THE SORGHUMS IN ARIZONA

By G. E. Thompson

Field of hegari on the Salt River Valley Experiment Farm.

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INTRODUCTION

The sorghums are increasing steadily in importance in Arizona. In 1922 the total value of the grain sorghum crops grown in the State was $720,000. This figure does not take into account the value of the sweet sorghums grown for hay, for silage, or for pasture. It is conservatively estimated that the value of sorghums grown primarily for these purposes exceeded that of sorghums grown for grain.

The term "sorghums" is a general one and includes those crops commonly called kafir, milo, feteriti, hegari, sweet sorghum, shallu, and similar crops. The word "sorgo" is sometimes used when referring to sweet sorghums. Sorghums grown primarily for grain are designated as grain sorghums.

Sorghums are, for the most part, native to the hot parts of Asia and Africa, and are adapted to warm growing conditions and drought. As a result, they are particularly well suited to the conditions that prevail in the southwestern United States. In the southern part of Arizona the season is long enough to mature even the latest of the important varieties, and the quick-maturing varieties can be used for double cropping. The grain sorghums, because of their ready sale, make good cash crops. Some of them make excellent silage or fodder, and the sweet sorghums are used for silage, for hay, and for pasture, as well as for the manufacture of sirup. All varieties are adapted to a wide range of soils, are hardy, and while responding to good care, will thrive even with unfavorable conditions. These reasons account largely for the increasing importance of sorghums in Arizona.

Sorghums of one variety or another have been grown successfully in all of the farming regions of the State where the altitude does not exceed 7,000 feet. Varieties, time and methods of planting, and methods of cultivation, must be varied to suit the particular climatic conditions. There is a wide difference between the methods of handling sorghums,
under irrigation and under dry-farming, and in many cases different varieties are used in these two kinds of farming.

GROWING SORGHUMS UNDER IRRIGATION

Most of the large farming districts of southern Arizona are irrigated districts. Important among these areas are the Colorado River Valley in the vicinity of Yuma (commonly called the Yuma Valley), the Salt River Valley, the Casa Grande Valley including the Florence district, the lower Santa Cruz Valley and the upper Gila Valley. Practically all parts of these districts are fertile and productive when well supplied with irrigating water. Other important irrigated areas, but of higher elevation, and consequently with different growing conditions, are the districts about Duncan, the irrigated parts of the Sulphur Spring Valley, the Little Chino Valley, also irrigated lands about St. Joseph, Snowflake, St. John, Eager, Springerville, and Lakeside.

Roughly speaking an elevation of 4,000 to 5,000 feet, depending upon latitude and rainfall, forms the dividing line between the corn and sorghum districts. At higher altitudes corn generally excels the sorghums, while at lower elevations the sorghums are better than corn.

SOIL ADAPTATION

Sorghums do reasonably well on all soils suited for general agriculture, but they thrive best in rich, warm, sandy loams well supplied with humus. They will not grow satisfactorily on waterlogged soils. They are moderately resistant to alkali, but cannot tolerate excessive quantities—especially of black alkali. Heavy types of soil that warm slowly in the spring and bake easily are less satisfactory than are the lighter types. However, these heavy soils are usually rich, and will produce large crops of sorghums when well handled. The root systems of sorghums are extensive, and they are vigorous feeders, growing better on poor soils than do most other crops. Their water requirements are relatively low.

SEEDBED PREPARATION

Thorough preparation of the seedbed pays as well with the sorghums as with any other crop; however, they will do better than most crops with poor soil preparation. A good seedbed requires that the soil be well supplied with moisture to a depth of several feet. There should be enough moisture in the soil to make irrigation unnecessary for several weeks after the young plants begin their growth. At the time of planting, the top 3 inches of soil should be neither wet nor dry, but moist; the
ground should be firm but not closely packed, and the surface should be in such condition that it will not bake. The method of preparing the seedbed will depend upon the type of soil and the previous crop grown on the land. Usually it will pay to plow the ground 6 or 8 inches deep, but if the previous crop has been a cultivated one, such as potatoes, or if the sorghum is to follow a small grain crop on loose, porous soil, plowing may be a useless expense. In the irrigated valleys of southern Arizona the lister is often used in preparing soils and in planting sorghums on land where small grain has been grown. It furnishes a rapid and economical method of planting, and the growing crop is easily cultivated and handled.

