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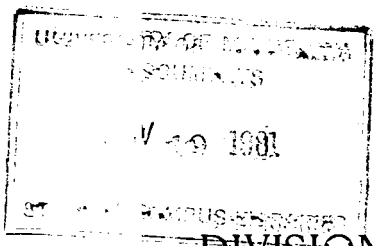
Agricultural Experiment Station



BULLETIN 115

DIVISION OF AGRICULTURE

APRIL, 1909

SEED GRAIN

SELECTION. TREATMENT. VARIETIES.

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SEED GRAIN.

ANDREW BOSS L. B. BASSETT
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SELECTION. TREATMENT. VARIETIES.

THE SEED.

Seeds consist essentially of an embryo or germ, an endosperm and a seed coat. These three parts are in direct relation to each other and are subject to the effects of the soil and climate upon the parent plants.

The Germ is the living portion of the seed and consists of a plantlet embedded in and attached to a cheese-like structure, which feeds the little plant during the very first stages of germination. The little plant is perfect in every way. A stem and root development is plainly visible to the naked eye in a kernel of corn that has been split in two lengthwise through the center of the germ. A good germ should be rich, bright colored and large. Small germs indicate stunted vitality and should be avoided.

The Endosperm, or stored up plant food, comprises the larger part of the seed, and consists mostly of starchy materials. In some seeds this starch is very soft and powdery, while in others it is hard or horny in texture. In corn these two kinds are often noticed in the same kernel. On the outside of this starchy material and under the seed coat there is stored a very thin layer of food, in which there is a high per cent of nitrogen. Both the starchy portion and this nitrogenous material are stored in the seed for food for the little plant during the first days of its growth, until the roots and leaves have been sufficiently developed to absorb food from the soil and nourish the plant.

The Seed-Coat. The covering of the seed, commonly spoken of as bran, is in reality the seed-coat provided by nature to protect the stored up food and the germ. Alternate wetting and drying in the shock, freezing and weathering, all affect the seed coat and injure the germ to some extent, sometimes fatally. Grain, to be good seed, shoud be cut when ripe, shocked and well capped, and threshed when dry, or stacked so as to prevent injury from weathering. The grain when threshed should not be permanently stored in large quantities if it is moist, as heating in the bin is sure to injure its germinating qualities.

Germination. Germination of seeds takes place under favorable conditions of heat, air and moisture. Certain seeds germinate at lower temperatures than others but a moderate temperature (65°—85° Fahrenheit) is favorable for the germination of most seeds.

Air is necessary to supply oxygen to the plantlet and to cause chemical changes in the stored up food of the seed.

Moisture is necessary to aid in the chemical change and in conveying plant food to the plantlet. Plant food must first be in solution before it can be taken up and utilized by the plant.

Growth. The size, rapidity of growth, and general vigor of the plants during the first stages of growth (the first two or three weeks) depend largely upon the quality of the seed used and the conditions under which the seed is sown. In the fully matured, well developed seed, the stored up food is sufficient to nourish the little plant until the leaves and roots have been sufficiently developed to gather food from the air and soil. It is readily seen therefore that the larger and plumper the seed, the more perfect will be the nourishment and development of the resulting plant.

A seed grown on a plant that was unable to functionate properly is likely to be weak in vitality. Shrunken seed or seed that is much exposed to weathering conditions has had its vitality lessened and will not produce as good plants as those from plump, heavy seed. Numerous experiments comparing shrunken, light and damaged (poor) seed with plump, mature, perfect (good) seed, have been

made at various experiment stations. The results have been universally in favor of the good seed. The poor seed gave plants of slow, weak growth, slender stalks, narrow leaves and decidedly poor root systems; on the other hand, the plants from the good seeds are of good color, stalky, broad of leaf and have a well developed root system (see Fig. 1.) Thus the plants from poor seed are unable to

