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UNIVERSITY OF WYOMING
AGRICULTURAL
EXPERIMENT STATION

THE USE OF WHEAT IN LIVESTOCK FEEDING

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J. J. HITCHCOCK, M.A., Junior Apiculturist.

*In cooperation with U. S. Department of Agriculture.
†Acting Superintendent.
‡On leave.
This bulletin is written in answer to numerous questions that have been raised regarding the value of wheat in comparison with some of the other grains that are more generally used in livestock feeding operations.

The interest in the use of wheat for feeding purposes has come about, in part, as a result of the government feed wheat program. This program makes available 125,000,000 bushels of wheat for livestock feeders at a price equal to about 85 per cent of the parity price of corn. Such wheat can be purchased by processors or dealers direct from the Commodity Credit Corporation, and by feeders from this corporation, or they may purchase it from local producers who have 1941 wheat under loan. The purchases are arranged through the county A. A. A. committees.

Tables and statements made in the following pages are based upon feeding tests which have been made at the State Experiment Farms with pigs and with lambs. The tables show various rations which contain wheat and also rations which contain either corn or barley, for the sake of comparison.

All of the feeds used in these tests were produced locally except the protein concentrates.

TESTS AT THE GILLETTE EXPERIMENT FARM

At the Gillette Experiment Farm two feeding tests, each continuing for three years, were made with pigs. In the first test three lots of pigs received shelled yellow corn, ground wheat and ground barley, respectively as the basic part of the rations. In these tests local pigs were used, predominating either in Jersey-Duroc or Poland-China breeding. In the first test, there were eight pigs in each lot during the first and second years, and in the third year there were 10 animals per lot. The test continued for eighty days for each of the three years. The trinity mixture consisted of two parts of tankage, one part of cottonseed meal and one part of alfalfa meal.
The mineral consisted of 40 per cent each of ground bone charcoal and hydrated lime and 20 per cent of salt. Long alfalfa was provided in racks for each pen, but only a small amount was consumed.

All lots were fed in similar pens with straw packed houses at one end and the self-feeders and automatic water tanks at the other end.

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>corn</td>
<td>9.11</td>
<td>gr. wheat 9.19</td>
<td>gr. barley 8.31</td>
</tr>
<tr>
<td>tri-mix</td>
<td>.69</td>
<td>tri-mix .50</td>
<td>tri-mix .69</td>
</tr>
<tr>
<td>long alfalfa</td>
<td>.10</td>
<td>long alfalfa .09</td>
<td>long alfalfa .07</td>
</tr>
<tr>
<td>mineral mix</td>
<td>.05</td>
<td>mineral mix .03</td>
<td>mineral mix .03</td>
</tr>
</tbody>
</table>

WEIGHTS AND GAINS, POUNDS

<table>
<thead>
<tr>
<th>Average Initial Weight</th>
<th>113.90</th>
<th>113.12</th>
<th>113.54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Final weight</td>
<td>284.21</td>
<td>275.31</td>
<td>263.66</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>2.13</td>
<td>2.03</td>
<td>1.87</td>
</tr>
</tbody>
</table>

FEED PER HUNDRED POUNDS GAIN

<table>
<thead>
<tr>
<th>Corn</th>
<th>426.05</th>
<th>453.05</th>
<th>442.48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground wheat</td>
<td>31.46</td>
<td>24.85</td>
<td>36.63</td>
</tr>
<tr>
<td>Ground barley</td>
<td>4.90</td>
<td>4.18</td>
<td>3.92</td>
</tr>
<tr>
<td>Tri-mix</td>
<td>2.07</td>
<td>1.60</td>
<td>2.01</td>
</tr>
<tr>
<td>Long alfalfa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral mix</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SHELLED CORN COMPARED WITH WHEAT AND BARLEY FOR FATTENING PIGS

It may be noted from Table I that the ground wheat lot was second in point of average daily gains. In comparison with Lot 1, one hundred pounds of ground wheat as used in Lot 2, replaced 94.05 pounds of corn and 1.45 pounds of the trinity mixture. Compared with the ground barley ration as fed in Lot 3, one hundred pounds of ground wheat replaced 97.66 pounds of ground barley plus 2.64 pounds of trinity mixture. In other words, the ground wheat as fed in Lot 2, was worth about 94 per cent of the value of corn as fed in Lot 1 and about 98 per cent the value of barley as fed in Lot 3.

