

Wisconsin Oats

B. D. LEITH AND E. J. DELWICHE

OATS IS THE MOST IMPORTANT GRAIN CROP Wisconsin produces. This grain is grown upon the great majority of farms in the state. Compared with other leading cereal crops for the past five years (1917-21), the corn acreage is about four-fifths that of oats, barley about one-fourth, and rye and wheat each about one-fifth of the oat acreage.

Because oats is so common, however, it is often grown under conditions entirely unsuited to it. While it does respond to poor treatment better than any cereal crop, yet certain care in the choice of the variety and kind of soil are necessary for best results.

OATS COMPARED WITH BARLEY

A comparison of barley and oat yields from this state shows a much better money return from an acre of barley than of oats. This is explained because oats is often grown on poorer soils than barley.

The data from the Hill Farm at the University of Wisconsin, where oats and barley are both grown, give a much fairer comparison.¹ A four-year average of oats is 62.3 bushels per acre or 1,994 pounds; and barley for the same four years gave 40.5 bushels per acre or 1,944 pounds. This makes the comparison very close, as the price per pound of these two grains does not vary much. In feeding value there is an advantage in favor of barley for in total digestible nutrients 88 $\frac{2}{3}$ pounds of barley is worth 100 pounds of oats.²

While barley has some advantage over oats as a feed, yet oats has a place on the farm that barley cannot always fill. It is the most palatable horse feed; it is a more agreeable crop to

¹ *Wisconsin Rye*; Wis. Agr. Exp. Sta. Bul. 326, p. 4.

² *Feeds and Feeding*, Henry and Morrison.

handle; it may be used for hay in combination with peas or alone; it is better adapted to new breakings than barley; and on light sandy soils oats will give good returns where barley would be a failure.

CLIMATE FOR OATS

The heaviest oats and the highest yields are produced in northern United States, Canada, and the north European countries, where hot weather at filling time rarely occurs. The late and medium late large kernalled varieties are particularly well adapted to this region. Most of the varieties of side oats are included in these groups.

South of this belt the mid-season varieties do best. Again south of this, the early small kernalled varieties are best suited because they are more drouth and heat resistant than the later varieties. Hot climates must have varieties suited to such conditions and these are not high yielders.

Northern Wisconsin is in the late oat region. Central Wisconsin produces mid-season oats best and the mid-season and early oats overlap below the central part of the state. Southern Wisconsin and Illinois grow early oats almost exclusively.

INCREASE THE YIELD

Since oats is so common, it is often grown under conditions entirely unsuited to it. In some cases it is merely scattered over the ground and worked in; again it is often sown on ground entirely too rich for it. It responds to poor methods of handling better than other cereal crops, but the best returns will be obtained if it is planted on soils suitable for it and if the seed is sown properly.

Too many growers look upon oats as a filler in a crop rotation to be used for feed only, and therefore think that any kind of oats will serve the purpose. This is a serious mistake. The great difference in the producing power of different varieties of oats, is shown in the tables of yields of the different varieties in the appendix, page 24.

Pedigree strains superior to the original mixed commercial varieties, have been developed by the agronomy department of the College of Agriculture. This pedigreed oats can be grown for seed at practically the same cost as feed oats. The oat crop can

thus be made to serve the double purpose of a cash crop and a feed.

LODGING IN OATS

The fact that oats lodges easily is one of the greatest difficulties in obtaining a profitable crop. This not only reduces the oat



FIG. 1.—THRESHING STATE'S PRIDE OATS FROM THE SHOCK.

Where the farmer owns his own threshing rig he can save by shock threshing.

yield but also smothers out the new seeding when it is sown with the oats. With the increase in dairying, therefore, there is more oat lodging, due to the greater fertility of the soil.

EFFECT OF RATE OF SEEDING UPON LODGING

The results at the Marshfield branch station indicate strongly that heavy rates of seeding will cause lodging.

TABLE I.—PERCENTAGE OF LODGING AT MARSHFIELD

Rate of seeding	Lodging percentage			
	1917 and 1918	1919	1920	1921
1 bu.....	No lodging	0	0	0
2 bu.....	No lodging	33%	0	36%
3 bu.....	No lodging	100%	50%	0
4 bu.....	No lodging			6%

The variety used in the tests was White Jewel Pedigree No. 132, a strain possessing much resistance to lodging.

LODGING AND SUPPLY OF PLANT FOOD

That lodging of oats can be only partially controlled, at best, by various fertilizer treatments, is shown by tests in progress at Marshfield and Madison. A large supply of organic matter in the soil seems to favor lodging by increasing the moisture holding capacity of the soil, thus furnishing more water than the plant needs for normal development. The plant gets an excess of nitrates under these conditions, which is another factor in causing lodging. Seasons of abundant rainfall tend to produce a rank growth of straw.

