

South Dakota State University
**Open PRAIRIE: Open Public Research Access Institutional
Repository and Information Exchange**

Bulletins

South Dakota State University Agricultural
Experiment Station

3-1-1932

Rye as a Fattening Feed for Cattle and Swine in South Dakota

J.W. Wilson

T. Wright

Follow this and additional works at: http://openprairie.sdstate.edu/agexperimentsta_bulletins

Recommended Citation

Wilson, J.W. and Wright, T., "Rye as a Fattening Feed for Cattle and Swine in South Dakota" (1932). *Bulletins*. Paper 271.
http://openprairie.sdstate.edu/agexperimentsta_bulletins/271

This Bulletin is brought to you for free and open access by the South Dakota State University Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Bulletins by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

Rye as a Fattening Feed For Cattle and Swine in South Dakota

Animal Husbandry Department
Agricultural Experiment Station
South Dakota State College
of Agriculture and Mechanic Arts
Brookings, S. D.

GOVERNING BOARD

Honorable W. S. Dolan -----	Milbank
Honorable Guy H. Harvey -----	Yankton
Honorable Alvin Waggoner -----	Philip
Honorable J. E. Peart -----	Flandreau
Honorable Francis D. Case -----	Custer

STATION STAFF

Executive

W. S. Dolan -----	Regent Member
J. E. Peart -----	Regent Member
Chas. W. Pugsley, B.S., D.Agr. -----	President of College
C. Larsen, B.Sc.Agr., M.S. -----	Dean of Agriculture
James W. Wilson, B.S.A., M.S.A., LL.D. -----	Director
N. E. Hansen, B.S., M.S., Sc.D. -----	Vice-Director
A. N. Hume, B.S.A., M.S., Ph.D. -----	Supt. of Sub-Stations
R. A. Larson -----	Secretary
A. A. Applegate, A.B., M.A. -----	Editor
June Disbrow -----	Bulletin Clerk and Stenographer

Agricultural Engineering

Ralph Patty, B.Di., B.S. in A.E. -----	Agricultural Engineer
H. M. Crothers, B.S., E.E., Ph.D. -----	Associate
D. E. Wiant, B.S. in A.E. -----	Assistant

Agronomy

A. N. Hume, B.S.A., M.S., Ph.D. -----	Agronomist
J. G. Hutton, B.S., M.S. -----	Associate
K. H. Klages, B.S., M.S., Ph.D. -----	Associate
M. Fowlds, B.S. -----	Assistant
Leo. Pühr, B.S., M.S. -----	Assistant
C. Franzke, B.S. -----	Assistant

Animal Husbandry

James W. Wilson, B.S.A., M.S.A., LL.D. -----	Animal Husbandman
Turner Wright, B.S. -----	Associate
Forrest Fenn, B.S., M.S. -----	Assistant

Chemistry

K. W. Franke, B.S., Ph.D. -----	Chemist
Florence Marx, B.S. -----	Analyst

Dairy Husbandry

T. M. Olsen, B.S., M.S.A. -----	Dairy Husbandman
Dan Jacobsen, B.S., M.S. -----	Assistant

Home Economics

Edith Pierson, B.S., M.S. -----	Home Economist
Anna Halgrim, B.S., M.A. -----	Associate
Grace Wasson, Ph.B., M.A. -----	Assistant

Entomology

H. C. Severin, B.S., M.A. -----	Entomologist
George Gilbertson, B.S., M.S. -----	Associate

Agricultural Economics

Sherman Johnson, B.S., M.S. -----	Agricultural Economist
R. E. Post, B.S., M.S. -----	Associate
Frank Hady, B.A. -----	Assistant
C. M. Hampson, B.S., M.S. -----	Assistant
G. Lundy, B.S., M.S. -----	Assistant
Paul Christopherson -----	Statistician