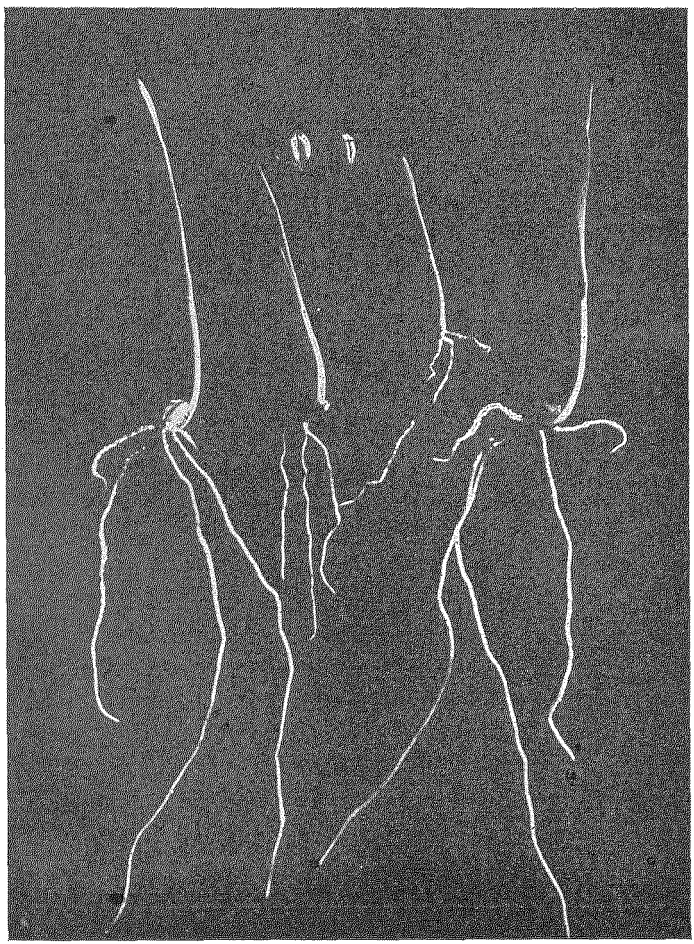

Fig. 1.—Plants from good and poor seed, also plump and shrunken kernels. The outside plants are from good seed. Those on inside are from poor seed. These seeds were planted under exactly similar conditions. The difference is a result of the seed value only.

cope with unfavorable conditions of soil and climate, while those from good seed are able to withstand them with better results.

TESTING SEEDS.

The germinating power of seeds should be known before they are sown. Sound bright grain will usually germinate well, but bleached, weathered or bin burned grain has a weaker germinating power. All seeds should be tested before sowing. The amount of seed required per acre is affected directly by its germinating power and the resulting crop may be correspondingly affected.

HOW TO MAKE A GERMINATION TEST.

Take two common plates and get two pieces of cotton cloth about the size of the plates. Dip the cloths in warm water and spread one of them on a plate. From the seed that is to be tested take a handful and place on the table. Count out one hundred seeds just as they come from the edge of the pile. Scatter these one hundred seeds upon the wet cloth on the plate. Spread the other cloth over the seeds and press it down closely. Then turn the other plate upside down on the plate with the seeds, leaving the corners of the cloths sticking out between the plates. This makes a complete tester and is satisfactory for most kinds of seeds. Place it where it will keep reasonably warm and keep the cloths moist by sprinkling with water two or three times a day if necessary. Count carefully and keep a record of the number of seeds that have sprouted each day until the test is complete, or until no more seeds show signs of life. A week is as long a time as this should take.

FIGURING THE GERMINATING POWER.

Add the "counts" of the different days together and the total number will be the per cent of germination, or an indication of the value of the grain for seed. If 90 to 95

seeds grow, the germination is pretty good, but below 90 the value of the grain for seed begins to be doubtful, and another test should be made a little later to see if the grain is losing its power. A little more seed can then be added in sowing to make up for the dead ones. Or if the germination is too low, new seed should be secured. If the seeds all sprout about the same time, it is a sign of good strength, but if a few sprout each day the vitality is injured in some way. In figuring germination it is best to count no seed germinated unless the sprouts are one-half inch or more long.

THE SEED BED.

A well prepared seed bed is of nearly as much importance as is the seed. It may be easy or difficult for the young plants to get food from the soil, depending on whether the seed bed has been well or poorly prepared. To gather moisture and food through the roots it is necessary that the roots be in actual contact with the soil particles. Therefore, it is obvious that the seed bed should be fine and compact, such as would be made on fall plowed land by disking in the spring and harrowing at least once before and once after sowing. A lumpy and open or too wet and heavy seed bed does not afford a hospitable condition which insures a prompt, vigorous germination and growth. The best of seed may make a perfect stand when sown upon such a seed bed under favorable conditions of heat and moisture. Seed weak in vitality must have a perfectly prepared seed bed to insure a fair stand. Even with seed of the best quality, it is always wise to prepare the seed bed well.

CLEANING AND GRADING GRAIN.

SELECTION OF SEED.

A bin of grain may be compared to a herd of cattle, and superior individuals may be selected from the bin of grain as well as from the herd of cattle. Individual kernels of

grain vary as much in ability to produce good or poor offspring as do individual animals. The heavy, plump seeds were produced in most cases upon the strongest and most vigorous plants, and the light, shrunken seeds from the weaker, less vigorous plants. That "like produces like" is a well-known axiom in plant breeding. The influence of heredity is as strong in plant life as in animal life. Improvements can be effected only by eliminating the poorest and breeding from the strongest individuals. Hence there is as much reason for selecting good individual seeds of grain as for selecting good individual animals.