No solution for entirely preventing lodging has been found. Any variety of oats will lodge on rich ground. Some kinds lodge more readily than others; some fill out fairly well when lodged, while others produce such light kernels that they are practically valueless.

Where lodging is troublesome, reduce the fertility before sowing oats by growing one or two crops of corn or a crop of barley, spring wheat, or winter grain, before putting in to oats. Do not work up a fine seed bed. Disk the corn stubble instead of plowing it. Choose a variety which will give best results on rich soils.

Common Faults of Oats

Lodges on rich ground
 Yields reduced by hot weather while filling
 Is subject to rust and smut
 Gives light weight berries when climate and soil
 are unfavorable

PERCENTAGE OF HULL

A high percentage of hull in oats is usually caused by lodging, heat or drouth. Light weight oats makes poor feed and if used as seed the small shriveled kernels will give the young plant a very poor start in life. The following data are taken from experiments in the department of agronomy:

TABLE II.—PERCENTAGE OF HULL IN TWO VARIETIES

	1913	1914	1915	1916	1917	1918	1919	7-year average
Ped. No. 7.....	24.11	34.2	27.48	29.99	27.2	29.7	26.59	28.4
Ped. No. 1.....	25.05	34.55	28.05	31.7	28.0	28.22	32.18	29.68

This table shows that a difference of nearly 10 per cent in hull was caused by the season. 1913 gave the lowest and 1914 the highest percentages. The variation between Pedigree No. 7 and Pedigree No. 1 is not so great as the variation found in different years. Seasons do not affect all varieties alike; 1918 gave Pedigree No. 7 a heavier hull than Pedigree No. 1, while 1919 gave Pedigree No. 7 a very light hull and Pedigree No. 1 a comparatively heavy one.

Varieties differ widely in their natural tendency to produce hulls. The Pedigree No. 7 and Pedigree No. 1 have comparatively light hulls, ranging from about 24 to 34 per cent. Some varieties run 10 to 20 per cent heavier. An extreme case was found in 1916 where a variety gave over 50 per cent hull. Table III shows some of the heaviest yields of hull found in 101 tests over a seven-year period:

TABLE III.—STRAINS GIVING HEAVY YIELDS OF HULL

Ped. No. 16.....	1916.....	52.81 per cent hull.
Ped. No. 14.....	1914.....	49.65 per cent hull.
Ped. No. 15.....	1914.....	44.82 per cent hull.
Ped. No. 11.....	1914.....	44.23 per cent hull.

Thinness of hull, therefore, is a practical point to keep in mind when selecting a variety of oats to grow.

OAT GROUPS

According to color we have black, white, yellow, gray or dun and red. Some varieties are fall sown, others are spring sown. Some are hulled, some are hull-less. Some are early maturing, some mid-season, and some late. Some have a panicle that spreads in all directions and others have all the kernels hanging on one side.

Fall sown oats are not suited to Wisconsin, as none of the varieties are sufficiently hardy to withstand the winter. Late maturing varieties are adapted to the climate of northern Europe, where the growing season is long and there are no hot spells. In Wisconsin the mid-season varieties are most commonly grown, but the early varieties are becoming very important in the southern and central part of the state.

Most of the varieties of side oats are late maturing. Only two have been found—the White Jewel and White Russian, which are adapted to upper Wisconsin conditions.

VARIETIES FOR WISCONSIN

Swedish Select, Wisconsin Pedigree No. 5

One of the oldest and best known of the oat varieties in Wisconsin is the Pedigree No. 5. This is a pure line selection from the Swedish Select. The original stock from which this selection was made was obtained from the United States Department of Agriculture in 1898. Several selections were made and bred up by the centgener method and finally Pedigree No. 5 was found to be superior to its competitors.

