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OAT VARIETIES IN COLORADO

By D. W. Robertson, Alvin Kezer, F. A. Coffman, J. F. Brandon, Dwight Koonce and G. W. Deming

Colorado Agricultural College
Colorado Experiment Station
Fort Collins

The Colorado Agricultural College

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SUMMARY

Colorado grows annually about 233,000 acres[1] of oats, yielding about 6,200,000 bushels. Of this amount nearly 102,000 acres are grown under irrigation and nearly 132,000 on dryland. The average yearly production, 1922 to 1926 inclusive, for irrigated land was 3,910,695 bushels and for non-irrigated land, 2,274,620 bushels.

In making recommendations for Colorado, one is confronted with various conditions such as rainfall, altitude and length of frost-free season. Any recommendations should be applied only to conditions similar to the district in which the various experimental farms are located. Various local conditions and demands may make it advisable to deviate slightly from the recommendations.

Irrigated Conditions

At Fort Collins under irrigation the midseason types of oats are best adapted. Colorado No. 37, a selection made by the experiment station, is the highest yielding oat tested for the 10-year period. Some promising oats are under test but, so far, none of these are superior to Colorado No. 37.

Early Oats.—Early oats of the Kherson or Kanota types are not so well adapted to conditions similar to those found at Fort Collins as the midseason type.

Hulless Oats.—Hulless oats have not yielded sufficiently high to recommend them.

Time and Rate of Seeding.—Oats have been planted from April 1 to 20 at Fort Collins. Good results may be obtained from planting some of the earlier varieties a little later. The usual rate of seeding is 80 pounds per acre.

Irrigation.—Under normal weather conditions in Northeastern Colorado a single irrigation at the jointing stage is recommended. If two irrigations are applied, one at tillering and one at the late-jointing stage are recommended.

High Altitude—Fort Lewis

The highest-yielding oats at the Fort Lewis station for a 7-year period from 1921 to 1927 inclusive are the midseason types. Great Dakota, Colorado No. 37 and Swedish Select all gave good yields.

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[1] 5-year average 1922 to 1926. Taken from Colorado Year Books published by the State Board of Immigration.

DRYLAND CONDITIONS—AKRON

On dryland, only early oat varieties have produced favorable yields. Midseason varieties have failed more often than the early ones and seldom have outyielded them. Late oats have usually failed at Akron as dry weather often prevents normal maturity.

VARIETIES.—Brunker and Kherson have yielded well. Among the varieties more recently introduced into the section, Fulghum and Kanota give much promise.

DATE TO PLANT.—Only early maturing oat varieties should be sown. The seeding date should be as early in the spring as practicable. Very often early varieties of oats sown after the middle of April will be injured by dry weather before maturity.

RATE TO SOW.—Seeding more than 4 pecks has given larger yields than lighter seeding rates and is advised. In the varietal experiments conducted at Akron the plats were seeded at the rate of 5 pecks per acre.

WHEN TO RECOMMEND.—Oats cannot be recommended for extensive seeding on dryland as either corn or barley generally produce a larger yield of grain. Oats may, however, be cut for and fed as hay when drouth prevents the crop from properly developing.

OAT VARIETIES IN COLORADO

By D. W. Robertson, Alvin Kezer, F. A. Coffman, J. F. Brandon, Dwight Koonce and G. W. Deming

Colorado grows annually about 233,000 acres[2] of oats, yielding about 6,200,000 bushels. Of this amount about 102,000 acres are grown under irrigation and about 132,000 on dryland. The average acre yield for Colorado is about 34.0 bushels[3], which is higher than the average yield of the entire United States for the same period. The average acre yield for irrigated oats for the 5-year period, 1922 to 1926 inclusive, is approximately 38.5 bushels. The average yield on dryland for the same period is slightly over 17.0 bushels. The average yearly production, 1922 to 1926 inclusive, for irrigated land was 3,910,695 bushels, and for non-irrigated land 2, 274,620 bushels. The five leading counties in the production of oats for the 5-year period 1922 to 1926 were Weld, Logan, Larimer, El Paso and Routt.

Most of the oats produced are threshed for grain. Around 90,000 acres are cut annually for hay.

CLIMATIC CONDITIONS

Colorado has a varied climate. This influences the kind of crop which may be grown. In sections where the mean summer temperature ranges between 60 and 70 degrees F., varieties of Common Oats (Avena sativa) will give the better yields.

Where the mean summer temperature is well over 70 degrees, red oat varieties (Avena byzentina) are better adapted. At altitudes below 7000 feet with the mean summer temperature below 70 and above 60 degrees, the midseason or Swedish type of common oat is best adapted, provided there is enough water either as rainfall or irrigation. In the drier sections of this area the Kherson type is better adapted and will outyield the later oats in dry years. Above 7000 feet in elevation, the earlier-maturing oats are better adapted for grain production, but the Swedish type oats will give the highest tonnage of hay.

LOCATION OF EXPERIMENTAL FARMS

Experiments with oats are conducted on three station farms in Colorado. The central station is located at Fort Collins in the north-central part of the state. All tests are under irrigation. The type of soil, elevation and climatic conditions make it fairly representative of

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[2] 5-year average 1922 to 1926. Taken from Colorado Year Books published by State Board of Immigration.

[3] Colorado Yearbook 1927.

Leading Types and Varieties of Oats Grown in Colorado

Group	Panicle (head) Type	Color of Kernels	Time of Maturity	Variety
Covered (oats)	Spreading	White	Early	Nebraska 21 Albion (Iowa 103)
		Yellow	Early	Kherson
		Red	Early	Brunker (Burt 916) Kanota Fulghum
		White	Midseason	Colorado No. 37 Swedish Select Great Dakota
	Side Oats	White	Late	White Russian Bliss Side
Hulless (Naked Oats)	Spreading	Hulless	Midseason	Hulless

the irrigated sections in the northeastern part of the state.

The Fort Lewis farm is located in the southwestern corner of the state in La Plata County. The elevation of the station is over 7000 feet. At this station, the tests are under irrigation. The elevation and climate make this station a desirable place to test grains for high altitudes.

The United States Dry Land Field Station, located at Akron, Colorado, is operated in cooperation with the Colorado Experiment Station. This station is located in the heart of Colorado's dryland. Tests conducted here apply to crops grown under similar conditions.

EXPERIMENTS AT FORT COLLINS

CLIMATE

The climate at Fort Collins is suitable for the production of small grains. With few exceptions, sufficient rainfall comes in the months of March and April to start an oat crop.

RAINFALL

Table No. 1 gives the rainfall data for the years 1918 to 1927 inclusive. The rainfall in 1918, 1920, 1921, 1922, 1923, 1924, 1926 and 1927 was adequate early in the season to start the crop and carry it to the time irrigation water could be applied. In 1919 and 1925 the rainfall early in the season was insufficient to start the crop evenly. This was particularly true in 1925 when much of the oats had to be "irrigated up" in May.

Under the conditions found at the Fort Collins station early irrigation is seldom possible. Therefore, it is necessary to depend on

Table 1.—Monthly Rainfall at the Colorado Experiment Station. Fort Collins for the years 1918 to 1927, inclusive.

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	0.41	T	0.54	0.96	0.35	0.19	0.51	0.27	0.25	0.04
February	1.05	0.30	0.64	0.19	0.53	1.39	0.54	0.09	0.28	0.40
March	0.14	1.65	0.14	0.13	0.36	2.74	1.83	0.58	1.54	1.87
April	3.72	0.93	3.60	1.63	2.95	2.18	0.93	0.05	2.88	2.77
May	2.95	0.45	1.95	2.30	0.46	3.60	3.90	0.95	1.67	0.83
June	1.18	0.19	0.60	4.24	1.03	5.72	0.22	1.99	1.66	1.95
July	4.83	0.64	0.58	1.34	0.83	5.26	0.16	1.70	0.71	1.96
August	1.91	0.61	1.72	2.60	0.91	0.69	0.05	1.17	0.76	1.52
September	3.23	2.61	0.60	0.66	0.00	1.28	0.84	1.79	1.01	1.10
October	0.71	1.93	0.50	0.53	0.50	3.08	0.79	3.26	1.00	1.05
November	0.90	1.22	0.24	0.32	1.44	0.10	0.09	0.89	0.36	1.00
December	0.76	0.39	0.54	0.89	0.31	0.25	0.74	1.50	0.83	0.25
Total	21.79	10.92	11.65	15.79	9.67	26.48	10.60	14.24	12.95	14.74

NOTE:

The monthly rainfall for 1918, 1919 and 1920 was obtained from R. E. Trimble, Assistant Irrigation Investigator. The records for January, February, March, November and December, are also furnished by Mr. Trimble. The records for the other months were obtained on the experiment station farm. They differ slightly from the United States records for Fort Collins. The difference is due to local showers in the summer. The United States Weather Bureau station is on the college campus, about 1 mile west from the experimental farm.

winter and spring moisture to start the crop and carry it to the middle of May when irrigation water can be applied.

TREATMENT OF PLATS

The oat-test plats are sown on summer-fallow. This is necessary to insure clean land. While this gives yields slightly higher than farm conditions, it gives a comparative test.

IRRIGATION

Average climatic conditions at Fort Collins allow the accumulation of sufficient moisture in the winter and early spring to bring an oat crop to the jointing stage without irrigation. Under normal conditions a single irrigation at this stage will produce a normal crop. If two irrigations are necessary, one should be at the tillering and the other at the jointing stage.

In 1923 sufficient rain fell in the months of June and July to mature crops without irrigation, and no irrigation water was applied.

CARE OF GRAIN

The threshed grain from the plats is cleaned and weighed. The bushel weights are determined from the cleaned-grain weights. The probable errors are calculated by the deviation from the mean meth-

od.[4] Ten plats of each variety are grown. These plats are scattered over the area so that a random sample may be obtained.

TIME AND RATE OF SEEDING AT FORT COLLINS

Oats are planted from April 1 to 20. Good results may be obtained from planting some of the earlier varieties a little later. The usual rate of seeding is 80 pounds per acre.

TREATMENT FOR SMUT[5]

Oat smut cannot be controlled by the copper-carbonate-dust treatment. Smut of hulless oats, however, is an exception.

The formaldehyde treatment is successful in treating oat smut.

