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PROSO OR HOG MILLET IN COLORADO

BY J. F. BRANDON, ALVIN KEZER, J. J. CURTIS AND D. W. ROBERTSON



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Summary

Turghai, an open-panicled type of Proso with a red or yellowish-brown grain has given an average yield of 24.6 bushels for a 13-year period during which it was tested at the Akron field station, and twice during this period there has been a complete crop failure.

The planting date has varied from April 7 to July 20. July 20 seems to be a little late for planting, altho good yields were obtained. The average date is from the twentieth of May to the first of June.

Small-grain stubble, worked early in the spring and kept free from weeds, gave good yields in good years but poorer yields in poor years than those obtained on fallow. The difference in yield over a 7-year period was 6.7 bushels in favor of the summer-fallow treatment.

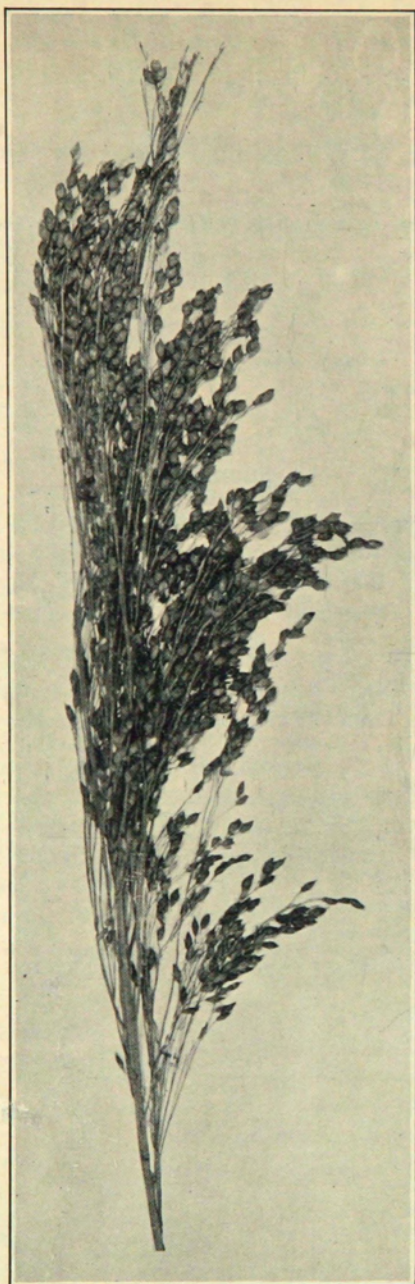


Fig. 1.—Head of proso or hog millet.

PROSO OR HOG MILLET

BY J. F. BRANDON, ALVIN KEZER, J. J. CURTIS AND D. W. ROBERTSON

In recent investigations¹ to determine the best use of grain and forage crops in fattening livestock on the dryland of Northeastern Colorado it has been found that in self-fed winter-fattening tests with protein and mineral-mixture supplements, ground barley showed 88.5 percent the feeding value of shelled corn while ground hog millet showed 100.5 percent the value of shelled corn.

The results of the above investigations have increased the demand for data on varieties and adaptability of proso in this section.

Proso or hog millet has been tested at the Akron Field Station for an intermittent period since 1902² and the results of these tests will be given in this bulletin.

Description

Martin³ states that:

"Proso, or proso millet, is the common millet of the Old World which has been grown since historic times as an important grain crop for human food. It probably was first introduced into the United States by Russian immigrants and is grown only to a limited extent here.

"In addition to the names proso and proso millet, this crop in this county is often called hog millet because of its frequent use as hog feed; broom corn millet, because of the shape of the head or panicle, which somewhat resembles the brush of broom corn; hershey millet, apparently an Americanization of the German word hirse, meaning millet; and Early Fortune millet or Manitoba millet if it consists of either of these two varieties."

Proso is distinguished from the forage or hay millets by having an open panicle head similar to oats. According to Martin,

"Proso has coarse, woody, hollow stems from 12 to 48 inches, but usually about 30 inches high. The stems are round or flattened and generally about as thick at the base as a lead pencil. The stems and leaves are covered with hairs. The stem and outer chaff are green, or sometimes yellowish or reddish green, when the seed is ripe. When thrashed, most of the seed remains inclosed in the inner chaff or hull. Proso is larger and not so tightly held in the hull as is that of the millets of the fox-tail group. The hulls of proso are of various shades and colors, including

¹Maynard, E. J. and Brandon, J. F. Hog millet, corn and barley in fattening rations for pigs—Colorado Experiment Station Press Bulletin 69 and 1929-1930 pig-feeding experiment.

