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Cornstalk Grazing in Protected and Unprotected Fields

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Calves grazing cornstalks do not require windbreaks during a winter with normal weather. However, it has not been determined if extremely long cold periods would reduce gains of unprotected cattle.

### Summary

A grazing trial during the winter of 1995-1996 was conducted to determine if windbreaks could improve calf gains by reducing cold stress. Unprotected cattle gained faster than protected cattle (P < .05). Unprotected fields contained more residual corn (P < .05) than protected fields that would account for added gains. Unprotected calves also found some shelter using the natural topography of fields. These results agree with previous work where calves grazing grain sorghum residue gained equally with or without protection. Windbreaks do not improve gains in a normal winter; however, during long periods of cold weather, protected cattle may have some advantage.

### Introduction

In the upper Midwest and Great Plains region, windbreaks have often been recommended for livestock protection. Cattle performance might be enhanced by decreasing the incidence of cold stress, thereby decreasing heat production for maintenance and increasing feed efficiency. The energy balance of cattle, and thereby their productivity, is a complex interaction between intake, physiological state, and thermal environment. Some of the gross energy consumed by calves is lost in the feces, urine, and gaseous products of digestion. The remaining energy, metabolizable energy, can be used for maintenance and/or production. A portion of this metabolizable energy used for maintenance is converted to heat thereby reducing efficiency of feed:gain.

Grazing of cornstalks by growing calves is a low cost and efficient use of residue remaining in the field. However, weather conditions may affect grazing time and behavior of cattle during extremely cold periods. Windbreaks decrease wind flow on both the windward and leeward sides of the barrier. Horizontal extent of the windbreak effects upwind and downwind airflow and is assumed to be proportional to the height. Protection from wind can extend up to 10-12 times the height of the windbreak on the leeward side and 3-5 times the height on the windward side. A well-placed windbreak should then greatly benefit young grazing animals by helping to reduce cold stress, allowing for more total grazing time, and benefit the producer economically through increased animal gains and feed efficiency.

The objective of this trial was to evaluate if windbreaks would reduce cold stress on calves grazing corn residues resulting in increased weight gains.

### Procedure

One hundred fourteen weaned crossbred steer calves were assigned randomly to one of seven corn fields. Three fields were protected by established conifer windbreaks, while the remaining four fields offered animals little protection only through the natural topography of the field. Protected fields had north:south 40 ft conifer windbreaks on the east, west, or both sides. The east protected field was relatively flat with slight depressions on the north end and a windbreak on the west side. The middle protected field was very similar to the east field with windbreaks on both the east and west sides. Topography of the west protected field was more rolling with wind protection only on the east side of the field. Protected fields were fenced to prevent animal access to the trees. Of the four unprotected fields, two were adjacent fields, separated by an electric fence and so, topography was very similar with slight depressions. The third unprotected field was flat with the southern end containing a grassy area in a relatively large depression. The fourth unprotected field had rolling hills with a few large ditches running through it.

Cattle were weighed on two consecutive days at the beginning and end of the trial after being limit fed for a period of three days to standardize fill differences. Cattle performance was measured in terms of ADG. All fields were stocked at one animal per acre. This stocking rate was determined through past research with calves grazing dryland corn residue at the University of Nebraska. Residual corn from each field was sampled in random locations by taking four 250 x 2.5 ft strips. Only whole and partial ears were collected. All ears were shelled to determine bushels per acre of residual corn. Each protected field had three anemometers placed in the middle and spaced equally apart. Two unprotected fields also contained three anemometers in the same fashion. However, due to a lack of anemometers, the two unprotected fields that were adjacent to each other contained only two anemometers that were placed one in each field. Each individual anemometer was protected from cattle by a 256 sq ft cage. A protein supplement containing 36 per-

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cent CP was fed at 1.5 lb/hd/day (as-is) to each treatment. Cattle were placed in fields on December 5, 1995 and removed on February 1, 1996. Anemometers were monitored throughout the trial. Observations of cattle were made during the trial, especially during periods of extremely cold and windy conditions to determine grazing behavior and bedding areas of calves.

Results

Average daily gains of calves on unprotected fields were greater ($P < .05$) than calves in protected fields (Table 1). The most likely explanation for this is found in the residual corn values for each treatment. Residual corn was greater ($P < .10$) in unprotected fields (Table 1). When broken down into lb of residual corn DM/hd/day, the added energy supplied by corn to calves in unprotected fields would have accounted for the added gains. Also, upon observation of animals during periods of extreme cold, unprotected calves appeared to find shelter using the natural topography of the land. Cattle huddled in slight depressions and ditches to find shelter. It is also possible that cornstalks provided some protection to the animals when they were lying down. Windbreaks used in this trial ran north to south, but over half of the winds were out of the north (27%) and northwest (25%). Perhaps east:west windbreaks would have benefited protected cattle more, thereby affecting gains. Typical wind speed reductions from east:west barriers are approximately 40 percent, whereas reductions from the north:south barriers used in this trial were only 25 percent.