Table 2.—Oat Variety Test at Fort Collins for a 6-Year Period from 1907 to 1911. Yield in Bushels per Acre

Variety	Colo. No.	1906	1907	1908	1909	1910	1911	Average	Years Grown	Yield in Percentage of Colorado No. 37
Colorado No. 37	100	122.3	86.7	91.2	65.3	27.8	67.4	76.8	6	100.0
Great Dakota	74	110.7	86.2	88.4	66.8	19.4	66.2	72.9	6	94.9
Minnesota No. 26	79	119.8	77.5	74.7	71.9	23.3	69.0	72.7	6	94.7
Big Four	69	127.5	73.4	68.7	68.1	20.5	66.2	70.7	6	92.1
Czar of Russia	86	117.5	72.1	79.3	72.2	17.2	65.9	70.7	6	92.1
Colorado No. 13	76	108.4	77.1	75.9	65.9	22.2	69.0	69.7	6	90.8
White Russian	83	112.1	79.6	67.3	69.1	9.6	72.5	68.4	6	89.1
Silvermine	71	117.6	70.9	68.6	62.5	19.4	70.6	68.3	6	88.9
Wisconsin No. 4	67	106.2	74.6	62.5	60.3	8.0	54.0	60.9	6	79.3
Olin's Choice	89	99.3	68.1	69.3	59.4	11.6	48.1	59.3	6	77.2
Welcome	73	105.1	.....	73.9	68.1	21.4	74.6	68.8	5	92.0
Kherson	65	91.4	.....	71.8	51.6	37.5	60.9	62.6	5	83.7
Banner	96			67.9	81.9	21.5	73.1	61.1	4	97.1
Garton's Regenerated	97			54.0	61.2	8.1	54.0	44.3	4	70.4
Extrareichster	101				41.5	12.5	66.2	40.1	3	75.0
Extrareichster	102				62.2	12.8	55.6	43.5	3	81.3
Sparrowbill	80	99.8	80.9	68.7				83.1	3	83.1
Dalmeny	88	106.9	61.2	59.1				75.7	3	75.7
Colorado No. 5	68	67.9	43.1					55.5	2	53.1
National	77	112.1						112.1	1	91.7
White Tartar	81	111.5						111.5	1	91.2
Danish (U. S. 12877)	82	110.9						110.9	1	90.7
Minnesota No. 6	78	108.9						108.9	1	89.0
20th Century	75	103.9						103.9	1	85.0
Texas Red	85	100.9						100.9	1	82.5
Sixty Day	64	90.4						90.4	1	73.9
Early Champion	87	64.8						64.8	1	53.0
Colorado No. 9	72	59.0						59.0	1	48.2

[4] Hayes, H. K. and Garber, R. J. Breeding Crop Plants, Second Edition 1927, pp. 81-84.

[5] Durrell, L. W. "Smuts of Colorado Grains," Bulletin 334, Colo. Exp. Sta.

Clean the seed before treating and pile on a clean floor or on a canvas. The oats are then sprinkled with a solution of formaldehyde, 1 pint to 40 gallons of water. Use about 1 gallon of the solution to each bushel of seed to be treated. While sprinkling the solution over the seed, the grain should be thoroly shoveled until each kernel is wet, after which the pile of grain should be covered with sacks or tarpaulin and allowed to remain for 2 to 4 hours. The seed may then be planted. If it is to be held, however, for any length of time after treating, care must be taken that it be dried out thoroly and quickly. For hulless oats there is danger of seed injury from formaldehyde.

FORMALIN SPRAY[6]

"WHEN TO USE.—The formalin spray or dry treatment should be used FOR OATS ONLY. It is injurious to other grains. It is safe and effective for oats, however, and it has an advantage over the other formalin treatment in that it does not wet the grain.

"SOLUTION.—Mix 1 pound of formalin with 1 pint of water. A quart of this concentrated solution will treat 50 bushels of grain. Never apply the solution at a greater rate. If less grain is to be treated mix up less solution.

"TREATMENT.—Place the grain in a pile on a clean granary floor and spray on the solution with a small garden atomizer-sprayer. Shovel the grain over as spray is applied. Keep nozzle of sprayer fairly close to the grain to avoid the disagreeable fumes. Spray solution on evenly, otherwise the seed will be injured. Shovel the grain into a pile and cover for 4 or 5 hours. The grain is then ready to sow at once."

A field of Colorado No. 37 Oats at Fort Collins.

[6] Conners, I. L. Seed Treatment for Cereal Smuts. Circ. No. 56, Dominion Experimental Farms, Canada, 1927.

Table 3.—Oat Yields at Fort Collins for One or More Years from 1918 to 1927 Inclusive. Bushels per Acre

	Colo. No.	1918	1919	1920	1921	1922	19
Colorado No. 37	100	103.7±3.90	63.8±2.62	109.3±1.93	107.2±2.35	96.5±2.18	116.8±
Welcome	73	99.4±3.54	65.2±2.53	104.0±1.84	92.3±2.02	94.0±2.12	108.8±
Czar of Russia	86	97.2±3.65	63.5±2.46	107.1±1.90	101.2±2.22	83.6±1.89	97.3±
Silvermine	71	102.2±3.64	67.8±2.63	102.9±1.82	92.1±2.02	94.6±2.14	110.5±
Minnesota No. 26	79	98.0±3.68	63.6±2.47	105.4±1.87	93.5±2.05	83.3±1.88	94.6±
Swedish Victory F. C.	679	95.5±3.40	60.0±2.33	106.9±1.89	94.0±2.06	93.5±2.11	112.8±
Banner	96	98.4±3.70	66.8±2.59	103.1±1.82	96.3±2.11	109.1±2.47	107.7±
Big Four	69	96.5±3.63	69.0±2.68	102.2±1.81	99.7±2.18	88.0±1.99	116.5±
Olin's Choice	89	95.1±3.39	60.9±2.36	105.1±1.86	89.5±1.96	84.1±1.90	100.5±
Extrareichster	101	96.7±3.85	56.2±2.18	104.6±1.85	91.7±2.12	98.0±2.21	94.1±
Extrareichster	102	88.6±3.33	57.3±2.22	104.6±1.85	91.0±1.99	93.8±2.12	93.8±
White Russian	83	97.7±3.48	59.3±2.44	106.9±1.89	82.4±1.80	66.6±1.50	65.4±
Swedish Crown F. C.	680	87.4±3.29	66.0±2.56	111.3±1.97	99.1±2.17	104.3±2.36	108.3±
Garton's Regenerated	97	88.4±3.52	53.7±2.08	101.5±1.80	95.0±2.08	84.3±1.90	90.4±
Colorado No. 13	76	85.6±3.05	61.4±2.38	105.4±1.87	93.2±2.04	92.1±2.08	97.8±
Wisconsin No. 4	67	87.4±3.11	57.1±2.21	104.2±1.84	91.0±1.99	94.6±2.14	95.7±
Kherson		85.8±3.05	57.1±2.21	86.4±1.53	84.9±1.86	77.9±1.76	81.6±
Kherson (Akron)		79.6±2.99	57.3±2.22	87.3±1.54	86.3±1.89	77.3±1.75	90.3±
Gold Rain	240					100.1±2.26	122.8±
Great Dakota	74			98.6±1.74	111.3±2.43	96.0±2.17	108.0±
Idomine	256				104.3±2.42	97.2±2.20	118.5±
Gold Rain	252				83.2±1.82	106.2±2.40	111.0±
Kherson	316						108.3±
Kherson	317						108.0±
Swedish Select	253				74.5±1.63	89.4±2.02	106.6±
Victory	241					98.5±2.23	106.5±
Nebraska No. 21	257				71.1±1.56	83.0±1.88	99.8±
Albion	318						98.8±
Victory Side	315						84.9±
Gopher	321						
Iowar	322						
Abed Silver F. C.	1027						
Burt	310						90.7±
Kanota F. C.	1053						
Alaska F. C.	1056						
Liberty Hulless F. C.	1029						
Great Dakota F. C.	1062						119.4±
Great Dakota F. C.	1063						116.7±
White Kherson F. C.	1064						
Markton F. C.	1061						

Table 3.—Oat Yields at Fort Collins for One or More Years from 1918 to 1927 Inclusive. Bushels per Acre