SHELLED CORN COMPARED WITH CORN AND WHEAT FED TOGETHER FOR FATTENING PIGS

In the second test the number of pigs per lot consisted of ten head the first period for 75 days, six head the second year for a period of 68 days and four head the third year for a period of 55 days. Packing house tankage was used instead of the trinity mixture. The mineral mixture was the same as used in the first test. In this test one lot of pigs had free choice of shelled corn and wheat in separate compartments of the feeder and another lot had access to a half and half mixture of ground wheat and ground barley. A comparison of these two lots with Lot 1, on shelled corn is shown in Table II. There was practically no difference in the rate of gain in Lots 3 and 4. Lot 1 on corn showed a smaller average daily gain for the three-year period than either of the other two.

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>1</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelled corn</td>
<td>6.11</td>
<td>1.54*</td>
<td>gr. barley 3.45</td>
</tr>
<tr>
<td>Tankage</td>
<td>.78</td>
<td>.51</td>
<td>gr. wheat 3.51</td>
</tr>
<tr>
<td>Mineral mix</td>
<td>.01</td>
<td>.01</td>
<td>tankage .48</td>
</tr>
</tbody>
</table>

*Lot 3 had free access to shelled corn and ground wheat in separate compartments.
Weights and Gains, Pounds

<table>
<thead>
<tr>
<th></th>
<th>74.39</th>
<th>75.17</th>
<th>75.23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Initial Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Final Weight</td>
<td>197.57</td>
<td>203.38</td>
<td>204.07</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>1.88</td>
<td>1.94</td>
<td>1.95</td>
</tr>
</tbody>
</table>

Feed per Hundred Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>325.67</th>
<th>79.79</th>
<th>345.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelled corn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground wheat</td>
<td>265.22</td>
<td>179.86</td>
<td>356.36</td>
</tr>
<tr>
<td>Ground barley</td>
<td></td>
<td></td>
<td>176.50</td>
</tr>
<tr>
<td>Tankage</td>
<td>39.75</td>
<td>26.29</td>
<td>24.62</td>
</tr>
<tr>
<td>Mineral mix.</td>
<td>.71</td>
<td>.64</td>
<td>.66</td>
</tr>
</tbody>
</table>

It will be observed from Table II that where the pigs had free choice of shelled corn and ground wheat as in Lot 3, they consumed more than three times as much of the wheat as they did of the corn and gained in weight at practically the same rate as the pigs in Lot 4, where the ground wheat and ground barley were eaten in equal amounts.

One hundred pounds of the grain as fed in Lot 3 replaced 94.39 pounds of corn plus 4.0 pounds of tankage as fed in Lot 1. One hundred pounds of the wheat-barley mixture as fed in Lot 4 replaced 91.38 pounds of corn plus 4.2 pounds of tankage as fed in Lot 1.

In both these tests the pigs on the rations containing wheat showed a thrifty condition. During the entire time of the feeding periods there were no losses in any of the lots and none of the pigs went off feed.
WHEAT USED IN LAMB RATIONS

In these feeding tests at the Torrington Experiment Farm native range lambs were used. In the first test the average number of lambs was 50 head per lot with an initial weight of approximately 60 pounds per head. The length of the feeding periods varied from 100 to 125 days.

In this experiment comparisons were made of three rations: (1) Fifty per cent mixture of shelled corn and whole wheat; (2) shelled corn; (3) whole barley. Cottonseed cake and alfalfa hay were used in all rations.