SEED AND SEED SELECTION

The seed for planting should be of a variety adapted to the locality and to the purpose for which the crop is to be used. The seed should be of known good germination, free from other sorghum, grain, or weed seeds, and also free from disease and insect pests. Seed resulting from the crossing of two varieties should not be planted. Such seed usually produces plants that lack uniformity, and that are late in maturing and often coarse and undesirable.

Seeds of new or untried varieties of sorghums are often introduced and sold at high prices. Such seed is usually disappointing to the purchaser. State and Government experiment stations are constantly testing new varieties of crops, and reliable information concerning these usually can be obtained by writing to the nearest experiment station.

The best results with sorghums are obtained when the seed has been produced under the same climatic conditions under which the crop is to be grown. The best time and place to make the selection for seed is in the field before the first frost. Regardless of whether the selection is to be made for the production of grain or the production of forage, seed heads should be chosen only from plants that have grown under average conditions. For this reason seed heads should not be selected from plants growing along the edge of the field, since such plants have better growing conditions than the average plant in the field. Plants growing in close proximity to those of poor type or low production should be avoided, as sorghums cross-fertilize readily.

In selecting seed for forage, leafy plants having an abundance of sweet juice should be given preference. Uniformity in maturity, type of plant, and habit of growth are desirable characteristics to be considered in selecting sorghum seed. Plants having a tendency to stool, or to develop many side branches, should be avoided.
In selecting seed for grain purposes, the points noted for forage should be given consideration, and in addition close attention should be given to the type of seed head and the manner in which it is borne. The head should be of a kind recognized as typical for the variety. The seed head should grow well out of the boot (sheath or last leaf), as any portion that remains covered by the boot may become mouldy or fail to fill with grain. Uniform, well-filled heads that do not shatter are very desirable. Lack of uniformity in height or ripening is more serious with a sorghum grain crop than with a crop grown primarily for forage.

TIME OF PLANTING

It is difficult to make a satisfactory rule concerning the right time to plant sorghums. In corn-growing districts it is customary to wait two or three weeks after the ground is warm enough to germinate corn before planting the sorghums. Ground that will give a full stand of cotton will usually give good germination of sorghum seed. There are a few varieties of sorghum that seem especially adapted to hot weather, and it seldom pays to plant them in any but warm ground; feterita and hegari are two such varieties. Unless there is some special reason for planting early, such as a desire to plant two crops in one season, it is best not to plant sorghum seed until the ground becomes quite warm. In ground well prepared and supplied with moisture the sorghums may be planted any time during the summer, provided sufficient time remains for them to ripen or make a profitable growth before cool weather in the fall. In the Yuma and Salt River valleys nearly all of the sweet sorghums, kafir, and milo can often be planted during the early part of April with entire satisfaction, but it is a more common practice to plant late in May, in June, or during the first half of July. Planted in July, sorghums may follow wheat or other small grains, thus permitting double cropping of the land. At elevations of 2,500 feet planting must be made later in the spring, though in the districts about Safford and Tucson the season is still long enough to raise two crops, some varieties of sorghum following small grains profitably. At elevations of 4,000 to 6,000 feet only one crop can be grown in a season and the seed should be planted during May or June.

RATE OF PLANTING

When grown in cultivated rows for grain production, milo or similar sorghums are usually planted at the rate of 3 to 4 pounds of seed per acre. If the seed is known to be of good quality and if the seedbed
THE SORGHUMS IN ARIZONA

in good condition, smaller amounts of seed may be used. One pound of ordinary sorghum seed, if every seed should grow, is sufficient to plant one acre with one seed every 6 or 7 inches in the row and with rows 42 inches apart. For several years it has been the regular practice to use 2 pounds of hegari seed per acre at the State Experiment Farm near Mesa, and full stands have always been obtained. However, hegari seed is comparatively small, and 3 pounds of milo seed are required to produce an equivalent stand. In southern Arizona, with good growing conditions and with rich soil, the largest yields of grain probably can be obtained by having the plants spaced approximately 3 to 4 inches apart in the rows. With poorer lands more space must be allowed. Because the average farmer does not provide as good conditions as described above, it is common practice to space grain sorghum stalks 6 to 8 inches apart in the rows. The sweet sorghums, when grown in rows for silage or fodder, are usually planted in such a manner as to space the plants about 4 to 6 inches apart; if grown for sirup, more space is allowed.

