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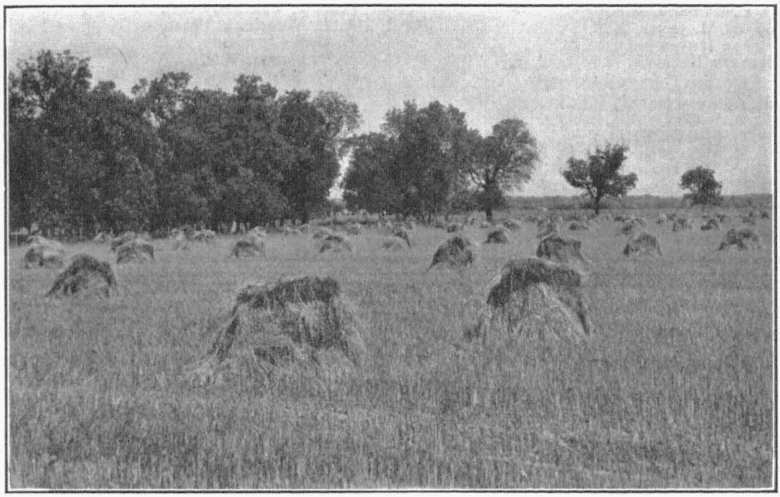
M. F. MILLER, *Director*

Growing Good Crops of Oats in Missouri

(Revision of Bulletin 359)

W. C. ETHERIDGE AND C. A. HELM



Columbia Oats on Putnam silt loam, medium in fertility, at the Missouri Agricultural Experiment Station.

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Growing Good Crops of Oats in Missouri

W. C. Etheridge and C. A. Helm

Oats, as compared with other grains, are low in bushel value. Therefore a crop of oats, to be worth growing, must give a high yield per acre, whether the returns are figured for the crop as a separate unit or as part of the year's production by an acre of land.

But in many seasons the yield of oats in Missouri is sharply checked by early hot dry weather. Our spring period is nearly always too short for the best development of the oats grain. That is the reason Missouri oats seldom if ever reach the large yields and heavy weight per bushel found in northern oats.

The limitation of growth by a short season may be partly avoided by an early crop. This favorable possibility is the basis of the more important methods for the production of good crops of oats here, whether they are grown after corn in one of the old rotations or grown with Korean lespedeza to form a double-crop rotation in one year.

Methods for an Early Crop

The early sowing of a productive, early variety is the essential practice for a good yield of oats in Missouri. If this is supplemented by the suitable preparation of the land, the reasonable use of fertilizer, and the treatment of the seed oats for smut, the resulting crop is likely to be satisfactory. Each of these measures for good production is discussed in this bulletin.

Effect of Early Sowing

The favorable influence on yield of sowing the oats crop early is generally known to progressive growers. It is clearly shown by the results of sowing the Columbia variety on advancing dates in three distinctly different seasons. The yields are summarized here.

(Excellent season, March to July) 1933		(Good season through May and June) 1931		(Extremely poor season through June) 1932	
Date sown	Yield per acre *bus.*	Date sown	Yield per acre *bus.*	Date sown	Yield per acre *bus.*
Feb. 28	68.3	Mar. 26	51.9	Mar. 28	29.0
Mar. 28	60.6	Apr. 2	50.3	Apr. 7	28.2
Apr. 12	47.7	Apr. 11	35.2	Apr. 18	22.9

The heavy reduction in yield from late planting in all three seasons—the excellent, the good, and the poor—indicates the necessity of starting the crop at an early date that will permit it to utilize the longest possible period of moist cool weather and thus reach an advanced stage of growth before it is damaged by drought and heat. If a late maturing variety, instead of the early maturing Columbia had been used in this test, the difference between the yields from early and late sowing probably would have been much greater.