YIELDS FROM HEAVY AND LIGHT WEIGHT SEEDS.

A plump, heavy kernel of grain will produce a stronger plant and nourish it better than will a shrunken, light kernel. This fact has been demonstrated beyond doubt by testing the yield from light and heavy weight seeds. The following table shows the yield of winter wheat obtained from light and heavy weight seeds at the Nebraska Experiment Station:

TABLE XII.

KIND OF SEED	Yield per Acre in 1900	Yield per Acre in 1901	Average Two Years
Heavy	29.5 bu.	29.3 bu.	29.4 bu.
Light	23.0 bu.	26.7 bu.	24.8 bu.
Gain in favor of heavy seed			4.6 bu.

A similar experiment at the Minnesota Experiment Station with heavy and light weight oats (Bulletin No. 31) gave an increase of 9½ bushels per acre in favor of the heavy seed and heavy wheat gave a yield 36 per cent greater than that of light wheat.

PRINCIPLES OF SEPARATING GRAIN.

Being convinced of the value of good seed, the question now arises: How may a farmer select good seed in a practical manner? Every field or bin of grain has kernels in it which differ in producing power, some are good, some are poor. It is only the best that is wanted for seed. There are two principles by which grain can be separated

in ordinary fanning mills, namely, by weight and by size of kernel. The average farm fanning-mill will handle about forty bushels per hour At this rate in eight hours two men can clean 320 bushels. This will make the cost something less than one cent per bushel. By setting the mill as shown in Fig. 2, or by using a coarse sieve in "end shake" mills any amount of heavy, large seeds desired can be taken out for seed purposes and the rest left in the market grain. Suppose a mill is set to take out ten per cent of

FANNING MILL SELECTION.

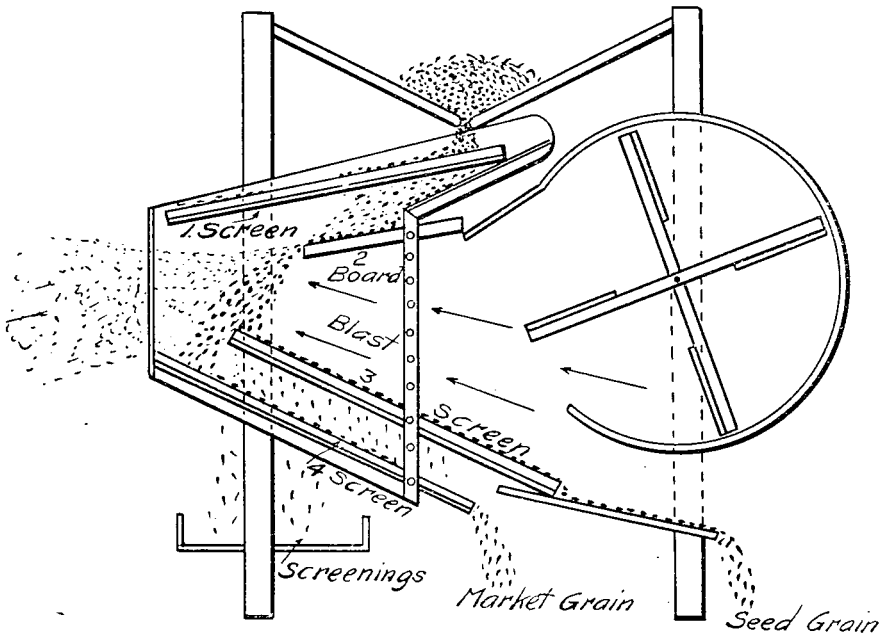

Fig. 2.—"Side-Shake" Mill for Separating Seed Grain.

Screen No. 1 should be just coarse enough to let the grain through. It is used simply to run off sticks and straw. Board No. 2 carries the grain backward in the mill, so as to let it drop through the blast at once. The light kernels are blown past the end of screen No. 3, the heavier kernels fall on screen No. 3. Board No. 2 may be moved forward or backward to throw a large or small per cent of grain on screen No. 3, as desired. Screen No. 3 should be coarse enough to let the small kernels through onto screen No. 4.

It is adjustable as to slant and may be moved forward or backward to regulate the amount of grain it will catch. Screen No. 4 is fine enough to carry nearly all of the grain over into market grain. Any side shake mill may be fixed up in this way. Separation by weight can easily be made with the end shake mills, but the large kernels can be separated from the small ones in any proportion desired, simply by using coarse or fine screens in the lower part of mill.

the best seed. Ten per cent of 320 bushels is 32 bushels. These 32 bushels will be free from weed seeds and will contain the best breeding individuals in the grain. It will cost in labor from five to ten cents per bushel. One bushel per acre increase in yield will pay for this labor and leave a very handsome profit An increased yield from two to ten bushels per acre may be expected if seed grain is properly selected. Separation based upon size of grain alone is insufficient, for size is not a reliable factor. For example, large oat kernels may be mostly "double oats." Thus the factors of *size* and *weight* of grain must determine its seed value.

