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SPELT IN MICHIGAN

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 COLLEGE

AGRICULTURAL
 EXPERIMENT
 STATION

SECTION OF FARM CROPS
 East Lansing

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Above: Side (left) and front views of heads of spring-sown emmer, fall-sown spelt and fall-sown wheat. Note the wider side view of emmer and the wider front view of wheat when these two are compared to spelt. (The beards were removed from the front view of the emmer heads to show the width of head better.)

Below: Back (left) and front views of whole grains of spring-sown emmer, fall-sown spelt and fall-sown wheat. Note that the rachis joints are at the ends of the emmer grains and on the front side of the spelt grains.



SPELT IN MICHIGAN

HUBERT M. BROWN

The interest that has been shown in spelt within the past few years in the southern portion of Michigan, primarily in Cass and St. Joseph counties, has inspired such questions as: What is spelt? How is it grown? What may be its place in Michigan agriculture?

Spelt belongs to the grass family and is closely related to emmer and wheat. Unfortunately Old World forms of the word spelt, namely "spelts" or "speltz," are still rather commonly used in the state when referring to either or both emmer and spelt, which (though somewhat similar in threshed grain appearance) are distinct enough types of grain to warrant the use of their correct names. The proper use of the two words, emmer and spelt, would tend to eliminate the confusion of ideas which arises when the term "spelts" (or "speltz") is used, for in the Thumb-area of Michigan "spelts" (or "speltz") means spring-sown emmer which will winter-kill when fall sown, while in the southwestern portion of the state it means fall-sown spelt which will not produce a crop of grain when spring sown.

CHARACTERISTICS OF SPELT

Head Form

The mature head of spelt appears somewhat more cylindrical than do the heads of emmer and wheat. (See page 1.) The head of emmer presents a broader "side" than "front" view while the head of wheat presents a broader "front" than "side" view. Spelt is about half-way between these two in form. The arrangement of the "grains" in a head of emmer is close (tight together) while in a head of spelt and of many Michigan wheats it is lax or loose (that is, comparatively farther apart).

Grain

The term "grain" is here used as it is commonly used when referring to the threshed product of barley, emmer, oats, rye, spelt, and wheat, even though three different structures are involved. A typical "grain" of (1) rye or wheat includes only one kernel and no chaff; (2) barley or oats includes one kernel and its surrounding chaff or hulls (except in the hullless types); (3) emmer or spelt includes one or more kernels and their surrounding chaff or hulls.

The grains of emmer and spelt can be easily distinguished because the basal end of the whole grain of emmer is more pointed than that of spelt (see page 1 and Fig. 1). This more pointed condition is due to a joint of the rachis (the term given to the jointed stem in the head



Fig. 1. Typical "grains" of spring emmer (left) and of fall spelt. Note that the rachis joint is at the end of the emmer grain, giving a pointed appearance to those grains. The spelt grains present a blunter appearance because a majority of them have the rachis joint at the side. Occasional spelt grains may have the rachis joint at the end and still others may have the joint entirely missing, but even so the grains are comparatively blunt in appearance.

of barley, emmer, rye, spelt and wheat) staying attached to the end of the emmer grain. The less pointed condition of the spelt grain is because, in most instances, the joint of the rachis remains attached to

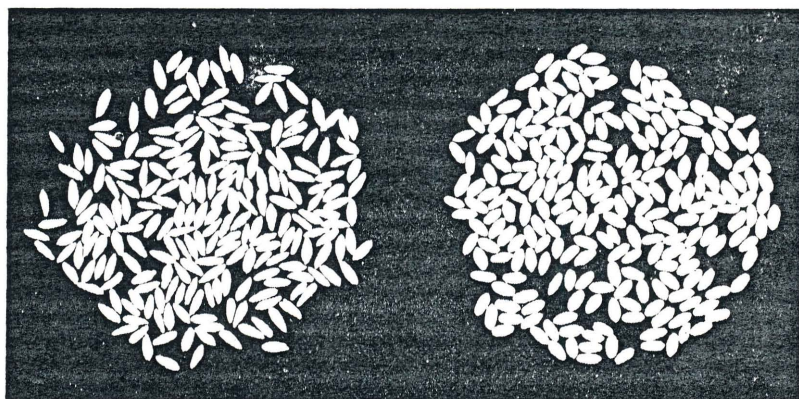


Fig. 2. Hullless kernels of spelt (left) and of wheat. Spelt kernels are slimmer and more pointed than those of wheat. The embryos of the spelt kernels are not quite as pronounced as those of wheat. Short, plump spelt is easily confused with non-plump wheat.