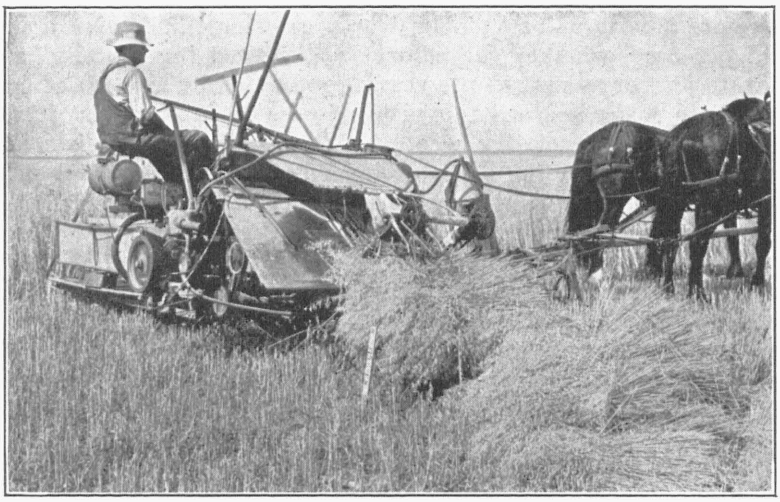

Fig. 2.—The 60-bushel crop of Fulghum oats shown here was grown on land scarcely medium in fertility. All good practices, including the early sowing of an early variety, were combined to produce this yield. The season was favorable.

In south Missouri oats should be sown as early in February as conditions permit the good preparation of the land. In central Missouri late February or early March would be average periods for early seeding. In north Missouri the crop should usually be sown by March 20. Oats sown during the periods recommended may be damaged or killed by cold weather after sowing. But delay on account of this possibility will in most seasons make certain the damage of the crop by drought in early summer.

Best Varieties

The special adaptation of early maturing varieties of oats to Missouri conditions has long been established. In the last ten years they have progressively filled our oats acreage. Perhaps 90 per cent of our 1939 oats crop will be composed of these early maturing kinds.

Columbia, Fulghum, and Burt, rated in the order named, are the three best varieties of oats now available in Missouri. Of the three, Columbia is the most consistent in good yields, under the variations in the time of sowing that occur in farm practice. Fulghum sown very early on highly productive land will compare favorably in yield with Columbia; but if sown late, as is often necessary in late spring seasons, or sown on the lower grades of fertility Fulghum is inferior to Columbia. For example, at Green Ridge in the spring of 1937 the seeding of oats was delayed by wet weather until May 1. Through May and June the conditions for growth were favorable. Columbia succeeded in even this short period, with a moderate yield of 21.8 bushels per acre; but Fulghum, unable to utilize efficiently that proportion of a full season, failed completely. Burt though consistent in good yields, will usually produce less than Columbia. It also is irregular in seed color and time of maturity. Columbia is regularly the earliest of the three.

Such late varieties as Victory are poorly adapted to Missouri because they require too long to ripen and consequently are usually caught in an immature condition by drought in June. In occasional seasons with moist weather through June these late varieties will produce good yields, but their average production falls much below the early varieties, and their grain is poorly filled and chaffy. Kherson, an old standard, early variety, is not as early nor as productive as Columbia or Fulghum. It lodges in the maturing period and becomes difficult to harvest. Texas Red, a medium maturing variety sometimes yields well in north Missouri, but even there its average production does not reach the high level of the very early kinds.

Varieties of oats have been extensively tested for a long time at Columbia and several outlying experiment fields. The principal comparison in recent years has been between the two leading kinds —Columbia and Fulghum. Their yields in bushels of grain per acre at Columbia over a 10-year period, beside the yields of Texas Red, a variety once widely grown in Missouri, are given in the following summary.

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	Average 10 yrs.	Average 8 yrs.
Columbia	43.4	49.5	55.2	64.8	50.2	41.2	75.3	73.1	33.5	70.4	55.6	56.6
Fulghum	34.8	50.3	45.9	69.2	45.6	39.2	67.1	60.2	27.9	64.4	50.5	51.5
Texas Red	27.0	51.5	50.2	61.4	50.4	31.0	67.8	21.4	...	...	...	45.1

The consistent superiority of Columbia over Fulghum on Putnam silt loam soil, medium in fertility, is illustrated above. On our experiment field at Sikeston, Scott county, the fertile Lintonia

loam soil of the Sikeston Ridge produced yields of the two varieties which differed but little on the average. The comparison on this field follows, in terms of bushels of grain per acre.

	1931	1932	1933	1934	1935	1936	1937	Average
Columbia	64.9	31.5	38.0	6.5	12.5	56.1	47.5	36.4
Fulghum	59.3	31.2	37.4	5.6	12.0	64.2	44.0	36.2

At Elsberry, Lincoln county, on the highly productive Wabash heavy clay (gumbo), the yields of the two varieties have been remarkably similar. This is a particularly favorable situation for Fulghum, and if the variety is sown very early on such land it will reach its highest comparative standing. Bushels of grain per acre are shown below.

