The Performance of Weaner Calves as Influenced by Low Levels of Alfalfa in the Wintering Ration

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The majority of the roughage used for wintering beef cattle in southeastern Oregon and many range areas of the west is a low quality native meadow hay. This hay is generally low yielding and is quite often harvested at near maturity to get maximum yields. Legume species, if present, are in very limited quantities. This hay is low in crude protein, ranging from 7 to 9%, but generally has a gross energy content approximating that of better quality roughages. Hay harvested past maturity often has a crude protein content as low as 4%. The cellulose content ranges from 30% at early cutting to 35% at maturity. Cellulose digestibility is high in hay harvested early, ranging from 65 to 75%, but drops to the range of 40 to 50% at maturity (Wallace and Raleigh, 1960 and Wallace et al. (1961).

Protein digestibility of the better quality hay is low, ranging from 45 to 50% (Wallace and Raleigh, 1960). This hay is very bulky and one of the major problems in feeding this roughage is to get the animals to eat it in sufficient quantity to meet more than their maintenance requirement.

Hubbert et al. (1958) reported a significant increase in rate of gain as a result of feeding phosphorus fertilized native meadow hay to weaner calves. It was not apparent from this study whether the increased rate of gain was due to the higher phosphorus content or the increased protein content of the fertilized hay. Later work by Hubbert et al. (1959) did not show improved rate of gain by phosphorus supplementation with unfertilized meadow hay. Cooper (1957) reported that phosphorus fertilization on native flood meadows generally resulted in an increase in the content of annual white-tip clover (T. variegatum). He found that the establishment of clover in flood meadows not only improved hay quality but also increased production of associated species through the fixation and release of nitrogen.

The value of small amounts of alfalfa hay or meal in a low quality roughage ration has been established by several investigators. Increased digestion, by ruminants, of low quality roughage rations supplemented with small amounts of alfalfa hay or alfalfa ash has been reported by Burroughs et al. (1950), Chappel et al. (1952), and Tillman et al. (1954b). Bentley et al. (1952) increased daily gain of fattening steers by replacing soybean oil meal with dehydrated alfalfa leaf meal. Alfalfa leaf meal added to the roughage ration of steer calves resulted in increased gains while trace minerals had no affect on performance (Gosset and Riggs, 1956).

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Unfavorable results using trace mineral mixtures and alfalfa ash with low quality roughages have been reported by others. Plumlee et al. (1953) reported that calves receiving a ration composed largely of corn cobs ate less and consequently grew at a slower rate when trace minerals were added. Tillman et al. (1954a) found that digestibility of low quality prairie hay was not improved by supplementation of either alfalfa ash or a complete mineral mixture.

The purpose of this study was to determine if alfalfa meal could beneficially replace part of the protein from cottonseed meal and, if so, what level of alfalfa would bring about the greatest increase in animal performance.

EXPERIMENTAL PROCEDURE

Forty weaner Hereford range calves were stratified by weight, sex, and previous management and randomly allotted to 4 treatments with 10 animals per lot. The average initial weight of the animals was 447 pounds. Native meadow hay was fed free choice and all animals received 2 pounds of rolled barley daily in addition to the protein supplement. The calves were weighed every 2 weeks after an overnight fast from feed and water. Hay was fed daily in sufficient amounts so the animals had hay before them at all times. Weekly records were kept of hay consumption. Salt, bone meal, and water were available in all lots.

The standard or control ration, consisted of the above mentioned feedstuffs and one pound of cottonseed meal per day. This is the normal ration used for wintering weaner calves at this station and generally results in daily gains ranging from about 1.25 to 1.5 pounds. In the experimental rations alfalfa meal was used to replace part of the cottonseed meal in proportions so the total crude protein content was the same for all rations. Treatments fed per head daily were as follows:

a. One pound of cottonseed meal.
b. 0.22 pound of cottonseed meal and 2.0 pounds of alfalfa meal.
c. 0.5 pound of cottonseed meal and 1.33 pounds of alfalfa meal.
d. 0.75 pound of cottonseed meal and 0.67 pound of alfalfa meal.

The cottonseed and alfalfa meals were mixed for each treatment and fed daily with the rolled barley in feed bunks. Meadow hay was fed in hay mangers. The trial was conducted over a 16-week period.

RESULTS AND DISCUSSION

The animals went on feed readily and no irregularities in health or behavior were observed during the trial. Performance data are presented in table 1. Average daily gains were 1.38, 1.29, 1.32, and 1.59 pounds for the control, high alfalfa, medium alfalfa, and low alfalfa groups, respectively. These trends were present throughout
the trial as is shown in figure 1. The steers receiving the lowest level of alfalfa gained significantly more than the other 3 groups. The differences among the other 3 groups were not of sufficient magnitude to be significant.

