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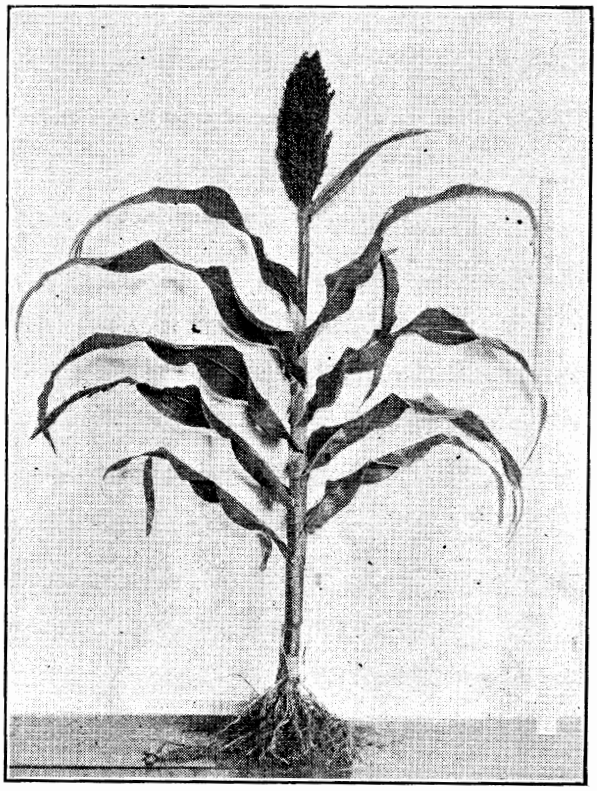
DARSO

BY M. A. BEESON AND ADRIAN DAANE
DEPARTMENT OF AGRONOMY



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DARSO

BY M. A. BEESON AND ADRIAN DAANE
Department of Agronomy

INTRODUCTION

Darso is a new sorghum developed and named at the Oklahoma Experiment Station. The exact origin and history is not known. *"In 1912 the Station received the first supply of seed from a farmer in southwest Logan county who sent a head for identification. Later it was learned that it had been grown in a small way in Kingfisher and adjoining counties." It was tried in the grain sorghum variety test and proved to be quite early and very dwarf. Owing to the possibility of its becoming a valuable addition to the grain sorghums, because of its earliness and dwarfness, selection work has been carried on at the Oklahoma Experiment Station for high grain-yielding quality and improvement of other characteristics.

Mr. G. E. Lemon of Nash, Oklahoma, on noticing a statement relative to darso, published in Bulletin No. 102, wrote to the Station in January, 1915, claiming to be the originator of darso. In his letter he makes the following statement: "I began in the fall of 1901, selecting seed from low,

*Quoted from "The Grain Sorghums", Oklahoma Agricultural Experiment Station Bulletin No. 102, by Churchill and Wright.

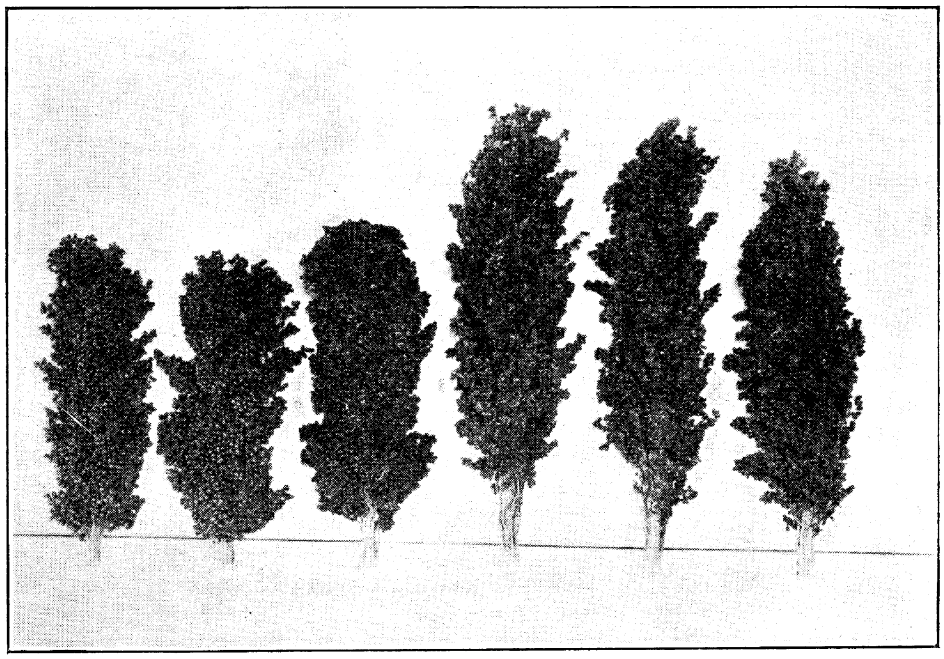

Figure 1—Three Heads of Lemon Sorghum on the Left, and Three Heads of Darso on the Right

heavy stalks bearing a good head in a field of mixed cane, my object being to produce a cane that would produce the most seed, stand up well, and be convenient to head. The field contained orange, amber, sumac, and other varieties. I selected without regard to color, but, on learning later that red cane brought the best price on the market, I left out the black, and in a few years I got red cane that yielded more than kafir, that would stand drouth better, was earlier, and does not grow as tall as kafir."

On receiving the above letter from Mr. Lemon, the Oklahoma Experiment Station secured seed from him, and in the spring of 1915 planted it in a variety test to compare with darso.

They were planted at the same time, on adjacent plots, and given the same treatment. It was found that they were similar in height and in general appearance, but differed in shape of kernel, and, as may be noted from the following cut, there is quite a difference in the head.

The three heads on the left are from seed secured from Mr. Lemon, and are rather short and compact, resembling sumac cane. The kernels are small and dark red, flinty, and round in shape. The glumes cover about one-fourth of the seed.

The three heads on the right are from the strain that has been developed at the Oklahoma Experiment Station. The heads are longer, rather loose, and somewhat tapering at both ends. The seeds are reddish brown, ovate in shape, and flat at the germ end, and covered about one-half with black glumes. The seed is softer and larger than the Lemon type. It may be possible that the two types had the same origin and that the difference is due to selection. The Oklahoma Experiment Station has tried through selection to develop a strain that is early, dwarf, and that gives a heavy yield of both grain and forage.