When the sweet sorghums are planted with a grain drill and grown for hay, 50 to 75 pounds of seed are commonly used per acre. If it is desired to keep the stems particularly fine, still larger quantities of seed may be used.

CULTIVATION

Because of the ease of cultivating and harvesting, sorghums are nearly always planted in rows. If the ground has been well prepared and is reasonably free from weeds, only a few (two to four) cultivations will be required in order to grow a good crop. Only the ordinary implements used in cultivating corn are necessary. The purposes of cultivation are to kill weeds, aerate the soil, keep the soil in condition to absorb rain or irrigation water readily, and to promote a vigorous growth of the plants. Early in the season one may cultivate reasonably close to the young plants. Later the cultivations must not be deep or too close to the plants, else many roots will be cut or broken and the growth of the plants injured.

IRRIGATION

If the seedbed has been well prepared and the young plants have made a good start without the soil baking, the irrigation of the crop is a comparatively simple matter. Flooding young sorghum plants, especially in tight soils, results in baking of the soil; but as the plants become larger and shade the ground, this is less likely to occur. Sufficient irrigation
should be applied to promote steady and vigorous growth. Stunting delays maturity, and reduces the yield. Excessive forage growth is not necessary for good grain production, but the plants should be well irrigated when the seed begins to ripen. Excessive irrigation may cause the soil to become waterlogged, develop alkali, or scald the plants.

HARVESTING

The time and method of harvesting sorghums depend upon the variety, the method of planting, and the purpose for which the crop is to be used. If the crop is to be used for grain, heading the standing stalks in the field is the common and most economical practice. This heading may be done by hand, with the aid of a large knife, or by means of machinery. Special machines for heading one row at a time are manufactured by several companies. If the crop is not too tall and if it is uniform in height, it can be headed by an ordinary grain header. When harvested for grain only, the heads should be allowed to mature on the stalk until the stem at the base of the heads snaps if bent sharply. If the stem is too green to snap when so bent, the grain is not sufficiently matured to be harvested and would probably heat and spoil if placed in unventilated bins.
If the crop is to be harvested for silage, for fodder, or for both grain and fodder, the cheapest means of harvesting is to use the row (or corn) binder. The crop may then be shocked to cure, and afterwards stacked, or it may be hauled directly from the binder to the silo, and made into silage.

If the grain is to be removed from fodder cut with a corn binder, it can be done economically by the use of a home-made heading device similar to that shown in figure 1. With this device attached to the side of a wagon box or to a sled drawn behind the silage wagon, the crop can be headed and the fodder hauled to the silo with very little extra handling. After the heads have lain on the ground for a few days, they will be dry enough to thresh from the field. This procedure is rapid and economical, and is fairly common in the older sorghum-growing localities. If harvested for silage only, it is recommended that sorghums be allowed to ripen until the seeds begin to harden or are almost mature. At this stage the largest yield of good feed can be secured. Harvesting at a more immature stage results in a sappy, sour silage; while harvesting at later stages results in the loss in the field of dry leaves. Sorghum fodder that
has been partially dried up may be used for silage even though it is in a relatively immature condition, but considerable water must be added to the silage.

If harvested for dry fodder, it is best to cut sorghums when the seed is in the milk or soft dough stage. In this condition the fodder is sufficiently mature to cure out and makes excellent feed; it contains a relatively high percentage of protein, and will not be as coarse and fibrous as if harvested later.

STORING

Sorghum seed heats readily when stored in large quantities, especially in humid climates, but under the dry atmospheric conditions in Arizona little trouble is experienced in keeping it. Care should be exercised, however, to see that the seed is well matured before it is harvested, and kept dry after it has been stored.

Unless used for pasture, the forage value of sorghums can be utilized most fully by means of the silo. When properly stored in a silo, feed can be kept for years with relatively small loss either in actual weight or in feeding value. If a silo is not available, and the fodder must be stored in some other manner, losses may be reduced by stacking. Sorghum fodder cut with a corn binder and tied in bundles may be stacked, after being cured, in much the same manner as bundles of wheat are stacked. Rectangular or rick stacks are more convenient to build than round ones.