	1924	1925	1926	1927	Years Grown	Total	Average	Percentage* of Colo. 37
olorado No. 37	79.8±2.71	83.1±2.45	123.5±2.33	95.7±1.97	10	979.4	97.9±0.90	100.00
elcome	87.6±2.98	75.2±2.22	103.4±1.95	96.3±1.98	10	926.2	92.6±0.84	94.57
ar of Russia	79.2±2.69	78.1±2.30	113.9±2.15	95.4±1.96	10	917.0	91.7±0.83	93.63
vermine	81.5±2.77	78.0±2.30	111.9±2.11	93.7±1.93	10	935.2	93.5±0.85	95.49
innesota No. 26	71.6±2.43	61.7±1.82	121.8±2.30		9	793.5	88.2±0.87	89.79
vedish Victory F. C.	89.2±3.03	68.5±2.02	127.3±2.41	95.8±1.97	10	943.5	94.4±0.86	96.33
nner	78.1±2.65	70.4±2.08	122.5±2.31	83.6±1.72	10	936.0	93.6±0.85	95.57
ig Four	82.2±2.79	77.7±2.29	119.0±2.25	91.4±1.88	10	942.2	94.2±0.86	96.20
lin's Choice	74.2±2.52	71.7±2.11	119.1±2.25		9	800.2	88.9±0.87	90.55
xtrareichster	75.0±2.55	66.1±1.95	115.3±2.18		9	797.7	88.6±0.89	90.27
xtrareichster					6	529.1	88.2±1.09	88.58
hite Russian	63.6±2.16	67.8±2.00	124.5±2.35		9	734.2	81.6±0.82	83.08
vedish Crown F. C.	89.7±3.05	67.4±1.99	122.1±2.31	99.7±2.05	10	955.3	95.5±0.87	97.54
arton's Regenerated					6	513.3	85.6±1.08	85.94
olorado No. 13	74.5±2.53	56.7±1.67	113.6±2.15		9	780.3	86.7±0.85	88.30
isconsin No. 4	72.4±2.46	76.7±2.26	112.2±2.12		9	791.3	87.9±0.86	89.54
herson					6	473.7	79.0±0.97	79.31
herson (Akron)	63.1±2.14	61.2±1.80	109.2±2.06	76.1±1.57	10	787.7	78.8±0.72	80.43
old Rain	81.3±2.76	72.6±2.14	124.5±2.35	101.5±2.09	6	602.8	100.5±1.15	101.24
reat Dakota	84.6±2.88	74.0±2.18	121.0±2.29	100.0±2.06	8	793.5	99.2±0.91	97.73
lomine	79.5±2.70	78.7±2.32	108.9±2.06	101.2±2.08	7	688.3	98.3±1.00	97.96
old Rain	87.5±2.97	69.0±2.04	121.6±2.30		6	578.5	96.4±1.10	95.32
herson	62.3±2.12	57.6±1.70	102.8±1.94	77.3±1.59	5	408.3	81.7±1.05	81.84
herson	64.5±2.19	61.7±1.82	101.4±1.92	80.4±1.66	5	416.0	83.2±1.07	83.38
wedish Select	79.9±2.72	68.1±2.01	110.8±2.09	88.6±1.82	7	617.9	88.3±0.90	87.94
ictory	76.7±2.61	73.5±2.17	122.1±2.31	95.2±1.96	6	572.5	95.4±1.09	96.15
ebraska No. 21	57.6±1.96	51.0±1.50	98.9±1.87		6	461.4	76.9±0.89	76.03
lbion	69.3±2.36	60.0±1.77	108.2±2.04		4	336.3	84.1±1.28	83.41
ictory Side	55.1±1.87				2	140.0	70.0±1.75	71.21
opher	67.9±2.31	75.7±2.23	119.3±2.25	88.0±1.81	4	350.9	87.7±1.16	91.83
owar	60.8±2.07	69.7±2.06	104.8±1.98		3	235.3	78.4±1.28	82.16
bed Silver F. C.	78.2±2.66	73.2±2.16	120.8±2.28	98.1±2.02	4	370.3	92.6±1.22	96.91
urt	52.0±1.77	62.7±1.85	112.2±2.12	89.7±1.85	5	407.3	81.5±1.05	81.64
anota F. C.		52.3±1.54	110.8±2.09	79.0±1.63	3	242.1	80.7±1.09	80.09
laska F. C.		64.8±1.91	102.9±1.94	100.5±2.07	3	268.2	89.4±1.21	88.72
iberty Hulless F. C.		57.1±1.68	89.5±1.69	81.5±1.68	3	228.1	76.0±1.03	75.45
reat Dakota F. C.	79.5±2.70	77.5±2.29	116.7±2.21	95.2±1.96	5	488.3	97.7±1.26	97.88
reat Dakota F. C.	87.5±2.97	80.6±2.38	115.1±2.17	100.0±2.06	5	499.9	100.0±1.29	100.20
White Kherson F. C.	58.8±2.00	57.2±1.69	101.8±1.92		3	217.8	72.6±1.18	76.05
arkton F. C.			124.7±2.36	93.5 –1.93	2	218.2	109.1±1.52	99.54

*Percentages based on totals.

EXPERIMENTAL RESULTS

VARIETY TEST, 1906 TO 1911

The oat variety tests from 1906 to 1911 were made on single one-tenth acre plats. The results of these tests are given in Table 2. Of the varieties grown for the entire 6-year period, Colorado No. 37 gave the highest yield. Great Dakota and Minnesota No. 26 both yielded well. While some of the other varieties grown for the entire 6-year period produced high yields, they did not equal Colorado No. 37. Banner, which was tested for 5 years, yielded well. None of the oats tested for a shorter period equaled Colorado No. 37. Many of them were dropped in the earlier years. The six highest-yielding varieties grown for a 5 or 6-year period were all of the white midseason class.

OAT VARIETY TESTS 1918 TO 1927

Table No. 3 gives the results of the oat variety tests at Fort Collins for a 10-year period, 1918 to 1927 inclusive. In 1918 new variety tests were started. Replicated plats were used instead of the earlier method of single one-tenth acre plats. At intervals between 1918 and 1927, new varieties were introduced and inferior varieties dropped. Of the 9 varieties grown for the 10-year period 1918 to 1927, Colorado No. 37 gave the highest yield.

Several other varieties tested for a shorter period of years show promise, but have not yielded high enough to recommend their replacing Colorado No. 37. None of the early oats yield high enough to recommend growing them under conditions similar to those at Fort Collins.

THE VARIETIES GROWN

Several different types of oats have been grown in the variety experiments at Fort Collins. The most important type has been of the midseason group. In addition, varieties of early oats, side or horse mane oats, and hulless or naked oats have been tested. At Fort Collins the midseason oats have yielded best and are recommended for sowing on irrigated land similar to that at the station.

MIDSEASON OATS

The following varieties classified as midseason oats have been tested at Fort Collins: Colorado No. 37, Welcome, Czar of Russia, Silvermine, Minnesota No. 26, Swedish Victory, Banner, Big Four, Olin's Choice, Extrareichter, Swedish Crown, Garton's Regenerated, Colorado No. 13, Wisconsin No. 4, Great Dakota, Swedish Select, Idomine, Victory, Abed Silver, Victory Side, Markton and Gold Rain.

EARLY OATS

The early oats which have been grown at Fort Collins are Kherson, Nebraska No. 21, Albion, Gopher, Iowar, Burt, Kanota, and Alaska. Of the early oats tested, Gopher gives the highest percentage yield, with Alaska second. Both of the oats, however, are intermediate forms between the midseason and early classes. Their yields, however, are only 91.83 and 88.72 percent of Colorado No. 37 grown in the same years.

SIDE OATS

Two varieties of side oats (Avena sativa orientalis) have been tested at the station, one for 9 years, and one for 2 years. Both varieties, however, have been dropped. White Russian, which has been tested for 9 years, yielded 83 percent of the yield of Colorado No. 37 for the same number of years. This variety is a little too late for Fort Collins conditions. It takes on the average about 10 days longer to mature than Colorado No. 37. Victory side is an oat similar to Storm King and yields poorly at Fort Collins. Besides, it has a very high percentage of hull. Its plump appearance suggests a large oat kernel. It has a hulling percentage of 33.60 as compared with only 25.59 percent for Colorado No. 37. It can clearly be seen that its feeding value would be much less than that of Colorado No. 37.

HULLESS OATS

One hulless oat has been tested at Fort Collins. This variety, Liberty Hulless, has yielded 75.45 percent of yield of Colorado No. 37 for a period of 3 years. While this oat may have some advantage as a feed for young stock, it does not yield sufficiently high to recommend its general use in place of Colorado No. 37 or several other of the hulled midseason oats.

HULLING PERCENTAGE

The percentages of hull of 16 varieties, including both early and midseason oats, are given in Table No. 4. The percentages of hull were obtained from 300 kernels[7] which were hulled and weighed. The percentage of hull is computed from the total weight of kernel including hull. The determinations were made on air-dry samples taken from oats stored in bins for at least 6 months. Table No. 4 shows that the lowest percentage of hull in oats grown at Fort Collins is found in the early oat varieties—Burt, Kherson and Kanota. There is, however, considerable seasonal variation even under irrigated conditions.

[7] Relation of Size of Sample to Kernel-Percentage Determinations in Oats, Garber, R. J. and Arny, A. C., Jour. Amer. Soc. Agronomy, Vol. 10, No. 3, March 1918.

These percentages should not be taken as a complete measure of the feeding value of oats. The degree of filling is undoubtedly an important factor in determining the percentage of hull. Of course some oats, like Victory side, will develop a higher percentage of hull under the same conditions that develops a thin hull on other varieties. Of the midseason oats, Swedish Select produces less hull than most other varieties. Colorado No. 37, Banner and Markton produce similar hulls.

AGRONOMIC DATA

Tables 5, 6 and 7 give the agronomic data for the varieties tested at Fort Collins for varying periods from 1920 to 1927. Table 5 gives the height of straw in inches. There is little variation in average height for the midseason varieties. The early varieties are usually about 10 inches shorter. There is considerable variation in the same variety in different years.

The number of days to mature is given in Table 6. This table shows that there are from 5 to 10 days difference in the maturity of the midseason and early oats. In the year 1927 the oats ripened exceedingly early. The fact that several of the early varieties were dropped from the test in 1927 makes the average number of days to

Table 4.—Hulling Percentage of Oats at Fort Collins 1922 to 1927.

	Years Grown									
	1922	1923	1924	1925	1926	1927	Total	Years taken	Average Percentage Hull	Compared to Colo. 37 as a standard of 100.
	Percentage of Hull									
Burt	21.30	22.44	25.54	24.40	24.71	23.87	142.26	6	23.71	92.66
Kherson 316	21.75	22.59	26.56	22.69	22.21	22.90	138.70	6	23.12	90.34
Nebraska 21	23.08	23.04	26.72	24.72			97.56	4	24.39	92.33
Gold Rain 240	22.74	22.95	28.55	22.13	24.68	23.04	144.09	6	24.02	93.85
Swedish Select	23.24	23.92	27.49	23.38	23.98	23.25	145.26	6	24.21	94.61
White Russian	24.62	25.80	26.38	23.21			100.01	4	25.00	94.65
Banner	24.59	24.20	29.48	23.94	24.46	23.78	150.45	6	25.08	97.99
Silvermine	24.76	25.17	29.29	24.97	25.69	24.66	154.54	6	25.76	100.66
Swedish Victory	24.82	25.08	30.34	25.44	26.42	26.21	158.31	6	26.39	103.11
Great Dakota No. 74	24.87	25.42	30.79	25.87	25.52	24.60	157.07	6	26.18	102.31
Colorado 37	24.03	26.57	31.00	24.06	24.61	23.26	153.53	6	25.59	100.00
Victory Side	35.85	31.01	33.93				100.79	3	33.60	123.52
Markton					23.43	23.65	47.08	2	23.54	98.35
Kanota					23.18	24.25	47.43	2	23.72	99.08
Great Dakota F. C. 1062					25.76			1	25.76	104.67
Great Dakota F. C. 1063					26.24			1	26.24	106.62

Table 5.—The Height of Straw of the Oat Varieties Grown at Fort Collins from 1920 to 1927.

