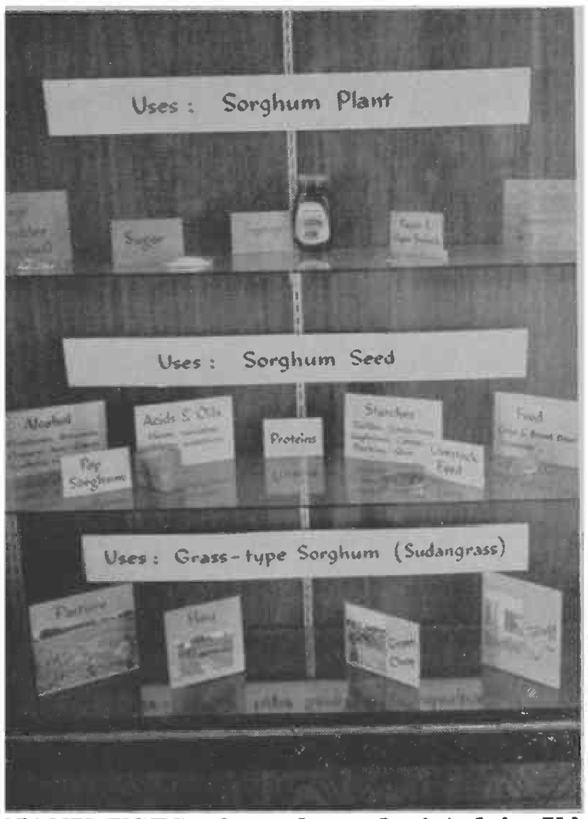


MANY USES of sorghum depicted in UA College of Agriculture lobby display.