FEEDING SORGHUM

Sorghums properly grown and handled make excellent fodder and silage crops. They are, however, rough feeds, and are deficient in protein. If the best results are to be secured in feeding, alfalfa hay and a concentrate, such as cottonseed meal, should be added to the ration.

Seed of the grain sorghums is usually considered to be worth nine-tenths as much for feeding purposes as the same weight of good corn. The seed of the sweet sorghums is much less valuable as feed than the seed of the grain sorghums.

The seed of broom-corn is usually considered very poor feed. If harvested when fully mature, it is fibrous and hard to digest. This is partly due to the fact that the glumes or hulls remain attached to the seeds.

The following table gives the result of many chemical analyses and shows the comparative composition of both the grain and the silage of sorghums as compared with corn:
TABLE I—COMPOSITION OF SORGHUMS COMPARED WITH CORN

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Ash</th>
<th>Crude protein</th>
<th>Fiber</th>
<th>Nitrogen free extract</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kafir grain</td>
<td>11.8</td>
<td>1.7</td>
<td>11.1</td>
<td>2.3</td>
<td>70.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Milo grain</td>
<td>10.7</td>
<td>2.8</td>
<td>10.7</td>
<td>2.4</td>
<td>70.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Sweet sorghum seed</td>
<td>12.7</td>
<td>1.9</td>
<td>9.2</td>
<td>2.0</td>
<td>70.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Broom-corn seed</td>
<td>11.8</td>
<td>2.9</td>
<td>10.2</td>
<td>8.2</td>
<td>63.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Corn No 1</td>
<td>12.1</td>
<td>1.5</td>
<td>9.9</td>
<td>2.0</td>
<td>96.7</td>
<td>4.9</td>
</tr>
<tr>
<td>Kafir silage</td>
<td>69.2</td>
<td>2.8</td>
<td>1.8</td>
<td>9.9</td>
<td>15.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Sweet sorghum silage</td>
<td>77.2</td>
<td>1.6</td>
<td>1.5</td>
<td>6.9</td>
<td>11.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Weil matured corn silage</td>
<td>73.7</td>
<td>1.7</td>
<td>2.1</td>
<td>6.3</td>
<td>15.4</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Analyses from Henry and Morrison.

PASTURING SORGHUM

Sorghums are valuable temporary pasture crops. The sweet sorghums are often used for hog pasture, and during recent years Sudan grass has been used to a considerable extent and under a wide range of conditions as pasture for all classes of animals. A few cattlemen in this State, particularly those who bring cattle from the ranges to feed in the irrigated valleys, are using sweet sorghum for pasture. For this purpose the sorghum is allowed to make its maximum growth, and when the seed is just beginning to mature the cattle are turned into the field.

Any of the sorghums may, under certain conditions, develop prussic acid, which is one of the most deadly poisons to stock. If discovered in time, affected animals may be saved by drenching with large quantities of glucose or any cheap sirup. This poison is seldom present in sorghums where the growth has been normal. Stunting sorghum from any cause apparently favors the development of prussic acid in the plants, and it is claimed that second growth sorghum is more likely to develop prussic acid than first growth sorghum.

SORGHUMS UNDER DRY-FARMING

A considerable part of the sorghum acreage of Arizona is grown tinder dry-farming conditions. The use of sorghums on dry-farms is increasing steadily, and probably will continue to increase for a number of years, because under such conditions they are very valuable and perhaps more dependable than any other forage. The same general principles discussed in growing sorghums under irrigated conditions will apply in growing sorghums with dry-farming methods. There are, however, a number of differences in detail, which will be considered here.
In general, the amount of water required to mature a sorghum plant is in direct proportion to the total area of its leaf surface. Likewise the larger the growth the more water required. Since water is the limiting factor with dry-farming, it is necessary to select varieties that have scanty foliage, that normally make less growth than average plants, and that will take advantage of all available moisture. In many cases so-called "drought resistance" is in reality "drought evasion." Quick-maturing varieties often can be planted at a time when they will escape the worst of the season's drought and take advantage of a short rainy season, thus becoming especially valuable to the dry-farmer. Sorghums, to a greater or less extent, have the ability to stand practically without growth for a period, and when favorable conditions come to spring into renewed life, complete their growth, and mature good crops.

In this State at the present time dwarf milo is the outstanding grain sorghum for dry-farming conditions. Dwarf kafir is of some importance. Hegiri would be important were it not for the fact that all our dry-farm areas are at relatively high altitudes and consequently have comparatively cool growing conditions. The kowliangs are worthy of further trial.