Horticulture

N. E. Hansen, B.S., M.S., Sc.D. -----	Horticulturist
---------------------------------------	----------------

Pharmacy

F. J. LeBlanc, Ph.C., B.S., M.S. -----	Pharmacist
--	------------

Poultry

W. C. Tully, B.S.A., M.S.A. -----	Poultry Husbandman
-----------------------------------	--------------------

Rural Sociology

W. F. Kumlien, B.S., M.S., M.S. -----	Rural Sociologist
---------------------------------------	-------------------

Veterinary

C. C. Lipp, D. V. M. -----	Veterinarian
J. B. Taylor, D. V. M. -----	Assistant

Rye as a Feed for Cattle and Swine

By James W. Wilson and Turner Wright

Introduction

The growing of rye as a grain crop is practiced quite generally throughout South Dakota. Statistics issued by the State Department of Agriculture at Pierre show that there were over one-eighth as many acres of rye as wheat grown in 1930. About one-fifth of the total acreage is credited to the counties in the North Central and the Northeastern districts in the East River section, while the largest county acreage is credited to Tripp county in the South Central district in the West River country. All counties with the exception of two are credited with rye acreage.

Corn and barley are the principal feeds grown in the State for fattening both cattle and swine. Feeding rye to livestock under ordinary conditions is not practiced to any great extent because the price as a rule is too high when compared with the prices of corn and barley. Conditions sometimes arise, however, which make it advisable to use rye for feeding purposes. The widespread cultivation of rye over the state, the inaccessibility of markets in many cases, and the relatively low market value during the last three years probably are the principal factors responsible for the increased inquiry as to the suitability of this grain as a feed for fattening livestock.

In Henry and Morrison's tables of digestibility of grains we find that in composition, rye resembles wheat and barley more than it does corn, although practically the same in digestible nutrients as corn. From these data corn has from three to four times as much digestible fat as rye, while barley and rye both have more digestible crude protein than corn. Perchance these differences in composition were the principal causes of difficulties experienced in feeding rye both whole and ground as the sole grain rations.

Fattening Cattle on Rye

The two-year-old grade Shorthorn steers purchased for this experiment had been browsing a cornstalk field, were in good condition and would grade in the market as good steers. They were divided into three lots of four head each, weighed up for the experiment and fed on the following rations:

- Lot I. Ground rye.
- Lot II. Whole rye.
- Lot III. Shelled corn.

In addition to the grains, the steers received all the alfalfa hay, salt and water they wanted.

The Feeds

The grains and hay were purchased in the local markets as needed. At the end of the 30-day period the steers in Lot I were eating an average ration of 10 pounds of ground rye and 13 pounds of alfalfa hay; in Lot II, 15 pounds of whole rye and 9 pounds of alfalfa hay, and in Lot III, 20 pounds of shelled corn and 9 pounds of alfalfa hay per head daily. At the close of the 90-day period the average ration was as follows:

Lot I. 13 pounds of ground rye and 14 pounds of alfalfa hay.

Lot II. 14 pounds of whole rye and 9 pounds of alfalfa hay.

Lot III. 20 pounds of shelled corn and 6 pounds of alfalfa hay per head, daily.

It was impossible to keep steers receiving rye on a full feed. They were not content with their grain rations but preferred alfalfa hay.

TABLE NO. I

	Lot I Ground Rye and Alfalfa hay	Lot II Whole Rye and Alfalfa hay	Lot III Shelled Corn and Alfalfa hay
Number of days fed -----	90	90	90
Average gain per head -----	234	197	265
Average gain per head daily -----	2.60	2.19	2.95
Grain for pound of gain -----	4.92	6.85	5.96
Hay for pound of gain -----	4.49	3.60	2.32
Average pounds of grain per head daily -----	12	15	17
Average pounds of alfalfa hay per head daily -----	11.63	7.72	6.84

Valuing rye at 40 cents a bushel, shelled corn at 45 cents a bushel, alfalfa hay at \$15 a ton and grinding rye at .0264 cents a hundred, it cost \$7.02 for 100 pounds gain with Lot I, \$7.60 for Lot II, and \$6.53 for Lot III.