	1931	1932	1933	1934	1935	1936	1937	Average
Columbia	95.3	81.7	61.2	24.9	25.3	39.1	59.7	55.3
Fulghum	96.7	79.2	62.3	24.1	24.7	39.5	62.9	55.7

At Green Ridge, Pettis county, on Oswego silt loam, a soil below medium in productivity, except in very favorable seasons, Columbia shows a sufficient margin over Fulghum to make it the preferred variety. Acre yields in bushels of grain are given below.

	1930	1931	1932	1933	1934	1935	1936	1937	1938	Average
Columbia	21.9	42.1	60.3	63.0	27.1	23.1	33.6	21.8	29.6	35.8
Fulghum	19.3	31.3	53.2	59.7	25.7	33.3	28.9	failed	26.7	30.9

Whether the oats crop follows corn or some other crop, or is sown on Korean lespedeza, early seeding is fully as important as the early variety. But early seeding should not sacrifice good preparation of the seedbed. The three factors (a) an early variety, (b) early seeding, and (c) a well prepared seedbed, are closely related in their effect on the success of the crop.

Treating for Smut

Treating seed oats for smut improves the immediate yield and checks the progress of this disease. Smut can be controlled easily, cheaply, and effectively by the formalin treatment applied as a spray. The procedure is as follows:

Reclean and bag the seed. Prepare a solution in the proportions of one pint of 40% formaldehyde and two pints of water. Pour the seed oats in a thin stream from the bag to a tight, clean floor or wagon box. Spray the oats with the solution as they fall to the pile. After spraying, cover the oats for five to ten hours, then uncover and air them for several hours. The seed may be planted directly after treating, or may be rebagged and held indefinitely for planting purposes. Because the fumes from concentrated formaldehyde are irritating to the eyes, nose and throat, the treatment is best made in the open or in a well ventilated place. In this

treatment, very little moisture is added to the oats, and there is no danger of the seed swelling or sprouting, even if it is left in large piles or bagged at once after being treated. There are other methods of treatment equally effective, but they are more expensive and the seed left from planting is unfit for feed. Left over seed that was treated with formalin, however, can be fed safely.

Preparing the Land for Seeding

Plowing in winter or early spring will usually increase the yield of oats, provided the seedbed is not left too loose when the oats are sown. But the increase will seldom pay for the extra cost in labor, if compared with the yield from thorough disking without plowing. Double disking and harrowing does not cause undue delay in seeding. Under some conditions double disking twice, the second crossing the first, is necessary to prepare a suitable seedbed. This is especially true where oats are to follow corn that was ridged in cultivation, or are to be sown on Korean lespedeza sod that was pastured the year before.

Seed Should Be Drilled

Drilling oats, instead of broadcasting, has advantages in addition to that of reducing the risk of losing the crop through late frost. Drilling controls the depth of seeding, putting the seed shallow or deep, depending upon the time of sowing and the moisture condition of the ground. In many seasons dry weather prevails during the early growing period. Oats sown broadcast in dry soil either germinate slowly or when they germinate grow unevenly. This results in late and uneven maturity, which reduces the yield and quality of the crop. Also the covering by a harrow of a broadcast seeding is likely to leave some of the grain exposed or covered only so shallow that on sprouting it may be killed by freezing weather. Less seed is required in drilling than in broadcasting, because the seed are more evenly spread.

Where good quality recleaned seed is drilled the lighter rates of seeding, 4 to 6 pecks per acre, are usually as productive as heavier rates. Moreover the lighter rates improve the quality of the grain produced, and by reducing the competitive effect of oats as a nurse crop, increase the growth of clover or grass in the oats stubble. Finally the compaction of the surface by the grain drill may help the soil to hold some of the moisture greatly needed during a dry June.

