



University of Minnesota Agricultural Extension Service, St. Paul

January 12, 1956

1956 Variety List Shows Important Revisions

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A number of oat and wheat varieties were removed from the recommended list at the recent Agricultural Experiment Station Varietal Conference. The varieties were removed because of poor performance over the past few years. Many farmers would say they had "run out." This brings up the old question, "Do varieties run out?"

The answer is "No," if the term is used to imply that the inheritable characteristics of these crop varieties have changed. Genetic characteristics of a pure variety of self-fertilized plants such as wheat, oats and barley do not readily change. However, the farmer may observe that the variety he has been growing does not perform as well as when he first got the seed. What are the causes for the reduced yield?

Disease Factor Important

Perhaps most important in causing the reduced yield of those small grain varieties removed from the list was the building up of new disease organisms which will attack the variety. Thus the variety does not change genetically, but the number and kinds of disease organisms which can attack it may increase rapidly. This is evidenced by races 7 and 8 of stem rust of oats. Not important a few years ago, they now are major considerations when selecting your oat variety. Likewise resistance to stem rust race 15B is important when selecting wheat varieties.

Another factor that may bring about lower yields of small grain is a reduction in the fertility level of the soil. A 50-bushel oat crop will remove 60 pounds of plant food from the soil—that 60 pounds being composed of 35, 15 and 10 pounds of N, P205, and K20 respectively. Unless the soils are un-

usually fertile, or fertilizers are added, the yield of grain will decrease if continued cropping is practiced.

Unfavorable weather may also bring about reduced yields in small grains.

Pest and Weed Damage

Insects may also damage your oats, wheat and barley. The insect population varies from year to year. When it is high, it will contribute to a reduction in the yields in certain years.

The mixing of varieties may also bring about lower yields. Suppose you had a high-producing variety that had become mixed with seed of a variety that had a low-yield potential. Naturally this would result in a reduction of the yield when the mixture was grown. Of course, the possibility could be eliminated by the purchase and planting of certified seed.

The Agricultural Experiment Station of the University of Minnesota conducts many tests on varieties. These tests determine which varieties are adapted to Minnesota. Those varieties placed on the recommended list must have proved superior to others in comparative tests. The 1956 list of recommended varieties and changes made from the 1955 recommendations follow.

Oats

In 1955, races 7 and 8 of stem rust were the most damaging ones on the oat crop. As in the past several years race 7 was more damaging than race 8. Therefore varieties susceptible to race 7 performed poorly again this year and were removed from the recommended list. The varieties taken off were Bonda, Mindo, Clinton, Clintafe, Clintland, and James.

Added to the recommended list of oats were Sauk, which resists race 7; and Rodney and the improved Garry,

Complete Story on Crop Varieties Given in Folder

A complete summary of the 1956 Minnesota farm crop varieties is given in Minnesota Agricultural Extension Folder 22, "Varieties of Farm Crops." Crops that are recommended, not adequately tested, or not recommended are all included. For your copy, write the Bulletin Room, University of Minnesota, Institute of Agriculture, St. Paul 1, Minnesota.

which resist both races 7 and 8 at moderate temperatures. All three are late-maturing varieties. Remaining on the recommended list are: Ajax, Andrew, Branch and Missouri 0-205, all resistant to race 7; and Minland, resistant to all prevalent races of stem rust except 7A and resistant to all races of crown rust.

Spring Wheat

Bread Wheat—Rushmore was dropped because of its susceptibility to stem rust race 15B and its poor performance over a period of years. Lee and Selkirk remain on the list, but Selkirk resists race 15B better than Lee.

Durum Wheat—Carleton, Mindum and Stewart were removed because of susceptibility to race 15B and consequent poor performance. Langdon and Ramsey, two new 15B-resistant varieties from North Dakota, were added to the list. In addition a "stop-gap" variety, Sentry, which is not resistant but tolerates 15B reasonably well, was added.

Winter Wheat

Minter and Minturki are recommended. Both are very winter-hardy.

Barley

The recommended varieties are Kindred, Montcalm, Peatland and Vantage. Kindred and Montcalm are satisfactory for malting; Peatland and Vantage are not. Peatland is adapted to the cut-over region of Minnesota and is recom-

* Extension Agronomist.