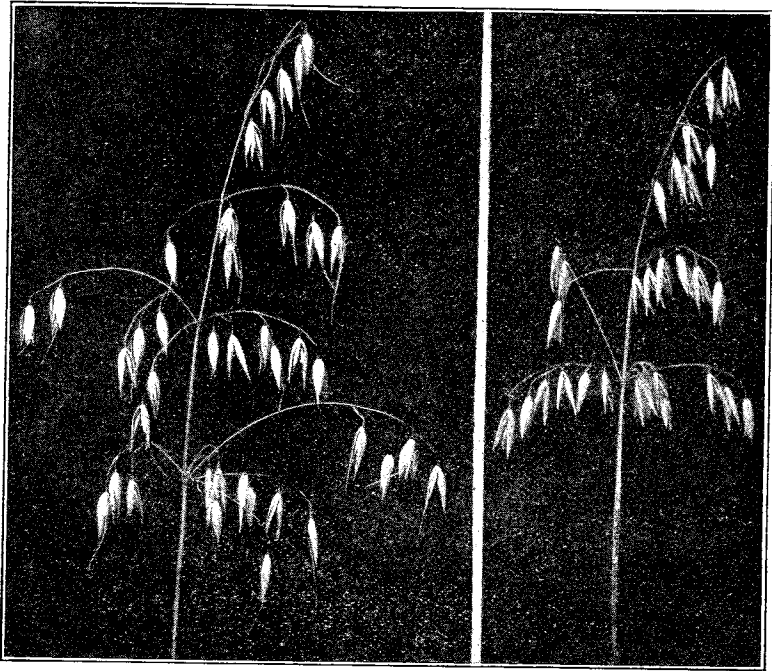


FIG. 2—THE TWO LEADING TYPES OF WISCONSIN PEDIGREE OATS

Left—Wisconsin Wonder, Ped. 1.
Right—State's Pride, Ped. 7.

The kernel is large, white, and plump. The head is large and spreading; the straw grows tall and rank. Where the soil is not too heavily charged with nitrogen and organic matter Pedigree No. 5 yields heavily and stands up well. But it lodges easily on rich soils and hence is not suited to farms maintaining large herds of live stock.

Wisconsin Wonder, Wisconsin Pedigree No. 1

The most popular oat in Wisconsin is the Wisconsin Wonder, Pedigree No. 1. This is a pure line selection from a strain of oats received from a Jefferson county farmer in 1901. It was also bred by the centgener method; and among many competing individuals Pedigree No. 1 was selected.

This oat has a stiffer straw than the Pedigree No. 5, the kernel is also white but more slender. The tables in the appendix show that this oats has the highest average yields of the mid-season varieties, except at Ashland and Spooner. It withstands lodging on rich soils much better than Pedigree No. 5. It is the oat most widely grown in the state.

State's Pride, Wisconsin Pedigree No. 7

Pedigree No. 7, a pure line selection from the Kherson oats, has come into prominence during the last few years. The original stock of this oats was obtained from the Nebraska Experiment Station in 1906. The Nebraska station obtained its lot from the Kherson district in Russia, where the climate is dry and early hardy varieties of oats are grown.

This oats is yellow, small-kerneled, thin-hulled and early. As a rule the straw is fine and does not grow as tall as the Pedigree No. 1 and matures about a week earlier. Owing to its earliness it is one of the best nurse crops. It often escapes rust, heat and lodging. If it lodges it fills out the kernel well. For this reason it is recommended for farms having very rich soils. It is one of the highest average yielders and gave a good crop at Madison the past season (1921), when the mid-season varieties were practically failures.

The small sized yellow kernel of this oats is somewhat objectionable. On light sandy soils, occasionally, it does not grow straw long enough to be cut with the binder.

White Cross, Wisconsin Pedigree No. 19

As small size and yellow color were objectionable features of Pedigree No. 7, an attempt has been made to produce a white oat of larger size than the Pedigree No. 7 and still maintain the earliness and high yield. Several crosses have been made with that end in view. The White Cross, Pedigree No 19, a pure line selection from a cross made in 1911 between the Big 4 (Pedigree

2) and Sixty Day, is showing much promise. The kernel is white, larger than the Pedigree No. 7, is from two to three days earlier, and the yields have been high.

Forward, Wisconsin Pedigree No. 1241

This strain was bred at the Ashland Branch Station from Silver Mine stock. In a seven-year test it outyielded its nearest competitor by five bushels per acre (See Table XIII). It has a white, plump, rather short kernel. The straw is stiff and of medium height. As a yield test is just completed, only a small amount has been disseminated.

White Russian, Wisconsin Pedigree No. 1214, and White Jewel

These are two newer oats which show up favorably in tests at the branch stations. The White Russian is not susceptible to rust and the White Jewel is quite resistant to lodging.

DISSEMINATION

The Experiment Station work with small grains would be of comparatively little value if it stopped after it had produced superior varieties. To be of real help to the farmers these improved strains should reach them with the least possible delay. In Wisconsin this is accomplished through the co-operation of the Wisconsin Experiment Association. Members are entitled to a small amount of the newer superior sorts, and thus, through the large membership, grains are quickly disseminated.

The Experiment Association membership includes farmers in neighboring states and in some foreign countries. Because of the wide distribution of members and the popularity of the best adapted varieties in the state, many acres of Wisconsin pure bred grains are found outside the state.

The Experiment Station has a further advantage in the co-operation of this organization in that it can determine the adaptability of new varieties to varying soil and climatic regions.

All the pure bred varieties of grains have been disseminated through this association. Prospective purchasers may obtain any of these through members or through the different Experiment Stations.