SAVING SEED.

It often happens that in a field of grain, parts of the field produce grain of a better quality than do other parts. This may be due to the condition of the soil, to rust, or to lodging. It will often pay to cut and thresh these best patches by themselves and keep this seed by itself, from which to separate grain for sowing. Some farmers prefer to grow small patches from select seed under favorable conditions. These patches can be hand-picked and kept pure and free from weeds Unless very careful methods of selecting seed for these patches are followed, better results can not be expected than from the similar method of selection by the use of the fanning mill as described above.

Grain to be used for seed should be allowed to fully mature. If it is necessary to harvest grain a little green, it should be carefully shocked and capped to allow the seed to fill. It is preferable to let grain go through the "sweat" in the stack, instead of risking its heating in the bin. Store seed where it can be kept dry and unmixed and do not allow it to heat.

THE GRAIN SMUTS.

DAMAGE FROM SMUT.

The grain smuts cause an annual loss in the crops of Minnesota that may be conservatively placed at 10 per

cent. The yield of oats is often lessened as much as 20 to 25 per cent by smut. Not only are yields lessened by the smuts, but the grades are also lowered by even a small amount of smut in the grain.

NATURE OF SMUTS.

The smuts of wheat, oats and barley are caused by the growth of minute parasitic plants that live within the tissues of the grain plants and feed upon their juices. The black masses of smut that are seen at harvest time replacing the seeds which are normally produced are composed of many "seeds" (spores) of these parasitic smut plants, which have grown and developed at the expense of the grain plant. Smuts belong to a class of plants called fungi, which are incapable of gathering plant food from the soil and water, but are capable, with the aid of sunlight of producing plant tissue. Fungi obtain their food either from the decaying tissues of plant bodies or from the juices of living plants. Smuts may be divided into two general classes, the *Covered* and the *Loose Smuts*.

Stinking or Covered Smut, common in wheat, receives its name from the fetid odor of the spore masses when ripe. These masses may be detected in the form of enlarged kernels of grain encased in a thin covering or "skin" which normally covers the wheat kernel. Sometimes the smut develops in only a few kernels in a spike of grain, and again every kernel on the spike may be affected. Loose smuts differ from the Stinking smuts in that the entire spike of grain except the central stem is replaced with the smut spore masses, whereas in the stinking smut the black smut masses replace only the inner portions of the kernels and are not seen unless the masses are broken open.

METHOD OF INFECTION.

The loose smuts of wheat and barley infect their hosts through the embryonic seed. The ripe spores find their way into the seed when the flowers of wheat or barley are open for fertilization. A smut spore coming in

contact with an ovary "sprouts" and sends its mycelium into the tender tissue which later develops a seed. When the seed is sown the smut mycela germinate coincidently with the seed keeping pace with the growing terminal point of the stem. When the plant forms seed heads the smut begins forming its spore, so that at the time the grain is headed the smut has complete possession of the seed area. At this time it is mature and ready to infect the crop.

The spores of stinking smut of wheat, of the covered smut of barley and of loose smut of oats ripen at about the same time as the grain and are blown about by the wind or distributed in threshing and handling the grain and find lodgement on the seed. When the seed is planted and germinates in the spring the smut spore also germinates and its mycelum penetrates the tissues of the host plant. Once inside the plant tissues, the process of development is the same as described for the loose smuts of wheat and barley .

Smut spores must come in contact with the seed in order to infect it. If they fall to the ground there is little or no chance for infection. *Smut infection is caused by smutty seed, not by smut spores that have fallen on the soil.*

TREATMENT FOR SMUT.

Smutty seed can be so treated as to kill the smut spores and not affect the vitality of the seed, thus the succeeding grain crops will be practically free from smut. There are a number of chemicals that will kill smut, but the Experiment Station recommends formaldehyde as being the cheapest and easiest applied and least dangerous to use. In buying, care should be taken to secure formaldehyde that tests at least 40 per cent pure, otherwise the treatment is apt to be a failure. There are a number of smut machines on the market for treating seed grain which will thoroughly rid the grain of smut. Just as good results can be secured, however, with home-made apparatus as with the machines, if proper care is used in the method of treat-

ment. A solution of formaldehyde should be made in the proportion of one pound formaldehyde (40 per cent pure) to 45 gallons of water. This amount will treat about 100 bushels of wheat and 75 to 85 bushels of oats or barley. The easiest method of applying the solution is to spread the seed on the granary floor and spray the solution over it with a common garden sprinkling can. The solution is not effective at a low temperature, hence the seed should not be treated during cold weather. While the seed is being sprayed it should be shoveled over and over, until the seed is thoroughly moistened. After the grain has been sprayed it is a good plan to cover the mass of seed with a few sacks or blankets in order to prevent too rapid evaporation of the formaldehyde. In a few hours the sacks may be removed and the grain allowed to dry before seeding.