Wind speed measurements taken by anemometers at a height of 10 feet in each field showed that protected fields had wind speeds which were less ($P < .05$) than those in unprotected fields. Table 1 shows two wind speed values for each treatment. One set of values are with the west protected field included, while the other values are with the west protected field removed from the data set. This was done because of unusually high wind speed measurements recorded in the west field. The west field had protection only on the east side, thereby only offering protection close to the tree line. Anemometers were placed in the middle of the field and apparently did not receive any wind reduction from the trees in the west field. In fact, anemometers in the west field recorded higher wind speeds than in any other field. Twenty-seven percent of the winds during the trial were out of the northwest, explaining why the west field had higher wind speeds than the other two protected fields. A line of deciduous trees which lines a small stream lies 200-300 feet to the west of the field, possibly causing a more turbulent airflow by the time air reached the anemometers. This could explain why the west field had the highest wind speeds of all fields. Because the windbreak would have offered cattle some protection next to the trees, anemometer readings may not have represented the protection cattle actually received.

Table 2 presents correlation coefficients for variables measured in the trial. Both final weight and ADG were positively correlated with the amount of residual corn in the field ($P < .05$). Residual corn and wind speed were positively correlated ($P < .10$). Although not significant, ADG and final weight were negatively correlated with corn yield. Allowing that as yields declined, cattle gains increased, possibly because more corn remained in the field. While the added residual corn in unprotected fields does not entirely account for differences in yields between the treatments, 1.5 bu per acre added to unprotected field yields does make yields among fields more similar.

The average temperature for the 66 days of the trial was 20.8°F which is below the critical temperature for cattle with a winter coat. The 30-year average temperature for the same period in eastern Nebraska is 22.7°F showing that cattle were exposed to similar or slightly colder than normal temperatures. Average wind speed during the trial as measured by the University weather station at Mead, NE was 8.8 mph compared to 11.1 mph which is the 30-year average for the area. So even though temperatures were slightly colder, wind speeds were below normal possibly offsetting each other in terms of cold stress to the animals. There were two days during the trial that were particularly cold and windy with significant amounts of snowfall. On each day, snowfall totaled 3.5 inches. For the most part, cattle were not exposed to extreme conditions for extended periods which might have significantly affected performance.

Data in the present study help to support data in a similar trial conducted at the University of Nebraska in the fall and winter of 1994-1995 where cattle grazed grain sorghum residue (1996 Nebraska Beef Report, pp. 44-45). Average daily gains for protected and unprotected cattle were equal at 0.59 lb per day. Weather conditions over the period of the trial were slightly milder than the 30-year average and, as in the present study, cattle were never exposed to extended periods of cold weather.

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Table 1. Calf performance, wind speed measurements, and field data.

<table>
<thead>
<tr>
<th></th>
<th>Protected</th>
<th>Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight, lb</td>
<td>497</td>
<td>496</td>
</tr>
<tr>
<td>Final weight, lb</td>
<td>577</td>
<td>588</td>
</tr>
<tr>
<td>ADG, lb</td>
<td>1.22</td>
<td>1.40</td>
</tr>
<tr>
<td>Wind speed, mph</td>
<td>5.8</td>
<td>6.8</td>
</tr>
<tr>
<td>(With west field)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind speed, mph</td>
<td>5.06</td>
<td>6.75</td>
</tr>
<tr>
<td>(Without west field)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield, bu/acre</td>
<td>80.0</td>
<td>75.6</td>
</tr>
<tr>
<td>Residual corn, bu/acre</td>
<td>3.13</td>
<td>4.54</td>
</tr>
</tbody>
</table>

*Protected < unprotected ($P < .05$).

Table 2. Correlation coefficients.

<table>
<thead>
<tr>
<th></th>
<th>Residual corn, lb/acre</th>
<th>Yield, bu/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final weight, lb</td>
<td>.862*</td>
<td>-.588</td>
</tr>
<tr>
<td>ADG, lb</td>
<td>.785*</td>
<td>-.607</td>
</tr>
<tr>
<td>Wind speed, mph</td>
<td>.730b</td>
<td>.129</td>
</tr>
</tbody>
</table>

*Significant ($P < .05$).

bSignificant ($P < .10$).