



Sorghum-Sudangrass Hybrids

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Sorghum-sudangrass hybrid forage grasses (*Sorghum bicolor* x *S. bicolor* var. *sudanense*), often recognized by trade names such as DeKalb's Sudax[®], are building a good track record as green manure crops for Hawaii. Farmers find them to be an important investment, with seed being relatively inexpensive and readily available. Sorghum-sudangrass hybrids yield payoffs in biomass production, weed suppression, nematode control, and reduction of subsoil hardpans without machinery and fuel costs. Farming systems that integrate animal and crop production can take advantage of the forage from these useful crops. Because the hybrids grow very quickly, many of their advantages can be obtained within 60 days after seeding. They are largely sterile and unlikely to become weeds in subsequent plantings.

Characteristics

Sorghum-sudangrass hybrid grasses are summer annuals. As crosses between forage-type sorghums and sudangrass, they have some variability in growth characteristics. In general, they can grow from 5–12 ft (1.5–3.7 m) tall and have long, slender leaves and stalks, which can grow woody as they mature. Their aggressive root systems can fracture compacted subsoils. Cultivars are available with resistance to diseases, insects, and nematodes. As a tropical grass with the same “C-4” photosynthetic pathway as corn and sugarcane, sorghum-sudangrass hybrids efficiently utilize sunlight and soil moisture to quickly accumulate large amounts of biomass. These are ideal crops for increasing soil organic matter content in areas that receive plentiful sunlight.

Environmental requirements

Sorghum-sudangrass hybrids are very heat- and drought-tolerant. They grow in soils having pH from 5.5 to 8.3.

Benefits provided by sorghum-sudangrass

EXCELLENT for quick growth and establishment, for increasing organic matter and improving soil structure, for loosening subsoil and hardpans, for taking up and storing excess N, for providing erosion control

EXCELLENT production, nutritional quality, and palatability of forage and silage

VERY GOOD for suppressing weeds and nematodes and providing lasting organic residues

TOLERATES heat and drought conditions

USE IN annual crop production systems at lower elevations, including vegetables, herbs, cut flowers and ornamentals, and dryland taro



Because these plants tolerate high pH, they are often used to reclaim alkaline soils. In Hawaii, sorghum-sudangrass hybrids grow year-round at elevations ranging from sea level to 1000 ft. At higher elevations (up to 2000 ft) plantings should be limited to the warmer spring and summer months, according to the USDA Natural Resources Conservation Service (NRCS), because their optimal growing temperature is above 90°F (30°C).

Cultivars

Sorghum-sudangrass hybrid cultivars commonly recommended by NRCS include ‘DeKalb SX-17+’ and ‘DeKalb ST-6E.’ Some newer cultivars also have excellent traits. For example, ‘Sweeter’N Honey’ performed very well when grown at CTAHR’s low elevation Waimanalo Research Station on Oahu. Best stands result from late spring to summer plantings.

Establishment

A seeding rate of 35 lb/acre is recommended if drilled and 40–50 lb/acre if broadcast. Broadcast and cover or drill to a depth of ½–1½ inches.

Uses

Soil improvement

Sorghum-sudangrass hybrids produce about 3 tons/acre dry matter and about 13 lb of N per ton of dry matter (NRCS). They can produce more organic matter per acre at a lower seed cost than any major cover crop grown in the USA. This attribute makes the sorghum-sudangrass hybrids very useful for renewing soil quality in over-farmed fields.

Several demonstration trials were planted at the Waimanalo Research Station to evaluate the biomass productivity of sorghum-sudangrass during different times of the year (see Table 1). Biomass production during the summer months was generally about double that of fall or winter plantings, 60,000 lb/acre compared to 30,000 lb/acre. The hybrid also grew very well when intercropped every other row with legumes such as mucuna, cowpea, and sunnhemp. When intercropped every other row, the grass’ fresh biomass production ranged from 15,000 to 18,000 lb/acre, or about half of what it produced under monocultures (Table 1). The tissue N content was is about 1½%. For optimal decomposition of residues from sorghum-sudan-grass hybrids, add N at plow-down at a rate of 25 lb/ton of dry matter. This helps to prevent decomposing residues from tying up soil N needed by the following crop in the rotation.

Fracture hardpans

Sorghum-sudangrass hybrids are especially valuable as a low-cost tool for breaking up compaction in subsoils, both for fracturing hardpans resulting from farm machinery traffic and loosening naturally heavy clay sub-

Table 1. Sorghum-sudangrass growth at Waimanalo, Oahu, from several plantings to demonstrate production as a green manure crop (average plot size: 100 x 40 ft; variety used in most trials: ‘Sweeter’N Honey’; yields are fresh weight).