SOILS FOR OATS

Oats yields best on clay or loam soils in a moderate state of fertility. It lodges on rich ground more easily than other small

grain crops. On light sandy soils, oats will give as good returns as any small grain crop except rye.

As rich soils are unsuited for oats, and as many Wisconsin dairy farms have such soil, it is necessary to use varieties which will give best results under this unfavorable environment or to use a rotation which will reduce the fertility, before planting oats.

ROTATION FOR OATS

In general, oats should be placed in the rotation where the least amount of plant food is available. It usually follows corn, or potatoes, both heavy users of plant food.

Where pasture is needed, the following four-year rotation is popular:

Corn
Oats seeded to clover and timothy
Clover hay
Pasture

Stock farms usually are troubled with lodging in oats due to excessive fertility. In good corn-growing localities where farms are equipped to handle large amounts of corn the oats is put in after two successive corn crops.

Corn	Corn
Corn	Corn
Oats	or Oats seeded to clover and timothy
Clover	Clover hay
	Pasture

The yields after various crops, which are averaged in Table IV for a four-year period, show no striking differences—an indication that oats is quite tolerant, so far as rotation is concerned. The difference between oats after oats and oats after peas is quite marked, while that between oats after corn and oats after oats is much less. The two other crops, barley and rye, were not used for a long enough period to be comparable. In 1920, and again in 1921, oats gave a relatively good yield when preceded by rye. There was less lodging than when oats followed corn or peas.

TABLE IV.—YIELD OF OATS AFTER VARIOUS CROPS—MARSHFIELD STATION

Year	Barley	Corn	Oats	Peas	Rye
	Bu.	Bu.	Bu.	Bu.	Bu.
1918.....	51.1	65.9	57.8	65.5	---
1919.....	38.0	39.5	47.1	38.6	---
1920.....	---	41.7	30.9	49.4	47.2
1921.....	---	23.8	21.3	21.8	26.5
Average.....	---	41.5	39.3	43.8	---

Two crops of grain in succession following a crop of corn will serve the same purpose as the rotations given above and will fit the needs of the farmer who prefers to grow more grain than corn. At Conrath and Marshfield this rotation has been found well suited to the growing of oats:

- Corn, potatoes or roots
- Barley, wheat or rye
- Oats seeded to clover and timothy
- Clover hay
- Pasture

PREPARATION OF THE SEED BED

Where the soil is poor or only moderately fertile the seed bed should be well worked up with the disk or spring tooth and should be worked down fine with a smoothing harrow. In other words, prepare as good a seed bed as is necessary for wheat or barley.

In dairy regions, where much lodging occurs in oats, many farmers disc up the corn ground for oats in the spring without fall plowing. This saves the cost of plowing, but they also claim they have less lodging in oats as a result. This is sound practice. In the first place, oats will stand poorer seed bed preparation than other small grain crops, and in the second place, too much fertility may be liberated by plowing and cultivation where the soil is very rich. Less lodging, therefore, might easily be expected from this practice. (Experiments from the Ohio Research Station bear this out). The great difficulty in such practice, however, is that the ground is likely to become weedy.

DRILLING VS. BROADCASTING

Many farmers on heavy clay lands prefer the broadcaster, while the drill gives best results on light soils. Clay soils

are difficult to work up fine enough for the best results for a drill. When they are worked up fine, if heavy rains occur after seeding, the soil is likely to crust over the seed bed and prevent the emergence of the young plants. In the light soils the main object is to get the grain down deep enough to get plenty of moisture. No hard crust forms to prevent the young plants from emerging.

On the experimental farm at Madison in a six-year test little difference is shown between drilling and broadcasting. Some years show a slight advantage in favor of drilling and other years show a gain from broadcasting. The six-year average on Wisconsin Pedigree No. 1 oats is 59.9 bushels per acre yield from drilling and 61.5 bushels per acre yield from broadcasting. On the Experimental Farm the ground was thoroughly worked and the grain well covered when broadcasted. It evidently makes little difference which type of seeder is used, provided the grain is properly covered and put where it will receive sufficient moisture.

TABLE V.—DRILLING VS. BROADCASTING—PED. NO. 1 OATS

	Drilled Bu. per acre	Broadcasted Bu. per acre
1916.....	71.9	77.9
1917.....	76.9	79.4
1918.....	57.2	61.6
1919.....	41.3	38.4
1920.....	82.1	88.1
1921.....	26.1	23.8
Six-year average.....	59.9	61.5

DATE OF SEEDING

For best results, sow oats as early as possible. Late seeding of oats is more apt to suffer loss from rust, lodging and heat damage than early seeding.

Where a piece of ground is prepared late and it is desired to get it seeded down, oats is one of the best crops to plant. In this case the oats should be cut for hay, as there will be little chance of having grain of good quality under such conditions. Rust or lodging is almost sure to injure it if left for seed. Furthermore, the early removal of the crop will be beneficial to the young seeding.

