Pine Sawdust as a Roughage Replacement in Gestating Beef Heifer Rations

A. L. SLYTER AND L. D. KAMSTRA

Highlight: No abortive tendencies were noted with Angus X Hereford crossbred heifers when fed a corn-roughage ration containing 25% sawdust during the last one-third of the pregnancy period. Inclusion of sawdust in the ration did not affect the calving difficulty score or birth weights.

Previous studies have shown that pine sawdust levels up to 10% of the total ration presented no visible toxicity symptoms with calves fed a growing ration during a 90-day period (Kamstra and Minyard, 1970). Also, no detrimental effects on either feedlot performance or carcasses were shown with cattle fed high energy rations for 115 days when sawdust was used to replace half the alfalfa roughage in a 90% concentrate ration. (Slyter and Kamstra, 1971b).

Sawdust has been suggested as a possible roughage in wintering rations for breeding stock in the range areas when other roughage materials are in short supply. The purpose of this study was to ascertain whether any toxicity might result from incorporating sawdust in wintering rations for pregnant heifers. Special emphasis was given to the possibility of embryonic abortion, since pine needles have been suggested as a causitive factor by Canadian researchers as early as 1927 (Bruce, 1927).

Materials and Methods

Twelve Angus X Hereford crossbred pregnant heifers were randomly allotted to two pens of six each. Experimental rations consisted of either 20 lb per head daily of grass and alfalfa hay or 20 lb of a mixed ration consisting of 25% ground corn, 25% sawdust, and 50% ground alfalfa hay starting December 24, 1970. These rations were calculated to be approximately equivalent in TDN and crude protein levels. Trace mineral salt and dicalcium phosphate (50-50) were provided free choice. Animals were weighed monthly, calves were weighed at birth, and calving difficulty was subjectively scored (Table 1, footnote). Animals were taken off treatment at calving.

Results and Discussion

No abortive tendencies were observed during this trial. The first calf was born February 18 and the last calf on June 8. Sawdust feeding was terminated on March 16, since only two animals remained on each treatment. The average calving date was March 23 and March 22 for the control and sawdust groups, respectively. One set of twins was born in the sawdust-fed group, although not attributable to sawdust feeding. Both rations supported adequate weight gains during the period fed (Table 1).

No significant differences were noted in calving difficulty or calf birth weights (Table 1).

Table 1. Weight changes and calving results.

<table>
<thead>
<tr>
<th>Ration</th>
<th>Control</th>
<th>Sawdust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in lot</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Average wt 12-24-70</td>
<td>878.3</td>
<td>883.3</td>
</tr>
<tr>
<td>Average wt 03-16-71</td>
<td>904.2</td>
<td>925.8</td>
</tr>
<tr>
<td>Average calving score</td>
<td>1.7</td>
<td>2.3</td>
</tr>
<tr>
<td>Average birth wt of calves</td>
<td>56.7</td>
<td>39.4</td>
</tr>
</tbody>
</table>

1 Weights included four heifers post-calving and two pre-calving in each lot.
2 Scored as follows: 1 = no difficulty; 2 = slightly difficult; 3 = difficult, calf puller needed; 4 = extremely difficult.
3 Includes one set of twins.

Previous work (Kamstra and Minyard, 1970) would suggest that not only is sawdust, fed at levels up to 25% of the ration, nontoxic, but it serves as a nutritive component as well. They found that fecal excretion of fiber did not increase proportionally with increases in sawdust in the ration. Increasing the level of sawdust from zero to 5% increased fecal fiber excretion from 39.6% to 40.0%, but when sawdust was increased to 7.5% of the ration, the feces contained only 46.6% fiber. In vitro dry matter digestibility ranged from 6 to 10% when used as the only substrate during a 48-hour fermentation period. This would suggest that stock could not be maintained on high sawdust rations unless the sawdust is treated to increase utilization, even if abortive tendencies or other toxicity factors were not critical.

Summary and Conclusions

Feeding a ration containing 25% raw pine sawdust to first-calf beef heifers during the last one-third of gestation resulted in no abortion or intake problems. No differences were noted in calf birth weights or calving difficulty in heifers fed the control or sawdust rations. Based on these results, it would appear
that sawdust could serve as a roughage source in wintering rations for breeding stock up to 25% of the total ration.