It is usually best to treat seed the day before seeding, but it may be done earlier in the season if desired. When seed is treated some weeks before seeding it should be allowed to dry thoroughly before storing in bins or sacks. When the seed grain is stored in bins, after being treated, the bins should be thoroughly swept out and sprinkled with formaldehyde to avoid infection from smut spores that may have adhered to the floor and walls of the bin.

When granary room cannot be had for treating the seed it can be successfully treated in a wagon box, conveniently placed. In seeding grain that has recently been treated, the drill should be opened a trifle wider in order to get the same amount of seed into the soil. (Half bushel more for oats.)

The formaldehyde treatment will kill the stinking smut of wheat and the loose smut of oats It will not rid wheat or barley of loose smut. Treating seed corn for corn smut does no good. The only way to decrease the amount of smut in corn is to pluck off the smut balls and burn them. Corn smut spreads rapidly if the smut balls are thrown on the manure pile and the manure is spread on corn fields *Never throw a smut ball on the manure pile.*

VARIETIES OF GRAIN.

There are few permanently established varieties of grain in Minnesota. This is probably due partly to the fact that strains are developed and named commercially as varieties, and partly to the common belief that a variety runs out when grown for a few years on the same soil.

There probably is no variety of wheat, oats, barley or other grain that is best for all parts of Minnesota. In each locality some varieties are better adapted to existing conditions than others.

Before investing in new varieties, it is well to search out the best home grown seeds, that are pure, free from foul seeds and satisfactory in yield and quality. Such varieties will generally give better results than newly introduced ones. If no good varieties can be found in the neighborhood, secure a small quantity of some new and promising variety and test it beside the old variety for a year or two before adopting it for the whole seeding. The Experiment Station has tested nearly all of the commercial varieties offered for sale and can advise as to their value in most instances.

Among the Blue Stem wheats the varieties known as Minnesota No 169, Hayne's Blue Stem and Bolton's Blue Stem are undoubtedly superior to the common blue stem wheats. Minnesota 163 is a superior variety of Fife wheat.

Manshury, a six-row barley, is the best for Minnesota soils. Minnesota No 105 barley has been developed from Manshury barley and is a standard variety. Among the oat varieties, White Russian, Silver Mine, Swedish Select, Minnesota No. 6 and Minnesota No. 26 are the leading varieties.

The best variety of flax yet tested at the Minnesota Experiment Station is Minnesota No. 25. Emmer or Speltz is sown to some extent within the state, but it is not destined to supplant oats and barley for feed grains as its yield and feeding value is no greater.

COMMON AND PEDIGREED VARIETIES.

The words "scrub" and "pure-blood" have as large a meaning in describing varieties of grain as they do in live

stock. The trained plant breeder may produce varieties of grain having the hereditary power to produce large yields just as well as the live stock breeder can breed cows that will produce thirty pounds of butter a week. It pays the grain raiser to use pedigreed varieties of grain and to keep them pure. Mixing varieties is a bad policy. The market has the best paying demand for No. 1 white oats, not for white, yellow and black oats mixed. The best grades of corn must be pure. When varieties of wheat are mixed the chances are that the field of grain will ripen unevenly and a loss in quality result. The markets give a premium to the producer who has grain of an even, standard quality for sale. The value of the pedigreed or pure bred variety lies in its ability to reproduce its type and to transmit its high yielding powers.

CHANGE OF SEED UNNECESSARY.

Experiment Station records show that it is unnecessary to change seed to get good yields. At the Nebraska Station a new variety of winter wheat was grown on the same soil for a number of years. The yields increased as the variety became adapted to its environment and showed a tendency to improve rather than deteriorate. The seed was carefully cleaned and graded each year, which aided materially in the improvement of the variety. Similar results have been shown with other grain.

At the Minnesota Experiment Station, where more than one thousand varieties or strains have been tested it is a matter of common observation that new introductions from distant sources rarely do well until acclimated.

"Running out" of varieties is due to careless selection of seed grain and poor tillage rather than to natural causes which deteriorate the variety. By reserving the best piece of grain on the farm for seed and by the use of the fanning mill and grain grader the yields can be increased and a variety made more valuable to the locality. Buying seeds every few years from regions having different soils and climate is unwise. Care in selection of seed in tillage and in

grading of the seed obviates the so-called "running-out" of grains.

COMMERCIAL VARIETIES OF GRAIN.