RATE OF SEEDING

The average rate of seeding oats in Wisconsin is $2\frac{1}{2}$ bushels per acre. While the Wisconsin Station has no data on rates of seeding, tests carried on by other stations show that a variation of as much as a bushel per acre may not show much difference in yield. In England sometimes as much as five bushels per acre is sown. On rich soils three bushels per acre will give an increase in yield over $2\frac{1}{2}$ bushels per acre, but it will be very likely to lodge, thus reducing the yield.

When used as a nurse crop, 2 bushels per acre is preferred. This competes less with the young clover plants for food and moisture, offers less shade, and there is less liability of lodging. Lighter rates are also preferable where the variety has small seed.

OATS AS A NURSE CROP

Heavy-leaved late maturing varieties of oats make poor nurse crops because they shade the ground too much and occupy the ground too long, thus draining both fertility and moisture which is needed by the young clover plants. If the oats is cut during hot, dry weather, the sudden exposure of the clover to the hot sun may seriously injure it. The heavier the shading the more severe the injury will be.

The Kherson varieties are superior to other types of oats as nurse crops. Its early maturity and rather small leaf growth make it the equal of any other small grain in this respect.

HANDLING THE CROP

As oats does not shatter easily nor cure as readily in the bundle as wheat or barley, it is usually not cut until fully ripe. It is a mistake, however, to wait until it is over-ripe. Storms may come and cause bad losses through lodging and beating out the grain.

Some prefer the long shock; others prefer the round. The long shock allows more rapid curing and drying and damages the clover seeding less than the round shock. The round shock turns water better; and where the shocks are apt to remain in the field for some time, they should be made round and properly capped.

Unless oats can be threshed just as soon as the shocks are cured and dry, it is better to stack than to allow the grain to

stand in the field to await threshing. The probability of damage from rains is too great to take any unnecessary chances by leaving the grain in the shocks. Shock threshed grain must be given special attention to prevent heating in the bin. Often it must be spread out and turned several times.

SUCCOTASH

Some farmers always grow a little wheat with oats, claiming that they get better results than by growing either of them alone. The Experiment Station at Madison has carried on a test for the past two years of planting Marquis wheat and Pedigree No. 1 oats together in equal amounts by weight. The grain was sown with the drill set at the rate of 2 bushels per acre for oats. In neither year was the wheat attacked by rust, although an adjoining strip of Marquis was badly rusted in 1920. The oats in both years was of better quality than that grown in the other plots. Another interesting fact was that no lodging occurred either year. The possible explanation for these results is that the oats and wheat do not compete as strongly when planted together as when planted alone, and the wheat straw being stiffer than oats helps to keep it from lodging. No explanation can be suggested now for the difference in rust infection.

The average for the two years that this experiment has been carried on shows that "succotash" has outyielded both the Marquis wheat and the Pedigree No. 1 oats in pounds per acre.

TABLE VI.—YIELD PER ACRE IN POUNDS

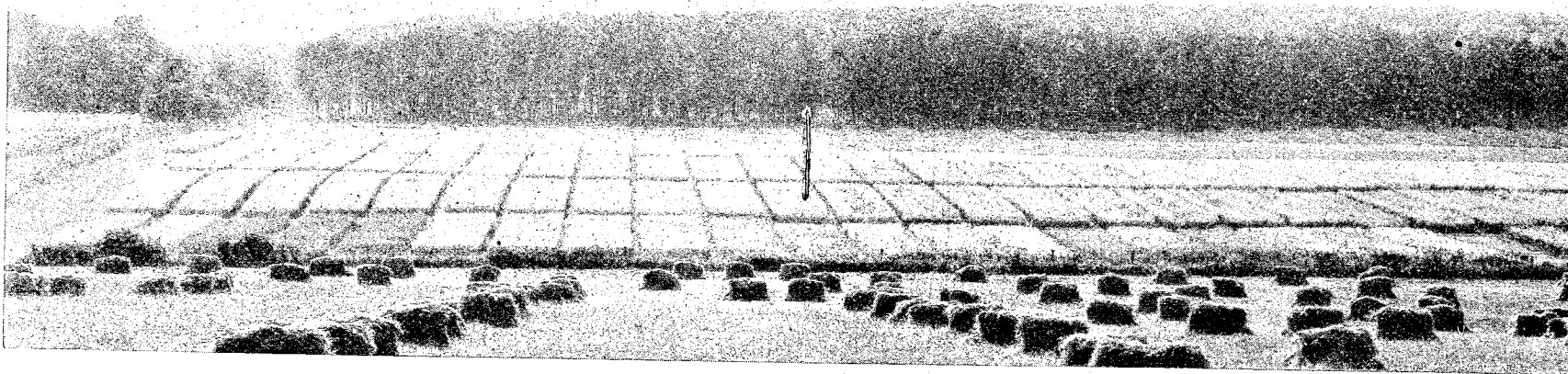
	Succotash Lbs.	Ped. No. 1 Oats Lbs.	Marquis Wheat Lbs.
1920.....	2530.8	2614.4	1242
1921.....	1232	787.2	1122
Average.....	1881.4	1700.8	1182