Variety	Colo. No.	Years Grown 1920 Ht.	1921 Ht.	1922 Ht.	1923 Ht.	1924 Ht.	1925 Ht.	1926 Ht.	1927 Ht.	Aver. Years age Grown Ht.	
		in.	in.	in.	in.	in.	in.	in.	in.	1920-27	
Colorado No. 37	100	46	47	47	57	46	37	49	44	47	8
Welcome	73	48	47	48	58	47	39	48	43	47	8
Czar of Russia	86	47	47	48	57	46	39	50	42	47	8
Silvermine	71	46	47	48	59	46	37	50	42	47	8
Minnesota No. 26	79	47	49	48	59	46	39	50	....	48	7
Swedish Select (FC)	679	48	48	49	59	47	39	50	45	48	8
Banner	96	48	49	50	58	47	38	51	44	48	8
Big Four	69	45	46	47	58	47	38	50	42	47	8
Olin's Choice	89	46	47	48	57	47	39	51	....	48	7
Extrareichster	101	50	49	50	59	46	39	50	....	49	7
Extrareichster	102	50	50	50	58	....	....	....	....	52	4
White Russian	83	50	53	51	59	49	40	....	....	50	6
Swedish Crown (FC)	680	47	48	48	59	47	39	49	44	48	8
Garton's Regenerated	97	46	48	48	56	....	....	....	....	49	4
Colorado No. 13	76	46	47	48	56	45	38	49	....	47	7
Wisconsin No. 4	67	46	48	49	58	47	39	51	....	48	7
Kherson		36	39	37	44	....	....	....	....	39	4
Kherson (Akron)		34	38	38	44	37	32	40	37	38	8
Gold Rain	240	....	....	49	61	48	39	51	45	49	6
Great Dakota	74	44	47	48	58	47	39	50	43	47	8
Idomine	256	....	46	47	58	47	38	50	42	47	7
Gold Rain	252	....	50	48	61	48	39	51	....	50	6
Kherson	316	....	....	....	42	34	30	35	34	35	4
Kherson	317	....	....	....	43	37	32	38	37	37	4
Swedish Select	253	....	48	44	58	47	39	51	43	47	7
Victory	241	....	....	49	60	47	39	49	45	48	6
Nebraska No. 21	257	....	40	37	45	39	32	38	....	39	6
Albion	318	....	....	....	43	38	35	39	....	39	4
Victory Side	315	....	....	....	54	44	....	....	....	49	2
Gopher	321	....	....	....	....	39	34	41	37	38	4
Iowar	322	....	....	....	....	39	34	42	....	38	3
Abed Silver (FC)	1027	....	....	....	....	44	39	48	45	44	4
Burt	310	....	....	....	49	42	36	42	39	42	5
Kanota (FC)	1053	....	....	....	....	....	33	38	34	35	3
Alaska (FC)	1056	....	....	....	....	....	38	43	42	41	3
Liberty Hulless (FC)	1029	....	....	....	....	....	38	45	43	42	3
Great Dakota (FC)	1062	....	....	....	59	47	38	50	43	47	5
Great Dakota (FC)	1063	....	....	....	59	47	37	50	43	47	5
White Kherson (FC)	1064	....	....	....	....	39	33	38	....	37	3
Markton (FC)	1061	....	....	....	....	....	....	47	42	45	2

mature of these varieties greater than for varieties tested last year.

The strength of straw is given in Table 7. This table shows that Colorado No. 37, the highest-yielding variety for a 10-year period, has a stiff straw under Colorado conditions. No variety grown in the test for the entire 7-year period, with the exception of Swedish Select, has a very weak straw. There is some variation in some of the varieties, but the weaker ones have been eliminated.

Table No. 6.—Number of Days to Mature for Oat Varieties at Fort Collins from 1921 to 1927.

Variety	Colo. No.	Years Grown 1921	1922	1923	1924	1925	1926	1927	Years Grown	Average No. Days to Maturity
Colorado No. 37	100	125	123	115	110	130	104	83	7	113
Welcome	73	123	119	115	108	129	102	83	7	111
Czar of Russia	86	123	121	115	107	127	102	83	7	111
Silvermine	71	122	119	115	108	127	102	83	7	111
Minnesota No. 26	79	125	124	115	110	130	103	....	6	118
Swedish Victory (FC)	679	126	124	115	110	132	105	84	7	114
Banner	96	126	126	115	111	132	105	83	7	114
Big Four	69	124	120	115	108	127	102	83	7	111
Olin's Choice	89	123	121	115	109	127	103	....	6	116
Extrareichster	101	126	125	115	111	133	105	....	6	119
Extrareichster	102	126	125	115	.....	.....	.....	....	3	122
White Russian	83	.....	134	124	125	136	107	....	5	125
Swedish Crown (FC)	680	126	123	115	111	132	105	83	7	114
Garton's Regenerated	97	123	120	115	.....	.....	.....	....	3	119
Colorado No. 13	76	126	124	115	111	132	105	....	6	119
Wisconsin No. 4	67	123	119	115	109	127	103	....	6	116
Kherson		119	115	107	.....	.....	.....	....	3	114
Kherson (Akron)		119	115	107	103	116	97	74	7	104
Gold Rain	240	.....	122	115	108	129	103	83	6	110
Great Dakota	74	122	119	115	108	124	102	82	7	110
Idomine	256	122	119	115	107	127	102	82	7	111
Gold Rain	252	101	123	115	110	129	103	....	6	113
Kherson	316	.....	.....	107	103	114	95	73	5	98
Kherson	317	.....	.....	107	102	117	95	73	5	99
Swedish Select	253	100	127	115	108	128	103	83	7	109
Victory	241	.....	125	115	111	132	104	84	6	112
Nebraska No. 21	257	119	115	107	104	116	95	....	6	109
Albion	318	.....	.....	107	103	113	95	....	4	104
Victory Side	315	.....	.....	116	108	.....	.....	....	2	112
Gopher	321	.....	.....	.....	106	118	97	76	4	99
Iowar	322	.....	.....	.....	105	117	97	....	3	106
Abed Silver (FC)	1027	.....	.....	.....	112	134	105	87	4	109
Burt	310	.....	.....	110	103	116	95	73	5	99
Kanota (FC)	1053	.....	.....	.....	.....	129	97	73	3	100
Alaska (FC)	1056	.....	.....	.....	.....	113	99	73	3	95
Liberty Hulless (FC)	1029	.....	.....	.....	.....	116	96	73	3	95
Great Dakota (FC)	1062	.....	.....	115	107	127	102	82	5	107
Great Dakota (FC)	1063	.....	.....	115	108	127	102	82	5	107
White Kherson (FC)	1064	.....	.....	.....	103	116	95	....	3	105
Markton (FC)	1061	.....	.....	.....	.....	.....	104	82	2	93

SUMMARY OF OAT VARIETY TESTS AT FORT COLLINS

Many varieties have been tested for various lengths of time from 1918 to 1927. Of the varieties tested, the midseason types of oats are best adapted for conditions similar to those surrounding Fort Collins.

Colorado No. 37, a selection made by the experiment station, is

Table 7.—Strength of Straw of the Oat Varieties Grown at Fort Collins from 1921 to 1927.

Variety	Colo. No.	1921	1922	1923	1924	1925	1926	1927
Colorado No. 37	100	Medium	Stiff	Stiff	Stiff	Stiff	Medium	Stiff
Welcome	73	Medium	Stiff	Medium	Stiff	Stiff	Stiff	Medium
Czar of Russia	86	Weak	Stiff	Stiff	Stiff	Stiff	Stiff	Medium
Silvermine	71	Medium	Stiff	Stiff	Stiff	Stiff	Medium	Medium
Minnesota 26	79	Stiff	Stiff	Stiff	Stiff	Stiff	Medium	.....
Swedish Victory (FC)	679	Medium	Stiff	Stiff	Stiff	Stiff	Medium	Stiff
Banner	96	Medium	Stiff	Stiff	Stiff	Stiff	Medium	Stiff
Big Four	69	Weak	Stiff	Stiff	Stiff	Stiff	Medium	Stiff
Olin's Choice	89	Weak	Stiff	Weak	Stiff	Stiff	Medium	.....
Extrareichster	101	Weak	Stiff	Weak	Stiff	Stiff	Medium	.....
Extrareichster	102	Weak	Stiff	Medium	.....	.....	.....	.....
White Russian	83	Weak	Stiff	Stiff	Stiff	Stiff	Stiff	.....
Swedish Crown (FC)	680	Medium	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff
Garton's Regenerated	97	Medium	Stiff	Medium	.....	.....	.....	.....
Colorado 13	76	Weak	Stiff	Weak	Stiff	Stiff	Medium	.....
Wisconsin 4	67	Weak	Stiff	Weak	Stiff	Stiff	Medium	.....
Kherson		Medium	Stiff	Weak	.....	.....	.....	.....
Kherson (Akron)		Stiff	Stiff	Stiff	Stiff	Stiff	Stiff	Weak
Gold Rain	240	.....	Stiff	Stiff	Stiff	Stiff	Medium	Stiff
Great Dakota	74	Medium	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff
Idomine	256	Medium	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff
Gold Rain	252	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff	.....
Kherson	316	.....	.....	Medium	Stiff	Stiff	Stiff	Stiff
Kherson	317	.....	.....	Stiff	Stiff	Stiff	Stiff	Stiff
Swedish Select	253	Medium	Stiff	Stiff	Stiff	Stiff	Medium	Medium
Victory	241	.....	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff
Nebraska 21	257	Stiff	Stiff	Stiff	Stiff	Stiff	Stiff	.....
Albion	318	.....	.....	Stiff	Stiff	Stiff	Stiff	.....
Victory Side	315	.....	.....	Stiff	Stiff	.....	.....	.....
Gopher	321	.....	.....	.....	Stiff	Stiff	Stiff	Medium
Iowar	322	.....	.....	.....	Stiff	Stiff	Stiff	.....
Abed Silver (FC)	1027	.....	.....	.....	Stiff	Stiff	Stiff	Stiff
Burt	310	.....	.....	Stiff	Stiff	Stiff	Stiff	Weak
Kanota (FC)	1053	.....	.....	.....	.....	Stiff	Stiff	Stiff
Alaska (FC)	1056	.....	.....	.....	.....	Stiff	Stiff	Stiff
Liberty Hulless (FC)	1029	.....	.....	.....	.....	Stiff	Stiff	Stiff
Great Dakota (FC)	1062	.....	.....	Stiff	Stiff	Stiff	Stiff	Stiff
Great Dakota (FC)	1063	.....	.....	Stiff	Stiff	Stiff	Stiff	Stiff
White Kherson (FC)	1064	.....	.....	.....	Stiff	Stiff	Stiff	.....
Markton (FC)	1061	.....	.....	.....	.....	.....	Stiff	Medium

the highest-yielding oat tested for the entire 10-year period. Some promising varieties of oats are under test. But none of these are sufficiently good to replace Colorado No. 37.