As darso possibly originated from the saccharine sorghums, or a cross between the non-saccharine and saccharine sorghums, it might properly be called a kafir sorghum as it has some of the qualities of both the non-saccharine and the saccharine sorghums. Selections were made with a view to developing a strain that would compare favorably in grain yields and quality with the grain sorghums, and at the same time retain its early-maturing and drouth-resistant qualities, making it a safe feed crop in years of severe drouth.

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DESCRIPTION OF PLANT

Darso is a dwarf plant about 4 feet in height, heavily foliated, with large stalks that are usually tinted with red. It is very uniform in height and in the shape and color of its heads. The stalk is about 1 inch in diameter, has short internodes, and is comparatively free from suckering and side-branching.

The heads are rather loose and from 10 to 12 inches long, 7 to 8 inches in circumference, contain a continuous center stem, and do not shatter readily. The kernels are ovate, flattened at the germ end, and are reddish brown. The glumes are black and extend about one-half way of the grain when mature. The kernels have dark rings similar to folds on the base end. The grain of darso is not so hard as that of kafir.

Table No. 1 shows a comparison of plants of darso and of standard black-hulled white kafir.

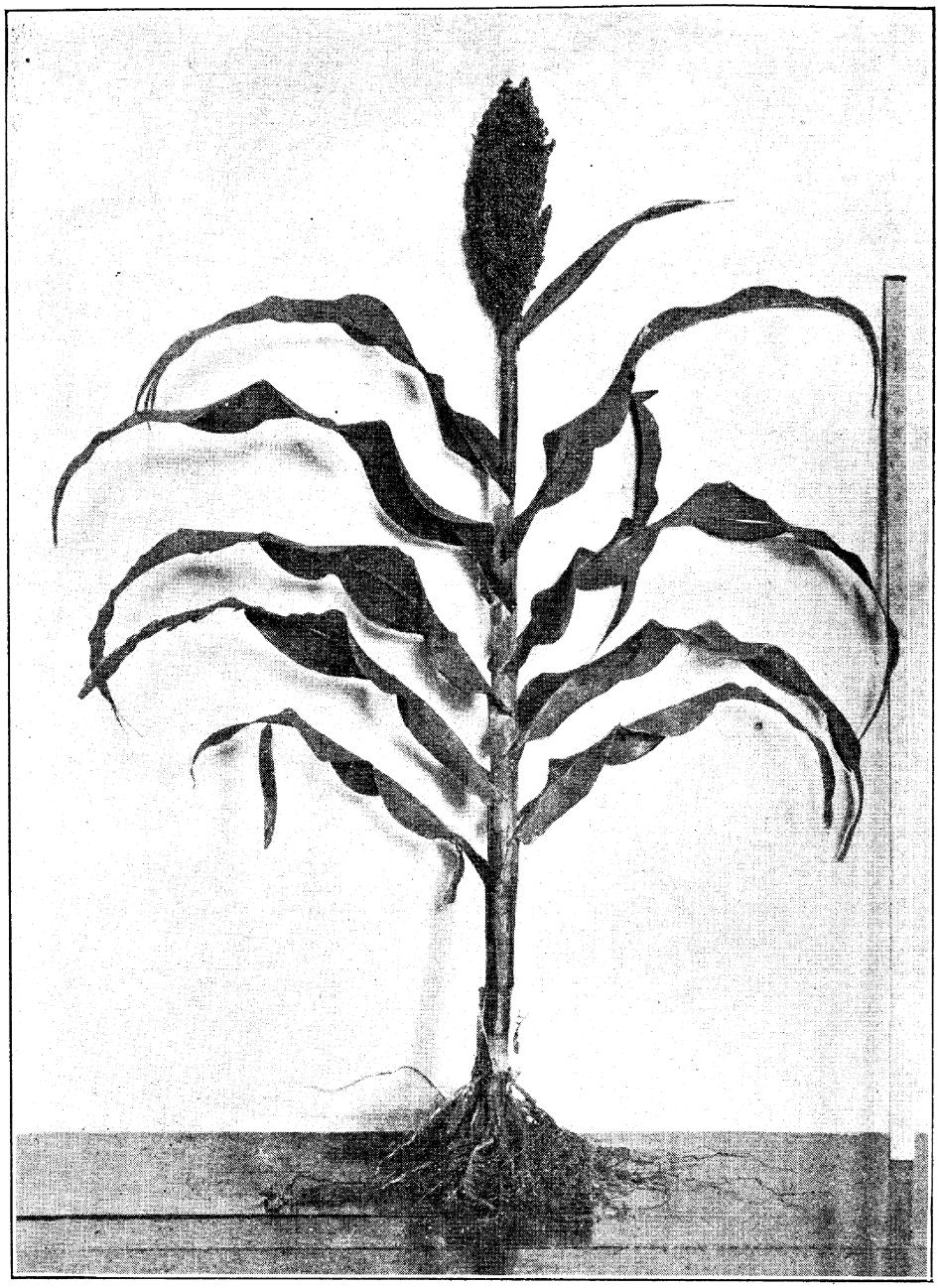


Figure 2—Single Stalk of Darso
Note dwarfness, large stalk, leafiness, and large head

Table No. 1

Physical comparison of darso with standard black-hulled white kafir.

	Darso	Kafir
Height of stalk	4 ft.	4.5 ft.
Diameter of stalk at butt	1 in.	⅞ in.
Diameter of stalk at tip	9-16 in.	½ in.
Number of internodes	11.5	11.2
Average length of internodes	3.35 in.	3.75 in.
Average length of last internode	13 in.	13.15 in.
Average number of leaves	10.9	11.8
Average length of head	10.2 in.	11.3 in.
Circumference of head	7 in.	7 in.
Number of grains per inch	7	7
Green weight, entire plant	1.45 lbs.	1.48 lbs.
Green weight of head	.45 lbs.	.37 lbs.
Green weight of leaves	.35 lbs.	.35 lbs.
Green weight stripped stalk	.65 lbs.	.72 lbs.
Percent of grain to whole head	76.5	79.3

*Measurements taken by E. E. Graham.

The standard black-hulled white kafir used in this comparison is a strain that has been selected for dwarfness and heavy grain and forage yield at this Station for a number of years. In 1915 the rainfall at Stillwater was well distributed, which made conditions most favorable for kafir. It will be noted from the comparison in Table 1 that darso is more dwarf than this dwarf strain of kafir, has a larger stalk, and is comparatively free from side-branching and suckering.