Fertilizer for Oats

The use of fertilizer with oats is not usually profitable if other practices in production are poor. But if such practices as the early

sowing of a productive early variety, thorough preparation of the seedbed, and the treatment of the seed for smut, are all followed,

Fig. 3.—Oats at the left treated with 140 pounds per acre of 20 per cent superphosphate exceeded by 16½ bushels per acre the untreated crop at the right. Over a long period similar treatment with fertilizer has increased the average yield by 6 to 8 bushels on this field.

the application of 125 to 150 pounds per acre of superphosphate or mixed fertilizer will give excellent results in the yield and quality of the crop. Where oats are used as a nurse crop for clover and grass, or produced in 1-year rotation of oats and Korean lespedeza, the use of commercial fertilizer has a double effect in increasing the grain yields and improving the stands of the legume or grass.

Oats as a Nurse Crop

A late variety of oats, a poorly prepared seedbed, and a heavy rate of sowing, together make an unfavorable condition in which to sow grass or clover. Under such conditions either fall sown barley, wheat, or rye is preferred to oats as a nurse. But where good practices in growing oats are observed in every detail, oats are preferable to wheat or rye as a crop in which to establish a legume or grass. In some seasons when the growth of oats is poor as a result of hot dry weather the crop may be more valuable if cut for hay, while in the milk or dough stage, than if left to ripen. Such early harvesting can be so timed as to save the stand of grass or legume which would otherwise perish through continued competition by the grain crop allowed to remain until fully mature. Where clover or grass has been sown on wheat the stand is likely to be lost in a very dry spring, because of the late heavy straw production of wheat, for the wheat crop is not well suited to early harvesting for hay.

Oats in Crop Rotations

Oats may be grown after any crop that occupied the land in the previous season. They may successfully follow even sorghum. The sorghum crop is reputed to be exceedingly hard on the land, though its average draft on soil fertility perhaps does not exceed by an important margin the draft of corn producing an equal tonnage of dry matter. On our experiment field at Green Ridge, oats were sown after both corn and grain sorghum. The comparative effect of the preceding crop is indicated here by the yields of oats in bushels of grain per acre.

	1930	1931	1932	1934	1935	1936	1937	Average
Oats after corn	19.2	41.0	53.6	30.9	32.6	30.3	22.8	32.9
Oats after grain sorghum	18.9	41.5	52.7	24.2	31.9	29.1	21.0	31.3

The familiar practice of sowing oats after corn is employed on the greater part of the present oats acreage in Missouri. This practice, however, imposes a heavy strain on soil fertility, unless it is included in the rotation of corn, oats, wheat and clover, or better still in such a rotation with Korean lespedeza as 1st year corn, 2d year oats and lespedeza, 3d year wheat and lespedeza. But the most efficient rotation of oats, from the view of total annual production per acre and the conservation of the soil, is with Korean lespedeza. This rotation is fully explained in the section which follows.

Oats-Lespedeza Rotation

Oats may be sown in the spring on last year's Korean lespedeza sod. In this way the 1-year rotation of lespedeza and oats may be carried on as long as desired, for the lespedeza under reasonable management will not fail to volunteer every year from seed produced and shattered to the ground in the previous fall season.

Double disking and harrowing will usually put the sod in good condition for the oats. In very dry seasons, double disking twice, the second disking at right angles to the first, then harrowing before sowing the oats, may be necessary to break and fit the sod thoroughly. Deep disking will not reduce the stand of lespedeza that will volunteer later. Any disking of course should be done very early for the timely sowing of the oats as well as to avoid injury to the young growth of the volunteer lespedeza. If disking is necessarily delayed until the lespedeza seed are sprouting, the stand will be reduced but not destroyed, as there will be an abundance of seed in the soil. The application to the oats of 125 to 150 pounds per acre of 20 per cent superphosphate may be expected to return a profit by increasing the yield of both crops.

In normal seasons the oats will ripen without injuring the growth of the lespedeza. If June is very dry and hot, however, the oats may well be cut for hay when their kernels are in the milky stage, so that a good growth of lespedeza for pasturage may be insured. In dry seasons this early harvesting of oats over lespedeza is an efficient practice, for oats hay is excellent feed, nearly or quite equal in feed value to the light and chaffy grain crop that matures in such weather, and the early growth of lespedeza is much