SORGHUM

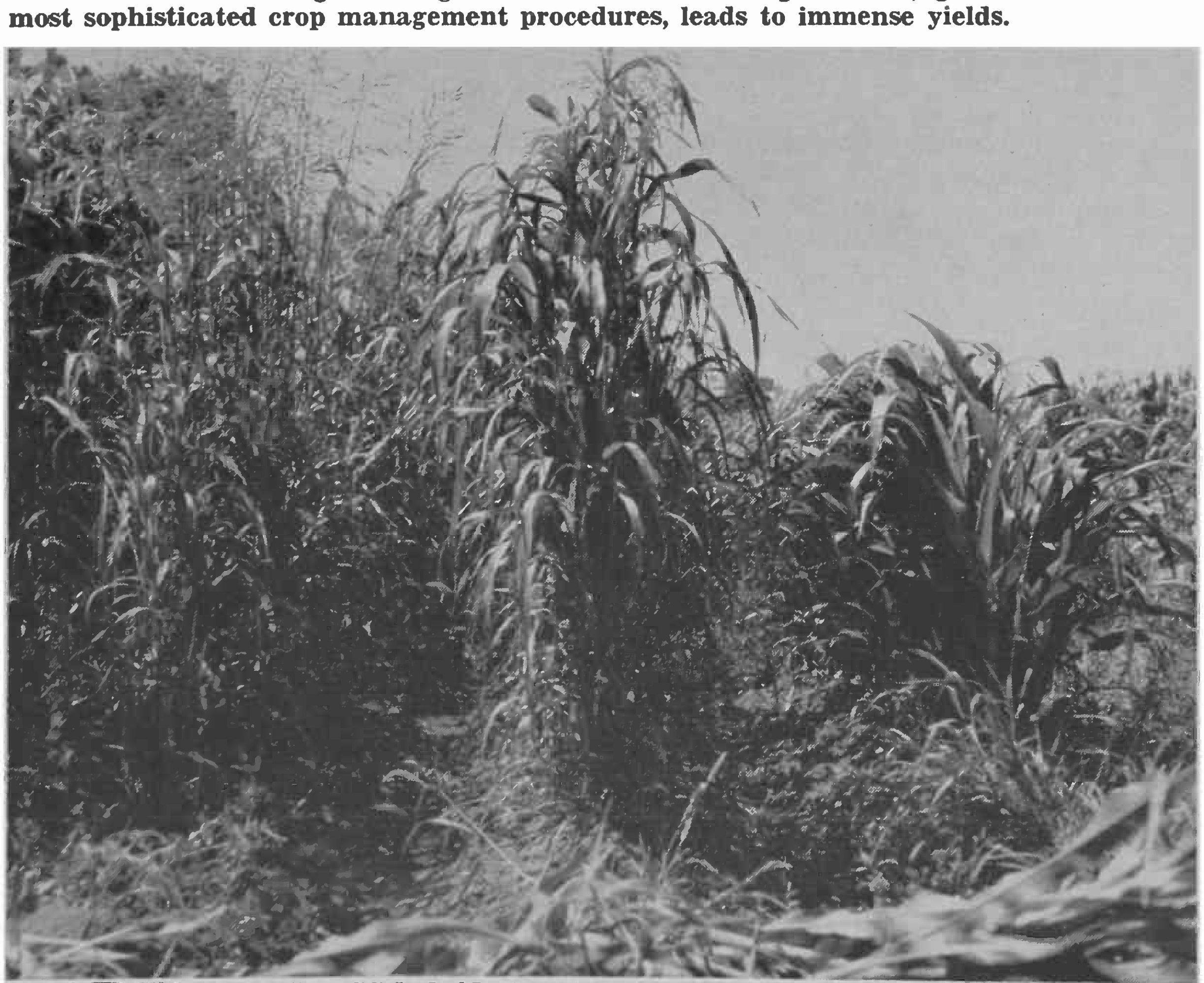
Food Plant of the Ages

By Robert L. Voigt

What is sorghum? For what is it used?

As our population becomes more urban in nature these questions become quite common. Also as our Agricultural industry becomes broader and more specialized, those in more "removed" areas of the industry desire more specific information to round out a sometimes vague understanding.


ARIZONA FIELD of grain sorghum. Combination of good seed, good land and the most sophisticated crop management procedures, leads to immense yields.


SORGHUM-SUDANGRASS hybrid offspring, in center rows, is heading out. Note large leaves of sorghum "mother" on the right and height and open heads of sudangrass "father" on the left. The hybrid yields prodigious quantities of forage for livestock.

Sorghum apparently is a native of tropical Africa. However, the exact story of its domestication is lost in the shadows of the past. A painting of a harvest field of sorghum exists on the walls of the tomb of Amenembes in Egypt, dating from over 2,200 years before Christ.

Sorghum culture has been known in India at least since the time of Christ, and known in China by the third Century A. D. These and many other isolated records indicate an early and extensive domestication of this plant.

Originating in the tropics of the Old World, sorghums are now grown in the temperate zones of both hemispheres. The bulk of the crop is grown between parallels of latitude 40° north and south. In some areas it is found as far north as latitude 45° or more.

Sorghum belongs to the family Gramineae, tribe Andropogoneae. *Sorghum vulgare* includes the annual sorghums with 10 pairs of chromosomes. As most families have a few relatives who would rather stand at the bank of a stream with a fishpole than do much useful work, so sorghum has a questionable country cousin, Johnsongrass, (with 20 pairs of chromosomes) which lines Arizona ditchbanks, steals water intended for more useful crops, and causes agricultural expense in chemicals and labor used to eradicate or repress it. The sorghums grown in the United States are classified according to use as grain

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sorghum, sorgo, broomcorn, sudangrass, or special purpose sorghum.

Sorghum, at earlier stages of growth, looks much like corn, another member of the grass family. However, the grain head of sorghum is terminal on the top of the stalk like a wheat or barley head but much larger — 4 to 12 inches long. The flowers (without petals), of which there are hundreds in a single head or panicle, are perfect. That is, each floret normally has its own male and female parts.

Its stems or stalks range in height from 1 or 2 feet up to 15 or more feet in height. A leaf arises from every node and there may be anywhere from around 15 up to nearly 30 nodes over the total lifetime of different varieties of sorghum. Not all leaves will be present at once, as the seedling leaves soon disappear. The number of nodes and length of internodes help determine height. There may be some extra stalks or tillers arising from the base of the plant at ground level, depending upon the plant population density.