The early oats of the Kherson and Kanota types are not as well adapted to conditions similar to those found at Fort Collins as the midseason type. Hulless oats have not yielded sufficiently high to recommend their being grown. Hulling-percentage tests have shown that Burt, Kherson and Kanota oats, when grown under irrigation, have a high percentage of kernel. They do not yield enough to justify their growth. Victory side (Storm King) has a high percentage of hull and gives a low yield.

EXPERIMENTS AT FORT LEWIS[8]

The Fort Lewis farm is located in the San Juan Basin in the southwestern part of the state. The farm is conducted in cooperation with the Fort Lewis School of Agriculture at Hesperus. The school lands are about 5 miles south of Hesperus. The experimental farm occupies bench land of the La Plata River. The land slopes to the southeast toward the river. The soil is a dark loam underlaid by gravel at a depth of 2 to 15 feet below the surface. The slope of the land is rather steep, which causes some difficulty in irrigation. Small heads of water must be used. The furrow method of irrigation is necessary for both grain and rowed crops.

Field of Colorado No. 37 Oats.

[8]The tests at Fort Lewis were made by L. H. Quinlan in 1921, Harrison D. Horton in 1922 and 1923, and by Dwight Koonce in 1924, 1925, 1926 and 1927.

CLIMATIC CONDITIONS

The season opens late in the spring due to the higher altitude and the fact that a heavy covering of snow usually falls in the winter. The normal frost-free period is between 90 and 100 days. Table 8 gives the dates of the last killing frost in the spring, the first killing frost in the fall, and the frost-free period for the years 1923 to 1927 inclusive.

Table 8.—Dates of the Last Killing Frost in the Spring, the First Killing Frost in the Fall and the length of the Frost-Free Period for the Years 1923 to 1927 Inclusive:

	Date of Last Killing Frost	Date of First Killing Frost	Frost-Free Period
1923	6/20	9/19	91
1924	6/19	9/12	85
1925	6/12	9/14	94
1926	5/14	9/29	136
1927	6/3	9/28	117

PRECIPITATION

The precipitation is well distributed thruout the year, see Table 9. During the growing season, April to July, the rainfall, however, was low in 1922, 1923 and 1924. Under normal conditions there is sufficient moisture stored in the soil with the addition of a normal rainfall to carry spring grain crops to the time irrigation water is available.

Table 9.—Precipitation at Fort Lewis from 1921 to 1927, inclusive.

Month	1921	1922	1923	1924	1925	1926	1927
January	.11	1.07	1.32	.34	.14	.40	.15
February	.13	1.31	.65	.43	T	.39	4.29
March	1.36	1.38	.79	4.77	1.13	.54	1.31
April	.60	.52	.85	2.00	.41	3.58	.53
May	.64	.80	.63	.15	.76	2.87	.60
June	.45	.30	.14	.00	2.05	.14	3.05
July	3.07	.88	2.09	1.85	3.87	2.14	1.85
August	3.38	.92	5.44	.52	3.22	.76	3.31
September	.28	.54	1.85	1.38	3.44	2.17	6.26
October	1.08	.21	.38	1.13	2.95	.85	2.06
November	.27	2.65	.38	.05	.32	.60	1.15
December	1.74	1.68	1.85	1.79	1.03	1.54	1.60
Total	13.11	12.35	16.37	14.41	19.32	15.98	26.16
April to July Inc.	4.76	2.59	3.71	4.00	7.09	8.73	6.03

EXPERIMENTAL RESULTS

Variety tests with oats have been conducted at the Fort Lewis Station for the 7-year period, 1921 to 1927, inclusive. The results

of these tests are tabulated in Table 10. The midseason type of oats has yielded best under irrigated conditions at this altitude. Colorado No. 37 and Great Dakota, a white oat with a slightly weaker straw than Colorado No. 37, have given average yields of 94.5 and 99.5 bushels respectively. The Great Dakota oat has slightly outyielded Colorado No. 37. Swedish Select, another midseason oat has yielded about the same as Colorado No. 37. Gold Rain, a yellow oat, has also given a high yield.

The early oats which have been tested for 5 years or longer have not yielded so well as the midseason oats at Ft. Lewis. They have a shorter straw and mature about 8 to 10 days earlier. This advantage however, will not offset the high yield of the midseason oats when the frost-free period is long enough to permit them to mature.

EXPERIMENTS AT AKRON ON DRYLAND[9]

BY F. A. COFFMAN, J. F. BRANDON AND D. W. ROBERTSON[10]

Oats do not rank with wheat or corn in importance under dryland conditions in Colorado. In favorable years excellent yields have been secured, but often several years elapse between seasons favorable for oat production. As a result the yield often is relatively low.

Investigations with oats were conducted at the U. S. Dry Land Field Station, Akron, Colorado, during the 20-year period, 1908 to 1927 inclusive.

The present publication presents only the result of the varietal and cultural experiments with oats and has been prepared to bring information up to date and place it in a form comparable with that from similar experiments conducted under irrigated conditions, making the data from both conditions more readily available to farmers and others of the state.

9 The Akron Field Station, Akron, Colorado is operated by the Office of Dry Land Agriculture Investigations of the U. S. D. A., with the Colorado Agricultural College cooperating. The cereal experiments were conducted by the office of Cereal Crops and Diseases in cooperation with the office named, from 1907, until 1924, when they were discontinued at the end of the crop season. The experiments were started in 1907. Wilson G. Shelly was in charge from March 1, 1908 until February 28, 1911; Clyde McKee from that date until February 15, 1913; Charles H. Clark from about February 15, until July 1, 1913; George A. McMurdo from July 1, 1913 until February 1917; F. A. Coffman from July 1917 until the work was discontinued at the close of the crop season of 1924; J. F. Brandon, Supt. of the U. S. Dry Land Field Station and D. W. Robertson, Associate Agronomist at the Colorado Experiment Station have carried the work since August, 1924.

10 Associate Agronomist, formerly in charge of experiments of the Office of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture at the Dry Land Field Station, Akron, Colorado. Associate Agronomist, superintendent of the Dry Land Field Station, Akron, Colorado. Associate Agronomist, Colorado Experiment Station, Fort Collins, Colorado.

Table 10.—Oat Yields at Fort Lewis Sub-Station 1921 to 1927, Inc.
Average yields in bushels per acre.

	1921*	1922	1923	1924	1925	1926	1927	Total	Ave.	Years Grown	Percent of Colo. 37
Swedish Select	101.0±3.66	88.4±3.04	69.4±1.83	69.6±2.95	123.3±5.90	81.4±2.63	129.7±3.24	662.8	94.7±1.28	7	100.21
Great Dakota	114.9±4.17	82.0±2.82	66.3±1.74	72.2±3.06	129.1±6.18	91.2±2.95	140.5±3.51	696.2	99.5±1.34	7	105.29
Gold Rain		75.0±2.58	68.3±1.80	61.9±2.62	116.8±5.59	89.3±2.88		411.3	82.3±1.38	5	101.55
White Kherson		76.3±2.62	56.7±1.49	69.4±2.94	116.8±5.59	73.1±2.36	125.3±3.13	517.6	86.3±1.26	6	95.68
Nebraska 21	103.1±3.74	67.5±2.32	55.4±1.46	60.6±2.57	110.3±5.28	78.3±2.54	128.4±3.21	603.6	86.2±1.16	7	91.23
Colo. 37	120.6±4.37	72.2±2.48	56.2±1.48	68.1±2.89	120.8±5.79	87.9±2.84	135.9±3.40	661.7	94.5±1.28	7	100.00
Victory		64.7±2.23	48.5±1.28	69.1±2.93	124.7±5.97	89.2±2.88	137.2±3.43	533.4	88.9±1.29	6	98.56
Swedish Victory	91.7±3.32	69.6±2.39	61.6±1.62	57.0±2.42	105.2±5.04	53.4±1.72	129.2±3.23	567.7	81.1±1.10	7	85.82
Markton						92.4±2.98	126.7±3.17	219.1	109.6±2.24	2	97.94
Great Dakota FC 1063							127.5±3.19		127.5±3.19	1	93.82
Kanota							93.0±2.32		93.0±2.32	1	68.43
Kherson 317							128.2±3.21		128.2±3.21	1	94.33
Gopher							139.9±3.50		139.9±3.50	1	102.94
Gold Rain							124.2±3.11		124.2±3.11	1	91.39

*Plats replicated 4 times in 1921. Plats replication 10 times in 1922 to 1927, inc.

Experimental Oats at Akron.

A number of publications presenting data obtained in the oat experiments at Akron are available for those interested in a more complete account of the results.[11]

The Akron Field Station is located about 4 and one-half miles from Akron, the county seat of Washington county. The station, containing some 382 acres, is located 112 miles northeast of Denver on the main line of the Chicago, Burlington and Quincy Railroad. The topography of the station is slightly rolling. The soil is a naturally fertile, sandy loam known locally as "hard land." The soil of this section is variable in texture but comparatively free from coarse gravel.

CLIMATE AND PRECIPITATION

The climatic conditions at Akron are similar to those of the rest of the eastern part of Colorado. The amount and distribution of the

11 McMurdo, George A. Cereal experiments at the Akron Field Station, Akron, Colorado U. S. Dept. Agr. Bul. 402, 34 p. 11 fig. 1916.

Warburton, C. W., and Stanton, T. R. Experiments with Kherson and Sixty-Day Oats. U. S. Dept. Agri. Bul. 823, 72 p., 15 fig. 1920.

Coffman, F. A., and K. S. Quisenberry. A multiflorous variation in Burt oats. In Jour. Hered. v. XIV, No. 4, 8 p., 5 fig. July, 1923.

Stanton, T. R., and Coffman, F. A. Natural crossing in oats at Akron, Colorado. In Jour. Amer. Soc. Agron. vol. 16, No. 10, 1924.

Coffman, Franklin A., John H. Parker, and K. S. Quisenberry. A Study of Variability in the Burt Oat. In Jour. Agr. Res. Vol. 30, No. 1, 1925.

Coffman, Franklin A. Experiments with cereals at the Akron Field Station in Colorado. U. S. Dept. Agr. Bul. 1287.

Coffman, Franklin A., and T. R. Stanton. Variability in Kherson oats. Jour. Agr. Res. Vol. 30, No. 11, 1925.

Stanton, T. R., Coffman, F. A., and Wiebe, G. A. Fatuoid or false wild forms in Fulghum and other oat Varieties. In Jour. Heredity. Vol. XVII, No. 5 and No. 6, 1926.

