

# **SUDANGRASS**

**IN**

**CALIFORNIA**

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# Sudangrass

is California's most productive summer-growing pasture crop. Its importance as a feed may be expected to increase with the state's expanding livestock industry.

California also produces a major portion of the sudangrass seed crop. About 35 per cent of all sudangrass seed grown in the country in 1949 was produced in California.

New varieties are being developed that show promise of increased yield.

## This Circular

lists and describes the new varieties of sudangrass, and gives cultural directions for successful production of the crop.

Sudangrass does best in fertile soils, where warm weather and a long growing season prevail. It is easily damaged or killed by light frosts, and even small amounts of alkali in the soil will tend to reduce yields.

The danger of stock poisoning by prussic acid in sudangrass is a relatively minor factor in California but certain precautions against trouble are listed.

Sudangrass has been used successfully to combat the effects of bloat, brought on by leguminous feeds.



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Photo on cover shows dairy cattle grazing on sudangrass pasture. For maximum results, stock should be removed, and the pasture allowed to grow, after it has been grazed to height shown. In photo at left, draft horses enjoy sudan pasture at Davis.



# SUDANGRASS

## in California

### **A word about the possibilities . . .**

About 150,000 acres of sudangrass are grown in California each year, under irrigation and on dry-land. It is the state's most productive pasture crop. Yields on good soil, under irrigation, at Davis, have ranged between 7 and 10 tons per acre on the hay-weight basis.

As a seed crop, California production has ranged between 2.4 and 10.8 million pounds annually during the past 20 years. Seed yields average about 800 pounds per acre, compared with about 370 pounds per acre for the entire United States. Under irrigation, seed yields of 2,500 pounds per acre are not unusual.

As with other crops, high yields require good management, but with good management, sudangrass seed can be a profitable cash crop in California.

### **Some background information.**

Sudangrass was introduced into the United States as a result of systematic search for a form of Johnsongrass without rootstocks. Johnsongrass is a perennial which develops vigorous rootstocks, from which an individual plant may rapidly spread and become troublesome. Under cultivation, sudangrass is an annual (dies at the end of the growing season) and only under frost-free conditions have individual plants lived over winter. Sudan does not develop rootstocks that live from one year to the next, and is never difficult to eradicate.

Thinly spaced plants may produce 20 to 100 shoots from the base, while close-drilled or broadcast seed shows much

less stooling (branching out from the base).

### **The new varieties are promising.**

Until recent years much of the sudan seed in commercial trade in the United States was sold simply as sudan seed, because improved varieties had not been developed. An exception to this was sudan 23, developed by the University of California Experiment Station a number of years ago. Recently, several new varieties have come into production and have been tested at the Experiment Station.

**Sudan 23** was developed by L. G. Goar, of the California Experiment Station, by selection from common sudan. First increase was made in 1936. Sudan 23 is the highest yielding variety among those tested at Davis, ranging from 10 to 20 per cent greater than common or sweet sudan. It is also a little later in heading and more uniform in growth characteristics than common sudan.

A particularly desirable characteristic for pasture use is its ability to recover quickly after grazing; production during late summer and fall has ranged from 35 to 100 per cent greater than sweet sudan.

Sudan 23 is certified by the California Crop Improvement Association. About 3.5 million pounds of seed of this variety were produced in the state during 1949.

**Sweet sudan** is easily identified by its broad, dark green leaves and thick, juicy stems which often show a whitish "bloom." The midrib of sweet sudan leaves is cloudy or milky colored, while those of other varieties are clear. The stalk is sweeter and juicier than common sudan, is less likely to shatter its seed,

and is more resistant to foliage diseases in humid areas where such diseases are a problem. The hulls which surround the seeds are dull brick red.

Sweet sudan was developed by Dr. R. E. Karper and Dr. J. R. Quinby of the Texas Agricultural Experiment Station, from a cross between Leoti, a sweet sorghum, and common sudan. The sweet, juicy stalk and non-shattering seed habit and some other desirable characteristics come from the Leoti parent.

Yields of sweet sudan at Davis have been about equal to common sudan, but below sudan 23. These differences are due largely to the slower recovery after cutting.

Seed yields of sweet sudan are greater than those of sudan 23, and in recent years sweet sudan has been the most widely-grown variety, for seed production, in the state.

**Tift sudan** is highly resistant to the leaf diseases found in the warm, humid regions of southeastern United States, and it is thought that demand for seed for export to these regions could increase.

Leaves of tift sudan are broad, like those of sweet sudan, and dark green in color. The seeds range in color from dark mahogany to yellow or straw color.

The variety was developed by Dr. Glenn W. Burton, at the Georgia Coastal Plain Experiment Station, Tifton, Georgia. Like sweet sudan, it is a cross between Leoti and common sudan, but the sweet, juicy stem characteristics were not retained, even though various other growth characteristics are common to the two varieties.