**TABLE III**
Wheat in the Grain Ration for Fattening Lambs
(4-year average)

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>wheat</td>
<td>corn</td>
<td>barley</td>
</tr>
<tr>
<td>Average daily ration, pounds per head</td>
<td>.52</td>
<td>.52</td>
<td>.52</td>
</tr>
<tr>
<td>Average Initial Weight</td>
<td>61.33</td>
<td>61.36</td>
<td>64.84</td>
</tr>
<tr>
<td>Average Final Weight</td>
<td>94.72</td>
<td>86.04</td>
<td>94.46</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>.334</td>
<td>.297</td>
<td>.296</td>
</tr>
</tbody>
</table>

**FEED PER HUNDRED POUNDS GAIN**

|          | Corn   | 306.23 | 174.29 |
|          | Wheat  | 174.26 |
|          | Barley | 346.48 |
|          | Cottonseed Cake | 68.05 | 79.16 |
|          | Alfalfa | 493.51 | 515.95 |
From Table III it may be shown that 100 pounds of wheat and corn as fed in Lot 7 had a replacement value equal to 99.4 pounds of barley as fed in Lot 6. The wheat-corn lot used a little more cottonseed cake and alfalfa hay. The rate of gain was practically the same for both lots. When the same comparison is made with Lot 5 it will be noted that 100 pounds of the wheat-corn mixture had a replacement value of 87.86 pounds of corn. Each 100 pounds of gain on the wheat-corn ration required 11 pounds more of cottonseed cake and 22 pounds more of alfalfa than did the corn lot. The gains in Lot 5 were approximately 13 per cent higher than they were in the wheat-corn lot.

The total death losses, for four years during which this test was carried, showed two lambs in Lot 5, three lambs in Lot 6 and two in Lot 7 or less than two per cent a year.

An appraisal of the condition of the lambs made by a representative of a livestock commission firm showed that at the conclusion of the feeding tests 98 per cent of the lambs in Lot 5 were fat, 91 per cent in Lot 6 and 97 per cent in Lot 7.

WHEAT IN THE GRAIN RATION DURING PART OF THE FEEDING PERIOD

A second test with lambs at the Torrington Experiment Farm compared carload lots for two years. In addition to grain, cottonseed cake and alfalfa hay, wet beet pulp was used in the rations. This particular experiment started with each lot varying from 240 to 245 head of western range lambs. The first year the test continued for 136 days, the second year for 127 days.

In Lot 1 the grain part of the ration consisted of barley for the first half of the feeding period with corn replacing the barley for the remainder of the period. In Lot 2 the grain for the first half of the period consisted of wheat and barley and for the second half of the period wheat and corn, mixed half and half.

Table IV shows that there was only a small difference in the rate of gain between the two lots. In Lot 2 one hundred pounds of the grain mixture which was half wheat, had a replacement value of 99.43 pounds of grain as fed in Lot 1. The Lot receiving wheat required 3 pounds less of cottonseed cake and 174 pounds
less of wet beet pulp for 100 pounds of gain. The average appraisals of the lambs in these two lots showed 95 per cent fat for Lot 1 and 91 per cent for Lot 2. The use of wheat in the ration did not increase death losses.

### TABLE IV

Wheat in the Grain Rations During Part of the Lamb Fattening Period

(2-year average)

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grain*</td>
<td>.69</td>
</tr>
<tr>
<td></td>
<td>Cottonseed cake</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>Wet pulp</td>
<td>6.22</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>.70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average daily ration, pounds per head</th>
<th>Lot 1</th>
<th>Lot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>59.33</td>
<td>58.95</td>
</tr>
<tr>
<td>Final Weight</td>
<td>95.73</td>
<td>96.00</td>
</tr>
<tr>
<td>Daily Gain</td>
<td>.275</td>
<td>.279</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feed per Hundred Pounds Gain</th>
<th>Lot 1</th>
<th>Lot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain*</td>
<td>249.00</td>
<td>249.68</td>
</tr>
<tr>
<td>Cottonseed cake</td>
<td>58.48</td>
<td>55.41</td>
</tr>
<tr>
<td>Wet pulp</td>
<td>1,981.14</td>
<td>2,154.88</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>256.55</td>
<td>230.25</td>
</tr>
</tbody>
</table>

*Lot 1 had barley first part of feeding period and corn for the last part.
Lot 2 had wheat and barley (fifty per cent of each) the first part. Corn replaced the barley for the last part of the feeding period.
SUMMARY

(1) Pigs self fed on ground wheat gained 95 per cent as fast as they did on shelled corn and 109 per cent as fast as they did on ground barley.

(2) One hundred pounds of ground wheat had a replacement value equal to 94 pounds of whole corn and 1.5 pounds of protein supplement, or 98 pounds of ground barley and 2.6 pounds of protein supplement.