In 1920, which was a particularly favorable season for oats, the Pedigree No. 1 oats outyielded the "succotash," but in 1921, which was a very poor season for oats, the "succotash" outyielded the oats. This test will be continued, as a two years' test is too short to reach conclusions.

It is obvious that wheat and oats cannot be sown together if either is to be sold for pure bred seed, as they cannot be completely separated by any fanning mill on the market.



A GOOD CROP OF OATS IS A SOURCE OF PRIDE AND PROFIT



STATE'S PRIDE OATS AND VARIETY TEST PLOTS AT MADISON EXPERIMENT STATION

OAT DISEASES

Oats has two diseases which cause considerable damage—rust and smut. The rust that attacks oats is a different species from that which attacks wheat. The wheat rust will not attack oats and the oat rust will not attack wheat. No practical control of oat rust has been found. Treatments which will kill the rust spore will kill the seed. The Red Rust Proof oats, which is grown as a winter oat in the South, shows considerable resistance to rust, but this variety is not adapted to northern conditions. Few of the northern varieties of oats have any marked resistance to rust, although White Russian is one that has.

The damage from oat smut may become very serious if allowed to go without attention. One sample of seed was sent to the Wisconsin Station three years ago that produced fully 95 per cent of damage in the resulting crop. Both the loose and covered smuts of oats can be entirely eradicated by the formalin treatment.³ Make up a solution of 1 pint formalin to 30 gallons of water. Dip the grain or use a good smut machine that wets every kernel thoroughly with the solution. If the work is done carefully and all sacks and other containers treated, it probably will not be necessary to treat again for three or four years.

USE THE FANNING MILL

Always fan and grade the seed oats. The large heavy kernels are always to be preferred for seed, as they have a large store of plant food and will give strong vigorous plants. Small shrunken endosperms are not readily detected in oats. Often the hull develops nearly to normal size and the meat on the inside is very small and shrunken. These will give a very weak germination and the resulting plants will lack vigor and will not survive if the season is unfavorable. The result will be a very poor stand and a low yield. It is clearly evident then, that such seeds should be cleaned out and used for feed.

It is worth while to use the fanning mill, if for no other reason than to clean out the chaff and bits of straw in the grain. Oats clogs in the seeding machinery rather easily and a small amount of trash in the seed may cause much inequality in the seeding.

³ *Fight Grain Smuts and Blights*, Wis. Agr. Exp. Sta. Circular 57.

VARIETY TESTS

One of the objects of the Experiment Station is to try out all the varieties offered or advertised on the market in comparison with standard varieties. Often great claims are made for a new strain of grain and a high price put on it. So far no advertised variety has been found which is superior to Wisconsin improved pedigree stocks. Some have proved very good but in many cases it is very evident that some of the best yielding varieties have been renamed and resold at an advanced price. These often are excellent yielders and in many cases are competing with those of their own kind. As an illustration of the confusion, Etheridge⁴ reports 138 names for Swedish Select oats.



FIG. 3.—PLOT THRESHING ON UNIVERSITY EXPERIMENTAL FARM. Small plots are used to determine yields. After each variety is threshed the threshing machine must be cleaned carefully. The grain is weighed, scaled and sacked separately.

Variety tests on oats were begun at the Experiment Station at Madison in 1898. Reports on the results of the earlier tests will be found in the annual reports of the Agricultural Experiment Station up to and including the 24th annual report.

The tables in the appendix show the comparative yields in the variety test plots, but do not show all the varieties under test either at Madison or at any of the branch stations.

⁴ *Cornell University Memoir 10.*

In many cases a variety was discarded after a one or two-year test. Others were carried farther but later thrown out. Hundreds of new selections have been produced, and several of them reached the test plots but were later discarded. All such yields have not been reported in the appendix, as they add no valuable information and would needlessly encumber the tables. The tables in the appendix are not an exhaustive report of the Experiment Station's variety test work in oats, but rather a compilation of results which may be helpful.

The size of the test plots where yields have been obtained were 1/20 or 1/40 of an acre. Since 1916 all varieties have been grown in duplicate. The different varieties have been grown side by side on ground as nearly uniform as possible. The standard pedigrees are grown each year as a standard for comparison of all other varieties.