Because forage yields of tift sudan have been relatively low, and diseases rarely occur in the arid regions of California, tift is not recommended for pasture hay in the state. But since seed production in the area where tift is adapted is uncertain, if not impossible (due to high humidity and contamination with Johnsongrass) seed production for export, as stated, might be worthwhile.

A seed yield of 1,445 pounds per acre was obtained at Davis, under irrigation.

**Other varieties.** Common sudan includes imported seed and the increase of seed from previous importations. As might be expected, it is quite variable.

Common sudan heads earlier than the imported varieties.

Trials have indicated that imported sudan was similar in growth characteristics, yield, and disease resistance to the common, domestic-grown seed.

## Experimentation is being continued.

Sudangrass breeding is in progress at several of the state experiment stations, and one of the objectives of plant breeders is to develop varieties containing low concentrations of prussic acid (see page 6). Variations are known to occur, and strains may be available eventually that are less likely to cause poisoning of stock, than those in common use today.

The following table shows the yields of various sudangrasses in tons of hay per acre (figured at 12 per cent moisture) grown at Davis in 4 different years.

Variety	1944*	1945	1948	1949
Sudan 23 . . . .	.75	5.81	8.11	10.3
Common . . . .	.66	—	—	9.3
Sweet . . . . .	.65	4.68	7.31	7.6
Tift . . . . .	.63	—	—	7.9

\* Unreplicated yields from a single cutting made July 14.

## What are the requirements of sudangrass?

Sudangrass does best in fertile soils, where the weather is warm and the growing season relatively long. It is severely injured or killed by light frosts.

The irrigated valleys are well suited for sudangrass. The upper altitude limits for profitable production appear to be 4,000 to 5,000 feet in northern California,



Here are the results of a sudangrass variety trial, held at Davis. The plot on the left is an experimental selection; next is the early-maturing, and shorter, common sudan; then sweet sudan; and on the right, sudan 23. Improved varieties show more vigorous growth.

and 5,000 to 6,000 in the southern part of the state.

It is grown on a wide variety of soils, ranging from heavy clay to light sands, but yield is reduced on sandy soils. Good drainage is essential and even small amounts of alkali will reduce yields.

The ability of sudangrass to endure drought is equal to that of the best sorghum varieties, but growth is proportional to the amount of water available. The plant has an extensive root system and will continue growth as long as the roots are able to reach moist soil.

### **The soil should be well prepared.**

A well prepared seedbed is necessary for good germination. Best results will be obtained by plowing in the fall or early winter and allowing the land to remain rough until spring.

The most critical period is during germination and stand establishment, so conservation of moisture is essential—especially when the crop is grown under dry-land conditions.

**Before planting,** disk the soil to kill weeds; follow with a spike-tooth harrow and a flat drag or cultipacker to smooth the surface and conserve moisture. These operations should follow each other in the shortest possible time, to avoid drying out the surface.

**When to plant.** Sudan requires a warm soil for good germination. Seeding may be done from mid-April to July. Planting on dry-land should be made earlier than under irrigation, so the root system can become established while moisture is still available near the surface. Delaying seeding until June or July reduces yield because of the short growing season. Treatment with new, improved Ceresan, or Ceresan M, prevents seed rot on cold, heavy soil, and also controls covered kernel smut.

**How to plant.** The most satisfactory method of seeding is the grain drill, set to discharge seed from 2 to 3 inches below the surface. Shallow seeding is best on heavy soil; deeper seeding may be required on sandy soil. Broadcasting and harrowing to cover the seed is less satisfactory.

Going over the land with a cultipacker immediately after seeding helps to conserve surface moisture and is advisable on most soils.

**Seeding rates** can be varied greatly without appreciably influencing yields, but general farm practice has shown that seeding at a rate of 15 to 20 pounds per acre is satisfactory under irrigation. On dry-land, seeding rates are usually reduced to 12 or 15 pounds per acre, and in wide rows, 3 to 6 pounds are adequate.

Plants tend to grow more coarse if planted at lighter seeding rates.





This is a seed increase plot of tift sudan, grown under irrigation at the Agronomy Division at Davis.

### **Sometimes fertilizing will help.**

Fertilizing sudangrass with nitrogen is often profitable on newly leveled land under irrigation. Applications of about 150 pounds ammonium sulfate per acre or equivalent amounts of other nitrogen fertilizers may be made. If sudangrass is sown on land used for the same crop in the previous year, fertilization rates should be about doubled, or 300 pounds per acre of ammonium sulfate or its equivalent. Sudangrass following alfalfa, irrigated pastures, or on dry-land will probably not require fertilization. Some of the reddish colored soils in the Sacramento Valley may require phosphorus in addition to nitrogen.

### **Keep weeds down by using 2,4-D.**

Most of the troublesome annual weeds can be eliminated during seedbed preparation for sudangrass. Certain summer growing broadleaf weeds like star thistle and ragweed can be controlled with 2,4-D weed spray. Applications are made when the grass is about six inches high using  $\frac{3}{4}$  pound of acid equivalent per acre in 30 to 60 gallons of water. Live-

stock are not injured by 2,4-D and therefore sudangrass for pasture can be sprayed. Precautions must be taken to avoid injury to susceptible crops in adjacent fields.