YIELD

Yesterday

59 Bushels

Today

123 Bushels

RETURN

Yesterday

\$35 per acre

Today

\$90 per acre



CORN YESTERDAY

1. Variety - Open Pollinated (Minn. 13)
2. Fertilizer - 8 tons manure
3. Seed Treatment - None
4. Insect Control - None
5. Planted - Up and downhill
Checked 3 on
40 rows
(12000 kernels
per acre)
6. Weed Control -
Harrowed
4 deep
cultivations

CORN TODAY

1. Variety - Hybrid
(Minhybrid 508)
2. Fertilizer - Based on
soil test...
400^{lb}/acre 5-20-20 broadcast
100^{lb}/acre 5-20-20 row
300^{lb}/acre 33-0-0 sidedressed
3. Seed treatment -
Orthocyde
4. Insect control -
Aldrin
5. Planted - On contour
drilled 20,000 kernels/acre
6. Weed control -
Dinitro
Rotary hoe
1 shallow
cultivation

Better Yields, Higher Returns

Selecting Your Fertilizer

A. C. CALDWELL and C. A. SIMKINS*

The farmer faces several problems in the use of fertilizer materials today. Two problems are foremost: (1) How much should be used? (2) What kind?

Present refinement in soil testing has led the way in answering, "How much fertilizer to use." In fact, a reliable soil test is almost a **must** if economical returns from continued use of fertilizer are to be anticipated.

Recent production of many types of fertilizer material has stimulated considerable interest in nitrogen and phosphate fertilizer materials—and some misunderstanding on their use. A brief review of these materials might be helpful at this time.

Phosphate fertilizers fall into three main categories with respect to water solubility. First are the phosphate-bearing fertilizers which are completely water soluble. Included among these are relatively pure chemical compounds such as some ammonium phosphates, potassium phosphates, chemically manufactured high-analysis complete fertilizers, and liquid phosphoric acid.

Some ammonium phosphates, such as 11-48-0 and 16-20-0, are from 85-90 per cent water soluble and should be included in this group. Not generally recognized is the fact that the phosphate in ordinary and concentrated superphosphates is from 80-85 per cent water soluble, which puts them right up with the ammonium phosphates in this regard. All the phosphates mentioned may be classed as water soluble and should be considered as equivalent when compared on this basis.

The next group of phosphate-bearing fertilizers contain about one-half or less of the phosphorus in a water-soluble form. Among these are included some ammoniated superphosphates and some complete mixed fertilizers. It has been found that in making up a nitrogen-phosphate fertilizer using superphosphate and ammonia, the water solubility of superphosphate decreases when the nitrogen supplied by ammonia goes beyond a certain level.

Over one-half of the phosphorus in ammoniated ordinary superphosphate is still water soluble in a product in which the nitrogen is supplied by ammonia to the extent of about 2.5 per cent. Concentrated superphosphate may be ammoniated so that the final product has up to 5 per cent nitrogen as ammonia, and still have over half of the phosphorus water soluble. The water

solubility of ammoniated concentrated superphosphate does not change much upon ammoniation beyond 5 per cent and up to 12 per cent.

These facts are known to the manufacturers of mixed fertilizers. Consequently they use ammonia as the source of supply for some of the nitrogen in their product, supplementing it with nitrogen from some other source (such as ammonium sulfate) in order to get a relatively high level of nitrogen without reducing water solubility of the phosphorus.

The third group of phosphate fertilizers have no water solubility at all. Included among these are calcium metaphosphate, di-calcium phosphate, fused tri-calcium phosphates. Water solubility should not be confused with the available phosphorus as must be indicated by law on the fertilizer bag. The "available phosphorus" is that phosphorus which goes into solution in a neutral normal solution of ammonium citrate. This solution dissolves some phosphates which are not water soluble. Using citrate solubility as the standard of availability, just about all commercial fertilizer phosphates are 100 per cent available. The rock phosphates are an exception.

Table 1. Characteristics of Various Nitrogen Sources

Material	Per cent N	Kind of Nitrogen	
		Ammonia	Nitrate
Ammonia Nitrate	33.5%	50%	50%
Anhydrous Ammonia	82	100
Sodium Nitrate	16	100
Ammonia Sulfate	21	100
Urea	45	100
Nitrogen Solution	20-44	*	*

* Varies with different solutions.