Table 11.—Monthly, Annual, Average Monthly and Average Annual Precipitation at U. S. Dry Land Field Station During the 20-Year Period, 1908 to 1927, Incl.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1908	O	0.34	T	1.70	3.30	2.37	2.42	1.47	0.05	3.20	2.00	T	16.85
1909	T	1.38	3.06	.40	1.87	3.32	4.61	3.77	2.16	0.86	.48	0.55	22.46
1910	.05	.16	.26	3.96	2.06	1.38	1.47	3.72	3.81	.05	.12	.32	17.36
1911	.60	.44	.06	2.63	1.15	1.48	1.34	1.30	2.40	1.47	.28	1.36	14.51
1912	.28	1.43	.78	2.49	2.86	3.39	3.58	1.58	1.88	1.99	.18	.29	20.73
1913	.22	.40	1.57	2.19	1.44	1.35	1.85	1.14	2.08	.34	.70	3.27	16.55
1914	.03	.32	.20	4.01	1.46	3.54	1.66	1.05	.23	2.08	.10	.90	15.58
1915	1.10	1.68	1.50	5.19	4.13	3.75	1.10	3.51	1.76	.48	.15	.65	25.00
1916	.50	T	.09	1.59	2.24	2.09	1.77	2.82	.26	1.02	.75	.61	13.74
1917	.28	.63	.72	.96	7.79	.56	1.52	1.78	2.19	.57	T	.50	17.50
1918	.70	.80	.60	1.20	1.76	.96	3.10	7.36	2.43	1.07	.75	1.55	22.28
1919	.07	.50	.65	1.96	1.59	2.27	1.79	.44	2.62	1.64	1.29	.70	15.52
1920	T	.02	.90	3.28	2.90	3.97	4.72	1.45	1.80	.44	.47	.90	20.85
1921	1.22	T	1.25	2.77	.47	1.32	2.88	.90	.79	.97	.20	.65	13.44
1922	.65	.25	.15	3.96	3.63	1.43	3.24	1.24	.06	.05	1.90	.10	16.66
1923	T	.18	.95	1.65	4.94	2.17	3.62	.75	.82	1.91	.47	.70	18.16
1924	.50	.59	1.25	.31	3.26	.35	1.71	.77	4.04	.40	.13	.77	14.08
1925	.05	T	.39	2.24	1.19	2.90	1.08	1.01	.50	1.46	.47	.53	11.82
1926	.41	.05	.36	.18	3.77	1.42	6.46	5.07	.72	1.03	.41	.28	20.16
1927	.17	.29	2.41	2.27	1.46	5.16	3.00	3.74	.90	.14	.64	.22	20.40
Average	.34	.47	.86	2.25	2.66	2.26	2.65	2.24	1.58	1.06	.57	.74	17.68

precipitation usually is the limiting factor in crop production, altho injury from low temperatures and by hail sometimes causes crop losses. Tables 11 and 12 present seasonal and annual climatic data at Akron Station for the 20-year period 1908 to 1927 inclusive. The evaporation records kept each year from April 1 to September 30 inclusive, show that the average seasonal evaporation from a free water surface is about 43 inches, or more than three times the precipitation for the same months. The average annual wind velocity is between 6 and 7 miles an hour. The highest monthly velocities generally occur in March, April and May, while July and August are generally months of comparative quiet. High wind velocities during the early spring months sometimes result in serious crop losses from soil blowing. Hot winds are almost unknown at Akron. The nights are almost always cool. Winter temperatures are low, but not so low as in sections farther north. Summer temperatures are usually not so high as in districts farther east and south.

Table 12.—Annual and Average Precipitation, Evaporation, Ratio of Evaporation to Rainfall, Date of Last Spring and First Fall Frosts, and the Length of the Frost-Free Period at the Akron, Colorado Field Station from 1908 to 1927, Inclusive.

Year	Seasonal (Apr.-Sept. Incl.)		Ratio Prec. to Evap.	Frost Date		Days in frost-free period
	Precipitation	Evaporation		Last Spring	First Autumn	
1908	11.31	44.936	1:3.97	May 7	Sept. 25	141
1909	16.13	42.353	1:2.63	May 16	Oct. 3§	140
1910	16.40	43.621	1:2.66	May 16§§	Sept. 25	132
1911	10.30	48.818	1:4.74	May 10	Oct. 7§	150
1912	15.78	37.696	1:2.39	May 13	Sept. 20	130
1913	10.05	42.960	1:4.27	May 3	Sept. 19	139
1914	11.95	41.863	1:3.50	May 12	Sept. 13	124
1915	19.44	33.550	1:1.73	May 20	Oct. 4	137
1916	10.77	47.166	1:4.38	May 16	Sept. 14	121
1917	14.80	42.709	1:2.89	May 11	Oct. 8	150
1918	16.81	41.422	1:2.46	May 11	Oct. 23	165
1919	10.67	47.232	1:4.43	June 4	Oct. 4	122
1920	18.12	40.912	1:2.26	May 15	Sept. 29	137
1921	9.15	45.903	1:5.02	May 7	Oct. 1	147
1922	13.55	44.579	1:3.29	Apr. 28	Oct. 7	162
1923	13.95	41.429	1:2.97	May 15	Sept. 28	136
1924	10.44	47.872	1:4.58	May 14	Oct. 13§§§	152
1925	8.92	47.290	1:5.30	Apr. 30	Oct. 8	161
1926	17.62	44.366	1:2.52	Apr. 25	Sept. 24	152
1927	16.53	40.429	1:2.44	May 10	Sept. 26	139
Average	13.63	43.355	1:3.42	May 11	Sept. 29	142

§ First frost occurred after this date when record ended.

§§ Temperature of 32° F. recorded June 9, but probably no frost.

§§§ Temperature of 31° F. recorded Sept. 21, only killing the more tender vegetation.

EXPERIMENTAL METHODS

SOIL PREPARATION.—The earlier oat experiments at Akron were conducted almost entirely on summer fallow. Beginning with the 1917 crop, the varietal experiments with oats were sown in quadruplicate plats, two on fallow and two on cornland. Data on each variety thus were obtained on two soil preparations each season. No definite system was followed in fallowing. Generally the stubble of the previous season's crop remained undisturbed over winter. In the spring the soil usually was plowed to a depth of 5 to 7 inches. In a few seasons the plowing was omitted and the soil double disked. The fallow was kept free from weeds by the use of disk or spring-tooth harrow or a duck-foot cultivator. The usual system practiced in preparing the fallow for seeding oats was to disk it before seeding time and to smooth the surface with a spike-tooth harrow.

Preparation of cornland for oats varied slightly in different years. The usual procedure was to allow the small-grain stubble of the previous season to remain undisturbed until the following spring when the ground was double disked. About the middle of May corn was listed on the entire area, the rows running across the plats later to be sown to oats. During the summer the land was cultivated several times to keep down weed growth and prevent the soil from baking. The corn was husked and the stalks allowed to stand until early spring, when they were disked into the ground.

SIZE AND REPLICATION OF PLATS.—Previous to 1917 the plats were not of a standard size. Early in the station's history all varieties were grown on single tenth-acre plats 8 rods long by 2 rods wide, separated by alleys 4 or 5 feet in width. Check plats usually were included at regular intervals in these earlier experiments. In later years replication was practiced. This increased the number of plats and necessitated a reduction in size. Starting in 1917, 4 systematically distributed plats were sown to each variety of oats included in the regular plat experiments. The plats used during later years were 8 rods long and 6 feet wide, separated by alleys 16 inches in width. Plats of these dimensions contain one fifty-fifth of an acre. But, as the plants in them draw considerably on the moisture and plant food in the alleys, it seems fair to consider them as fiftieth-acre plats in computing yields, altho their actual area is slightly less. The sowing of 4 plats at some distance from each other tends to reduce experimental error resulting from soil variation; consequently, the use of check plats was discontinued. With less important varieties, sometimes 2 plats only were sown, one on each soil preparation.

RATES AND DATES OF SEEDING.—From rate-of-seeding experiments conducted at Akron it appears that the best rate of seeding for oats

is more than 4 pecks per acre. During the past few years the oat varieties were seeded at the rate of 5 pecks per acre.

Conditions in Eastern Colorado generally are favorable for oat seeding about the latter part of March. The climate records at Akron Field Station show that any delay in the seeding of the crop after early April is not advisable, as the chances against favorable weather for seeding increase very rapidly as April advances.

EXPERIMENTAL RESULTS

VARIETAL EXPERIMENTS.—The yields of oats at Akron usually have been less in pounds per acre than the yields of barley. Drought sometimes prevents heading of oats in which case the crop may be cut for hay. The annual and average yields of all the varieties grown at Akron are presented in Table 13, except those of 8 varieties grown only 1 or 2 years between 1908 and 1915, yields of which have been published previously.[12]

Most of the varieties included in the experiments at Akron are early maturing, altho several different types have been grown. Good yields were obtained from the early maturing oat varieties in 1908, 1909, 1910, 1912, 1914, 1915, 1920, 1923 and 1927. Fair yields were produced in 1913, 1921 and 1922. Poor yields or failures resulted in the other 7 years. The midseason and late varieties were somewhat favored by late rains and produced higher yields than the early varieties in 1909, 1911, 1913 and 1920. When seasonal rainfall was low the early maturing oat varieties usually outyielded the later-maturing ones. White Tartar (White Russian), a late-maturing side oat variety, generally produced the lowest yield. With the exception of 1914, 1915 and 1920, this variety produced poor yields or failed entirely. In no year did it outyield the best varieties of the other types.

Kherson, used as the standard for comparison in these experiments, produced an average acre yield of 30.2 bushels during the 20-year period. The average date of maturity of Kherson was July 17, the average height about 28 inches, the average bushel weight 31 pounds, and the average acre yield of straw 1,423 pounds. Oat straw usually is very good feed for livestock and the yield of straw is worthy of consideration.

The only midseason variety grown in all years, Swedish Select, gave an average acre yield of 6.7 bushels less than Kherson. In the 16-year period 1908 to 1923 inclusive, it headed and matured on the average from 10 to 12 days later than Kherson and averaged about 3 inches taller. The weight per bushel of Swedish Select averaged 33

12 McMurdo, George A. Cereal experiments at the Akron Field Station, Akron, Colorado. U. S. Dept. Agr. Bul. 402, 34 p., 11 fig. 1916.