the side of the spelt grain. There may be some spelt grains with the rachis joint at the end and some grains with no joint attached, but most grains will have the joint on the side.

Spelt chaff color may be red (brown) or light yellowish-white with the latter being the color of varieties commonly grown in Michigan.

Though some varieties of spelt are bearded, it has been found that only the beardless (awnless or bald) type is grown in southwestern Michigan.

The hullless kernels of spelt are red in color, soft or starchy in texture and tend to be longer and more pointed than kernels of Michigan wheat (Fig. 2).

Test Weight

During a survey of spelt conducted in 1939 in Cass and St. Joseph counties it was found that the accepted test weight for spelt varied from 30 to 40 pounds per bushel, depending on the particular locality. The actual test weight of spelt of course will vary from farm to farm and is dependent not only on the plumpness and proper filling of the kernel but also on the percentage of kernels which are threshed out of the hulls: The greater the percentage of hullless kernels the higher the test weight, other factors being equal. There is a growing tendency to consider the legal test weight of oats, 32 pounds per bushel, to be the proper test weight for spelt and likewise to consider the price per bushel of oats to apply to spelt.

Fall Growth

Spelt is commonly considered to be slower in making its fall growth than is wheat; this is one of the reasons given for planting it earlier than wheat. However, during the past six years of testing spelt varieties at East Lansing, the spelt was planted at the same time as the wheat, September 19-21, and no outstanding differences have been observed. The germination of the spelt, whether only hullless kernels or only hulled kernels were planted, was not appreciably slower than that of wheat. The fall growth has not appeared to be so luxuriant as the erect, broad-leaved varieties of wheat but is similar to that of the less erect, narrow-leaved wheats.

Winter Hardiness

Samples of spelt from various sources have been included in the testing program and it has been found that the type of spelt commonly grown in Cass and St. Joseph counties is comparatively winter hardy when grown on upland soils. One lot of spelt obtained from the United States Department of Agriculture, which appeared similar to the Michigan type in chaff color and grain color, is decidedly less winter hardy. This circumstance indicates that merely because the grain is labeled "spelt" is no guarantee that it is winter hardy.

In two years that spelt was grown on muck soil, it winter-killed.

Lodging

In the various tests during the past four years, the samples of Michigan spelt have shown a fair degree of resistance to lodging. On very fertile areas and in wet years, lodging may be expected but no more than would be with wheat.

Diseases and Insect Pests

Spelt is susceptible to loose smut. At heading time loose smut shows its presence by replacing the head with black powdery masses which are blown away in the wind, leaving only the stem (or rachis) of the head. There is no easily applied control.

Though not immune to bunt (or stinking smut), fields of Michigan spelt have been fairly free from this type of smut. How long this desirable condition can be maintained without control treatment will depend somewhat on the care exercised by the growers. Improved Ceresan dust may be used as a control, with the method of treatment similar to that used on oats.

Leaf rust has been observed to cause fall damage on spelt which was planted in August. The rust caused the leaves to turn yellow and weakened the seedlings. Such a condition increases the likelihood of winter killing.

Leaf rust and stem rust may attack spelt after heading time; the extent of damage being largely dependent on the season.

Spelt is not resistant to the Hessian fly and for this reason the Entomology Department of Michigan State College recommends that spelt be planted after the Hessian fly-free dates rather than as early as the middle of August. It is thought that the slight reported damage from fly in the early-planted fields is due to lack of careful notes on the extent of damage and also to these fields being widely scattered. Should larger acreage be planted to spelt before the fly-free dates appreciable damage can be expected.

