimated kidney fat, estimated cutability or taste panel evaluation scores (table 2).

Roughage addition (alfalfa and/or sawdust) significantly reduced liver abscesses. Seventy-eight percent of the animals on the all-concentrate ration had abscessed livers as compared to 11% and 22% for those on alfalfa-containing rations and the ration containing only sawdust, respectively.

Table 2. Means of Performance and Carcass Measurements by Treatments

Item	Ration[a] All concentrate	15% alfalfa	15% sawdust	5% alfalfa 10% sawdust	SE[b]
Initial wt., kg	268.6	268.8	270.2	268.2	5.44
Final shrunk wt., kg	343.8[f]	391.6	378.6[f]	391.3	7.89
Gain, kg	79.8[f]	130.7	107.0[f]	130.8	6.69
Avg. daily gain, kg	0.64[f]	1.04	0.85[f]	1.04	0.05
Hot carcass wt., kg	202.5	231.7	220.4	231.2	5.41
Dressing percent	58.9	59.2	58.3	59.2	0.49
U.S.D.A. carcass grade[c]	18.8	19.8	18.9	19.3	0.37
Marbling score[d]	4.8	6.0	5.2	5.1	0.30
Fat thickness, 12th rib, cm	0.93	1.09	0.97	1.10	0.10
Fat thickness/100 kg carcass, cm	0.45	0.47	0.44	0.47	0.04
Rib eye area, cm^2	64.2	72.8	68.4	68.5	2.44
Rib eye area/100 kg carcass, cm^2	31.6	31.5	31.0	29.6	1.04
Kidney fat, %	1.9	2.8	2.3	2.5	0.24
Cutability estimate, %	51.5	51.2	51.4	50.8	0.37
Condemned livers, %	77.8	11.1	22.2	11.1	
Taste panel evaluation[e]					
Tenderness	3.8	4.3	4.5	4.7	0.34
Flavor	3.5	3.4	3.5	3.7	0.19
Juiciness	3.1	3.3	3.2	3.3	0.19

[a]See table 1 for complete ration composition.
[b]Standard error of treatment means.
[c]Score of 13 = low standard, 14 = average standard, etc. through 24 = high prime.
[d]Score of 1 = devoid, 2 = practically devoid, etc. through 12 = extremely abundant.
[e]Score of 1 = extremely desirable, etc. through 8 = extremely undesirable.
[f]Means followed by a superscript differ significantly ($P<.05$) from the control ration (15% alfalfa).

To convert kilograms to pounds multiply by 2.2. To convert centimeters to inches multiply by 0.4.

Table 3. Mean Feed Consumption by Treatment

Item	Ration[a]			
	All concentrate	15% alfalfa	15% sawdust	5% alfalfa 10% sawdust
Avg. daily ration, kg				
As fed basis	5.53	8.24	8.68	8.85
Dry basis	4.57	6.96	6.59	7.00
Feed/kg gain, kg				
As fed basis	8.64	7.92	10.21	8.51
Dry basis	7.13	6.69	7.76	6.73
TDN/kg gain, kg[b]	6.25	5.55	5.77	5.19

[a]See table 1 for complete ration composition.
[b]Calculated TDN, dry basis.

To convert centimeters to inches multiply by 0.4.

Summary and Conclusions

Feeding of untreated ponderosa pine sawdust at levels up to 15% of a high concentrate ration appears feasible without substantial loss in animal performance. It would be expected that the feeding of coarse sawdust would also serve in reducing liver abscesses commonly associated with high concentrate feeding. Sawdust at this level in a ration should not be toxic to ruminant animals or contribute any undesirable factors to the meat products.

The economic importance of utilizing sawdust in this manner will depend on the current market price of alfalfa or other roughage, transportation charges and availability of an adequate sawdust supply. Experiments are continuing on treatment methods of all fibrous wastes to increase their potential as animal feeds, especially in maintenance rations.