Table 1. Summary of gain and feed data

<table>
<thead>
<tr>
<th>Supplement 1/</th>
<th>Alfalfa meal (lb.)</th>
<th>Cottontail meal (lb.)</th>
<th>Number of calves</th>
<th>Average daily gain (lb.)</th>
<th>Average daily hay gain (lb.)</th>
<th>Feed 2/ per cwt gain (lb.)</th>
<th>Cost 3/ per cwt gain ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>1.00</td>
<td>10</td>
<td>1.38</td>
<td>10.6</td>
<td>986</td>
<td>13.84</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>0.22</td>
<td>10</td>
<td>1.29</td>
<td>9.8</td>
<td>1086</td>
<td>15.55</td>
<td></td>
</tr>
<tr>
<td>1.33</td>
<td>0.50</td>
<td>10</td>
<td>1.32</td>
<td>10.0</td>
<td>1050</td>
<td>15.11</td>
<td></td>
</tr>
<tr>
<td>0.67</td>
<td>0.75</td>
<td>10</td>
<td>1.59</td>
<td>10.9</td>
<td>898</td>
<td>12.57</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>1.40</td>
<td>10.3</td>
<td>1005</td>
<td>14.27</td>
<td></td>
</tr>
</tbody>
</table>

1/ The daily protein supplement per animal for all lots was calculated to supply total crude protein equivalent of 1 pound of cottontail meal.

2/ Includes consumption of meadow hay, protein supplement, and barley which was fed at a rate of 2 pounds per head daily in all lots.

3/ Native meadow hay was priced at $20.00, cottontail meal at $70.00, alfalfa meal at $45.00, and barley at $50.00 per ton in arriving at these figures.

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![Graph showing the average cumulative daily gain of calves on each treatment by 2-week intervals.](Image)

**Figure 1.** Average cumulative daily gain of calves on each treatment by 2-week intervals.
Average daily consumption of meadow hay followed the same pattern as average daily gains. Animals receiving the low level of alfalfa consumed significantly more of the native meadow hay than the animals on the high and medium alfalfa levels. The hay intake of the control group closely paralleled that of the low alfalfa group. Average meadow hay intake during the trial was 10.6, 9.8, 10.0, and 10.9 pounds for the control, high, medium, and low alfalfa groups, respectively. Figure 2 shows the hay intake for each treatment during each week of the trial.

![Graph showing hay intake over weeks](image)

Figure 2. Average daily hay consumption of calves on each treatment by weekly periods.

The increased gain from the low level of alfalfa is in agreement with that reported by Bentley et al. (1952) and Gosset and Riggs (1956). Gosset and Riggs reported that steers receiving 1, 2, and 3 pounds of dehydrated alfalfa leaf meal in the ration made significantly greater gains than steers with no alfalfa. They found no significant difference in rate of gain among the 3 levels of alfalfa supplement. Feed intake was held constant in their work; whereas, in this trial the
animals were allowed meadow hay free choice. Also, the alfalfa meal used was not alfalfa leaf meal and would be higher in fiber than that used by Gosset and Riggs. Apparently the extra fiber from the alfalfa meal inhibited the consumption of meadow hay in amounts sufficient to offset any beneficial effect of improved digestibility that has been attributed to the presence of alfalfa meal. Plamlee et al. (1953) reported a decrease in roughage consumption when trace minerals were added to a corn cob roughage ration.

Feed efficiency data and cost of gain are presented in table 1. The calves receiving the lowest level of alfalfa were the most efficient converters and consequently made the most economical gains. They were followed in the order of controls, medium alfalfa, and high alfalfa for both feed efficiency and economy of gain.

**SUMMARY**

Small amounts of alfalfa meal were used at 3 levels to replace part of the protein supplemented by cottonseed meal in a low quality roughage ration for wintering weaner calves.

Gains by calves fed 0.67 pound of alfalfa meal per head daily were significantly greater than those made by the control calves and by those receiving 1.33 and 2.00 pounds of alfalfa meal.

Meadow hay consumption was significantly decreased in those animals receiving the two higher levels of alfalfa over that of the control and the low level alfalfa group.

The calves receiving the lowest level of alfalfa meal were the most efficient feed converters and consequently made the most economical gains. They were followed in the order of controls, medium alfalfa, and high alfalfa for both feed efficiency and economy of gain.

**LITERATURE CITED**