The palatability of the rye was not increased by grinding.

The results in table No. I show that steers receiving ground rye consumed nearly twice the number of pounds of alfalfa hay as did steers in check lot that received shelled corn. Also, the steers that received the whole rye consumed over one-third more alfalfa hay than steers in check lot. In this connection it might be well to state that alfalfa hay without a grain ration is a good feed for cattle. The results reported in bulletin 229 of this station show that during a preliminary feeding period of 56 days an average daily gain per head of 1.73 pounds was secured with two-year-old steers. These steers were similar to the ones used in this experiment. These cattle receiving the alfalfa hay made much growth and were leggier than steers of other lots in that experiment.

The steers in the rye lots did not have the appearance of those in the check lot that received shelled corn. Instead of being fat they apparently had grown, had not shed their old hair as was noticed with steers that received corn in the check lot. There evidently was an absence of the necessary nutrients in the feed.

We believe that better results would be had if rye was mixed with other grains for fattening cattle as other grains would tend to increase the palatability of the rye.

Gain of Pigs Following Steers

After steers had become accustomed to their grains, pigs were put in the lots to pick up the waste.

TABLE NO. II

	Ground rye	Whole rye	Shelled corn
Number of pigs	1	2	3
Weight of pigs -----	135	196	284
Weight of pigs, 70 days later ----	156	288	360
Gain of pigs -----	21	92	76
Average gain per head daily-----	.47	.59	.49

Fattening Pigs on Rye

Rye Compared with Corn and Barley for Fattening Spring Pigs on Rape Pasture

Rye is one of the first feeds considered as a substitute for corn and barley for fattening pigs. Two experiments have been conducted at this station to determine the feeding value of rye compared with corn and barley fed under the same conditions. The first experiment was conducted during the summer of 1926. Spring pigs raised by the Animal Husbandry department were divided as uniformly as possible into three lots of eight head each. Each lot included one Hampshire, four Duroc-Jerseys, and three Poland-Chinas. These pigs were full fed on rape pasture from July 30 to November 5, or for a period of 98 days. The rations fed and data showing the weights of the pigs and the gains made are given in Table No. III.

TABLE NO. III

Rations fed	Ground rye and mineral	Shelled corn and mineral	Ground barley and mineral
Number of pigs -----	8	8	8
Number of days fed -----	98	98	98
Initial weight per lot -----	460.0	460.0	475.0
Final weight per lot -----	1118.0	1148.0	1530.0
Initial weight per pig -----	57.0	57.5	59.4
Average final weight per pig --	139.8	143.5	191.3
Total gain per lot -----	658.0	688.0	1055.0
Total gain per pig -----	82.3	86.0	131.9
Average daily gain per pig----	.84	.88	1.35
Total feed consumed			
Ground rye -----	2982.0		
Shelled corn -----		2756.4	
Ground barley -----			4568.8
Mineral -----	53.0	55.0	54.4
Feed consumed for 100 pounds gain			
Ground rye -----	453.1		
Shelled corn -----		400.6	
Ground barley -----			433.1
Mineral -----	8.1	8.0	5.2

The mineral used consisted of ground limestone, bone meal and salt mixed equal parts by weight.

A comparison of the results given in the foregoing table shows the pigs fed ground rye made almost as rapid gains as did the pigs fed shelled corn. They ate more, and required 13 per cent more feed for 100 pounds of gain. The ground rye fed in this experiment without a protein supplement to pigs on rape pasture gave a lower feeding value than ground barley fed under the same conditions. The pigs fed ground barley made much faster gains than the pigs fed ground rye, and were ready for market at least 45 days earlier than the pigs fed rye. A comparison of the amounts of feed consumed indicate that ground barley proved more palatable than either ground rye or shelled corn. This probably was due to the barley supplying more protein than either rye or corn.