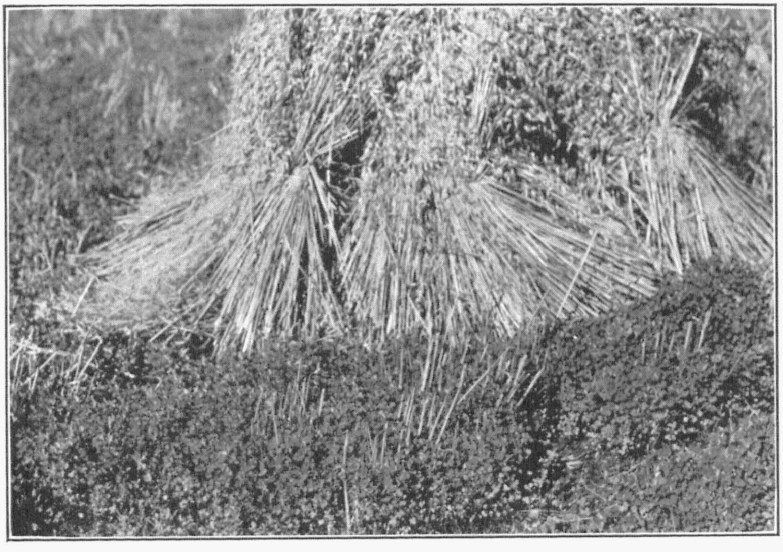

Fig. 4.—A thick stand of Korean lespedeza volunteers every spring in the 1-year rotation with oats, and is ready for grazing soon after the oats crop is cut. A small section of lespedeza in the lower right corner was cut down to show the height and density of the legume stand.

improved by the removal of the oats crop that competes with it for soil moisture. The oats crop as either grain or hay, however, will help the lespedeza in the long run, for it controls the growth of weeds from late March into June and leaves the legume in a clean stand.

For the most successful production of lespedeza, continuously on the same land, the spring growth of weeds must be controlled. Oats, spring-sown on lespedeza sod, is one of the best means of doing this. The oats crop may be managed to produce normal yields and at the same time benefit the lespedeza. This is a gain in the economy of production and in the use of land, as compared with the usual practice of sowing oats after corn. After the oats crop is harvested the volunteer lespedeza is pastured through the summer and into early fall, or it may be cut for hay or seed, or by good

management under favorable conditions may serve any two of these purposes in some degree.

The productivity of this rotation is well illustrated by cases drawn from our experiment fields or closely observed on other land. On a very fertile field of Summit silt loam at Sni-A-Bar Farms, oats and lespedeza have been grown continuously in 1-year rotation for the last six years. The land has not been plowed in this time, but thoroughly disked every spring; nor has the lespedeza stand been resown since the first spring, but has volunteered thickly every spring from seed left on the ground by the previous crop. Records of yields from the whole 6-year period are not available, but in 1935 the oats crop produced 45 bushels per acre and the lespedeza 1½ tons of hay. By late September there was a large second growth of lespedeza capable of yielding at least another ton. The season of 1935 was unusually favorable for both oats and lespedeza on Sni-A-Bar Farms, though in every year the total product of this rotation has been comparatively large.

On Putnam silt loam at Columbia, medium in productivity, the last 5-year average yield of oats in 1-year rotation with lespedeza, has been 36.9 bushels per acre. Every season the lespedeza has furnished excellent pasturage, or acre yields of hay ranging from 1¼ to 1½ tons, or of seed ranging from 200 to 500 pounds. The land here, like that at Sni-A-Bar Farms, has not been plowed for oats or resown to lespedeza since the rotation was begun.

On extremely poor Lebanon silt loam at Cuba, Crawford county, in the drouth of 1934, the acre yields of this rotation were 1232 pounds of oats hay and 349 pounds of lespedeza hay. In the favorable season of 1935, the acre yields of one field were 2840 pounds of oats hay and 1260 pounds of lespedeza hay. In another field the oats standing until ripe yielded 33.2 bushels per acre and the lespedeza 1120 pounds of hay. The 1935 crops of oats and lespedeza were unusually large for such land, partly as a result of an excellent season; but they may be heavily discounted and still stand above the returns from any other kinds of crops found during seventeen years of continuous study on the Cuba experiment field.

A large annual return per acre, produced at a low cost, is the most conspicuous feature of the oats-lespedeza rotation. But that is not all. If the oats crop is at least moderately treated with superphosphate, and the lespedeza is pastured down, adding nitrogen and organic matter to the soil, the fertility will be improved rather than reduced, notwithstanding the heavy production. This rotation is the easiest and most practicable method of maintaining a continuous stand of lespedeza in Missouri. It is equally efficient for growing a good crop of oats.