Of the few sweet sorghums Red Amber ranks first for dry-farming. In the better dry-farm regions, or under the best of soil conditions, Sumac and Orange sorghum will give larger yields and are consequently more valuable. Where the conditions become too severe for the Red Amber variety, Black Amber and Freed's sorghum may be used.

SEEDBED PREPARATION

The selection of the right variety of sorghum, the preparation of the seedbed, and the right kind of cultivation are of the greatest importance in dry-farming. As much care should be used in preparing the seedbed for sorghums as for corn. The seedbed should be free from weeds; it should be in a state of good tilth, and if possible contain sufficient moisture to sprout the seed properly and to carry the young plants until the summer rains come. However, there are many cattlemen in this State who regularly plant sorghum in dry ground late in the spring or early in the summer and depend upon the summer rains to sprout, grow, and mature the crop. This practice has been fairly successful.

RATE, TIME, AND METHOD OF PLANTING

Under dry-farming, the general rule is to plant about one-half as much seed per acre as is used under irrigation farming. Thick planting exhausts
the moisture early in the season, causing the crop to suffer as it approaches maturity. For grain production, even more than for forage, sorghums must be thinly planted.

Since it is possible to grow only one crop in a season, there is seldom any need for early planting in dry-farming areas. It is more economical to kill weeds in a field with cultivation before rather than after a crop has been planted. Consequently, the dry-fanner seldom plants his crops until late in the spring after he has killed one or two growths of young weeds by cultivation. Below elevations of 4,000 or 5,000 feet sorghums are usually planted late in April or in May; above these elevations plantings are more often made late in May or early in June.

The lister is a much used implement in the dry-farm regions, and planting by means of the combined tiller and drill is a common practice. Planting by this method places the seed deep in the ground, where it is not so easily affected by drought. Likewise listed crops are cultivated more easily and cheaply than those planted in a flat field. When the surface of level ground is too dry to sprout sorghum or seeds of other crops, good starts can often be secured by planting with furrow openers attached to the ordinary planter or by planting with a lister. Even when using a lister, a light soil mulch should be provided over the newly planted seed. Without such a mulch the seed may dry out instead of sprouting.

CULTIVATION

In the cultivation of sorghums in the dry-farm areas, every possible means should be used to conserve the rain that falls. Thorough cultivation is essential to keep weeds out of the fields. The ground should be kept in good tilth, so that rainfall is absorbed readily, and should not be allowed to form a crust or to bake. If the ground is rich, smaller amounts of water will be required to grow a good crop than if the ground is poor in fertility.

YIELDS UNDER DRY-FARMING

Crop yields under dry-farming are a great deal less than under irrigation farming. Experience in any locality will soon teach the farmer what yields to expect. Definite statements of yields are often misleading, but it may be said that silage yields up to 8 or 10 tons are not uncommon, and grain yields of three-quarters of a ton are frequently reported.

INCREASING YIELDS BY USE OF FERTILIZERS

Dry-farm soils are usually rich in the mineral elements necessary for plant growth, but they are often deficient in organic matter. Barnyard
manure when available furnishes a convenient means of adding organic matter to the soil. Experience shows that under dry-farming large quantities of manure should not be used at one time, but that light applications (three to five tons per acre) well worked into the soil, will give increased yields. On the Prescott Dry-Farm in 1922, Red Amber sorghum grown without the use of manure yielded 10,590 pounds of silage per acre. The use of 2½ tons of manure per acre, applied as indicated above, increased the yield to 11,508 pounds and the use of 5 tons of manure per acre
increased the yield to 14,400 pounds. When barnyard manure is not available, green manure can be used instead.

SEED SELECTIONS

Careful selection of home-grown seed is much more important to the dry-farmer than to the irrigation farmer. The selection, year after year, of hardy, early-maturing plants that are well adapted to the locality and conditions under which they are to be grown, will in time develop superior strains on which the dry-farmer can safely rely.

IMPORTANT VARIETIES

GRAIN SORGHUMS

Milo.—There are three important types of milo grown in Arizona, viz., Standard, dwarf, and white.