In the final analysis, the important thing in the solubility or availability of fertilizers is how it is related to plant growth. Some research has been done on the relative response of plants to phosphates varying in water solubility. In general, on acid soils, plants respond about equally well to materials which are 10 per cent water-soluble or 100 per cent water-soluble. On calcareous soils the water solubility of the fertilizer seems to make a difference. More research needs to be done on the alkaline soils, but results obtained would indicate that materials containing about one-half or more of the phosphorus in a water-soluble form are about equivalent in giving crop responses. Most mixed fertilizers sold in this area would fall in that category.



Published by the University of Minnesota Agricultural Extension Service, Institute of Agriculture, St. Paul 1, Minnesota.

Feed Service Committee—Cora Cooke, chairman; Rodney Briggs; William Flemming; Lester Hanson; Harold Jones; Hal Routh; Harold Searles; and Harold B. Swanson. Earl Brigham, editorial assistant for the committee.

Nitrogen fertilizers are offered for sale in three forms: as gas, solutions, or solid materials. All three forms have proved to be effective in increasing crop yields where nitrogen is needed. Because of differences in their properties and methods of handling, these materials vary in suitability for use.

Anhydrous ammonia (82 per cent nitrogen) is a gas; but when confined under pressure it becomes a liquid. This liquid must be stored in pressure tanks and applied below the surface of the soil with pressure equipment to prevent it from escaping into the air. Ammonia nitrogen is attracted to the soil by an electrical charge—much as steel is attracted to a magnet. This ammonia nitrogen must be changed to nitrate nitrogen by soil bacteria before large amounts of it are used by the plant. The change is rapid in well-limed, well-drained, warm soils. It may take place in as little as 10 days under favorable conditions. In acid, water-soaked, or cold soils, this nitrogen may remain as ammonia for several weeks.

Nitrogen solutions (20-44 per cent nitrogen) are nitrogen materials dissolved in water. These solutions contain varying amounts of ammonia and nitrate nitrogen, depending upon the source of nitrogen materials. Usually you must apply a solution containing 37 per cent or more nitrogen under the surface of the soil in the same way as you do anhydrous ammonia to prevent loss of nitrogen as ammonia.

Solid nitrogen fertilizers are offered for sale in many forms. Among them are ammonium nitrate, ammonium sulfate, urea, and sodium nitrate. Some of these materials contain nitrogen in only the ammonia form, others in both ammonia and nitrate forms. Table 1 summarizes the characteristics of some of the commercial nitrogen sources, in respect to per cent of nitrogen and form of nitrogen present.

The important consideration in applying nitrogen is proper application and determination of need (by cropping history, management, and soil testing), rather than too much concern over the form or kind to use.

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Salt in Livestock Rations

Editor's Note—As an introduction, we stated some general concepts of mineral nutrition in the preceding issue of *Minnesota Feed Service*. Here is the first one of a series of discussions on the place of specific minerals in livestock feeding.

For Sheep—

A sheep's craving for common salt is due to the physiological need for the two components of salt, namely sodium and chlorine. Both of these elements are vitally concerned with the blood neutrality regulation and acid-base relations. Sodium is associated, in some unknown manner, with muscle contraction and the utilization of digested protein and energy. Addition of salt increases the salivation and water intake of the sheep and palatability of the feed.

Since sheep crave salt and will consume a remarkably consistent amount of salt per day, salt is often used as the carrier for various medicines (phenothiazine) and trace minerals (iodine, cobalt, copper, and so forth). In the western states, salt blocks are distributed throughout the pastures to distribute grazing more uniformly. This same principle might, advantageously, be practiced in the farm states.

Sheep do not store either sodium or chlorine in their body to any great extent. However, during periods of a short supply of either or both of these elements, they do husband what little salt if provided them either in the feed or in the water and soil, and excrete only minute amounts. For this reason, symptoms of salt shortage do not show up for a considerable length of time. The University of Wisconsin recently reported that ewes had lambed successfully for the second time and yet had not received any supplemental salt for eighteen months. There was no difference in the productivity of the ewes receiving no supplemental salt, block salt, or loose salt.

The fact that sheep are able to excrete excessive amounts of salt from their bodies readily, and yet, at the same time, have a limit to the amount that they will consume per day, is the principle that makes possible the use of salt as a regulator of protein supplement intake. This makes it possible to self-feed protein to fattening lambs or ewes and regulate the amount of protein eaten per head daily by increasing or decreasing the proportion of salt in the mixture. One part of granulated salt to two or three parts of soy-

bean oil meal will limit the soybean oil meal consumption to about 0.2 pound per ewe daily.