An analysis made at this Station for the pecrentage of total sugars in the juices of the green stalks of darso, kafir and feterita is shown in the following table:

Table No. 2

Table No. 2 shows a comparison of the chemical composition of darso and kafir plants which had been field-cured two days.*

	Percent of Sugars in Juice of Plant*		
Variety	As Sampled	Air-Dry	Moisture-Free
Black-Hulled White Kafir	2.49	6.86	7.78
Feterita	4.73	7.90	8.85
Darso	5.79	15.96	17.85

Darso is here shown to contain a higher percentage of total sugars than either feterita or black-hulled white kafir.

Table No. 3

Composition of darso and kafir*.

Variety	Water	Ash	Protein	Fiber	Ether Extract	Fat
		STALKS (Green)				
Darso	70.99	2.11	1.28	7.29	17.70	.63
Kafir	71.8	2.82	1.3	7.32	16.08	.68
		GRAIN				
Darso	11.75	1.6	10.94	3.44	65.53	3.74
Kafir	10.08	1.56	10.19	2.39	72.66	3.20

From Table No. 3 it is evident that there is little difference in the composition of the stalks of these two sorghums. Judging from the chemical composition of the grain, there would be very little difference in the feeding value. From analysis made by Dr. C. T. Dowell, Experiment Station chemist, it is shown that darso contains only .16 of 1% of tannin. This is

*Analyses by C. K. Francis, former Oklahoma Experiment Station chemist.

such a small percentage that it probably has little or no effect on the feeding value of darso grain.

A preliminary report of a feeding experiment by J. S. Malone* indicates that darso does not seem to be quite so good as kafir as a feed for hogs. However, this one feeding test is not considered sufficient from which to draw definite conclusions, and the Animal Husbandry Department of the Experiment Station is continuing the investigations.

Digestibility of Darso

During the fall of 1919 a digestion experiment was carried on by C. T. Dowell of the Station Chemistry Department to determine the digestibility of darso. The result of this experiment is given in Tables 4 and 5.

As red-seeded grain sorghums are usually discriminated against as not being as desirable for feeding purposes as kafir, milo or feterita, tables showing the digestibility of darso and of kafir are here given for comparison.

Table No. 4

Showing the digestibility of darso, as determined by a digestion experiment with sheep.

	Animal Used	Dry Matter	Ash	Protein	Fiber	Nitrogen-Free Extract	Fat
Percent digested	Sheep	73	.....	56	.....	84	69

Ash and fiber were present in such a small amount that the calculations showed a positive or negative digestibility (being within the experimental error).

Table No. 5

Showing the digestibility of kafir (percent digested).

	Animal	Dry Matter	Ash	Protein	Fiber	Nitrogen-Free Extract	Fat
Oklahoma	Steer			53		76	46
Texas	Sheep		64	64	32	85	78
Arkansas	Hogs			77	67	96	62
Oklahoma	Chickens			53	20	96	73
Henry & Morrison, Feeds and Feeding kafir in unbalanced ration	a ruminant	50		47	44	51	51

The digestion experiment with sheep seems to indicate that the nutrients in darso are as digestible as are those in kafir. No final or definite conclusion can as yet be drawn regarding the relative feeding value of darso and kafir.

Variety Tests With Grain Sorghums

For six years darso has been grown in the variety test plots of grain sorghums on the Experiment Station. Table No. 4 gives the results of this test with standard black-hulled white kafir, feterita, white milo, dwarf hegari kafir, and schrock kafir.

Table No. 6 shows that darso gave an average yield of 19.4 bushels for the six years from 1913 to 1918, while standard black-hulled white kafir was second in yield, giving 16.4 bushels per acre. Feterita ranked third, dwarf hegari kafir fourth, and the milo last in yields per acre. This would be expected of milo, as it is a crop better adapted to the western part of this state. It is noted that the dwarf hegari kafir was very irregular in its yield. This was due possibly to its not being acclimated. Schrock kafir has been grown in the variety test only two years, which is not long enough for comparison with the other grain sorghums.

*"A Preliminary Report on Feeds for Fattening Pigs", by J. S. Malone, Oklahoma Agricultural Experiment Station, Bulletin No. 120.

Table No. 6

Showing the yields of grain and forage, and the length of time to mature some of the non-saccharine sorghums grown in the variety test at the Oklahoma Experiment Station for the years 1913-1918, inclusive.

Variety	1913**			1914			1915			1916			1917			1918		
	Tons per Acre	Bushels per Acre	Days to Mature	Tons per Acre	Bushels per Acre	Days to Mature	Tons per Acre	Bushels per Acre	Days to Mature	Tons per Acre	Bushels per Acre	Days to Mature	Tons per Acre	Bushels per Acre	Days to Mature	Tons per Acre	Bushels per Acre	Days to Mature
Darso	1.5	31.2	98	19.1	107	1.3	14.4	100	1.5	24.2	114	1.2	14.7	96	1.4	12.6	104
B.- H. W. Kafir ..	2.6	34.4	110	6.0	134	1.0	14.4	106	1.0	16.4	114	2.4	21.1	110	1.6	6.5	114
Feterita .	1.7	28.0	93			1.2	12.4	94	1.4	21.4	99	.5	3.6	103	.5	4.4	103
White Milo						1.2	10.5	107	.4	6.6	107	.1	1.0	114	.5	2.6	104
Dwarf Hegari Kafir ..						1.4	15.4	112	.4	7.7	107	3.20	22.9	123	1.0	4.7	120
Schrock Kafir ..												1.5	15.2	99	1.2	9.0	109

SIX YEARS AVERAGE

	Tons per Acre	Bushels per Acre	Days to Mature
Darso	1.4	19.4	103
Black-Hulled White Kafir	1.7	16.4	115
Feterita	1.0	13.9	99
White Milo	.6***	5.2***	108***
Dwarf Hegari Kafir	1.5***	12.7***	116***
Schrock Kafir	1.4*	12.1*	104*

*Two years' average.
**Results in 1913, published by Churchill and Wright, in Oklahoma Agricultural Experiment Station Bulletin No. 102.
***Four years' average.