The first is grown principally under irrigation in the southern part of the State, and is used for silage. It is being replaced rapidly by hegari. White milo is grown to a limited extent under dry-farming, but so far as experiments in this State show, it appears to have no advantage over dwarf milo. Dwarf milo is the important variety in Arizona. It is grown in all parts of the State, both under irrigation and dry-farming. There are several good strains of this variety. Stannard’s milo, Avondale milo, and Double Dwarf milo.

Milo is primarily a grain crop. The stems, although juicy and slightly sweet when green, are dry and pithy when mature. As the grain approaches maturity, the leaves dry up and are easily whipped off by the wind. The heads are compact and of good size, and the grain does not shatter badly. If milo plants are allowed plenty of room and water, most of the heads will turn downward, forming “goosenecks.” If both space and water are limited, as many as 95 percent of the heads may be borne on erect stems. Grain yields should average 11/2 tons per acre if grown under cultivation. In the Salt River and Yuma valleys yields of 2 tons of threshed grain per acre are common. Under irrigation in this State, milo usually requires about 110 days for its maturity.

Hegari.—In southern Arizona hegari is a good grain and silage crop. Since it ripens in 110 days under good conditions, it can be planted after small grains are harvested, with every assurance of a full crop in the fall. It is a hardy, vigorous plant that stands up exceptionally well under irrigation, grows to a uniform height, is very leafy, retains its leaves until the grain is well matured, and from every standpoint is a desirable crop for
the farmer to grow. The grain yield averages a little less than that of milo, but because of its silage or fodder value and the fact that the heads are produced on straight necks, thus making harvesting economical, it has become the most popular sorghum crop in the irrigated parts of Arizona where temperatures permit its satisfactory growth. At elevations above 4,000 feet, the nights are often cold and it does not thrive so well. However, even at this altitude, it is a good silage crop. At 5,000 feet elevation or above, its usefulness is questionable.

Feterita.—Feterita in Arizona has been almost entirely replaced by hegari. It is less desirable than hegari in most respects, ripening more unevenly, shattering worse, and having a tendency to fall down and to throw out suckers from the base and side branches from the upper joints. It can be grown wherever hegari grows well. Its fodder value is superior to milo—its grain yield smaller.

Kafir.—In the Great Plains region there are many important varieties of kafir. None of the varieties are extensively grown, or are of much importance in the irrigated districts of Arizona. The sweet sorghums outyield the kafirs for silage, and because of quicker maturity milo and hegari are more popular for grain. In the dry-farming regions of the State dwarf kafir is of some importance. It is a good combined grain and forage crop and is quite drought resistant. It usually requires a little longer period for its maturity than does dwarf milo.

Kowliang.—At the present time the kowliangs are not grown commercially in Arizona. They are primarily grain sorghums, having dry, pithy stalks and few leaves. Many of them are quick to mature and they do not require as warm growing conditions as do most sorghums. Their use is still in the experimental stage in Arizona, but they have some promise at our higher elevations, where the more common sorghums cannot be grown profitably.

Darso.—Darso is a sorghum of uncertain origin that has undergone selection and improvement by the Oklahoma Agricultural Experiment Station. It is a dwarf, leafy, juicy, semi-sweet plant of comparatively early maturity. The seed head is large, borne on an erect stem, and has the general shape of a plump kafir head, but otherwise the appearance of a sweet sorghum head. Darso has been tried in many places and under a wide variety of conditions in Arizona, but it has not found general favor among farmers.

Shallu.—Shallu is a grain sorghum of little economic importance in this State. The seeds are flinty, and shatter badly. The stalks are dry and
pithy and often fall down or lodge. It is sometimes called desert wheat, rice corn, Egyptian wheat, and other names.

**SWEET SORGHUMS**

*Gooseneck.*—This is the largest, latest-maturing, and coarsest sorghum grown in Arizona. It derives its name from the fact that the seed heads often turn downward, forming "goosenecks." The seed head is small and compact, and shaped very much like a milo head. The seed covering or glume is very dark, almost black. The seed itself is yellowish brown in color. The stalks are juicy, sweet and leafy. Usually it reaches a height of 8 to 10 feet. Ordinary harvesting machinery does not handle it easily. Its acreage in Arizona is small, but it is grown partly for silage and partly for sirup. For the latter purpose it yields more heavily than any other of the varieties in southern Arizona. Notwithstanding its coarse stalk, it does not stand up as well as Honey sorghum.