The second experiment in feeding rye was conducted during the summer and fall of 1929. Chester-White, Duroc-Jersey, grade Hampshire, and Poland-China pigs were used. As before these pigs were divided as uniformly as possible into three lots of eight head each.

The rations used were the same as in 1926 except that the mineral mixture consisted of 50 pounds ground limestone, 28 pounds bone meal, 20 pounds salt, 2 pounds iron oxide, 4.536 grams copper sulphate, and 9.072 grams potassium iodide. The pigs were started on feed July 15. When each pig reached a weight of approximately 225 to 230 pounds, it was weighed on three consecutive days and taken out of the experiment. This practice was followed until the last of the rye fed pigs were weighed out on January 22. The pigs in each lot had access to good rape pasture until November 12 when frost killed the rape. After this the pigs still in the experiment were finished in dry lots. The weights of the pigs in each lot, the gains made, and the amounts of feed consumed are given in Table No. IV.

TABLE NO. IV

Rations fed	Ground rye and mineral	Shelled corn and mineral	Ground barley and mineral
Number of pigs -----	8	8	8
Number of days fed -----	149	136	120
Initial weight per lot -----	576.7	588.0	601.5
Final weight per lot -----	1732.7	1867.0	1821.0
Average initial weight per pig --	72.1	73.5	75.2
Average final weight per pig --	216.6	233.0	227.6
Total gain per lot -----	1156.0	1279.0	1219.5
Total gain per pig -----	144.5	159.9	152.3
Average daily gain per pig ----	.97	1.17	1.28
Total feed consumed			
Ground rye -----	5402.8		
Shelled corn -----		5519.4	
Ground Barley -----			5778.4
Mineral -----	39.0	33.3	31.0
Feed consumed for 100 pounds gain			
Ground rye -----	468.6		
Shelled corn -----		431.54	
Ground barley -----			473.8
Mineral -----	3.4	2.6	2.5

The results in the second experiment were similar to those obtained in the first. The pigs fed ground rye made somewhat slower gains than

those fed shelled corn. They also required more feed for 100 pounds of gain. It should be noted that the pigs in this experiment were fed longer and to a heavier final weight than those in the first experiment. It was noticed that after the pigs had been on feed for about 90 days they seemed to tire of the rye. This was especially noticeable after the frost killed the rape. The rye also had a tendency to scour the pigs. The pigs fed barley, as in the previous experiment, made faster gains than those receiving either corn or rye. In this case, however, the pigs fed barley required more feed for 100 pounds gain than the pigs fed rye. The increase in each case in the amount of feed required to produce 100 pounds of gain in this experiment as compared with the first probably was due to the pigs being fed longer, to being fed several weeks in dry lots after the rape froze, and to being fed to heavier final weights.

A summary of the results obtained in the two experiments is given in table No. V.

TABLE NO. V

Rations fed	Ground rye and mineral	Shelled corn and mineral	Ground barley and mineral
Number of pigs -----	16	16	16
Number of days fed -----	124	117	109
Initial weight per lot -----	1036.7	1048.0	1076.5
Final weight per lot -----	2850.7	3015.0	3351.0
Average initial weight per pig -----	64.8	65.4	67.3
Average final weight per pig --	178.2	188.4	209.5
Total gain per lot -----	1814.0	1967.0	2274.5
Total gain per pig -----	113.3	122.9	142.2
Average daily gain per pig ----	.92	1.05	1.30
Total feed consumed			
Ground rye -----	8384.8		
Shelled corn -----		8375.8	
Ground barley -----			10347.2
Mineral -----	72.0	88.3	85.4
Feed consumed for 100pounds gain			
Ground rye -----	462.2		
Shelled corn -----		418.8	
Ground barley -----			454.9
Mineral -----	4.0	4.5	3.8