Uses

The primary use for spelt is as a part of the grain ration for live-stock, and it has been successfully fed to poultry, dairy cattle, horses, sheep, and swine. It is recommended that the grain be ground before feeding because, by so doing, the sharp point on the chaff of the whole grain is broken and no mouth troubles are encountered.

Spelt is used as a nurse crop for late summer or early spring seedlings, as an addition for fall pasture, and as a "soil-depleting," non-cash, winter, annual grain to replace wheat or oats.

CULTURAL PRACTICES

Type of Soil

Experiences of farmers in the southwestern section of the state indicate that spelt is adapted to a wide range of upland soils, from the lighter sandy loams to the medium heavy clay loams.

While spelt is frequently planted on soils not considered productive enough for wheat, and may produce a crop on these poorer soils, some farmers have planted spelt on the more fertile, well-drained fields and found that the increased yields were sufficient to warrant its occupancy of these better fields.

In tests at East Lansing, spelt winter-killed on muck soil although it did well on nearby upland soils.

Seedbed Preparation

Various types of seedbed preparation are used with spelt. Disking the field, rather than plowing, is a frequent practice but plowing, when it can be done early, will probably give greater yields of grain.

Plowing should be done early enough to allow the ground to settle and form a compact seedbed. On some soils it may be necessary to follow with a cultipacker in order to pulverize and firm the soil adequately. If plowing is done in early August, subsequent dragging or disking may be necessary to kill the weeds before spelt is planted.

Fertilizer

Although fertilizer is all too infrequently applied to spelt because this grain is used as a feed crop, those farmers who have applied 200 pounds or more of fertilizer per acre report that spelt responds as well to the fertilizer applications as does any other grain crop. Since spelt is a very close relative of wheat, the recommendations of the Soils Section of the Michigan Agricultural Experiment Station for wheat may be considered applicable to spelt. It is suggested that the reader refer to several of the available publications issued by the Soils Section: Ext. Bul. E-71 (revised), "Farm Manure—Value and Care"; Spec. Bul. S-133, "Fertilizers—What They Are and How to Use Them"; and the Extension Bulletin E-159 (revised) "Fertilizer Recommendations" which gives the fertilizer recommendations for the current year.

Wherever possible the fertilizer is applied at the time of planting as this procedure reduces the number of operations necessary to produce the crop. If this is not possible, then the fertilizer should be applied just previous to planting and worked into the soil with a suitable implement.

Seed Cleaning

Chess is one of the chief weeds found in spelt. Some farmers have found that by using the proper screens nearly all of the chess seed can be removed from the spelt. Virtually all of the hulls spelt is also removed, but the chess and hulls spelt may be saved and ground for feed. The screens used for cleaning spelt are a 26/64 or a 28/64 round-hole top screen and a $\frac{1}{8}$ x $\frac{3}{4}$ slotted bottom screen (measurements are in inches). Sufficient air should be used to blow out empty hulls and poorly filled grain.

During this cleaning process not only are chess and other weed seeds, unfilled grain and chaff removed, but stems and unthreshed heads are also removed, leaving a grade of seed which will feed through the drill more uniformly than uncleaned seed (Fig. 3).

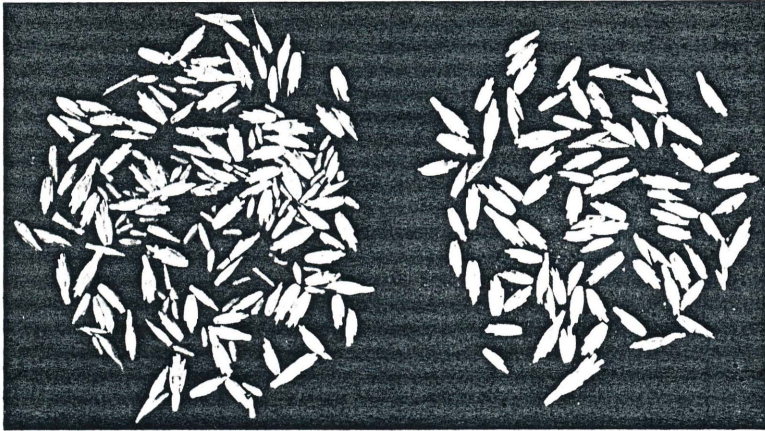


Fig. 3. A sample of spelt before and after cleaning with a fanning mill to remove chaff. Virtually all hullless spelt was also removed. The upper screen had 28/64 round holes, the lower had $\frac{1}{8} \times \frac{3}{4}$ slots. Full air was also used to blow out empty spikelets. The screenings may be ground and included in the feed ration.