²The cereal experiments were conducted by the office of Cereal Crops and Diseases in cooperation with the office of Dryland Agricultural Investigations. These experiments were started in 1907. Wilson G. Shelley was in charge from May 1, 1908, until February 28, 1911; Clyde McKee from March 1, 1911, until February 15, 1913;

white, cream, yellow, red, brown, gray and black. The bran, or seed coat, of all varieties is a creamy white.

"The proso flowers may be either cross-fertilized or self-fertilized. When two varieties are grown side by side, considerable mixing results, but not enough to change the appearance of the variety."

Climatic Requirements

The following extract is taken from Martin:

"Proso is sown in the spring and is adapted only to regions where spring grain is fairly successful. It is easily injured by frost either in the spring or fall and is not adapted to high altitudes or to localities where summer frosts occur. Moderately warm weather is necessary for the germination of the seed and growth of the plant. Even under favorable conditions proso grows very slowly during the first few weeks. Early and midseason varieties of proso require from 50 to 90 days from sowing to maturity, and unless there is probability of at least 60 days until a killing frost occurs proso should not be sown. This crop does not ripen well, and frequently not at all, during cool autumn weather.

"Proso has the lowest water requirement of any grain crop. At Akron, Colorado, only about two-fifths as much water was required to produce a ton of proso seed as was necessary to produce a ton of grain or Kubanka durum wheat."

It is sometimes fraudulently advertised as being drouth resistant. In the later part of the season it matures very rapidly, sometimes only 60 to 65 days between seeding and harvest, and it may make a fair crop on one to two consequential rains falling at very opportune times. This is more truly drouth evasion than drouth resistance. Largely because of its shallow-rooting habit, however, proso is not resistant to severe drouth and seeded in season may yield no better than other varieties of grain seeded in season. It is sometimes a complete failure in seasons when wheat and barley have produced good yields and conversely it is sometimes a good producer in seasons when wheat and barley have produced lightly. Proso is reported to produce crops in Siberia under an annual precipitation of 8 inches, but experimental evidence shows that it cannot be expected to do this in the United States, nor can it be expected to produce much grain unless a reasonable amount of rain falls during the growth period. It seems to be about as safe, no safer, than other grain crops in North-eastern Colorado.

Charles H. Clark from about March 1, 1913, until July 1, 1913; George A. McMurdo from July 1, 1913, until February, 1917; and F. A. Coffman from July, 1917, until August, 1924. J. F. Brandon, Superintendent of the U. S. Dry Land Field Station, and D. W. Robertson, Associate Agronomist at the Colorado Experiment Station, have carried on the work since August, 1924. J. J. Curtis, Junior Agronomist, has been in charge of this cereal work since September, 1930.

3Martin, J. H. Proso or hog millet, U. S. D. A. Farmers Bulletin 1162.

"Attempts have been made to exploit proso fraudulently as a very high-yielding dry-land crop."

Proso is not so well adapted for growing under irrigation as most other crops, except as a catch crop, largely because it does not make sufficient use of an abundant supply of moisture.

Preparation of Soil

Several methods of preparation may be followed, depending on the rainfall, soil type and sequence of crops. Summer fallow undoubtedly gives the best yield, but at prevailing prices the expected increase in yield would hardly pay for the extra cost of the fallow. Crops grown on summer fallow have to stand the cost of cultivation the first year and taxes for 2 years. It is then very doubtful whether proso is an important enough crop to take the place of winter wheat for seeding on fallow.

If grown on stubble land, the stubble should be worked very early in the spring and kept absolutely free of weeds until seeding time. Thus, the crop will be freed of much of the weed competition; besides, considerable moisture should be stored. Corn or bean land should be handled similarly. Fall working of stubble land on the plains of Eastern Colorado is not advisable unless it can be done very early in the fall immediately following the combine. The work should be done with the idea of controlling weed growth and at the same time leaving the surface as rough as possible for preventing soil blowing and for catching a fair share of the winter's drifting snow. Small millet seedlings cannot compete with weeds and on weedy land an unsatisfactory yield will be obtained.

The practice of seeding proso on hauled-out small-grain land is to be commended for it is the only grain crop known that may be seeded as late as July 1 with any reasonable hope for a matured crop. On winter-killed winter-wheat land one has the choice of either corn, beans, forage feeds or proso. The seedbed for proso should be moist and rather compact so that the chances for immediate germination are enhanced.

Method of Planting

In this section proso is usually sown with a grain drill. Dr. Martin states that "At Newell, South Dakota, proso sown in 7-inch drill rows yielded 8.9 bushels per acre more than when sown in 21-inch rows." The seedbed should be firm and the seed should never be sown deeper than 1½ inches.