There are many variable characteristics in sorghum such as height sweet or non-sweet pith, dry or juicy stalks, dense to loose panicle (seed head), awned or awnless lemmas, different colors of seed through white, red, brown, and yellow. These more obvious differences and many others make it possible to utilize sorghum for many different purposes.

Other genetic variations in sorghum, such as differing maturities or rates of floral initiation and differing responses to temperatures, make sorghum adaptable to many different environments. Such characteristics are valuable in making sorghum a world-wide crop. Sorghum has the ability to postpone "heading out" under periods of moisture shortage and then proceed with heading, blooming and seed production when moisture becomes more plentiful. Such a characteristic makes sorghum a "better bet" in areas of questionable moisture than corn, which does not possess this ability to "wait out" a dry spell. However, sorghum yields under such adverse conditions are not quite what would be obtained under optimum growth conditions.

How do we utilize sorghums? The whole plant may be used — seed or grain, stalk, leaves and all — for one purpose or another. Particular parts of the plant may be "harvested" at different stages of plant development depending upon the use of the plant part. Grain is harvested at maturity. The whole plant may be cut off, at an earlier stage of plant development, chopped up and made into silage. The whole plant can be cut when near maturity and dried in "whole plant" form for fodder. "Sugary" types can be processed for s u g a r, similar to sugar cane. An extremely long panicle type of sorghum is used to make all of our brooms. It is called "broomcorn" but is a sorghum.

The more grassy sorghums, such as sudangrass, are suitable as a temporary pasture crop for grazing. They can be cut green, chopped and fed to livestock immediately as "green chop" or cut, dried and stored as hay.

Sorghum vulgare and sudangrass readily hybridize, producing an intermediate type of plant suitable for about every purpose of either sorghum or sudangrass except high grain production.

If you should get out into a sorghum field that is headed out and find the sorghum heads from waist to shoulder high — you are in a "grain" sorghum field. If you find you can barely reach the heads or the only blue sky is a little patch straight up, then you are in a "forage" sorghum type field (assuming *you* are normal height).

The grain is ultilized primarily as a livestock feed but specialized varieties, among other things, yield high quality starch, a waxy endosperm for adhesive, sizing and glues, and corneous seeds which pop like popcorn.

There are many industrial uses for sorghum grain. In fact, it is commonly said (and proven) that about anything that can be made from corn can also be made from grain sorghum. A

(Continued on Page 23)

LA ESCOBA (the broom) is symbol of office of the housewife. Broomcorn, grown through the Southwest, is a sorghum cousin.

WHILE FORAGE sorghums grow tall, the grain sorghum varieties are short; note comparison here with field corn.

HARVESTING GRAIN sorghum on a UA experimental farm. New varieties, hybrids and crop practices are constantly being adapted to commercial use.

SORGHUM...

(Continued from Page 19)

long list of uses includes alcohol, synthetic rubber, dyes, plastics and many, many more.

As a human food, grain sorghum ranks as the third most important world crop after wheat and rice. Grain sorghum is one of the major food crops in Asia and Africa. Presently less than 5 percent of our sorghum production in the U.S. is directly utilized in some form or other for human consumption. The other 95 percent or more of sorghum production is utilized for livestock feed in one form or another. As a food, sorghum may be utilized more successfully as a meal for making pancakes, corn bread, mush, puddings, etc. It can also be mixed with wheat flour where desired in the same way as corn meal.

Grain sorghum flour does not possess leavening properties because of the absence of gluten in the protein. A compartive analysis of grain sorghum flour and wheat flour is given below:

	Grain Sorghum Flour	Wheat Flour
Protein	9.16%	10.50%
Carbohydrates	79.39%	76.10%
Ash	0.80%	0.40%
Fiber	0.65%	0.33%
Fat	3.10%	1.45%
	(- Mg. per lb. -)	
Thiamin	0.85	0.26
Riboflavin	0.40	0.225
Niacin	11.74	4.05
Iron	16.3	3.60

Sorghums have been transformed by plant breeders from the tall forage type of 30 years ago to a short plant (grain type) with early maturity. Thus it is well suited to modern machine harvest, and is adapted to a much greater area of the world to meet mankind's current food needs.