The following table shows the seven best yielders for the past four years. The first four belong to the Kherson type, State's Pride having a comfortable lead; 1921 brings down the average of the medium early white oats and makes the Kherson oats stand out prominently.

TABLE VII.—SEVEN BEST VARIETIES OF OATS (GROWN AT MADISON OVER FOUR-YEAR PERIOD—1918-21)

Variety	Average yield per acre
State's Pride, Ped. No. 7.....	66.1 bu.
Golden Rust Proof.....	61.5 bu.
Iowa 105.....	59.0 bu.
Iowa 103.....	58.6 bu.
Wisconsin Wonder, Ped. No. 1.....	57.4 bu.
Gold Mine.....	53.1 bu.
White Cross, Ped. No. 19.....	52.2 bu.

VARIETY TESTS AT ASHLAND

Improvement and breeding work at the Ashland Station was started in 1908, but no variety tests were made previous to 1912. Work under very similar climatic and soil conditions, however, was done at Superior beginning with 1908, and continued until 1912. Selections from the best yielding varieties were made at Superior in 1911 and planted in nursery rows at Ashland in 1912. All told, some 200 selections were planted. From these a few pedigree strains were retained and put in the regular variety test. At Ashland the very early types, such as Kherson and Early Daubeney, were dropped out because of low yield and poor quality.



FIG. 4.—PEDIGREE NO. 1289 OATS AT SUPERIOR

This oats yields over 80 bushels an acre.

In the appendix are the yields for all varieties which were under test. The following table is a nine-year average of the best yielders. Results show that Forward, Pedigree No. 1241, has a decided lead. This variety is most worthy of dissemination in the upper section of the state.

TABLE VIII.—NINE BEST YIELDERS AT ASHLAND STATION (AVERAGE FOR NINE YEARS, PURE LINES FOR THE LAST FIVE YEARS)

Variety	Average yield per acre
Forward Ped. No. 12.41.....	55.9 bu.
Wisconsin Wonder, Ped. No. 1.....	51.7 bu.
Early Gothland, Ped. No. 4.....	50.9 bu.
Giant Swedish, Ped. No. 12.128.....	50.4 bu.
White Russian, Ped. No. 12.14.....	49.7 bu.
Irish Victor, Ped. No. 12.89.....	47.5 bu.
Swedish Select, Ped. No. 5.....	46.8 bu.
White Jewel, Ped. No. M-13.16.....	44.6 bu.
White Jewel, Ped. M-132.....	41.4 bu.

VARIETY TESTS AT MARSHFIELD

Variety work with oats at the Marshfield Station was begun in 1912. Owing to poor drainage conditions, the results for that year are not included as they are not comparable between varieties. In 1917 and 1918, owing to faulty labor conditions, some of the oats were mixed and others not threshed, thus breaking the continuity of the work. Beginning with 1920 a new seed supply was sent from Ashland and Spooner.

Results have been very unsatisfactory for these reasons and recommendations of varieties are made with reservations. Pedigree No. 1, Pedigree No. 3 and Pedigree No. 4, however, are recommended because of their good yield and considerable resistance to lodging.



FIG. 5.—THE NEW IMPROVED VARIETIES ARE GIVEN CAREFUL STUDY IN ROWS

After observation and careful study the superior or promising varieties are selected for further testing in plots.

TABLE IX.—SEVEN BEST YIELDERS AT MARSHFIELD
(FIVE-YEAR AVERAGE—1917-21)

Variety	Average yield per acre
Wisconsin Wonder, Ped. No. 1.....	59.6 bu.
Tobolsk, Ped. No. 3.....	48.2 bu.
Early Gothland, Ped. No. 4.....	46.7 bu.
White Russian, Ped. No. 1214-A.....	46.7 bu.
State's Pride, Ped. No. 7.....	46.5 bu.
Swedish Select, Ped. No. 5.....	45.6 bu.
Irish Victor, Ped. No. 1289-A.....	43.5 bu.

VARIETY TESTS AT SPOONER

Work with oats was begun at Spooner in 1912, with 26 varieties, three of which were pure lines. Selections were made the same year and a breeding nursery was put in in 1913, containing



FIG. 6.—BREED OATS THAT DO NOT LODGE READILY.

Some strains of oats do not lodge as easily as others. Pedigree No. 1241 and White Jewel were found to be the best for the Lake Superior district.

some 400 different pedigrees. A few of the most promising were continued and compared with standard kinds and with pedigree strains from various sources. Table XIV in the appendix shows results for each year and for five-year averages. Table X shows average yields for nine years for pure lines and for pure lines with the parent variety. Medium early varieties gave the best results but very early kinds did not average as well.