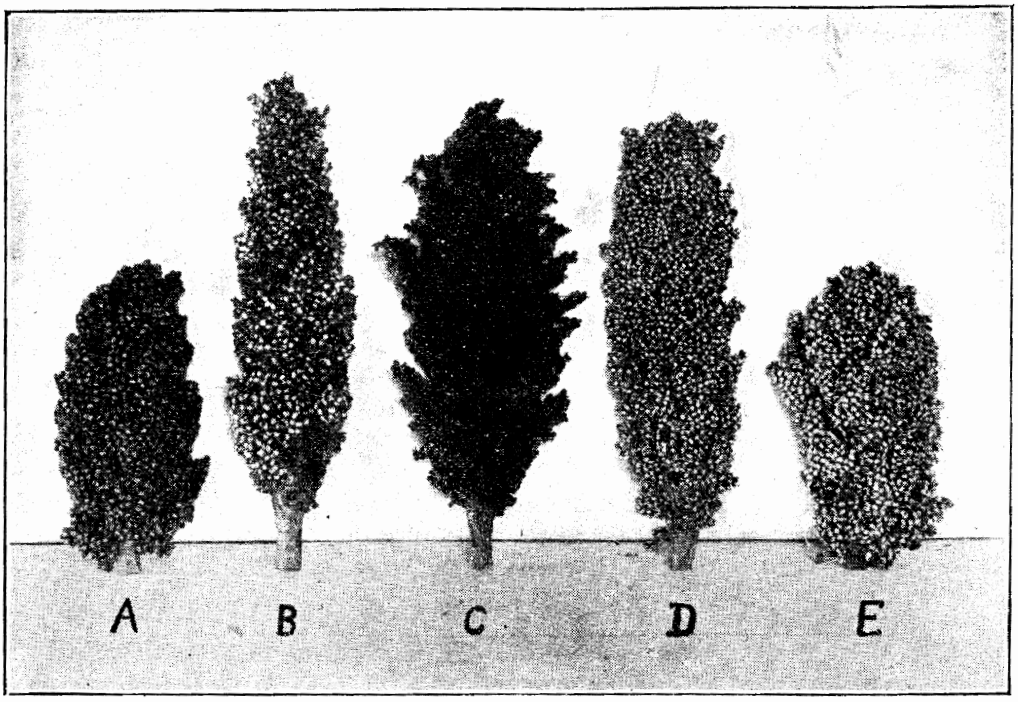


Figure 3—Heads of (A) Yellow Milo, (B) Feterita, (C) Darso, (D) Kafir, and (E) White Milo

It is observed that standard black-hulled white kafir gave a slight increase in forage yield over darso and dwarf hegira. Darso matured on an average of twelve days earlier than standard black-hulled white kafir, while feterita matures about four days earlier than darso.

Relation of Rainfall to Yields of Darso and Kafir

Table No. 7 gives the yields of kafir and darso with monthly, seasonal and annual rainfall. The table is arranged in the order of the yields of kafir and not in yearly sequence. The yearly rainfall is divided into four periods of three months each, and are arranged so as to throw the growing season (June, July and August) in one peirod.

In making a study of the relation of rainfall to yields of darso and kafir, no relation was found between the annual rainfall and the yields of kafir or darso, with the exception of kafir in 1914, when the annual rainfall dropped to approximately one-half of the normal rainfall at Stillwater. During this year the yield of kafir was only six bushels per acre, while the yield of darso was 19.1, which is about an average production for darso for the past six years.

There is no relation between monthly rainfall and the yield of either kafir or darso during the seasons 1913 to 1918, inclusive. However, there is a relation between the rainfall of June, July and August and the yields of kafir.

Table No. 7

Showing the yields of kafir and darso as compared with the rainfall by months for the years 1913 to 1918, inclusive.

Yield Kafir	Yield Darso	Year	December	January	February	Total	March	April	May	Total	June	July	August	Total	September	October	November	Total	Annual
34.4	31.2	1913	4.59	.56	3.46	8.61	3.00	3.87	3.31	10.18	1.88	3.49	.05	5.42	6.13	3.29	2.96	12.38	36.59
21.1	14.7	1917	.03	.27	.90	1.20	.34	3.26	2.80	6.40	2.58	2.34	9.19	14.11	.50	T	2.45	2.95	24.66
16.4	24.2	1916	.93	3.18	.29	4.40	1.70	3.77	.94	6.41	9.49	.18	.72	10.39	1.81	2.11	2.89	6.81	28.01
14.4	14.4	1915	.26	1.38	6.61	8.23	2.20	.12	5.64	7.96	4.38	1.14	2.60	8.12	8.56	4.47	1.68	14.71	48.02
6.5	12.6	1918	3.37	1.48	T	4.85	1.63	3.86	7.10	12.59	3.86	1.26	1.40	6.52	5.36	5.88	4.63	15.89	39.85
6.0	19.1	1914	1.34	T	.65	1.99	1.41	2.25	2.04	5.70	.51	.52	2.48	3.51	3.48	1.23	.52	5.23	16.79

*Climatology data furnished by J. P. Slaughter of United States Weather Bureau, Still water, Oklahoma.

Yields of kafir and the June, July and August rainfall for six years are represented by curves in Diagram No. 1. It is observed that the curve representing the yield of kafir and the curve representing the June, July and August rainfall take the same direction with the exception of 1913. This would indicate that a low rainfall during the growing season reduces the yields of kafir.

Diagram No. 1

Showing the yield of kafir and the seasonal (June, July and August) rainfall from 1913 to 1918, inclusive.