Evidence of this transformation is shown in acreage and production figures. On a worldwide basis, data from the Food and Agriculture Organization of the United Nations shows an annual world production of 31,400,000 metric tons of sorghum in 1963-64 for a 134 per cent increase in 13 years over the 13,440,000 metric tons annual average produced in 1948-53.

In the United States the "grain sorghum" production went from a 1949-58 10-year average of 261,008,000 bushels to 720,415,000 bushels in 1966. This is a 176% increase in production in about 12 years. In this same 12 year period Arizona increased annual production by 296%! — from 3,788,000 bushels to 15,015,000 bushels.

For a comparion, wheat in the United States went from an average annual production in 1949-58 of 1,092,071,000 bu. to 1,310,642,000 bushels in 1966. Thus wheat production in the United States increased only 20% in this same 12 year period.

Both increases in acreages and increased yields per acre contributed to the increased total production figures.

Perhaps the greatest single cause for this jump in production per unit of land area was the advent of successful commercial hybrid seed available to growers starting in the period of 1956-1958. In fact sorghums, like a lot of people I know, enjoy our Arizona climate so well that in 1967 the Arizona state average grain yield of 81 bushels per acre (4536 pounds per acre) again was highest in the nation. Individual fields reportedly have yielded from 10,000 to 12,000 pounds per acre (180 to 215 bushels per acre). As an example the March-April 1966 issue of this magazine shows a picture (p. 18) of Mr. Joe Sheely, of Tolleson, Arizona harvesting a 1965 grain sorghum production of 11,051½ pounds per acre (197.3 bushels per acre).

An example of the current value of sorghum to the Arizona economy may be illustrated by 1967 USDA figures showing a total value of $23,371,000 from 254,000 acres of sorghums. *All* other cereal grains grown in Arizona (barley, wheat, corn) added together gave a total value of $18,716,000 from 274,000 acres.

These 254,000 acres of sorghums grown in Arizona in 1967 compared to only 248,000 acres of all cottons. (Political pressures in the form of government programs are illustrated here).

Sorghum is a "fast moving" crop as it changes in character, changes in use, increases in production and becomes a more important part of mankind's food supply.

How about joining me now in a cup of coffee and some *Chocolate Midgets*:

½ cup margarine
¾ cup sugar
½ cup chocolate syrup
2 eggs, unbeaten
½ cup milo
¼ cup wheat flour
¼ teaspoon baking powder
½ cup chopped nuts
1 teaspoon vanilla

Melt margarine in saucepan; add sugar, chocolate syrup and mix thoroughly. Cool slightly and stir in eggs, one at a time. Sift together flours and baking powder. Add to chocolate mixture along with nuts and vanilla. Mix well. Pour batter into 8x8-inch pan, which has been lightly greased and floured. Bake for 35 minutes in 350-degree oven. Cut in squares to serve.

Grain sorghum flour is not available on retail grocery shelves, but can be purchased from Harvest Queen Mills in Plainview, Texas.

UA Student Delegates At Agronomy Sessions

James M. Shea, President and Roberta Stevenson, Corresponding Secretary of the University of Arizona Crops and Soils Club were official representatives of the Club at the American Society of Agronomy meetings held November 5-10 in Washington, D. C. The American Society of Agronomy is the professional organization for some 6,000 crops and soil specialists in agricultural industry, Government and in Universities. There is a very active undergraduate student section of the society representing local clubs at institutions throughout the country.

Miss Stevenson was not only an official delegate, but as winner of the local speech contest, competed in the national contest at Washington in a field of 18 local winners from as many states. Although she did not place, she gave an excellent speech.

Mr. Shea is a Senior in Agronomy specializing in turfgrass management. Miss Stevenson is a Junior in Agricultural Chemistry and Soils.

Three student essays were also submitted to the National American Society of Agronomy Essay Contest in May of 1967. James Conway, former undergraduate major in Ag. Chem. & Soils currently graduate student in soils at Colorado State, placed sixth in national competition. His essay, entitled "Extra-terrestrial Soil Science", discussed the problems associated with interplanetary space travel in relation to soil conditions which may exist on Mars.

Student travel to Washington, D. C. was made possible through grants from Associated Students, Chevron Chemical Co., Arizona Cotton Planting Seed Distributing, and Valley Feed and Seed Company.