This summary shows that in the average for the two feeding trials, pigs fed ground rye did not gain as fast as either the pigs fed shelled corn or those fed ground barley. Considering the total feed consumed, we find the amount of rye and corn practically the same. Those fed ground barley ate considerably more feed than pigs in either of the other two lots. Results indicate that when these grains are fed without a protein supplement that ground barley is more palatable than either ground rye or shelled corn. The largest amount of feed consumed resulted in the fastest gains and the shortest feeding period. When the amount of feed consumed for 100 pounds gain is considered, the rye fed pigs had the highest feed requirement, the difference being 13 per cent more than the corn fed pigs and 1.5 per cent more than the barley fed pigs. These differences in palatability and amount of feed required to produce 100 pounds

gain suggest that better results might be obtained by mixing the ground rye with either shelled corn or ground barley or both than by feeding it alone.

Ground Rye; Ground Rye Mixed with Corn; and Ground Rye Mixed with ground Barley Compared with Shelled Corn for Fattening Summer Pigs in Dry Lot

The third experiment in feeding rye to fattening pigs was conducted during the winter of 1931 and 1932. Thirty-two Poland-China, Duroc-Jersey and Chester-White pigs farrowed in the summer of 1931 were used in this experiment. All of these pigs were in good, thrifty stocker condition at the beginning of the experiment. They were divided as evenly as possible with regard to breed, sex, weight and litter mates into four lots of eight pigs each. The four lots of pigs were fed as follows:

Lot I. Shelled corn, tankage, alfalfa hay, and a mineral mixture.

Lot II. Ground rye, tankage, alfalfa hay, and a mineral mixture.

Lot III. Ground rye and ground corn mixed equal parts by weight, tankage, alfalfa hay, and a mineral mixture.

Lot IV. Ground rye and ground barley mixed equal parts by weight, tankage, alfalfa hay and a mineral mixture.

The grain, tankage, alfalfa hay, and mineral mixture were each self-fed, free choice. The mineral used was made by mixing 50 pounds ground limestone, 28 pounds bone meal, 20 pounds common white salt, 2 pounds iron oxide, 1 ounce potassium iodide, and $\frac{1}{2}$ ounce copper sulphate.

The feeds used in this experiment were the best which could be obtained. Due to the drouth of 1931 the quality was not quite so good as that of the feeds used in previous experiments. The corn was of fair quality, showed a moisture content of 10.6 per cent and graded No. 2. The rye was relatively of better quality than the corn. It tested 55 pounds to the bushel. The barley was rather light, testing only 43 pounds to the bushel. It also contained 12.2 per cent of wild oats and other foreign material.

The weights and gains of the pigs, the total amounts of feed consumed and the amount of feed consumed for 100 pounds gain by the pigs in each lot are shown in Table No. VI.

TABLE NO. VI
October 1, 1931 to March 1, 1932

Lot number	1	2	3	4
Rations fed	Shelled corn, Tankage, Alfalfa hay, Mineral mixture	Ground rye, Tankage, Alfalfa hay, Mineral mixture	Ground rye, Ground corn, tankage, Alfalfa hay, Mineral mixture	Ground rye, Ground barley, Tankage, Alfalfa hay, Mineral mixture
Number of pigs -----	8	8	8	8
Average number of days fed ---	126	116	116	100
Average initial weight per lot ---	842.0	842.3	841.7	851.7
Average initial weight per pig ---	105.3	105.3	105.2	106.5
Average final weight per lot ---	1861.7	1835.0	1840.0	1830.3
Average final weight per pig ---	232.7	229.4	230.0	228.8
Total gain per lot -----	1019.7	992.7	998.3	978.6
Total gain per pig -----	127.4	124.1	124.8	122.3
Average daily gain per pig -----	1.01	1.07	1.08	1.22
Total feed consumed				
Corn -----	5112.5		2580.0	
Ground rye -----		5593.9	2580.0	2300.0
Ground barley -----				2300.0
Tankage -----	333.5	201.9	250.5	185.9
Alfalfa hay -----	128.3	114.5	84.3	67.0
Mineral mixture -----	39.5	21.0	16.7	15.7
Feed consumed for 100 pounds gain				
Corn -----	501.4		258.4	
Ground rye -----		563.5	258.5	235.1
Ground barley -----				235.0
Tankage -----	32.7	20.3	25.1	19.0
Alfalfa hay -----	12.6	11.5	8.4	6.8
Mineral mixture -----	3.9	2.0	1.8	1.6