WHEAT.

The wheat produced in Minnesota may be divided into three great classes, viz.: spring, winter and durum or macaroni wheat. In each class there are numerous local or commercial varieties. The commercial varieties of wheat commonly known to the Minnesota farmer are variable. Old names of varieties are continually being dropped out and new ones added. Many of the so-called new varieties are strains of the old ones sold under new names. It is easy for the seedsman or farmer with the aid of advertising matter and a new name to commercially launch on the market an apparently new variety. Often the new and old variety is identical. It is evident therefore, that the names of many varieties of grain are meaningless. The method is yet to be practiced, that enables the seed grower to put forth varieties of grain that are absolutely true to type and pedigreed, although such a system is in vogue at the Experiment Station and on the farms of a few leading seed growers.

SPRING WHEAT.

In general spring wheat is divided into three types, Blue Stem, Fife and Bearded. No one of these types is best suited to all conditions of soil and climate in Minnesota, although the Blue Stem wheats more nearly fill this requirement than any other. The question as to which type is best suited to any locality can only be determined by trial and is affected by yield, market demands and the likes and dislikes of the producers.

Blue stem wheat seems to yield better than Fife in the southern and central part of the state and since it mills equally well is more generally grown. In the northern part of the state, especially in the Red River Valley, there

is little difference reported in the yields of the Blue Stem and Fife and by far the larger portion of the Fife wheat grown in Minnesota is produced in that part of the state. It is probable that in the future as in the past these types of wheat will continue to make up the bulk of Minnesota's crop, but that each will be localized to some extent and improved in yield and quality.

Bearded wheats such as typified by Johnson wheat, Early Java, Preston, Minnesota No. 188 and all of the so-called Velvet Chaffs have been grown in parts of the state for the past three years with varying degrees of success.

So far as determined at this Station there is very little difference, if any, between the varieties named. All are bearded and mature from a week to ten days earlier than the Blue Stem or Fife. They are not, however, as well adapted to all parts of the state as are the Blue Stem or Fife wheats.

Bearded wheat is localized and in Minnesota has proved most valuable in sections of Renville, Nicollet and Brown counties. Here the yield is commonly reported from two to ten bushels greater than Blue Stem. This coupled with its early maturity and generally heavy weight per bushel has made it a favorite in these localities.

The milling quality of the wheat has been questioned and preliminary tests indicate that it is inferior to the other spring wheats. On this account a new market classification has been made for all forms of "velvet chaff." The yield of the bearded wheats on the Station farm in 1908, the only year they have been grown in comparison, was lower than either the Blue Stem or Fife wheats.

TABLE XIII.—Yield of Bearded Wheat.

Minn. No.	Common Name	Yield 1908	Days Maturing
188	Preston	20.7	113
1010	Early Java	13.4	113
1011	Velvet Chaff	16.6	113

However, the yields shown for the one year are not a measure of the value of these wheats in all parts of Minne-

sota. Minn. No. 188, for example, has an average yield at Minnesota Experiment Station for fourteen years of 26.7 bushels per acre, though it is not recommended for general use on account of inferior milling qualities.

Two commercial Fife wheats have been grown at University Farm during the past three years:

TABLE XIV.—Yield of Fife Wheat.

Minn. No.	Common Name	Yield 1906	Yield 1907	Yield 1908	Av. Yield 3 years	Av. Days Maturity
846	Red Chaff	26.6	24.2	27.5	26.1	117
980	Red Fife	23.3	18.7	32.6	24.8	115

The standard Fife wheat, Minn. No. 163, has yielded an average of 26.4 bushels per acre for the past fourteen years.

Minn. No. 169 has proved so satisfactory to the farmers and millers that it is practically the only Blue Stem wheat not offered as seed. *This wheat has averaged 26.7 bushels per acre for the past* 14 *years.*

WINTER WHEAT.

The winter wheat area in Minnesota is being extended from year to year. It is now grown to a considerable extent in certain localities in the southern part of the state and is grown as far north as Crookston. Where hardy varieties of winter wheat can be acclimated and grown larger profits and greater yield per acre may be expected than from the spring wheats. Minnesota farmers, however, must be conservative about growing winter wheat and give it a fair test on a small acreage for at least two years before relying on it as a profitable market crop. Only Minnesota grown seed should be used.

The best yielding varieties of winter wheat at the Minnesota Experiment Station are Turkey Red (Minn. No. 529), Bearded Fife (Minn. No. 550), and Russian White (Minn. No. 642.)

Winter wheats in Minnesota should be sown not later than September 1, to give the plants a chance to develop a

strong root system before winter. Sowing the wheat in standing corn, unless the soil be unusually wet in the fall, gives better results than to sow on newly fall plowed land, as the grain will be better protected through the winter and spring.