Table 13.—Annual and Average Yields of Oat Varieties Grown at the Akron Field Station During the 16-Year Period.

Group and Variety	C. I. No.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
Early yellow or white:																
Albion (Iowa No. 103)	729	–	–	–	–	–	–	–	–	8.6	24.0	8.2	12.3	31.4	24.6	23.8
Albion (Sel. 2-2-18)	729	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Albion (Sel. 6-3-18)	729	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Aurora	831	–	–	–	–	–	–	–	–	–	–	–	–	–	30.2	27.1
Burt x Sixty-Day	727	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Early Champion	553	41.8	25.0	21.9	–	–	–	–	–	–	–	–	–	–	–	–
Ferguson Naverro	996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Kherson (Check)	459	52.8	33.1	34.6	12.4	38.5	36.1	66.9	85.0	16.8	14.7	6.1	11.2	39.2	24.7	25.7
Nebr. No. 21	841	–	–	–	–	–	–	–	–	–	–	–	14.1	40.9	27.4	21.5
Kherson (Sel. No. 6-2-18)	459	–	–	–	–	–	–	–	–	–	–	–	–	–	–	24.4
Kherson (Sel. No. 8-1-18)	459	–	–	–	–	–	–	–	–	–	–	–	–	–	–	22.9
Peru	170	–	–	–	2.0	34.5	20.6	50.5	78.0	–	–	–	–	–	–	–
Richland (Iowa No. 105)	787	–	–	–	–	–	–	–	–	12.5	–	–	–	–	–	–
Sixty Day	165	42.9	37.2	34.8	3.3	38.0	28.3	65.0	82.6	12.5	14.9	6.3	11.9	–	–	–
Sixty Day (Sel. No. 4 P 2)	788	–	–	32.0	4.2	40.0	26.2	61.2	74.2	9.3	–	–	–	–	–	–
Early Red:																
Brunker	2054	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fulghum	708	–	–	–	–	–	–	–	–	–	–	–	–	–	27.0	30.5
Kanota	839	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Burt Sel. 7-5020-44																
Burt Sel. 7-5020-49																
Early Black:																
Black American	549	–	–	–	–	–	35.6	60.0	–	–	–	–	17.6	52.5	20.8	12.5
Colburt (Burt Sel.)	2019	–	–	–	–	48.2	36.8	63.1	82.6	11.7	13.9	5.8	9.4	32.0	30.5	28.2
Midseason yellow or white:																
Canadian	444	19.2	53.1	29.4	–	–	–	–	–	–	–	–	–	–	–	–
Colorado No. 37	619	36.8	55.6	29.9	32.5	30.9	32.5	53.7	79.2	7.4	7.9	4.8	4.8	44.4	15.6	5.6
Golden Rain	493	–	–	–	–	–	–	–	–	5.1	7.6	5.3	3.3	53.0	16.7	7.0
Lincoln	738	–	–	–	–	–	41.2	61.2	67.8	9.4	9.4	5.7	5.9	–	–	–
Swedish Select	134	62.5	50.7	29.4	22.3	30.2	27.5	48.7	69.4	10.5	9.2	2.7	4.3	47.9	15.9	9.5
Late White: (Side)																
White Tartar (White Russian)	300	19.7	–	–	–	23.4	23.7	43.1	65.0	0.7	4.1	3.4	2.1	37.1	9.4	3.0

Table 13.—Annual and Average Yields of Oat Varieties Grown at the Ak ron Field Station During the 16-Year Period.

Group and Variety	C. I. No.	1923	1924	1925	1926	1927	Total	Years Grown	Average	1908 to 1927	1912 to 1927	1916 to 1927	Comparison with Kherson Kherson Bu.	Comparison with Kherson in per-cent	Difference from Kherson in per-cent
Early yellow or white:															
Albion (Iowa No. 103)	729	36.3*	10.2	12.5	3.8	46.0	242.1	12	20.2			20.2	20.3	99.5	-0.5
Albion (Sel. 2-2-18)	729	38.3	8.3				46.6	2	23.3				20.7	112.6	+12.6
Albion (Sel. 6-3-18)	729	34.2					34.2	1	34.2				34.8	98.3	-1.7
Aurora	831	–					57.4	2	28.7				25.2	113.9	+13.9
Burt x Sixty-Day	727	46.3	11.2	16.9	3.0	44.0	121.4	5	24.3				21.0	115.7	+15.7
Early Champion	553	–					88.8	3	29.6				40.1	73.6	-26.4
Ferguson Naverro	996	30.0					30.0	1	30.0				34.8	86.2	-13.8
Kherson (Check)	459	34.8	6.6	11.4	5.5	46.8	603.1	20	30.2	30.2	29.4	20.3	30.2	100.0	
Nebr. No. 21	841	–					104.0	4	26.0				25.2	96.9	-3.1
Kherson (Sel. No. 6-2-18)	459	30.3					54.8	2	27.4				30.3	90.4	-9.6
Kherson (Sel. No. 8-1-18)	459	30.0	5.5				58.5	3	19.5				22.4	87.1	-12.9
Peru	170	–					185.5	5	37.1				47.8	77.6	-22.4
Richlan (Iowa No. 105)	787	–					12.5	1	12.5				16.8	74.4	-25.6
Sixty Day	165	–					378.0	12	31.5				34.0	92.6	-7.4
Sixty Day (Sel. No. 4 P 2)	788	–					247.1	7	35.3				41.5	85.1	-14.9
Early Red:															
Brunker	2054	45.0	13.1	15.7	3.2	51.6	128.6	5	25.7				21.0	122.4	+22.4
Fulghum	708	40.9	7.6	13.3	2.2	50.1	171.6	7	24.5				22.2	110.4	+10.4
Kanota	839	40.5	8.6	15.7	2.7	48.7	116.2	5	23.2				21.0	110.5	+10.5
Burt Sel. 7-5020-44			6.7	14.1	2.2	51.8	74.8	4	18.7				17.6	106.3	+6.3
Burt Sel. 7-5020-49			8.5	13.7	2.9	49.6	74.7	4	18.7				17.6	106.3	+6.3
Early Black:															
Black American	549	–					199.2	6	33.2				34.0	97.6	-2.4
Colburt (Burt Sel.)	2019	42.4	7.2	14.1	1.8	46.7	474.2	16	29.6		29.6	20.3	29.4	100.7	+0.7
Midseason yellow or white:															
Canadian	444	–					101.7	3	33.9				40.2	84.3	-15.7
Colorado No. 37	619	–		7.5	2.4	20.6	471.5	18	26.2				31.2	84.0	-16.0
Golden Rain	493	–		4.4	1.6	17.6	121.6	10	12.2				20.2	60.4	-39.6
Lincoln	738	–					200.9	7	28.7				33.8	84.9	-15.1
Swedish Select	134	15.9	0	0	1.6	10.9	468.5	20	23.4	23.4	19.0	10.7	30.2	77.5	-22.5
Late White: (Side)															
White Tartar (White Russian)	300	–					235.2	12	19.6				34.8	56.3	-43.7

*Average of the yields of two selections from Albion, the original variety not being grown.

pounds, 2 pounds more than Kherson. The average straw yield of Swedish Select was 1,641 pounds per acre or slightly more than 200 pounds greater than for Kherson. Table 14 shows the yield data of these two varieties for the 20-year period 1908 to 1927, inclusive. Table 15 shows the average agronomic data for the 16-year period 1908 to 1923, inclusive. Among the varieties grown for the 5-year period 1923 to 1927, Brunker, a selection from Burt made at Akron, produced good yields. It outyielded Kherson during the period when both were grown.

Other early maturing varieties grown for several years are Fulghum and Kanota. No other variety or selection has been grown for a period of sufficient length to warrant recommending it for general seeding.

All of the data obtained from plat and nursery experiments during the 20-year period, 1908 to 1927, show that early maturing oat varieties are best adapted to the dryland sections of Eastern Colorado. The exceptionally early varieties, such as Kherson, Brunker, Fulghum and Kanota, a strain of Fulghum introduced by the Kansas Agricultural Experiment Station, are accordingly recommended.

Table 14.—Annual and Average Yields of Three Types of Oat Varieties (Early, Midseason and Late) Grown at the Akron Field Station from 1908 to 1927 Inclusive.

	C. I. No.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918
Early: Yellow or White Kherson	459	52.8	33.1	34.6	12.4	38.5	36.1	66.9	85.0	16.8	14.7	6.1
Midseason: Yellow or White Swedish Select	134	62.5	50.7	29.4	22.3	30.2	27.5	48.7	69.4	10.5	9.2	2.7
Late: White Side White Russian	300	19.7	–	–	–	23.4	23.7	43.1	65.0	0.7	4.1	3.4

											Averages	
	C. I. No.	1919	1920	1921	1922	1923	1924	1925	1926	1927	11 yr. Ave. 1912-1922	Ave. 20 yr. 1908-1927
Early: Yellow or White Kherson	459	11.2	39.2	24.7	25.7	34.8	6.6	11.4	5.5	46.8	33.2	30.2
Midseason: Yellow or White Swedish Select	134	4.3	47.9	15.9	9.5	15.8	.0	0	1.6	10.9	25.1	23.5
Late: White Side White Russian	300	2.1	37.1	9.4	3.0	dropped					19.5	19.6

Table 15.—Average Agronomic Data for the Two Oat Varieties Grown at the Akron Field Station Each Year During the 16-Year Period from 1908 to 1923, Inclusive.

Group and Variety	C. I. No.	Date of Heading	Date of Maturity	Height	Weight per bushel	Yield per acre Grain	Yield per acre Straw
				Ins.	Lbs.	Bu.	Lbs.
Early, yellow or white:							
Kherson	459	June 26	July 17	28	31	33.3	1,423
Midseason, yellow or white:							
Swedish Select	134	July 7	July 30	31	33	28.5	1,641

Table 16.—Annual and Average Yields of Five Oat Varieties Grown on Fallow and on Corn Land During 11-Year Period, 1917 to 1927 Inclusive.