The experiment was started on October 7, 1931 and was continued until the pigs in each lot reached an average weight of approximately 230 pounds each. Those fed rye did not show any evidence of scouring as did the pigs fed rye in the previous experiment. They also did not tire of the rye so quickly, although the pigs fed the ground rye and the ground rye mixed with corn did not seem to relish their feed as did the pigs fed the ground rye mixed with the ground barley.

When judged by the rate of gain the shelled corn proved to be the poorest feed used. The pigs in this lot required 10 days longer to reach market weight than the pigs fed the ground rye or those fed the ground rye mixed with ground corn. The slowest gaining pig and the fastest gaining pig in the experiment were in this lot. It is not uncommon, however, for pigs fed a corn and tankage ration to make very uneven gains. The pigs fed the shelled corn, however, made 100 pounds of gain on less feed than the pigs fed rye or rye and corn. Comparing lots I and II and valuing shelled corn at 45 cents a bushel, tankage at \$1.50 a cwt., alfalfa hay at \$10 a ton and mineral at \$2 a cwt., we find that the ground rye

had a feeding value of 95 per cent that of shelled corn. Replacing one-half the rye with ground corn increased the rate of gain slightly and lowered the feed cost per 100 pounds gain.

At the end of two weeks of feeding it was evident that the pigs in Lot IV, fed the ground rye and ground barley mixture were making the fastest gains. These pigs soon had a thriftier appearance and seemed more contented than the pigs in the other lots. They reached market weight 16 days earlier than the pigs in the other two lots fed rye and 26 days earlier than the pigs fed shelled corn. The feed requirement for 100 pounds gain also was lower for the pigs in this lot than for those in either of the other lots. Using the same prices as before for shelled corn, alfalfa hay, tankage, and mineral the ground rye and ground barley mixture had a value of 92 cents a cwt., or 12 cents a cwt. above that of shelled corn and 16 cents a cwt. above that of ground rye fed without the barley.

Summary

1. Results indicate that rye as the sole grain ration is a comparatively poor grain to fatten cattle and swine.

2. The palatability of the rye we believe was the principal cause for the comparatively small gains made by both lots of steers and also their condition at the end of the 90-day feeding period.

3. By grinding the rye the palatability was evidently reduced and instead of cattle eating a reasonable amount of ground rye they preferred the alfalfa hay. In fact they consumed nearly twice as much alfalfa hay daily as did steers receiving shelled corn. In this connection results reported in bulletin 229 of this station show that when similarly aged and conditioned steers were fed alfalfa hay, as the sole ration, for 56 days an average daily gain per head of 1.73 pounds was made. Of course these steers were not fat but apparently had made considerable growth.

4. Because of availability rye and barley are the first grains to be considered as substitutes for corn for fattening pigs on pasture. In each of the experiments the rye proved to be less palatable than either corn or barley. The rye had a tendency to scour the pigs.

5. Results reported in table No. VI indicate that it was an advantage to mix the ground rye with the ground barley half and half by weight. This proved to be the best feed in the experiment requiring only 489.1 pounds of concentrates for 100 pounds of gain as compared to 534.1 pounds for lot that received shelled corn and tankage. Pigs in this Lot IV consumed only 19 pounds of tankage for 100 pounds of gain as compared to 32.7 pounds for pigs in Lot I that received corn and tankage. The feeds were self-fed, free choice, to each lot.