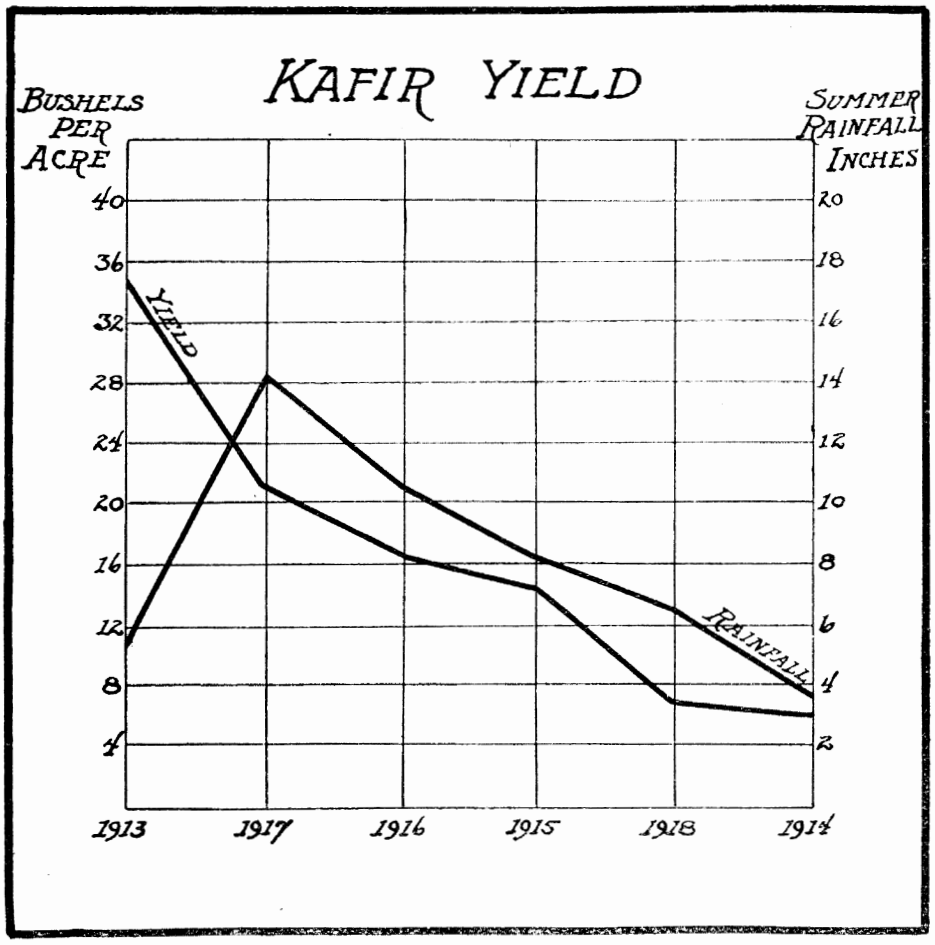
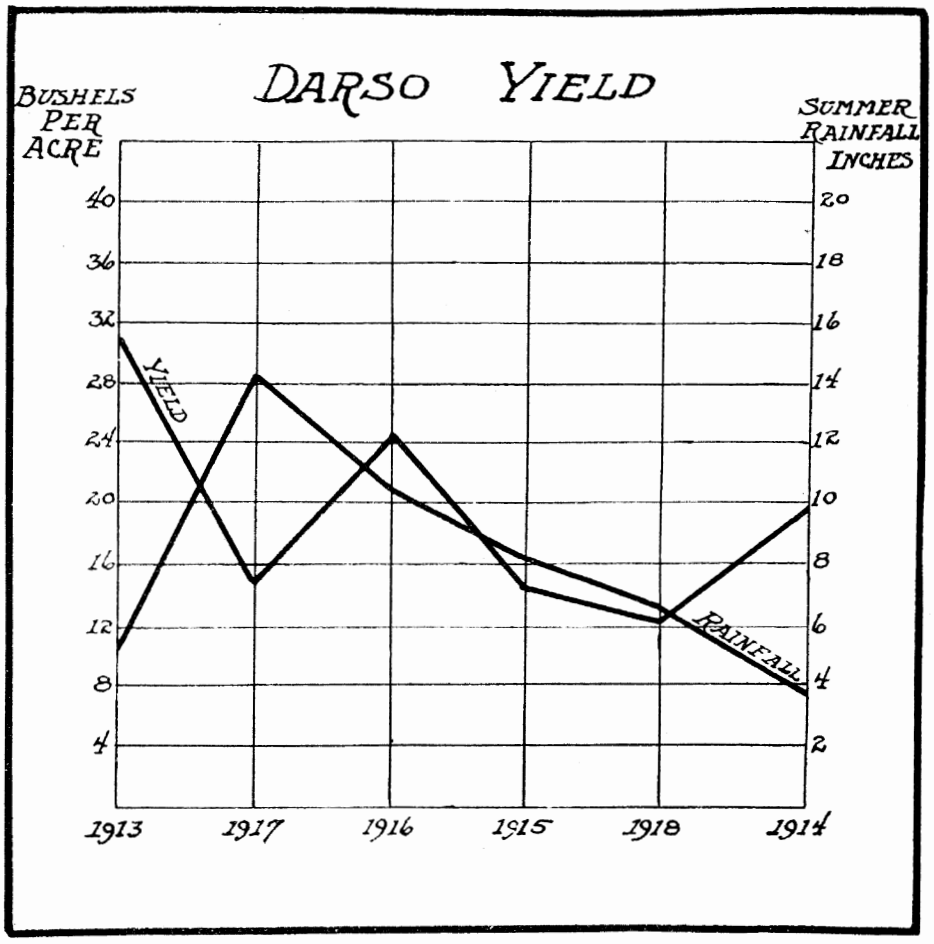


Diagram No. 2 shows the yield of darso and the seasonal (June, July and August) rainfall for six years. There is very little relation between the seasonal rainfall and the yield, which would indicate that darso is more drouth-resistant than kafir. Darso gives an average yield on years of low rainfall during the growing season, which makes it a safe feed crop.

Diagram No. 2

Showing the yield of darso and the seasonal (June, July and August) rainfall from 1913 to 1918, inclusive.



The soil where the variety test was made has been plowed every fall and kept in good condition to absorb moisture, but the soil belongs to the Kirkland clay hardpan series, with only about seven or eight inches on the surface capable of absorbing moisture readily. Therefore the winter and early spring rainfall fails to influence the yields, as moisture cannot be stored readily in the subsoil. No doubt there would be a relation between the winter and spring rains and the yields if the experiment had been conducted on a different type of soil where moisture would be more readily absorbed and stored for the growing season.

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CULTURAL METHODS

The methods used in preparing the seedbed, planting, harvesting and storing the grain and stover are similar to the methods employed in handling kafir. A brief discussion of these methods follow.

The Preparation of the Seedbed

Early fall or winter plowing is recommended in preparing the seedbed for the sorghums. Exceptions to this are found in the sandy, blow soils of Oklahoma where the seedbed is not disturbed until near planting time.

Land that has been plowed in the fall or early winter should be worked as soon as possible in the spring in preparation for the crop. The land should be thoroughly disked or harrowed in the spring after each rain in order to break the surface crust and destroy the weeds. Weeds can be killed in the spring before planting time much more easily than they can after the crop is planted. By working the soil after each rain, the moisture already in the soil will be conserved and the surface will be kept in the best possible condition to receive more rain. Any tillage methods used in plowing or preparing the seedbed for darso, as for other grain sorghums, should be thorough and as early as possible. Many yields of row crops are lowered much by too little attention being given to the preparation of the seedbed.