Time of Planting

Farm experience in planting spelt has shown that under the varying conditions of soil and season spelt has been successfully grown when planted as early as August 10 and as late as October 12. The latter date is not recommended, for the likelihood of getting a vigorous, winter-resistant stand when planting is deferred until after September 25 is none too great. Unless alfalfa or sweet clover is being seeded with the spelt at the time of planting (see "Legume and Grass Seedlings"), there is no need to plant before September 1. This still leaves a range of 25 days within which planting may be done with good assurance that, barring very bad weather, the spelt seedlings will become sufficiently established to withstand the rigors of winter and early spring. There is a growing and commendable tendency among spelt growers to plant spelt closer to the regular time for planting wheat (which for Cass and St. Joseph counties is about September 20) than was formerly thought advisable.

At East Lansing, during the past six seasons, spelt has been planted at the same time as wheat, and good, healthy stands have been obtained each year.

Rate and Method of Planting

The rate of planting spelt varies from $1\frac{1}{2}$ to 3 bushels per acre with the 2-bushel rate being used by most growers.

The usual method of planting spelt is with a regular grain drill so set that the grain will be covered with about an inch of soil. On the lighter soils the depth of planting should be increased to $1\frac{1}{2}$ or 2 inches.

Legume and Grass Seeding

Spelt is considered by most growers to be a good nurse crop, equal to oats and better than wheat. Seedings of alfalfa and sweet clover have been successfully established when sown with spelt during the period of August 15 to 20, but the likelihood of winter-killing increases rapidly after this period. Stands of either brome grass or timothy have been established when the seeding was made with the spelt and the date of planting as late as September 25. Alfalfa, red clover, and sweet clover have been seeded in the spring and good stands have been obtained.

When sowing alfalfa, sweet clover or timothy in the fall, the seeder attachment on the grain drill is used. When sowing brome grass, the grass seed is thoroughly mixed with the spelt before being put in the drill box. When the legume is seeded in the spring, any method of applying the seed early and uniformly may be used. This may be with a grass seed drill, a grain drill, or some broadcasting apparatus. The seeding should be made in such a manner and at such a time that the stand of spelt will not be greatly injured.

A word of caution about the fall seeding of alfalfa or sweet clover with spelt should be given. Experience has indicated that these two legumes, especially sweet clover, make such a vigorous growth in the spring that it may not be possible to cut the spelt for grain, even with a high-cutting combine. Some farmers, finding this to be the case, have cut the entire crop for hay, considering the spelt had paid for itself by aiding the legumes to survive the winter, the spelt reducing the damage from blown sand and tending to conserve the snow in a protective cover.

Pasturing

Spelt planted during the last half of August or the first week of September may provide considerable pasturage during the fall. Whether fall pasturing is practiced on such early planted spelt, or even on spelt planted after September 7, will be determined by the amount of top-growth the spelt is able to make. Care must be exercised not to over-pasture and so reduce the likelihood of the spelt coming through the winter in good condition.

While spelt makes only a limited amount of top-growth in the spring, more similar to wheat than rye, it may be lightly pastured at that time, as is occasionally done with wheat.

Topdressing

In general, a topdressing of barn yard manure, either plain or phosphated, is advisable on light soils and on those of low fertility when a seeding is not being grown. If it is necessary to try to grow both a grain crop and a seeding on light soils low in fertility, a top-dressing of manure may be beneficial, if not applied too heavily. Top-dressing, whether with manure or nitrogenous commercial fertilizer, should be withheld if the fertility of the field is such that there is a likelihood that the additional nitrogen would cause the spelt to lodge. Barnyard manure should be applied at the rate of 4 to 6 tons per acre.