(3) When pigs had free choice of shelled corn and ground wheat they ate three and one-third times as much wheat as they did corn.

(4) Pigs having free choice of whole corn and ground wheat or of a 50 per cent mixture of ground barley and ground wheat gained faster than pigs fed shelled corn.

(5) When pigs had free access to ground wheat and to shelled corn, one hundred pounds of the grain consumed had a replacement value equal to 94 pounds of corn and 4 pounds of tankage.

(6) One hundred pounds of ground barley and wheat, mixed in equal amounts had a replacement value equal to 91 pounds of corn and 4 pounds of tankage.

(7) Lambs fed a fifty per cent mixture of wheat and corn made practically the same rate of gain as they did on barley, and 89 per cent as fast as they did on shelled corn.

(8) The replacement value of 100 pounds of a fifty per cent mixture of wheat and corn fed to lambs was equal to 99 pounds of barley or 88 pounds of shelled corn.

(9) Lambs on a grain ration of half barley and half wheat made slightly larger gains than lambs on a barley ration the first half of the period and a corn ration for the last half of the period.
CONCLUSIONS

From these results it is evident that wheat either alone or in combination with other grain is satisfactory as a ration in fattening pigs. Based on the amount of corn and wheat consumed where the pigs had free access to each, the wheat was more palatable.

For lambs a fifty per cent mixture of wheat and corn was about 88 per cent as efficient as shelled corn alone and 99 per cent as efficient as barley alone.

ACKNOWLEDGMENT

The feeding tests at the Gillette Experiment Farm were in direct charge of the farm superintendent, Paul K. Thompson. At the Torrington Experiment Farm the work was in charge of Axell Christensen who served as farm superintendent during the first test and C. Wesley Roath, who was superintendent of the experiment farm at the time of the second lamb feeding test.
The following publications of the Wyoming Experiment Station may be had upon request: (Revised list, June, 1942).

No. BULLETINS—
112. The Poisonous Properties of the Two-Grooved Milk Vetch (*Astragalus bisulcatus).*
163. Results with Tree Planting at the Sheridan Field Station.
185. Barley Tests at the Sheridan Field Station.
205. Economic Studies of Irrigated Farms in Big Horn County.
209. Forty Years of Weather Records.
212. Steer Feeding in Southeastern Wyoming.
216. Sugar Beet By-Products for Fattening Lambs.
220. Study of Psyllid Yellows in Wyoming.
221. Occurrence of Selenium and Seleniferous Vegetation in Wyoming.
223. Corn Production on the Campbell County Experiment Farm.
227. Sugar Beet Tops, Cottonseed Cake and Mono-Calcium Phosphate in Rations for Steers.
228. Type of Farming and Ranching Areas in Wyoming.
229. Vegetative Composition, Density, Carrying Capacity and Grazing Land Values in the Red Desert Area.
231. Poisonous Plants and Livestock Poisoning.
232. Breastbones of Turkeys.
234. Cellar Wintering of Bees.
237. Roughage Feeding of Dairy Cattle.
238. Wintering Bees in Wyoming.
239. The Two-Queen Hive and Commercial Honey Production.
240. Salinity Conditions in the Big Horn River During the Years 1938 and 1939.
241. Livestock Poisoning by Oat Hay and Other Plants Containing Nitrate.
243. Practical Results from the State Experiment Farms.
244. Bacterial Ring-Rot of Potatoes.
245. Sulphur Dusting for the Control of Psyllid Yellows of Potatoes.
246. Hybrid Corn Adaptation Trials in Wyoming, 1940.
248. Influence of Cereal Grains Upon Quality of Meat in Turkeys.
249. Coccidia Infesting the Rocky Mountain Bighorn Sheep in Wyoming.
250. Vegetable Culture and Varieties for Wyoming.
251. Hybrid Corn in Wyoming, 1941.
252. The Control of Chlorosis in Cottonwood Trees and Other Plants.
253. Range Forage Production in Relation to Time and Frequency of Harvesting.
254. Crossbreeding for Lamb and Wool Production.
255. Lungworms of Domestic Sheep and Bighorn Sheep in Wyoming.