Time of Planting

Darso being a crop which is relatively early and able to withstand very well long periods of drouth, the planting season extends over a longer period than that of most any of the other grain sorghums. However, it should not be planted until the soil is thoroughly warmed in the spring. The earliest date of planting the grain sorghums usually follows the date on which corn should be planted by two or three weeks. The time of planting in northern Oklahoma is about the last of April or the first part of May, while in the southern part of the state it may be planted one or two weeks earlier. Darso will mature in about one hundred days. While an earlier date for planting is recommended, it has been and may be planted as late as the first part of July and still produce compartively good results.

Method of Planting

Darso is planted in a way similar to that of the grain sorghums, with either level planting or listing. Level planting seems to be more favored in the eastern part of the state, where the rainfall is relatively heavy. Listing is more generally practiced in the western part of the state. On good rich soils this crop, when planted for grain, should be planted in rows 3½ feet apart with the plants about 8 to 20 inches apart in the rows, depending on the section of the state; the thicker seeding is recommended for the eastern and the thinner seeding for the western portion of Oklahoma.

From two to four pounds of seed are used to the acre when planted in rows 3 to 3½ feet apart. If grown for forage, a little thicker rate should be used than when grown for grain. When sown with a drill for hay, three-fourths to one and one-half bushels of seed should be used per acre.

The depth of planting depends on the soil and the climatic conditions. A poor stand when planted early is due largely to poor germination on account of the cold soil, therefore the necessity of planting relatively shallow to place the seed in warm soil. A poor, irregular stand with late planting is often caused by lack of sufficient moisture to insure prompt germination and continued growth after gremination. Therefore the necessity of planting deep enough to get the young root systems in moist soil. On sandy soils, deeper planting can be practiced than on clay soils. Under favorable conditions, sorghum seeds are planted from one to two inches deep.

Cultivation

The cultivation of all row crops should be thorough, and should begin as soon as the crop is planted. This can be done with the ordinary spike-

Figure 4—Darso Growing on the Oklahoma Experiment Station Farm in 1917

tooth harrow, and can continue with the same implement until the grain sorghum or darso is 2 or 3 inches high. Such working of the soil is more thorough than would be the case with an ordinary row cultivator. The first cultivation that is given with a row cultivator should be relatively deep and may be somewhat close to the plants. The older the plants become the shallower should be the cultivation, and the farther from the row should the near shovels of the cultivator be kept. The frequency of the cultivations is largely determined by the amount of weeds, the condition of the soil and the kind of weather.

One of the main reasons for cultivating row crops is to keep down the weeds. It is possible that this reason for cultivating should be emphasized as much as any other in Oklahoma. Too frequently our fields show a greater amount of vegetative growth of weeds than there is of the economic crop, and where moisture is the limiting factor in the production of all crops in practically all sections of Oklahoma, they should not be allowed to secure any kind of a start, as they not only use up soil moisture, which is needed for the row crops, but they also interfere with root development and use available plant food. Clean cultivation is one of the great essentials in growing any row crop. There is no place on the farm for weeds, and much less in the field where row crops are planted.

Harvesting

Like most of the other grain sorghums, it is not necessary to harvest darso at any particular period. However, since forage as well as grain is an important item in the production of feed in the more arid sections of the United States, it is best to harvest just as soon as the seed is sufficiently ripe. This period is determined by examining the seed, which should be just past the dough stage; at this time the plants are still green, and if properly cured make good forage for rough feed during the winter.

If harvesting is delayed until the plants are turning yellow, beginning to die, or until after frost, the feeding value is decreased, for the leaves are

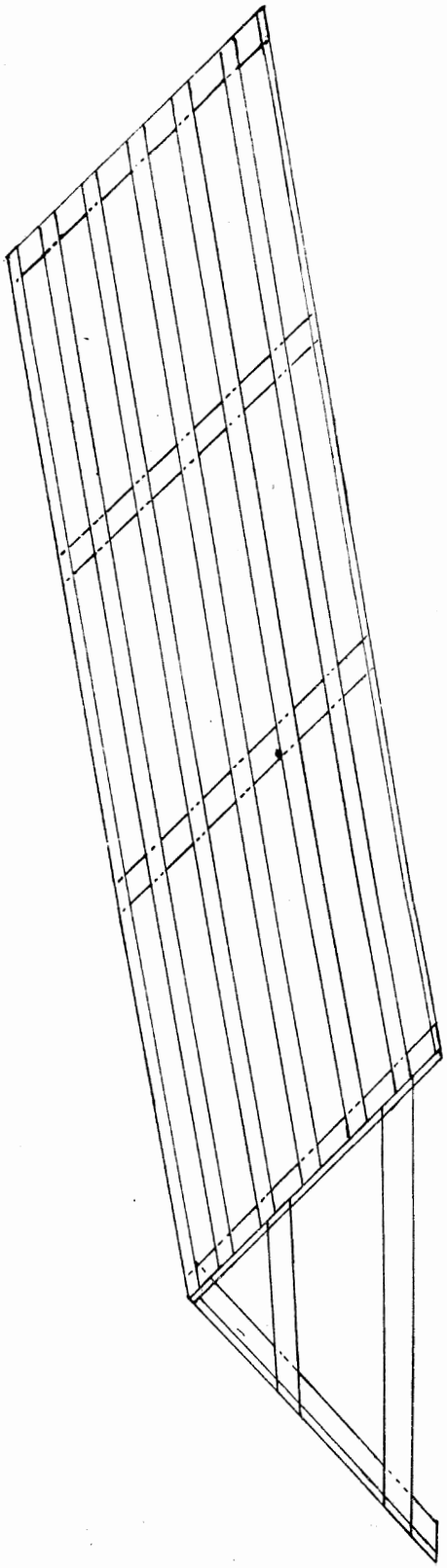

Figure 5—A Rack on Which the Headed Grain Can Be Stacked

then brittle and many are lost in handling. Since darso does not shatter very easily and is not bothered by birds as much as is kafir, milo or feterita, it has these advantages over the other grain sorghums when left standing late in the field.

Because of its uniformity in height, darso heads can be harvested with a header much more easily than any other grain sorghum. If the crop is harvested before the heads are removed, the ordinary corn binder can be used.