Harvesting

Spelt comes to maturity about the same time as wheat; the actual date varying with the soil and the season. The two general methods of harvesting wheat are equally applicable to spelt and the same precautions must be taken.

BINDER CUT—When spelt is to be cut with a binder it should be in the hard dough stage but not dead ripe. If cut before hard dough, trouble may be encountered in its curing; if cut when dead ripe, loss may be sustained from shattering in handling, for the dry head breaks up rather readily.

COMBINE CUT—When spelt is to be cut with a combine, the grain should be left standing until thoroughly mature and should be cut only during that portion of the day when the straw is brittle-dry. If these precautions are followed, no trouble should be encountered in the threshing operation or in keeping the threshed grain from molding. There is virtually no shattering of the grain while left standing, awaiting combining.

THE PLACE OF SPELT IN THE FARM ECONOMY

What may be the place of spelt in Michigan agriculture, especially when compared to wheat and oats, its two chief competing crops? Barley is not considered a competing crop of spelt as barley is not grown extensively in the area where spelt is now grown.

General Comparisons

Spelt with Wheat

Fall-sown spelt is a direct competitor of fall-sown wheat inasmuch as the two crops are planted about the same time of year, cover the ground during the winter months, and are harvested about the same time. Both are "soil-depleting" crops (as classed by the AAA) and may be used as nurse crops for legume or grass seedings. Both are susceptible to loose smut and to leaf rust. These two grains are used for feeding all classes of livestock, but have decidedly different feeding values. Wheat is usually grown as a cash crop and as a result is sold off the farm, while spelt is grown as a feed crop and so seldom moves far from the farm upon which it was grown.

Spelt with Oats

The situation between spelt and oats is somewhat different. Spelt is sown in the fall when a few days difference in date of planting is not too vital—oats in the spring, at a time of year when labor is at a premium and when a few days of delay in planting may mean the difference between a good crop or a near crop-failure. Spelt matures earlier than oats. Both grains are "soil depleting" crops (as classed by the AAA) and may be used with seedings with apparently the same

success. As a rule, spelt and oats are fed on the farm that produced them or not far therefrom. These two grains are fed to all classes of livestock, and they have but slightly different feeding values.

Allotments

The regulations for payments under the Agricultural Adjustment Administration program are having some effect in determining the acreages devoted to various crops. This is possibly why, in the last few years, so much interest has been shown in "soil-depleting" grain crops which are usually fed on the farm. For southwestern Michigan, oats and spelt are two such crops and it is probably for this reason that these two crops have become competitors for acreage and for place in the feed ration.

Comparative Per Acre Yields of Grain

The comparative yields of grain for wheat, spelt and oats are given in pounds per acre rather than bushels per acre because of the wide differences in test weights. Two sets of data are available for study.

The Department of Farm Management, Michigan State College, has for several years cooperated with increasing numbers of farmers in analyzing accurately kept farm account records. These records for Area 2 which includes Cass and St. Joseph counties, and comprises the chief spelt growing section, go back to 1935 and contain the most extensive set of data available. The yields in Table 1* for this area are based only on those farms which grew spelt. Most of these farms also had wheat and many had oats.

Table 1. Comparative data from those farms in Farm Management Area 2 which grew spelt, 1935-40.

Year	Total No. of Farms	Farms with Spelt		Spelt		Wheat		Ratio of Wheat to Spelt (lb. per acre)	Oats		Ratio of Oats to Spelt (lb. per acre)
		No.	Per cent	Total acres	Lb. per acre	Total acres	Lb. per acre		Total acres	Lb. per acre	
1935	80	16	20	200.0	1,122	362.6	1,218	1.09	172.5	940	0.84
1936	89	13	15	121.2	793	233.7	885	1.12	102.5	774	0.98
1937	86	20	23	226.5	1,363	494.3	1,294	0.88	158.5	970	0.66
1938	124	20	16	256.6	962	664.4	1,153	1.20	269.8	946	0.98
1939	136	30	22	425.9	747	537.6	1,034	1.38	274.9	995	1.33
1940	148	28	24	197.7	1,108	411.2	1,272	1.15	350.8	1,472	1.24

For the six years given, and on a pounds-per-acre basis, spelt was out yielded by wheat five years but produced more than oats four years.