Planting date	Mowing date (flail mower)	Weeks of growth (approximate)	Top growth (lb/acre)	Height (inches)	Yield per week lb/acre/week
Jan. 13	Feb. 26	5	7,600	40	1,520
Feb. 19	June 8	14	17,800	NA	2,542
(intercropped every other row with mucuna)					
Feb. 29	May 27	12	30,850	91	2,571
March 23	April 29	4	39,000	70	9,750
May 8	July 1	7	14,900	73	4,256
(intercrop every other row with cowpeas)					
May 19	Aug 15	12	16,300	91	2,717
(intercropped every other row with sunnhemp)					
May 25	Aug 2	9	55,400	120	6,155
Average winter/spring planting		5	33,212	80	4,215
June 23	Aug 15	6	59,300	105	9,883
July 16	Sept. 15	8	56,300	106	7,037
Average summer planting		7	57,800	105.5	8,460
Oct. 8	Nov. 30	6	29,700	64	4,950
Average fall planting		6	29,700	64	4,950

soils. To maximize the ability of the root system to penetrate the subsoil, mow whenever stalks reach 3–4 ft in height. This will force the plant's roots to reach more deeply into the subsoil.

Weed control

Sorghum-sudangrass hybrids are useful for reduced chemical weed control in several ways. When seeded at higher rates, they are excellent as a smother crop. In addition, the seedlings, shoots, leaves, and roots of sorghum-sudangrass hybrids contain allelopathic compounds that suppress the growth of many weeds. In multi-year cover crop demonstration trials at the Waimanalo Research Station, the mean percentage weed level (area covered by weeds) for the hybrid was 4%, compared to 74% for bare-ground plots (Table 2, column 1). In another planting (Table 2, column 2), the level of weeds at 6 weeks after planting was 2% for the hybrid and 90% for bare-ground plots. These data indicate the excellent levels of weed control that can be achieved with sorghum-sudangrass compared to other popular cover crops. These data also indicate the potential value of using the cover crop residues as an organic mulch in a weed control management program.

Nematode control

In general, sorghum-sudangrass hybrids and other sorghum-related crops and cultivars are able to suppress certain species of nematodes. This feature varies widely with the cultivar, location, and the particular nematode species.

Researchers have identified three ways that sorghum-sudangrass hybrids control nematodes. First, they are a non-host of certain nematode species. In addition, nematicidal chemicals are produced as the plants' tissues decompose. Finally, the organic matter decomposition increases soil populations of beneficial nematodes that feed on bacteria and fungi and compete for resources with pathogenic nematodes. An enriched soil ecosystem may also stimulate development of predaceous

Table 2. Weed control (percent of weed cover) with various cover crops grown at Waimanalo, Oahu.

	Multi-year mean weed coverage	Weed coverage 6 wk after planting	Weeds remaining 2 mo after mowing
Sorghum-sudangrass	4	2	2.5
Bare ground	74	90	
Rye-buckwheat	40	6	
Canola	14	15	31
Rhodesgrass	12		20
Oats	5		
Cowpeas		1	40
Rape		9	70

nematodes that can suppress pest nematode populations. Cover crop trials conducted by CTAHR's Alton Arakaki on Molokai showed that among 25 cover crop species tested, sorghum-sudangrass was among those most resistant to *Meloidogyne javanica* root-knot nematodes. Work in other locations has shown that it is also a non-host of *M. incognita*, *M. arenaria*, and *M. hapla*.

Management cautions

Sorghum-sudangrass hybrids tend to grow woody as they mature, and the fibrous residues may be difficult to manage. Mowing when the stalks are 3–4 feet tall keeps the plant succulent and less fibrous. Soil N tie-up from the crop's residues can occur. To minimize this effect, interplant or follow up with a legume cover crop or apply N and leave the field fallow while the residues decompose. Chopping or mowing the residues to decrease their particle size will shorten the decomposition period. For maximum biomass production, plant in late spring or early summer. Sorghum-sudangrass produces toxic levels of cyanide when young, so it should be grazed by livestock in its mature stage.

Pest problems

Chinch bug, sorghum midge, corn leaf aphid, corn earworm, greenbug, sorghum webworm, and armyworm may attack sorghum-sudangrass hybrids. Look for cultivars with resistance to particular pests or diseases. Sorghum-sudangrass can harbor high populations of root lesion nematode (*Pratylenchus penetrans*), and sting nematode (*Belonolaimus* spp.).

For assistance:

Contact your nearest Cooperative Extension Service office for additional assistance in selecting appropriate cover crops and green manures for your farm and cropping situation. Help can also be obtained from the USDA Natural Resources Conservation Service field offices located on each island.

Visit CTAHR's Sustainable Agriculture for Hawaii Program Website at <<http://www.ctahr.hawaii.edu/sustainag>> to find additional information about green manure and cover crops. The site also includes references and links to other useful on-line resources.



Sustainable Agriculture in Hawaii . . .

. . . integrates three main goals—environmental health, economic profitability, and social and economic equity. Sustainable farms differ from conventional ones in that they rely more on management practices such as crop diversification and crop rotation, agroforestry, integrated pest management, rotational grazing, and innovative marketing strategies. For further information on Sustainable Agriculture in Hawaii, contact:

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