![Fig. 4—A field of Black Hull kaffir on the Salt River Valley Experiment Farm.](image)

**Honey Sorghum (Honey Drip).**—This is a tall, leafy and somewhat coarse variety. The stalks are sweet and juicy, for which reason it is valuable for sirup. The seed head is loose, open, and borne on an erect stem. The seeds are almost entirely enclosed by the reddish brown glumes or hulls, and in threshing these glumes usually remain on the seeds. It is a long season variety, requiring more time for maturity than is available after the small grain harvest, except in the lowest valleys in the State. It often reaches a height of 8 or 9 feet, and because of its height and weight it lodges badly if struck by a heavy wind storm late in the season. The yields are large, often reaching 20 or more tons of silage per acre.
**Sumac (Red Top).**—This is perhaps the best sweet sorghum grown in Arizona for silage purposes. It is very sweet, juicy and leafy. It has small, erect heads and small, dark red seeds. With irrigation it usually grows 7 or 8 feet high and stands up well. It may be harvested economically with corn binders or other common machinery. In Arizona the strains now grown require about 120 days to mature under good conditions—longer with less favorable conditions. Its silage yields range from 12 to 20 tons per acre. The sirup produced from it is of good quality, when grown on good soil. Under equally favorable conditions it does not yield as much sirup as Honey sorghum.

**Orange.**—This variety is sweet and juicy and almost as leafy as the Sumac variety. The stems are coarser and grow to about the same height as the Sumac, and it requires about the same time for its maturity. The seed head is light brown, rather loose but not of the open panicle type like Red Amber. As far as Arizona is concerned, Orange sorghum is less desirable than Sumac.

**Club Top.**—This is a loosely used name and usually refers to some strain of Orange sorghum. Occasionally seed houses sell Sumac sorghum seed under the name of “Club Top.”

**Red Amber.**—This variety, being comparatively quick to mature, is valuable in parts of the State where the season is too short to grow Sumac or Honey sorghum satisfactorily. It is less leafy than Sumac, yet leafy enough to make good forage or silage. It is sweet and juicy. Yields of 8 to 14 tons per acre are often obtained when grown under irrigation. With dry-farming the yields average much less. It is the most valuable sweet sorghum now grown in the State under dry-farming conditions.

**Black Amber.**—There are a good many strains of Black Amber sorghum. Some are small-growing and early-maturing, while others are rather large, coarse, and late. Usually the leaves are comparatively narrow and not as numerous as on the Red Amber. The seed head is very loose and of the panicle type; the seed is brown and covered with a black glume. Black Amber is generally considered to be very drought resistant. Under the name “cane” it is widely grown in the dry-farming areas of the State. The quality of feed produced is not quite as good as that of Red Amber.

**Freed's Sorghum.**—Freed's sorghum is a very early maturing variety, and therefore is valuable where the growing season is short. It is juicy and sweet and usually has 7 or 8 leaves per stalk. The stems are small, and seldom reach more than 5 or 6 feet in height. This variety may prove valuable in the northern part of the State at moderately high alti-
Fig. 5—A typical head of Honey Drip sorghum, and a fairly typical head of Sumac sorghum.

tudes or with restricted rainfall. It has no place in the agriculture of a locality that can grow successfully the larger and later-maturing varieties.

Sudan Grass.—Sudan grass, Johnson grass, and Tunis grass all belong to the sorghum family, and for this reason are briefly mentioned here.
In this State Johnson grass is considered a weed and a State law forbids it to be planted. Tunis grass is similar to Sudan grass in many respects, but is less leafy and, as the seed shatters badly, it is less desirable. Sudan grass is a very important crop, it is used as a substitute for millet, which it has largely replaced, and is also valuable for pasture. It grows quickly and produces large amounts of good quality hay. Circular No. 35 of the Arizona Agricultural Experiment Station gives detailed instructions for growing and handling this crop.

Broom-corn.—Two types of broom-corn have been grown commercially in Arizona, viz., Standard and Dwarf.

Standard broom-corn grows to a height of 7 to 10 feet or more. It is difficult and expensive to harvest, but produces the largest yields of any of the broom-corn varieties.