Literature Cited


Chromatographic Identification of Big Sagebrush Seed

DAVID L. HANKS AND KENT R. JORGENSEN

Highlight: Paper and thin-layer chromatography of big sagebrush seed provides a rapid, simple means of identifying more palatable forms of this shrub. Methanol extraction of seed for 24 hr followed by two-dimensional paper chromatography of big sagebrush seed provides a rapid, simple means of identifying more palatable subsp. vaseyana and wyomingensis seed from those of the less palatable subsp. tridentata.

Utilization of big sagebrush (*Artemisia tridentata*) as a forage shrub in current range improvement projects has become more promising with the development of techniques by which the more palatable forms of this shrub can be identified (Hanks et al., 1971). Under properly controlled conditions, these forms (subsp. vaseyana and wyomingensis) can then be used as a seed source for reseeding programs where shrubs are desired for which animals show some grazing preference. However, all too frequently the sources of available seed are from populations where the preferential utilization by big game or livestock is unknown. Under these circumstances, a means of detecting the types of big sagebrush from which the seed lots were collected would be a valuable aid in the proper management of reseeding programs. Taylor et al. (1964) pointed out the differential fluorescence between moist *A. tridentata tridentata* and *A. tridentata vaseyana* seeds. When viewed under long wave ultraviolet light the *A. tridentata vaseyana* seeds fluoresce more brightly. The following procedure describes a more definitive means of distinguishing subsp. vaseyana and wyomingensis seed from those of the less palatable subsp. tridentata.

One-half gram seed samples (98% purity) are placed in vials containing 10 ml absolute methanol and allowed to extract for 24 hr. The extract is decanted and evaporated to a final volume of 1.0 ml. Two-dimension chromatograms are developed by the application of 40 ~μl of this extract to Whatman 3 MM chromatographic paper¹ using butanol:acetone:water (4:1:3; acetic acid:water 15:85) as the first solvent system and acetic acid:water (15:85) as the second. The appearance of a bright, iridescent blue spot, $R_f = .54/78$ (distance of spot from origin/distance of solvent from origin) under ultraviolet light is indicative of either subsp. vaseyana or wyomingensis seed. If the above spot is present but lacking in iridescence, the seed belongs to the subsp. tridentata.

If instant thin-layer chromatography (ITLC) apparatus is available, the time required for seed identification is greatly reduced. The solvent system, chloroform:methanol:water (85:10.5) reveals distinctive differences between Artemisia tridentata subsp. tridentata and the more palatable subsp. vaseyana and wyomingensis. A bright, iridescent blue spot characterizes the more palatable subspecies; the same spot is much smaller and duller in *A. tridentata* subsp. tridentata.

Highlight: Small weighing lysimeters provide a useful tool for investigating simultaneously soil water use and plant productivity in annual grasslands. Details of construction, sensitivity and accuracy of weighing, and field and harvest techniques are given. PVC irrigation pipe is used for both the lysimeter and its sleeve—5 inch and 6 inch nominal diameter, respectively. Weight changes equivalent to .002 inch (.05 mm) can be detected, allowing diurnal use to be determined if desired. Comparisons using data from harvest and soil water use for Spring, 1971, show good agreement between the lysimeters and the field.

Weighing lysimeters can provide useful information concerning water relations because they physically confine soil water. However, most lysimeter installations employ relatively large lysimeters to simulate surrounding community conditions, thereby precluding sufficient replication to estimate variability within communities. In Russia, the State Hydrological Institute has carried out extensive experimentation with lysimeters of various sizes, concluding that small lysimeters need not substantially distort either the water or thermal regimes within the lysimeter with respect to the field (Konsiantinov, 1966). The lysimeters specified by the Russian Hydrological Institute were 0.05 m² in surface area, 0.5 m deep, and were constructed with steel walls. Smaller diameters were discouraged because the conductivity of the wall disturbed the temperature conditions with the lysimeter, while shallower lysimeters were precluded by the expected depth of rooting of the experimental grasses (barley, wheat, and rye). This paper describes a modification of the USSR small lysimeter and discusses some simple field techniques for meaningful replication in the field.

Construction of the Lysimeters

The major disadvantage of small lysimeters for field use is their small surface-to-edge ratio, allowing a greater potential for thermal distortions in the enclosed volume of soil. In the Russian lysimeters, the author is research scientist, Ecosystems Department, Battelle-Northwest, Richland, Washington.

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