DURUM WHEAT.

Durum or Macaroni wheat was introduced into the United States from Russia and North Africa. In those countries it is grown under semi-arid conditions, on light soils. Hence it is peculiarly fitted to be grown in those regions where the rainfall is insufficient for our common bread wheats. In such sections it is a valuable crop. However, there are few soils in Minnesota than will grow No. 1 Durum wheat. Durum wheat grown on the heavy prairie soils of Minnesota usually produces grain of a starchy, inferior quality that does not compare with the Durum wheat from the "plains" region. It seems to be peculiarly susceptible to scab in most sections of this state.

This wheat is used for the manufacture of macaroni products and to some extent in milling. The price is usually lower than for our bread wheats.

The Velvet Don, Argentina and Kubanka have been the best varieties at this Station. Their yield has not equalled that of our best Blue Stem or Fife wheats. Wheat growers who can raise 18 to 20 bushels or more of Blue Stem or Fife wheat to the acre will find no increased profit in growing Durum wheat.

OATS.

The oat crop is increasing in importance to the Minnesota farmer. In many sections of the state where wheat is no longer the staple crop the oat crop has taken its place. As a crop it fits in well with the standard rotation and is in good demand in the market. With average yields of 50 or more bushels per acre it is a more profitable crop than any of the other grains.

The size of an oat kernel is not always a criterion of its weight. Many large kernels are often double oats.

These are lighter in weight than their appearance would indicate and should be avoided in seeding. The wind blast rather than the screen is the only dependable method of grading oats for seed.

There are a great number of named oat varieties grown in the northwest. Many are dissimilar only in name. Oats grown in Minnesota may be classified as Early and Late. The late oats are generally from a week to three weeks later than our so-called 60-day or early oats. Under favorable climatic conditions they are heavy yielders, but in many years they are too late to escape the attacks of rust and are exposed to storms that blow them down, thus materially decreasing the yield.

Practically all the commercial varieties of oats have been grown at the Minnesota Experiment Station for purposes of comparison. The following table gives the yearly yields and average yields for the past three years of the more common commercial varieties.

LATE OATS.

TABLE XV.—Yield of Commercial Varieties.

Minn. No.	COMMON NAME	1906	1907	1908	Average Yield 3 years	Days Maturing
311	American Banner	88.1	36.9	40.7	55.2	111
348	Myrick Banner	89.3	46.8	45.3	60.5	108
353	Big Four	71.8	50.6	32.5	51.6	106
282	Lincoln	76.8	48.1	49.0	60.7	112
302	White Russian	85.0	38.7	33.5	52.4	110
383	*Garton's Regenerated Swedish Select			28.7		104
391	*Roosevelt			35.3		106

* Grown in 1908 only.

Table XV. clearly shows the effect of adverse climatic conditions on the oat yield as the yields in 1907 and 1908 were but little over half of that obtained in 1906.

For comparison with the late oats the following table showing the yields of the three most common early oats is offered:

EARLY OATS.

TABLE XVI.—Yield of Commercial Varieties.

Minn. No.	COMMON NAME	1906	1907	1908	Average Yield 3 years	Days Maturing
358	Kherson	36.2	77.5	42.0	38.5	104
261	Sixty Day	76.8	62.5	44.0	61.6	103
267	Early Champion	63.7	65.6			

The Early Champion oat was not grown at the Minnesota Experiment Station in 1908, although it is the most popular early oat grown and a larger acreage is probably devoted to its culture in this State than to any of the other early varieties.

In favorable years the early oat will not yield as heavily as will the medium late varieties, but during a series of years in which adverse climatic conditions are experienced the best early oats will out-yield the best medium late oats.

The early oat has a smaller kernel and is thinner hulled than the late varieties and is generally of a rather yellowish color instead of white. Because of the smaller kernel a lighter seeding can be made than of the late oats.

Black oats are not commercially grown in this state because of their low yield per acre, lack of market demand and thick hulls. The two common varieties of black oats are the Black Beauty with an average yield for the past three years of 46.1 bushels per acre, and the Black Tartarian which yielded an average of 38.7 bushels per acre during the past three years. Both varieties matured in 111 days.

The standard varieties of oats distributed by the Minnesota Experiment Station are No. 6 and No. 26. These were selected and grown for their high yields and have been quite generally distributed in the state. All other varieties grown at the Minnesota Experiment Station are compared with these. *No. 6 has averaged 60 bushels per acre for the past fifteen years and No. 26 has averaged 66.6 bushels per acre for the same period.*

CANADIAN AND WESTERN SEED OATS.