This system minimizes the amount of labor and equipment required to feed ewes or lambs and assures more uniform intake of the protein supplement by all ewes, since it prevents big, strong ewes from getting a greater proportion of the feed and the smaller, weaker ewes from being crowded out. If such procedure is followed, it is absolutely essential that an adequate supply of water be available to the sheep at all times.

Salt offered to either fattening lambs or ewes, free-choice in either granulated or block form, will meet their needs very well.

—R. M. Jordan, Assistant Professor of Animal Husbandry

For Dairy Cattle—

Common salt, also known as sodium chloride, should always be included as part of every dairy herd ration. This is true because none of the feeds commonly fed contain enough salt to supply the needs of cattle for it. Cattle crave salt not alone for its taste but also because their bodies have a real need for the sodium and chlorine it contains. Both of these elements are present in all the organs and tissues in the body and enter into all of its vital processes. The fact that of all body tissues blood is the richest in salt suggests that a salt deficiency in the diet will cause grave physiological disturbances or even death if long continued.

Dairy cattle when fed a salt deficient ration will show a strong craving for salt within two or three weeks, but the more serious effects on their milk production and physical condition may not develop until several months later. Affected animals show loss of appetite and a rapid decline in weight and milk production. They take on a rough haggard appearance and are listless and dull. In extreme cases animals will die. When affected animals are fed salt they generally make a complete recovery without any serious after effects.

The amount of salt required by a dairy animal depends on various factors such as its age, size, milk yield, and the ration fed. Salt is continually being lost from the bodies of cattle in the urine, sweat, and the milk produced. Heifers usually require more salt than mature cows in proportion to their weight, and high-yielding cows have a higher requirement than low producers because milk is relatively

rich in sodium and chlorine. Experiments have shown that a cow when producing milk needs about three-fourths of an ounce of salt daily per thousand pounds of liveweight for maintenance, plus 0.3 ounce more for each ten pounds of milk she produces daily. This salt is in addition to that naturally found in feedstuffs in ration.

The required amounts of salt will usually be provided if the common practice of including one per cent of salt in the grain mixture is followed. However, to guard against a possible salt deficiency because of variations in the salt content of feeds fed, cattle should always be allowed free access to a supply of clean salt. There is evidence that when cattle are on pasture they will consume more salt than when fed dry feeds.

The form in which salt is offered free choice to a cow affects the amount of it she will eat. Cattle apparently wish to allay their hunger for salt with the least effort and in the shortest possible time—for invariably a loose, finely granulated salt is their first choice. Also they will consume more of it in this form than of block salt. Experiments have shown, however, that they will get all the salt they need from a hard block of salt.

—Thor W. Gullickson, Professor of Dairy Husbandry

For Beef Cattle—

Salt should be available for beef cattle at all times. It may be mixed with the feed but usually it is self-fed, free-choice. Loose salt, block salt, and rock salt are all satisfactory. If loose salt is fed, it should be protected from weathering. Block salt that is extremely hard should be avoided, because the cattle may find it difficult to eat sufficient amounts.

In experiments at the Iowa Experiment Station, cattle fattened in dry lot with shelter, ate an average of about two-thirds pound of block salt per head per month. Twice that much was needed when salt was fed in the open.

Cattle on pasture consume more salt than those fed in the dry lot. On the average, a mature animal will eat about 2.5 pounds per month. At the Agricultural Experiment Station, Rosemount, Minnesota, yearling steers on pasture alone during the summer of 1955 consumed an average of 0.09 pounds of block salt per head per day (2.7 pounds per month) over a four-month grazing period. Kansas experiments have shown that cattle on early season pasture consumed more salt than later in the pasture season.

—A. L. Harvey, Professor of Animal Husbandry

(Continued on page 6)

page 6 is back, before this page.

1956 VARIETY LIST

(Continued from page 1)

mended for feed. Vantage is a feed barley adapted to all of Minnesota.

Rye

Adams and Caribou are recommended.