TABLE XII.—VARIETY TESTS OF OATS AT MADISON STATION

	1915	1916	1917	1918	1919	1920	1921	5 Yr. Av. 1915-19	5 Yr. Av. 1917-21	4 Yr. Av. 1918-21
Wisconsin Wonder, Ped. 1	90.0	71.9	65.4	61.6	61.6	61.7	24.6	70.1	59.0	
State's Pride, Ped. 7	111.8	69.7	75.6	82.8	52.8	82.0	46.9	78.5	62.0	
Swedish Select, Ped. 5	58.7	64.5	68.3	64.1	37.5	53.8	21.7	53.6	49.1	
White Shonen, Wisconsin 127	80.6	58.1	58.2	62.5	35.5			55.9		
Scottish Chief, Wis. 129	90.6	80.0	68.2	67.8	34.0			64.7		
Tartar King, Wis. 128	56.8	64.3	57.5	65.6	34.0			66.8		
Irish Victor, Wis. 107	83.1	77.2	62.5	57.5	44.7			66.7		
Improved American, Wis. 108	81.8	87.7	62.5	63.1	35.3			61.6		
Victory, Svalof, Wisconsin 103	81.8	90.6	68.7	64.3	37.7			63.3		
N. Austria, Wis. 117	76.4	81.1	48.7	64.3	28.1					
Banner Wis. 106	87.5	62.5	68.8	58.4	40.0					
Fourth of July, Wis. 102		50.3	63.5	58.4	36.9	55.3	28.5		51.9	
Ashland 1241		66.1	73.1	62.8	36.9	64.1	25.1		48.1	
Red Russian Wis. 130		66.3	49.7	63.5	42.0	64.1	26.0		53.5	
Toholsk Ped. 3		81.5	65.0	66.2	34.4	39.9				
Iowa 105, Wisconsin 133			65.0	55.0	49.4	58.2	55.3			
Golden Rust Proof Wis. 136			75.0	71.6	40.6	63.1	53.2			
Gold Mine Wis. 148			69.4	77.0	40.6	63.7	54.0			
Russia 304, Wis. 138-11				72.8	45.0	62.5	31.9			61.5
Russia 304, Wis. 138-10				70.0	32.4	55.5	20.0			53.1
Russia 304, Wis. 138-5				70.0	38.6	61.9	20.1			45.0
Russia 304, Wis. 138-6				66.3	41.1	64.4	19.4			47.7
Russia 304, Wis. 138-4				63.7	36.1	63.7	19.4			46.7
Russia 304, Wis. 138-7				60.6	39.4	53.4	20.9			43.8
Record Wis. 143				62.2	32.3	53.4	21.4			44.4
Yelder Wis. 145				66.2	37.4	58.4	21.4			42.0
Minn. 512, Wis. 150				65.0	37.8	58.4	30.3			47.9
Swedish Crown Wis. 131				64.1	45.0	51.6	23.6			46.1
Swedish Victory Wis. 132				60.7	42.0	78.4	21.3			50.6
Green Mt. Favorite Wis. 135				59.0	34.7	60.9	18.6			43.3
Garton Wis. 140				57.2	38.0	57.8	23.8			44.2
New Victory Wis. 151				57.2	35.2	43.7	21.6			39.4
Ped. 19 White Cross				56.2	30.0	60.9	25.0			40.6
Ped. 18				54.1	45.6	87.2	41.9			52.2
Ped. 17				54.1	44.9	71.2	49.9			51.6
Canadian Wis. 149				47.6	47.8	74.4	32.9			49.8
Sparrow Bill Wis. 142				46.6	25.6	34.1	20.4			31.7
B. H. 11, Wis. 154				43.1	24.7	41.3	27.6			
B. H. 5, Wis. 154					51.1	78.2	57.5			
Berry's New Sensation Wis. 137					47.6	66.6	52.9			

TABLE XII.—(Continued)

	1915	1916	1917	1918	1919	1920	1921	5 Yr. Av. 1915-19	5 Yr. Av. 1917-21	4 Yr. Av. 1918-21
Silver Mine Wis. 153										
Lincoln Wis. 157						50.8	28.8			
Irish Victor Wis. 156					41.1	47.8	22.2			
Garton Wis. 141					40.5	51.9	26.6			
New Victory Wis. 159					35.5	51.3	24.3			
Early Yellow Wis. 164					33.9	53.4	26.1			
Gold Mine Wis. 174						73.4	22.2			
Golden Sheaf Wis. 161					34.4	67.3	34.4			
Great Dane Wis. 166					40.7	73.4	40.7			
Royal Prince Wis. 163					20.5	61.3	20.5			
Great Dane Wis. 162					16.9	59.9	16.9			
Quaker Wis. 175					20.6	55.9	20.6			
Granary Filler Wis. 165					26.6	52.2	26.6			
					31.9	41.6	31.9			