A large amount of seed oats are being shipped into

Minnesota this season from the Western States and Canada to relieve the seed situation. Some of these oats have been grown under irrigation and present an excellent appearance, and cannot fail to impress the buyer favorably. Practically all the oats shipped in to be sold for seed have been grown under climatic and soil conditions very different from our own. Seed of this kind, while of good appearance, is often very disappointing in its results and if used at all should be used in small quantities until it has proved its value by field trials in the locality.

The farmer who saves his own seed oats, providing they are pure, and who increases the weight per bushel as much as possible with a good fanning mill, has a much better chance of harvesting a good crop in the fall than the purchaser of seed that has very likely been produced under conditions very different from those that prevail in his own locality.

BARLEY.

At present there are four distinct types of barley grown in Minnesota: (1) Six-row bearded, (2) two-row bearded, (3) hull-less, and (4) beardless barley.

The bulk of the barley crop produced in this state is the six-row bearded type. This barley yields better than any of the other types, finds a readier market and is the one in greatest demand by the barley users.

During the year 1908 forty-one varieties of six-row barley were grown on the Experiment farm with an average yield of 44 bushels per acre. In the same year 23 varieties of two-row barley were grown with an average of 31.5 bushels per acre.

The two-row barley on account of its lighter yield and late maturity is not grown in the state to any great extent.

Hull-less barley of either the black or the white variety matures early and is less productive than either the two or the six-row types. There is very little sale for this barley. It is grown principally as a feed.

Beardless barley resembles the hull-less in yield and early maturity, and like the hull-less, seems to possess a weaker straw than the two or six-row types.

Among the best commercial six-row types of barley grown at the Minnesota Experiment Station in 1908 are the Manshury, Minnesota No. 105, Oderbrucker, Blue Ribbon and Houston's Golden Queen. Minnesota No. 105 has averaged 50.4 bushels per acre for the past ten years. In 1908 Minnesota No. 105 yielded 40.1 bushels per acre, Oderbrucker 40.6 bushels, Blue Ribbon 38.6 bushels, and Houston's Golden Queen 48.3 bushels per acre.

The best two-row types grown at the Minnesota Experiment Station in 1908 were the French Chevalier and the Highland Chief, with a yield of 38.3 and 33.1 bushels per acre, respectively.

DISTRIBUTION OF SEEDS BY THE MINNESOTA EXPERIMENT STATION.

For a number of years the Minnesota Experiment Station has followed the plan of testing and disseminating varieties of seed grain. Many of these varieties have been developed by careful nursery selection or by cross breeding. They are then given field tests and are distributed as commercial varieties when found to be satisfactory. It has been the policy of this Station to clean, carefully grade and test these seeds before offering them for sale at a fair price per bushel. The Station does not offer seeds free. as it is believed that seeds obtained under such conditions are not as carefully handled as where a reasonable price is paid for them. The Station prefers to sell these seeds to careful farmers, who will sow them on clean land and care for them properly; keeping them pure and free from weed seeds. Until it is known that these varieties under trial are superior to those commonly grown, only small quantities are sold to each customer.

Parties purchasing seeds from the Experiment Station are listed as Co-operators and when orders for Experiment Station seeds are received from the Co-operator's locality, they are referred to the Co-operator, if the seeds have been kept pure and free from foul seeds. It is believed that seed grown in a given locality is better for that locality than newly introduced stock.

Upon suitable information and the submission of a sample of the grain to be used for seed, the Station issues to the original purchaser seed growers' certificates, which he may use as a guarantee that he has stock of the original and identical variety distributed by the Experiment Station. If he desires these certificates to supply customers purchasing seed from him, they are, upon request, filled out and supplied by the Station.

The theory under which seed is distributed is as follows: That the Station is equipped to develop and increase superior varieties of grain. These superior varieties can be sold in small quantities to many seed growers in various portions of the state. These seed growers in turn can supply their neighbors with superior seed at less expense than from any other source, providing the variety proves to be adapted to the locality. In this way many people become interested in the new varieties and the result is a wider distribution of improved varieties.

The following seeds have been distributed during the past few years. Only a part of them are for sale at the present time, though the prices of all are included in the table:

TABLE XVII.

KIND OF SEED	Minn. No.	No. Years Tested	Av. Yield per acre	Largest Amt to 1 custom'r	Price per bushel
Wheat—Fife	163	14	26.4	2½	$2.00
Blue Stem	169	14	26.7	2½	2.00
Bearded	188	14	26.7	Out	2.00
Winter	529	6	32.6	Out	2.00
Oats—White	6	15	60.	Out	2.00
" "	26	15	66.6	5	1.00
Barley	105	11	51.9	4	1.50
Flax	25	7	16.4	Out	2.50
Rye, Winter	2	9	39.8	Out	1.25
Com. Yel. Dent	23	2	44.5	¼	2.00

Further information upon any of the above varieties will be furnished upon application to the Minnesota Experiment Station.