Soybeans

Soybeans continue to grow in importance in Minnesota with more than 2.3 million acres being planted in 1955. Currently Minnesota ranks second in the nation in soybean acreage. This year Grant, Acme and Harosoy were added to the recommended list.

Grant is a new high-yielding, high-oil-content soybean of early maturity. The maturity period for this variety is the same as for Ottawa Mandarin. Grant was selected from a cross between Lincoln and Seneca.

Acme is a very early variety suited to the northern corn maturity zone and Northern Minnesota. The variety came from Canada. It is a selection from the variety Pagoda and is about a week earlier than Flambeau. Harosoy is a late-maturing variety that is adapted to the southern corn maturity zone.

These three varieties join Flambeau, Norchief, Ottawa Mandarin, Capital, Renville, Chippewa and Blackhawk, already recommended.

Flax

No changes were made in the list of recommended varieties of flax this year. B5128, Marine and Redwood are still recommended. These varieties are immune to all races of rust found in Minnesota. They are also resistant, or moderately resistant, to wilt. Marine is earlier than the others and is the most resistant to pasmo.

Corn

Minhybrid 504 and 607 were removed from the recommended list because superior varieties are now available. A complete list of the recommended corn varieties is given in Extension Folder 22, "Varieties of Farm Crops."

Alfalfa

Vernal was added. It has more wilt resistance than any adapted variety now in production in this area. It also has been one of the highest yielding varieties in University of Minnesota field tests. Vernal joins Ranger, Naragansett and Ladak on the recommended list.

Bromegrass

The varieties Achenbach, Fischer and Lincoln are recommended. They

are southern bromegrass varieties and have been superior to northern strains in Minnesota trials.

Red Clover

The two recommended varieties, Midland and Wegener, will be in short supply this year. If you are unable to get either one, you could substitute good Minnesota-grown common red clover satisfactorily.

Sweetclover

Evergreen, a white-blossomed variety, and Madrid, a yellow-blossomed variety, are recommended. They produce more growth the first year than common varieties.

Other Varieties

No changes were made in the recommendations for other farm crops. The recommended list includes Advance and Arrowhead sunflower; Chancellor, Dashaway, and Multiplier field peas; Empire birdsfoot trefoil; Piper sudan-grass; and Itasca and Lorain timothy.

SALT IN RATINGS

(Continued from page 5)

For Pigs—

The importance of salt in the ration of the growing pig was demonstrated in a dramatic fashion by Purdue University a few years ago. When pigs were fed a ration of corn, soybean meal, alfalfa meal, limestone and bone meal—but no salt—they gained only 0.67 pound per pig daily. The feed bill was over \$17 (at present feed prices) per 100 pounds of gain. Another group which was fed the same ration, **plus salt**, gained 1.7 pounds per pig daily, and cost only \$9.80 per 100 pounds of gain. Stated another way, each pound

of salt eaten by the pigs saved 183 pounds of feed.

Rations which contain packing-house by-products or fish meals will contain more salt than an all-plant ration. Thus less salt needs to be added to such rations to meet the pig's requirements. The pig has a rather wide tolerance for salt, and since most rations contain limited amounts of animal proteins we usually add 0.25 to 0.50 per cent salt to the total ration. Supplements that are self-fed separately from the grain should contain 2 to 3 per cent of salt. These levels of salt in the supplement or in the total ration will meet the pig's requirement even though the ration or supplement may contain no animal protein. Salt can also be self-fed to pigs if there is any doubt as to the adequacy of the ration.

Occasionally we hear reports of salt-poisoning in pigs. The Purdue Station tried to produce this condition in salt-starved pigs (no salt fed from weaning to 225 pounds), by offering a slop which contained 1.5 per cent salt. This level produced no noticeable damage in 2 weeks so that salt level was raised to 2 per cent. The pigs ate a small amount at first and then left the salty slop alone.

This summer we self-fed 5 per cent or 10 per cent salt in a dry ration to pregnant gilts. The gilts had free access to fresh water. They ate from 8 to 8.5 pounds of feed per head daily, in spite of the high salt content, drank unbelievably large amounts of water and suffered no apparent ill effects. The University of Wisconsin has produced salt-poisoning by feeding a slop containing 2 per cent salt to salt starved animals that had **no access to fresh water**. Give the pigs all the fresh water they want to drink and salt poisoning is not likely to occur.

—L. E. Hanson, Professor of
Animal Husbandry

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