In Table 2 are given the data from the variety trials which have been conducted in Cass and St. Joseph counties and involves the com-

*These unpublished data were furnished by Mr. C. O. May, Department of Farm Management.

Table 2. Yield of grain in pounds per acre for the variety trials in Cass and in St. Joseph Counties.

Year	Number of tests*	Spelt	Wheat	Ratio of Wheat to Spelt
1937.....	1.....	1,893	1,482	0.78
1938.....	1.....	1,975	2,037	1.03
1939.....	1.....	1,204	1,100	0.91
1940.....	3.....	2,407	2,610	1.08

*Grateful acknowledgment is here made to cooperators, Lester Spencer, Cassopolis, 1937, '38, '40; Henry Gleason, Three Rivers and E. A. Fairchild, Constantine, 1940, and to county agricultural agents George McIntyre, Cass County, and James Hoekzema, St. Joseph County, for their aid in conducting these tests

parative grain yielding abilities of only wheat and spelt. These yields are the averages of two wheats, Red Rock and Baldrock, and the averages of one to four lots of spelt which were obtained from farmers in this section. All of these lots of spelt appear to belong to the same original variety, for they are bald, white chaff, red-grained, and definitely a fall-sown type (when planted in the spring they produce no heads). Except for 1937 the two grains, spelt and wheat, yielded about the same in pounds of grain per acre.

Comparative Feeding Values

The percentages of total digestible nutrients* (TDN) in wheat, spelt and oats are given as 83.6, 74.7 and 71.5 per cent, respectively. These figures mean that for every 100 pounds of grain fed to the animal it has been found that, on the average, the animal will digest 83.6 pounds of the wheat, 74.7 pounds of the spelt, and 71.5 pounds of

Table 3. Total digestible nutrients (TDN) in pounds per acre as determined from the yields of grain for Area 2 (Table 1) and for the variety trials (Table 2).

Year	Area 2					Variety Trials		
	TDN in lb./acre			Ratio of		TDN in lb./acre		Ratio of
	Wheat	Spelt	Oats	Wheat to Spelt	Oats to Spelt	Wheat	Spelt	Wheat to Spelt
1935.....	1,018	838	672	1.21	0.80			
1936.....	740	592	553	1.25	0.93			
1937.....	1,082	1,093	694	0.99	0.63	1,239	1,414	0.87
1938.....	964	719	676	1.34	0.94	1,703	1,475	1.15
1939.....	864	558	711	1.55	1.27	920	899	1.02
1940.....	1,073	827	1,052	1.30	1.27	2,182	1,798	1.21

*These percentages were obtained from Morrison's "Feeds and Feeding", 20th Edition, 1941.

the oats. Converting then the yields of grain as given in Tables 1 and 2 into pounds of TDN per acre, one may compare the amounts of available nutrients produced by these three types of grain. Such values are given in Table 3.

When yields of grain are put on a yield of total digestible nutrients basis, spelt is seen to be less productive than wheat but as productive as oats.

The reports of farmers interviewed in fall of 1939, indicate that spelt was as good as oats in the dairy cattle ration, was nearly as good as oats for horses, produced variable results with pigs, and was good for lambs, sheep (except at lambing time), brood sows, and poultry. These two grains have about the same fiber content and so are naturally compared with each other rather than with the less fibrous wheat.

The results from self-feeding trials conducted with fall pigs by the Animal Husbandry Department, Michigan State College, during the winters of 1938-41* corroborate the observations of the farmers that spelt may be used in place of oats.

*The data on the 1938-39 trials were reported in the Mich. Agr. Exp. Sta. Quart. Bul. 7 (4) [May 1939]: 279-280, and for the three year averages in the same publication 7 (1) [August 1941]: 41-42.