Rate of Seeding

Good stands may be obtained by sowing from 14 to 20 pounds with a grain drill. Good stands have been obtained at Akron by sowing 12 pounds per acre. If sown in rows, the rate of seeding can

be cut to 5 or 6 pounds per acre. All evidence, however, indicates the crop is not adapted to sowing in rows and cultivating. It is clearly a "sowed-crop."

Date of Planting

The date of planting has less influence on the yield than the moisture and condition of the seedbed. Good yields have been obtained from plantings from April 7 to July 20, the average date being from May 20 to June 1. Better results probably will be obtained by planting immediately following a heavy rain between the dates June 15 and July 1. A clean, well-prepared seedbed is necessary to secure a good stand, free of weeds.

Methods of Harvesting

Proso should be harvested when the seeds in the upper half of the heads are ripe. At this stage the plant is usually green. If cut earlier, there will be much immature seed and if cut later, considerable seed will be lost from shattering. If the binder is used for cutting proso, care should be taken not to cut it too green because there is danger of the straw molding. If the plants are too short to bind, the crop can be cut with a mower and raked and shocked like hay, but there is quite a loss of seed when this method is used. If a binder



Fig. 2.—Millet cut with a combine and windrow attachment. Note windrow.

is used, the bundles should be placed in rather small or long narrow shocks to prevent molding and to permit drying. In recent years some success has been obtained by the use of the combine with a windrowing attachment. The crop is cut and left to cure in the windrow. (Fig. 2, page 8.) Later it is thrashed with a combine equipped with a pick-up attachment. This method allows for cheaper handling of the crop and permits it to dry out with less shattering than if it were left standing until ripe enough to combine.

Experimental Results

The variety tests at Akron were started in 1909. Field plots were grown that year and from 1912 to 1923 inclusive. Twelve varieties have been tested for a period of from 1 to 13 years. The dates of seeding have varied from April 7 to July 20, the mode being between the

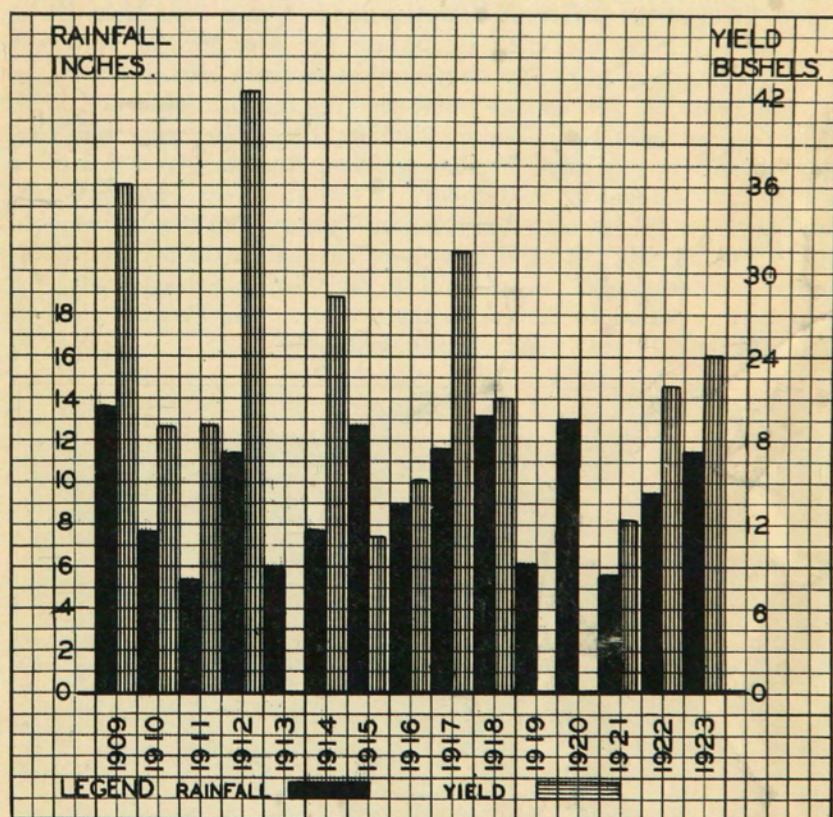


Fig. 3.—A comparison of the total rainfall in May, June, July and August with the yield of Turghai at the Akron Field Station, Akron, Colorado.

20 and 30 of May. The ripening period varies from 70 to 130 days, averaging about 90 days from planting to maturity.

Method of Planting

The millets were sown at the rate of 12 pounds per acre with a grain drill. The plots were in duplicate and were usually planted on land which had previously been in fallow.

Climatic Conditions

The amount of precipitation in May, June, July and August is plotted against the yield of Turghai in Figure 3. There seems to be a slight correlation between the rainfall in these months and the yield. However, some exceptions are found. A failure was obtained in 1920 with 13.04 inches of rainfall and in 1921 a good crop was obtained with 5.59 inches of rainfall. Undoubtedly, other conditions accounted for the loss of the crop. The above data agree with the conclusions of Martin, regarding the adaptability of the crop.