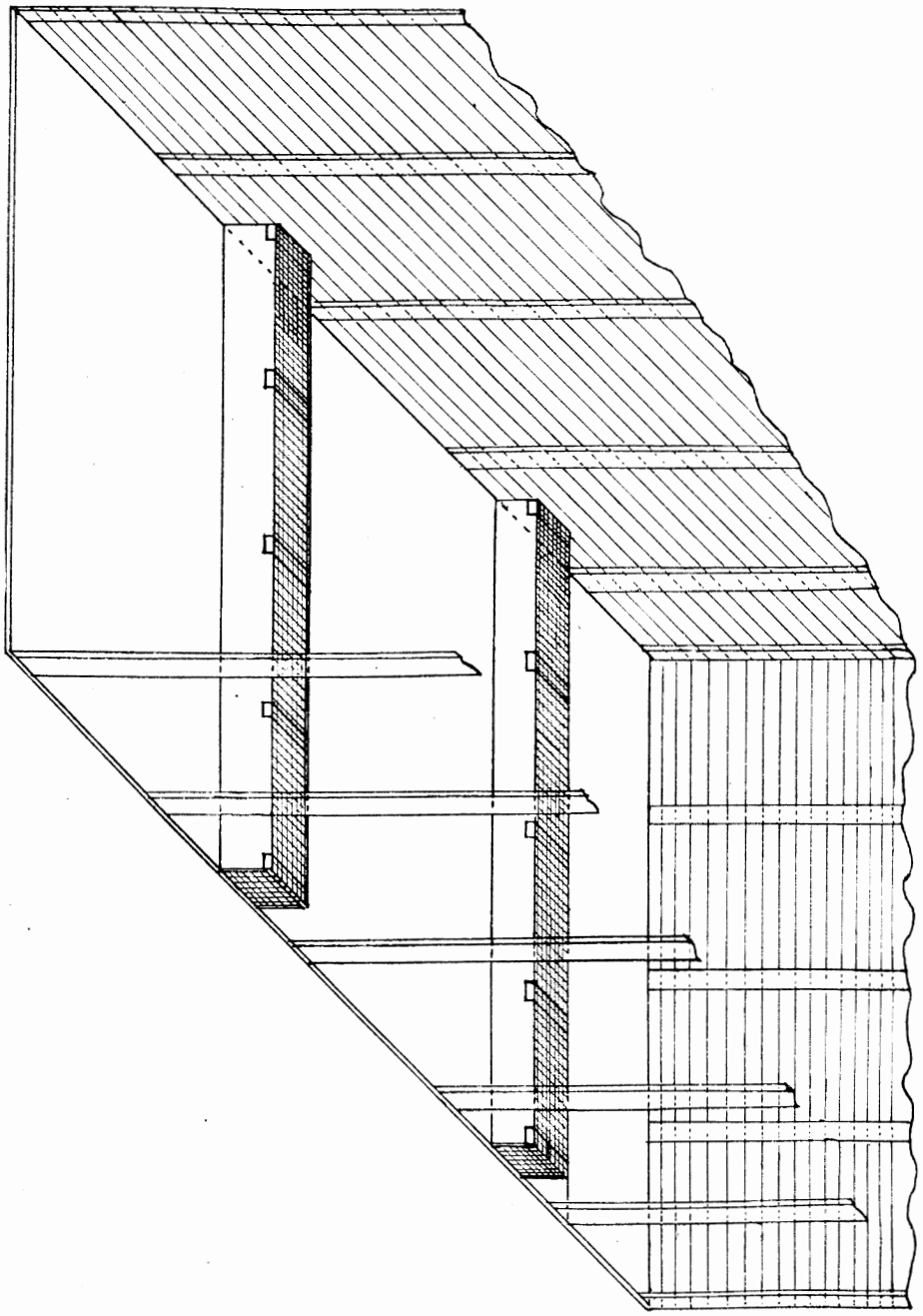

Figure 6—A Bin Showing Ventilators in Place

Storing

The grain of the sorghums usually keeps better when stored in the head than when threshed. This is because of better ventilation than is usually obtained when so stored. It is well after harvesting with the corn binder that the bundles be shocked and allowed to thoroughly cure in the field before threshing the seed or stacking the forage. After threshing, the seed should be stored in a dry place and arrangements made for ventilating.

For storing the grain in the head, long narrow cribs are to be preferred. However, a rack made similar to the one shown in Figure No. 5 gives very satisfactory results. Such a rack made of planks or poles properly spaced over which is stacked the heads of grain in long narrow ricks furnishes good ventilation and also keeps much of the grain off the ground. The stack should not be very wide or high, as the larger the stack the greater is the danger of heating and spoiling, especially is it necessary to take such precautions if the heads are not thoroughly cured when stored. For protection from the weather bundles of kafir fodder or sudan hay may be used as a covering to keep the headed grain dry.

Storing the threshed grain in bins necessitates greater care than storing the grain in the head. Insufficiently cured grain, wet weather and a high percentage of cracked kernels are common causes for the grain heating or spoiling. To avoid losses in storing the threshed grain it is necessary to provide good ventilation.

A system recommended for this purpose is shown in Fgure No. 6. The ventilators shown in the cut are opened on two sides and at both ends. In making one of these ventilators, use two boards one by six inches and as long as the bin is long or wide. The boards are held about five or six inches apart by short cross-cleats which are mortised in on top but nailed on the bottom edge of the plank. This allows air to enter the ventilator at the bottom. Over the two open sides and ends tack galvanized wire fly screening. These ventilators should extend through the sides of the bin as when so inserted good circulation of air is provided. The ventilators should not be nailed to the bin. They can then be easily removed and the bins cleaned when empty. A number of such ventilators are necessary to provide good ventilation for a bin holding one hundred bushels or more. Ordinarily they should be placed three or four feet apart at or near the floor and if the bin is filled with grain to a depth of six feet or more, other ventilators should be put in about four feet above the floor. In storing the threshed grain of the sorghums thorough ventilation is necessary.

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REPORTS FROM FARMERS

For the past four or five years darso seed has been sent to farmers in various sections of Oklahoma, Texas and Kansas. The amount of seed distributed to each farmer was small, usually from two to three pounds. This amount under ordinary conditions, is sufficient to plant two or three acres.

In some sections of the state, climatic conditions have been such that little, if any, results were secured the first or even the second season. Consequently the reports from some of the farmers have not been complete.

In order to obtain as much information as possible as regards the value of this crop in other sections of the southwest, a questionaire was sent to the farmers who had been supplied with seed. The reports and information received through the use of this questionaire have been somewhat varied. Many of the reports have been favorable, some have been neither favorable nor unfavorable, while relatively few of them have been unfavorable.