Weeds are usually crowded out of sudan, and seldom become a problem unless the stand is poor. However, watergrass is a vigorous competitor on irrigated land. Because watergrass is quite palatable, it presents little problem when sudangrass is grazed. When sudangrass is to be used for seed watergrass can be troublesome.

### **The good and the bad of sudangrass for . . .**

**Pasture.** Sudan pasture is used for all classes of livestock. Rate of gain for beef cattle or sheep is equal to other kinds of green feed. Pasturing should be delayed until the stand is at least 18 to 24 inches high. The best yields are obtained if the field is subdivided into various pastures, and grazed in rotation.

Irrigation should be frequent enough to keep the plants in a healthy, vigorous growing condition.

**Poisoning** from excessive concentration of prussic (hydro cyanic) acid in sudangrass has caused considerable concern to livestock men in certain areas in

the northern part of the United States. The problem has been one of infrequent occurrence in California, and in southern states. A number of losses occurred in the Sacramento Valley on dry-land sudan in 1949.

High concentrations of prussic acid are more likely to occur in sudan that is growing slowly. For this reason, early spring or late fall growth is more likely to cause trouble.

Precautions for avoiding injury are:

1. Use only pure sudan seed. (The sorghums and Johnsongrass contain higher concentrations of prussic acid than sudangrass).
2. Allow 18 to 24 inches of growth before grazing.
3. Graze drought or frost-injured sudan cautiously.
4. Do not allow excessively hungry cattle to feed on sudan pasture.

**Bloat** from grazing succulent alfalfa, Ladino clover, or other legumes has been successfully overcome by night grazing of sudangrass. Farmers who have had bloat problems might consider the use

of sudan in addition to other irrigated pastures.

**Hay.** Sudan hay is equivalent in feeding value to other non-leguminous hay, such as cereal. The protein content is much less than that of alfalfa, but is high enough to keep stock in a healthy condition without the use of other feeds.

**Time to cut.** For best production, cut sudan hay shortly after it begins heading. Because the stems are large and juicy, the hay should be dried in the swath or windrow until it becomes dry enough to prevent heating—this may require several days.

Little leaf shattering occurs with sudan. Some farmers find chopping is desirable before feeding.

**Seed production** of sudangrass is becoming increasingly important in California because of high yields and the excellent quality of the seed produced in arid regions.

**Land selected** for sudan seed production should be free from Johnsongrass and morning glory because the seed from these two weeds are almost impossible to



Here is a picture of WHAT NOT TO DO. The sudangrass in this pasture has been grazed much too short, and recovery will be difficult. Close grazing such as this tends to reduce yields considerably.



separate from the sudan seed. Both of these plants are secondary noxious weeds in California.

**Planting.** Nearly all sudangrass seed is produced from close-drilled plantings, and mostly under irrigation. One pre-irrigation plus 1 or 2 later irrigations are usually sufficient to make a good seed crop.

Plantings made primarily for seed production should be made between June 1 to 15, if the crop is not to be grazed. About 110 days are required to produce a seed crop from plantings made at this date.

Planting earlier, and grazing or harvesting the hay before letting the stand go to seed is hazardous because grazing too long, or harvesting too late may delay ripening of the seed into the fall. This will result in danger from wind and rain, as a longer time is required to ripen the seed during the cooler fall weather. Also, the crop is subject to shatter losses from wind and rain over a longer period of time.

**Cut the seed crop** when the majority of the heads on the main portion of the stem are ripe. Delaying harvesting until after this time may result in excessive shattering.

The crop should be swathed and allowed to cure for about a week—a 6- to 8-inch stubble will hold the plants off the ground and permit air circulation and

rapid drying. Harvesting from the swath is done with the combine. Cylinder speed should be reduced enough to prevent removal of coverings from too much of the seed.

Direct combining of standing sudan is not recommended. This method requires the plants to be more mature before harvesting and results in excessive shattering. Also—green pieces of stems and hulls are not separated readily from the seed, and may cause heating and damage to germination.

**Hazards.** Aside from contamination by Johnsongrass and morning glory, the greatest hazard to seed quality is low germination. This may be caused by frost, immature seed, excess moisture and heating of seed, or too high temperatures when the seed is artificially dried.

All of these are avoided by managing the seed crop so it can be harvested in late August or early September.

**Expected yields.** Seed yields range from 600 to 3000 pounds per acre.

A good seed producer can expect to obtain about 1800 pounds of sweet sudan seed per acre; somewhat less for sudan 23, under favorable conditions.

The fact that the state average for seed yields is around 800 pounds per acre indicates that losses from shattering, or improper management run very high. By cutting losses, sudan seed can be a profitable cash crop for California farmers.