Yield of the Different Varieties under Akron Conditions

Table 1 gives the yield in bushels per acre for the different varieties grown at Akron for varying periods since 1908.

In Table 1 it will be noted that the crop failed in 1919 and 1920. When we compare Red Russian, Tambov, Black Voronezh and Turghai, it will be seen that Turghai and Red Russian give the highest yields, followed closely by Tambov. When an 8-year average is taken, Turghai outyields both Red Russian, Tambov, and Black Voronezh. Early Fortune did not yield as well as Turghai in the 8 years it was tested comparatively. Several other varieties have been tested for too short a period to determine their value. The average yield of Turghai for a 13-year period is 24.6 bushels per acre.



Fig. 4.—Field of Yellow Manitoba near the Akron Field Station, August 23, 1930.

Table 1.—Annual and average yield of 12 varieties of proso grown at the Akron Field Station, Akron, Colorado, during the 18 years from 1908 to 1931, inclusive.

	Red		Tambov		Black		Turghai		Red		Early		Red		White		Red		White		Red		Yellow	
	Russian C. I. 11	C. I. 13	Voronezh C. I. 16	C. I. 31	Voronezh C. I. 60	C. I. 23	Orenburg C. I. 4	Ural C. I. 15	S. P. I. 22490	C. I. 39	Fortune C. I. 23	Orenburg C. I. 15	Ural C. I. 4	S. P. I. 22490	C. I. 39	Proso C. I. 39	French C. I. 4	S. P. I. 22490	C. I. 39	Proso C. I. 39	French C. I. 4	S. P. I. 22490	C. I. 39	Yellow Manitoba C. I. 101
1908	37.0	43.0	12.0	34.0																				
1909	29.8	20.2	17.7	36.2																				
1910	19.5	21.8	21.8	19.3																				
1911	55.0	27.5	14.4	19.4																				
1912	48.7	36.2	38.5	42.3x																				
1913																								
1914	30.3	27.1	22.1	28.2x																				
1915	8.9	38.3 =	34.4 =	11.2	2.2	5.0	6.2	11.2 =																
1916	13.4	9.4	13.4	15.2		15.5	11.1	7.1																
1917	21.5	23.9	32.2	31.7	25.7	30.8	17.6	18.1																
1918	9.6	15.6	10.8	21.0	11.9	18.1	15.0	7.1																
1919	0	0	0	0	0	0	0	0																
1920	0	0	0	0	0	0	0	0																
1921		4.1	5.6	12.3	3.0																			
1922				21.9							16.5													
1923				24.2							18.8													
-1930	43.8	42.0	37.2	48.9							37.1													28.8
-1931	7.9	8.2	8.7	12.3							4.8													12.1
13 yrs.	319.4	305.8	263.2	319.9																				
Average	24.57	23.5	20.2	24.6																				
8 yrs.	128.9	158.2	154.4	176.5																				
Average	16.1	19.8	19.3	22.1																				
x Selections of Red Turghai.																								
= Field Plots in 1915.																								
- Average of 4 plots—2 on fallow and 2 on small grain stubble.																								



Fig. 5.—Proso variety test plats at the Akron Field Station, August 20, 1930.

Variety Characteristics

Turghai, Tambov and Red Russian all have spreading panicles and have reddish-brown or yellowish-brown seed.

Early Fortune has a compact type of head and reddish-brown seed. This should make the latter variety easily distinguishable from Turghai. Yellow Manitoba, another variety commonly grown in this section, has a loose, one-sided head and brownish-yellow seed. Black Voronezh has a similar type of head and has brownish-black seed. The Yellow Manitoba variety has only recently been included in the test, altho it is grown extensively in the Akron section.

Results from Cultural Methods

Since 1925 Turghai has been grown on fallow and in small-grain stubble worked early in the spring and kept free from weeds to seeding time. The following yields were obtained:

Table 2.—Average and annual yields of Turghai grown on fallow and small-grain stubble for a 7-year period from 1925 to 1931, inclusive.

Year grown	Fallow Bu. per Acre	Small-grain stubble Bu. per Acre
1925	12.4	0.7
1926	2.7	4.8
1927	34.5	36.3
1928	9.6	7.4
1929	34.6	17.0
1930	48.4	49.4
1931	22.5	2.1
7-year Average	23.5	16.8

The yeild on fallow is 6.7 bushels greater than on small-grain stubble. This increase would hardly pay for the increased cost of preparation. In years when the weather conditions are favorable good yields can be expected on small-grain stubble and in poor years a failure would be more common than on fallow land.