C. I. No.	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	Tot.	Ave.
Grown on Fallow—Acre Yield (Bushels)													
Early													
Albion 729	26.2	11.9	16.4	32.4	29.3	30.3	40.9	12.7	17.2	5.9	52.3	275.5	25.1
Colbert 2019	18.2	7.8	14.4	32.4	34.5	35.9	47.5	8.0	16.4	2.0	51.7	268.8	24.4
Kherson 459	16.4	7.4	17.0	39.1	30.3	29.6	38.6	7.1	14.9	7.0	53.5	260.9	23.7
Midseason													
Swedish Select 134	11.3	3.3	7.0	47.0	20.1	12.5	14.8	.0	0.0	2.3	10.9	129.2	11.7
Late													
White Tartar (White Russian) 300	4.9	5.2	3.5	34.0	11.9	4.1						63.6	10.6*
Grown on Cornland													
Early													
Albion 729	21.8	4.5	8.2	30.4	19.9	17.3	31.7	7.6	7.8	1.6	39.7	190.5	17.3
Colbert 2019	9.6	3.9	4.3	31.6	24.6	20.6	37.3	6.3	11.7	1.6	41.6	193.1	17.6
Kherson 459	12.9	4.9	5.4	39.3	19.2	21.9	31.0	6.1	7.8	3.9	40.1	192.5	17.5
Midseason													
Swedish Select 134	7.2	2.1	0.6	48.8	11.8	6.6	16.9	0.0	0.0	0.8	10.9	105.7	9.6
Late													
White Tartar (White Russian) 300	3.3	1.6	0.6	40.2	6.9	1.9						54.5	9.1*

*Average of 6 years.

WINTER OATS.—Winter oats have been sown at Akron 6 different years, but only once did the crop survive. A plat of Boswell winter oats sown in the fall of 1907, with low winter survival, gave a yield of 15.7 bushels per acre.

OATS ON FALLOW AND CORN LAND.—Table 16 presents the yields of five oat varieties grown on fallow and on corn land, during the 11-year period from 1917 to 1927, inclusive. Table 17 gives agronomic data for the same varieties during the same period. These data show that in growing oats at Akron there has been little advantage in the fallow. These results indicate that, in Eastern Colorado, oats are more profitably grown when sown on disked corn land than when sown on fallow.

Table 17.—Agronomic Data on Five Varieties of Oats Grown on Fallow and on Cornland at the Akron Field Station During the 11-Year Period, 1917 to 1927 Inclusive.

	C. I. No.	Dates of Heading	Dates of Maturity	Straw Length	Wt. per Bu. Lbs.	Acre Yield Grain Bu.	Acre Yield Straw Lbs.
			Grown on Fallow				
Early							
Albion	729	June 24	July 15	28	31	25.1	1402
Colburt	2019	June 22	July 10	26	32	24.4	1460
Kherson	459	June 24	July 15	27	30	23.7	1268
Midseason							
Swedish Select	134	July 3	July 27	31	32	11.7	1223
Late							
White Tartar (White Russian)	300	July 3	Aug. 1	31	32	10.6*	1217
			Grown on Cornland				
Early							
Albion	729	June 23	July 15	26	30	17.3	893
Colburt	2019	June 21	July 10	24	32	17.6	882
Kherson	459	June 24	July 15	26	30	17.5	822
Midseason							
Swedish Select	134	July 1	July 27	26	33	9.6	718
Late							
White Tartar (White Russian)	300	July 6	July31	25	32	9.1*	912

*Average of 6-years, dropped in 1923.

Albion, a white selection from Kherson, headed and ripened about the same time as Kherson, Colburt, a Burt selection made at the Akron Field Station, headed only 2 or 3 days earlier than Albion and Kherson, but matured 5 days earlier. The midseason variety, Swedish Select, headed and matured usually about 10 to 12 days later than Kherson and Albion. White Tartar (White Russian), a late-maturing variety seldom reached full head on corn land. Usually the maturity of all of the later varieties was hastened by dry weather. The previous treatment of the soil had little influence on the time of heading and ripening of most of the varieties. But all responded by producing taller straw, and larger yields of both grain and straw when grown on fallow than on corn land.

RATE-OF-SEEDING EXPERIMENT.—A rate-of-seeding experiment with oats was conducted at Akron during 9 seasons. The rates of seeding varied by 1-peck intervals from 2 to 6 pecks, but only the rates from 2 to 5 pecks were sown during the entire period. The variety, Kherson, C. I. No. 459, was grown in these experiments. The yields obtained are shown in Table 18 and the agronomic data are given in Table 19.

Considerable variation in yield was shown from year to year. Good yields were obtained in 1912, 1914 and 1915. Fair yields were obtained in 1913, and poor yields or failures resulted in 1911, 1916, 1917, 1918 and 1919. Increases in the seeding rate resulted in earlier heading and maturity. The height of plant and the weight per bushel

Table 18.—Annual and Average Yields Obtained in a Rate-of-Seeding Experiment with Kherson Oats Grown on the U. S. Field Station at Akron During the 9-Year Period from 1911 to 1919, Inclusive.

Rate of Seeding	Acre yield (Bushels)									Average	
	1911	1912	1913	1914	1915	1916	1917	1918	1919	1911-1919	1912-1919
1 peck	–	–	–	57.5	–	–	–	–	–	–	–
2 pecks	6.9	46.9	30.0	74.4	85.0	11.5	16.2	5.5	10.6	31.9	35.0
3 pecks	10.6	61.7	23.1	71.8	86.9	15.6	19.5	6.4	13.9	34.4	37.4
4 pecks	13.1	40.0	40.6	84.4	87.5	16.8	23.0	6.1	11.2	35.9	33.7
5 pecks	13.7	71.9	25.0	65.0	90.0	19.5	24.3	7.7	13.2	36.7	39.6
6 pecks	–	71.9	18.2	73.8	90.6	20.2	25.3	6.4	14.0	–	40.1
7 pecks	–	–	–	–	–	–	–	7.9	14.0	–	–

Table 19.—Average Agronomic Data Recorded on the Kherson Oat Grown in a Rate-of-Seeding Experiment at the U. S. Field Station at Akron During the 9-Year Period from 1911 to 1919, Inclusive.

Rate of Seeding	Dates of		Height	Bushel Weight	Acre Yield	
	Heading	Maturity	ins.	(Lbs.)	Grain (Bu.)*	Straw (Lbs.)
2 pecks	June 27	July 19	28	29	35.0	1,651
3 pecks	June 27	July 19	29	29	37.4	1,613
4 pecks	June 26	July 19	29	29	38.7	1,522
5 pecks	June 26	July 18	28	30	39.6	1,472
6 pecks	June 27	July 18	28	30	40.1	1,460

*Average for the 8-year period from 1912 to 1919, inclusive.

did not vary appreciably with the seeding rate. The acre yield of straw varied inversely with the rate of seeding. This may be partially accounted for by the presence of numerous weeds in the plats sown at the lower rates. The yield of grain increased with the increased rates of seeding and seedings of 6 pecks per acre produced the highest average yields. The results clearly indicate that the heavier seeding rates of 4 to 6 pecks per acre were better than lower rates.

SUMMARY OF THE EXPERIMENTS AT AKRON

Oats are not so extensively grown in the dryland sections of Colorado as in the irrigated sections. As a rule, at Akron, oats have not yielded as many pounds of grain or straw per acre as has barley.

Only early oat varieties have produced favorable yields. Mid-season varieties have failed more often than the early ones and seldom have outyielded them. Late-maturing oats have usually failed at Akron as dry weather more often prevents their reaching full head and hastens ripening.

Among the early maturing varieties, Kherson has given favorable results. Brunker, a selection from Burt, made at the Akron Field

Station, has yielded exceptionally well. Among the varieties more recently introduced into the section, Fulghum and Kanota give promise.

Only early maturing oat varieties should be sown. The seeding date should be as early in the spring as practicable. Very often even early varieties of oats when sown after the middle of April will be injured by dry weather before maturity.

Seeding oats on fallow does not increase the yield sufficiently over that secured on disked corn ground to justify growing the crop regularly on fallow. The results obtained during the 11-year period 1917 to 1927, inclusive, show fallowing to be unprofitable for oats. It is, however, more certain. Oats grown on disked corn ground, however, will usually make a larger return for the effort expended.

In seeding oats, rates of more than 4 pecks have given larger yields than lighter seeding rates and are advised. In the varietal experiments conducted at Akron the plats were seeded at the rate of 5 pecks per acre.

Oats cannot be recommended for extensive seeding on dryland as either corn or barley generally produces a larger yield of grain. Oats may, however, be cut and fed as hay when drouth prevents the crop from properly developing. Oat straw usually makes excellent feed for livestock. The average yield of straw at Akron is about three-fourths ton per acre on fallow and about one-half ton on corn land.

HISTORY AND DESCRIPTION

OAT VARIETIES DEVELOPED IN COLORADO

COLORADO NO. 37. REG. NO. 53[13].—Colorado No. 37 (C. I. No. 1640) was selected in 1900 from a field of commercial oats on the farm of P. A. Amiss at La Gratin, in the San Luis Valley, by A. H. Danielson, of the Agronomy Section, Colorado Agricultural College. Colorado No. 37 is a midseason white common oat similar to Swedish Select, except that it has decidedly fewer awns and a little shorter culm. The superior characters are high yield, stiff straw and awnless kernels.

BRUNKER, REG. NO. 73[14].—Brunker (C. I. No. 2054) was originated as a pure line from Burt at the Akron Field Station, Akron, Colorado, in 1919. The original plant row was isolated by F. A. Coff-

[13] Report of Committee on Registration of Varieties and Strain of Oats. Jour. Amer. Soc. Agronomy. Vol. 18, No. 10, p. 942, 1926.

[14] Stanton, T. R., Gaines, E. F., Love, H. H. Registration of Varieties and Strains of Oats IV. Jour. Amer. Soc. Agronomy. Vol. 21, No. 12, p. 1175, 1929.

man, under whose direction the variety also was subsequently developed. Brunker was grown in head row number 16 in 1919, and thereafter it was known as Burt No. 916. The collection of panicles used for sowing this series of head rows was made by T. R. Stanton from fields of Burt in the southeastern states during a field trip in the spring of 1918.

"Brunker is a very early variety of the red oat *(Avena byzantina)* group, maturing even earlier than Fulghum. The straw is rather short and slender, with a typical reddish tinge. The panicles are small and equilateral, with short, spreading branches. Spikelets usually are two-flowered, sometimes three-flowered. Lemmas reddish, with an occasional slender awn on the lower floret of the spikelet; basal hairs usually present, nerves somewhat prominent. Under favorable conditions the variety produces plump kernels of good bushel weight. It has shown considerable resistance to some physiologic strains of *Ustilago avenae* which infect other red oats, such as Fulghum."