The information sought through the use of these questionaires was as follows: Number of acres planted to darso, the yield per acre, other grain

sorghums grown on the farm, the number of acres devoted to other grain sorghums, the yield per acre of each, the value of darso compared with the other grain sorghums, and the advantages and disadvantages of darso compared with the other grain sorghums.

The reports as a whole which were received expressed very well the opinions of the farmers growing this crop. In a few instances little information is contained in the reports due to the fact that the area planted to this crop was very small, and no definite yields were secured or the crop was a failure due to the extreme drouths which have been experienced in the southwest for the past two years. However, in practically all cases where the darso crop failed, all other grain sorghums failed also.

The folowing is a general summary of the reports under the several headings as indicated above:

Number of Acres Planted to Darso.—In the majority of cases about an acre was planted to darso the first year it was grown. The second and following years, the area varied from three to fifteen acres, depending on the results secured the first year. In a few instances as much as fifty to seventy acres were devoted to this crop the second and third seasons.

Yields per Acre.—Of the seventy-three reports, five stated that the crop was a failure in 1917, and that all other grain sorghums were a failure that season also. In other reports the yields varied from seven to thirty-five bushels per acre, except in a few instances where the yields were not taken on account of the size of the plot, which was very small. In most of the reports where definite yields were secured, the results have been in favor of darso, its yield being from one to two bushels up to as much as twenty bushels per acre more than the kafirs or milo. A few farmers reported that the yield of darso was from two to twelve bushels per acre less than that of kafir or milo. Three farmers reported that the yields of darso were the same as that of kafir or milo.

Other Varieties of Grain Sorghums Grown on the Farm.—In nearly all cases, either milo, kafir or feterita was grown on the farm in comparison with darso. These crops were either grown in adjacent plots or in nearby fields. In practically all cases the conditions under which these crops were grown were such as make comparisons possible. However, the reports show that the comparison is more often with kafir than with milo or feterita, as kafir is a more general crop in the greater portion of Oklahoma.

The Value of Darso Compared With the Other Grain Sorghums.—In answer to the question, "Will darso be of value in your community?" three-fourths or 75% of the farmers who expressed their opinions reported in the affirmative, 15% did not think it was any better than the other grain sorghums, and 10% stated that they did not think it had any advantages over the other grain sorghums, and that they were not particularly pleased with it.

The Advantages and Disadvantages of Darso Compared With the Other Grain Sorghums.—In expressing their opinions relative to the disadvantages or faults of darso, a few quotations from these reports are here given:

"Darso dries up and falls down when it matures."

"No particular fault with darso, but no particular advantage."

"Too dwarf. Does not grow tall enough."

"Its heads are too small."

"I do not like any of the grain sorghums."

The above quotations are the only ones which expressed somewhat unfavorable opinions of this crop. All other reports on this suggestive topic

in the questionnaire, excepting in a few cases where no opinion was expressed, were favorable.

From additional remarks that were added to the questionnaire in the report, darso seems to have made a favorable impresion on a large percentage of those farmers who have grown this crop.

The following quotations are taken from the remarks:

"Darso made heads under more unfavorable conditions than kafir."

"It is earlier than other grain sorghums."

"Darso seems to be better than any other grain sorghum."

"It stands up well, is early, and is easy to harvest."

"The darso made grain under conditions where other grain sorghums failed."

"Darso yields better on dry soil than does kafir."

"Darso could hardly be recommended over the other standard varieties of grain sorghums."

"This was a very bad season (1917); no threshing done. Have fed my horses on ground darso and am feeding hogs on it also."

"More darso will be planted in this community than either kafir or milo."

"It is better for late feed than kafir, and stock like the fodder better."

"I believe it will be a good grain sorghum."

"Darso headed and made some grain, while other grain sorghums failed."

"The drouth kept it from coming up. Will give it another trial."

"No grain sorghums headed this year."

"Drouth prevented any results."

"I had but a small plot, but it yielded very well."

In addition to proving its worth here at the Oklahoma Experiment Station, darso has met with favor by most of the farmers who have grown it.

Table No. 8

Below is a table showing the various percentages of reports that are favorable, neither favorable nor unfavorable, and unfavorable:

Section	Percent of Total Reports Favorable	Percent of Total Reports Neither Favorable nor Unfavorable	Percent of Total Reports Unfavorable
Western Oklahoma	65	35	0
Central Oklahoma	78	20	2
Eastern Oklahoma	0	50	50
Western Texas	57	14	29
Western Kansas	67	33	0
Average of all reports	63	30	7

The unfavorable reports in this table mainly come from sections having relatively heavy rainfall, and where none of the grain sorghums are considered with favor. Darso, like the other grain sorghums, is best adapted to semi-arid and arid sections. It is a well known fact that in the humid sections the grain sorghums are not considered a profitable crop as they cannot compete with corn. However, as one goes from the humid to the more arid sections, corn becomes less profitable and the grain sorghums become more profitable comparatively. For this reason a greater percentage of unfavorable reports come from the more humid sections of Kansas, Texas and Oklahoma.

SUMMARY

1. Darso is a grain sorghum of unknown origin. It is probably a cross between a non-saccharine sorghum and a saccharine sorghum.

2. It is a leafy, stocky sorghum, red-seeded, drouth-resistant, early maturing, and very uniform in height.

3. The forage contains a higher percentage of total sugars in the juice than does black-hulled white kafir or feterita.

4. The chemical composition of the grain and the forage is very nearly the same as that of Black-Hulled White kafir.

5. The feeding test conducted with hogs by the Animal Husbandry Department of this Station seems to indicate that the feeding value is not the equal of black-hulled white kafir. However, the results of one feeding test are not considered sufficient from which definite conclusions can be drawn.

6. In the variety test of grain sorghums extending over a period of six years the average yield for darso has been three bushels per acre more than the black-hulled white kafir, and more than any other grain sorghum. Being a dwarf plant, the yield of forage is less than that of black-hulled white kafir.

7. Darso is able to withstand relatively long periods of drouth better than black-hulled white kafir.

8. The cultural methods are practically the same as for the other grain sorghums. Because of its early maturity it can be planted later than most of the grain sorghums and still give relatively good yields.

9. Darso has been grown in a limited way by many farmers in various sections of Texas, Kansas and Oklahoma the past few years. The reports from these farmers indicate that this crop may be of value to the southwest.

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Previous to 1915 the work on darso was carried on under the direction of O. O. Churchill, then agronomist at the Oklahoma Experiment Station.

Acknowledgement is also given H. H. Finnell, Station farm foreman, for assistance rendered in working up climatological data and drawing diagrams.