Dwarf broom-corn has met with the most favor in Arizona, and is usually the more profitable variety to grow. The stalks reach a height of $4\frac{1}{2}$ to $5\frac{1}{2}$ feet under irrigation. It can be harvested more cheaply than Standard broom-corn. The fodder of Dwarf broom-corn, if harvested immediately after the brush is jerked, can be used for silage to good advantage. Acme broom-corn is a variety developed by the United States Department of Agriculture. It has a stalk like Dwarf broom-corn and a head or brush similar to the Standard variety.

Japanese Sugar Cane.—Japanese sugar cane is one of the true sugar canes but differs from most of them in appearance in that the stalks are very much finer and smaller, the leaves are more abundant, and somewhat narrower and drooping. The joints of the Japanese sugar cane are relatively close together and the stalk itself is tougher than that of the sugar-making varieties. Japanese sugar cane is not used in Arizona, or any other portion of the United States, for the production of either sugar or syrup, but it is used in some localities as stock feed. Cattle will thrive on Japanese sugar cane pasture for a while, but after a time their mouths become sore and they have difficulty in eating it. If Japanese sugar cane is to be used for stock feeding, it is recommended that it be used as silage. In southern Arizona Japanese sugar cane is a perennial, since the winter temperatures are not low enough to kill the underground portions of the plant. Methods of propagating it are the same as for other varieties of sugar cane. Although large yields can be secured from Japanese sugar cane, it is doubtful whether it is as desirable under any conditions in Arizona as the common varieties of sorghum, such as Sumac or Honey.
Napier Grass or Elephant Grass.—Napier grass is another large, coarse, grass plant that does not belong to the sorghum family, yet its habits of growth and its uses are similar to the sorghums. In southern Arizona winter temperature kills the standing stalks, but seldom kills the roots of the plant. Napier grass sometimes comes into head in southern Arizona, but as yet it has not produced seed on any of the State experiment farms. Napier grass is valuable for silage purposes, chemical analyses of the silage showing it to be quite similar to sweet sorghum silage. However, the stalk is rather rough, and when pastured or fed as fodder, there is a tendency for it to cause sore mouths of cattle in much the same manner as does Japanese sugar cane.

Fig. 6—Sudan grass on the Prescott Dry-Farm.

OTHER USES OF SORGHUMS

The grain sorghums are widely used for poultry feed. For this purpose they do not require grinding or cracking. They have nearly the same composition as corn, and most of the varieties are eaten readily by all classes of poultry. Kafr is used to a greater extent in commercial feeds than are the other varieties. As high as 90 percent of certain commercial poultry feeds have been found to be kafr grain.
COMMON DISEASES OF SORGHUMS

KERNEL SMUT

There are three important sorghum diseases present in Arizona. Of these the most common is kernel smut. This disease affects all varieties of sweet sorghums and kafir. It does not affect milo under ordinary conditions, and hegari and feterita are more or less resistant to it. Fortunately this disease is very easy to control. It is carried over from year to year on seed, and formaldehyde treatment of the seed readily kills it. This treatment is as follows: Soak the sorghum seed for 1 hour in a solution consisting of 1 pound of standard strength formaldehyde in 30 gallons of water. Then plant the seed immediately, or dry it thoroughly before storing. If partially dried sorghum seed is placed in bags it will heat and injure the germination. Sacks, planter boxes, or other containers used in handling the seed should be washed with the disinfecting solution, otherwise, reinfection may occur.

HEAD SMUT

In the head smut of sorghum, instead of each grain being affected separately and retaining its own individuality, the whole head is affected as one mass. This disease, while often doing considerable damage, is seldom noticed, as many affected heads never come out of the boot, and thus they are not seen by the casual observer. There is no known method of seed treatment that is satisfactory for the control of this disease. It is carried over from year to year by spores in the soil, as well as by other methods, and the planting of clean seed and the use of crop rotations are the best methods of control.

SORGHUM BLIGHT

Sorghum blight is a bacterial disease. The symptoms are irregular, elongated, red blotches which are yellow at first and later, black. The blotches occur on leaves, leaf sheaths, and even on the roots. Badly diseased roots cause yellowness of top. The disease is much worse in humid sections than in semi-arid or arid sections. Over-irrigation favors its development, but under ordinary conditions it has never been serious in this State. Some varieties of sorghums are more susceptible to it than others. Control measures consist of the burning of infected stalks and the practice of rotation of sorghum with immune crops.

*The subject matter of this topic has been approved by the Division of Plant Pathology of the Arizona Agricultural Experiment Station