

Title: Forage Sorghum-Sudan Grass

Division: Agriculture and Rural

History:

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Introduction

Sorghum-Sudan grass hybrids offer a solution to producing forage dry matter when an emergency occurs. They are warm season grasses, unlike most of our forage species which are cool season grasses. Hybrids of Sorghum and Sudan grass are often used in Ontario. The resulting hybrid may favour either parent, so be sure to discuss what you want from the hybrid with your seed sales person. Sorghums are known for being drought resistant. They are more efficient in water absorption because they have twice as many secondary roots per unit of primary root as corn and have only half as much leaf area as corn for evaporation. Their water requirements are the same as corn but they have the ability to go dormant during extended drought periods. Growth will begin when the rains come.

Sorghum-Sudan grasses yield slightly lower than corn when harvested for silage, but they have the advantage that they can be cut 2-3 times during the season and can also be stored as either chopped silage or wrapped bale silage, green chopped or pastured. Corn silage produces more tonnes per hectare but it must be harvested in the fall with specialized forage harvesting equipment. Sorghum-sudan grasses can also be harvested using a strip grazing system. They are thus more versatile to harvest than corn. The availability of harvesting equipment and the immediate need for forage will help you to decide between Sorghum-Sudan grass and other annual forages.

There are three very distinct types of forage on the market. These are:

1. Forage sorghum

These varieties and hybrids have sweet juicy stems. They produce less than Sudan grass hybrids and have very slow regrowth. They have been selected for one-time harvesting. A grain Sorghum hybrid should be harvested in the soft dough stage for maximum forage production.

2. Sudan grass

This is a fine stemmed and leafy plant with very quick regrowth. It is best used for pasture or in multiple cut systems. If used in a one cut system, yields will be less than that of Sorghum. Forage quality will be high due to low fiber content if cut frequently.

3. Sorghum-Sudan grass hybrids

These are the most popular for use in Ontario. They have larger stems and are less leafy than the Sudan grass but perform best in our climate.

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Caution

Members of the Sorghum family contain dhurrin, a glucoside that breaks down to release hydrocyanic acid also known as prussic acid. A sudden disruption of growth such as frost, drought or cutting, causes prussic acid to be released inside the plant at a more rapid rate. High prussic acid levels may be lethal to cattle. Prussic acid will breakdown in one to two weeks, so material made into hay or silage is safe to use. See Nutritional Concerns and Animal Health Hazards, below.

Seeding

These warm season grasses must be planted into warm soil, which generally means delaying planting until the end of May or first of June. A seeding rate of 15 kg/ha(13.5 lb/ac) should be planted at a depth of 2-3.5 cm (1-1.5 in) in 18-36 cm (7-14 inch) rows. Packing may be required if the seedbed is dry.

Fertility

Recommendations for fertilizing corn should be used for the sorghum family, including the 100-125 kg/ha (90-110 lb/ac) nitrogen applied at planting. After each cut, 50 kg/ha (45 lb/ac) more nitrogen should be applied to encourage growth. Sorghum-sudan grasses can grow in a wide pH range with 5.5-7.5 as the optimum.

Weed Control

Under good growing conditions the competition from the plants will keep weeds in check. No herbicides are currently registered for use on these hybrids.

Harvesting

The first cut will be ready for harvest about 60 days from planting. The plants should be over 65 cm (26 inches) in height, and just before head emergence when cut (usually early August). For a faster recovery of aftermath growth, leave at least 10 to 18 cm (4-7 inches) of stubble when harvesting. Optimum growth of these plants occurs under hot, moist conditions. A second cut should be ready 30-35 days later.

The crop may also be harvested just once, at the hard dough stage, to get maximum volume in a one cut system. You will sacrifice yield that you could have captured under a 2 cut system. If this is your goal you should reconsider corn silage as it would yield more in a one cut system.

At cutting, the crop is about 70-75% moisture and requires wilting before ensiling. It dries slower than alfalfa. Yield data is limited, but 5- 7.5 tonnes per hectare (2-3 tons /ac) are reported from research and farm experience. Yields vary with season, moisture and warmth, and are higher in hot summers than in cool ones.

Pasture

Sorghum-Sudan grass may be pastured but livestock should not enter before the plants are 45 cm high. Trampling damage will be very high unless a strip or rotational grazing system is used. As the plants will reach this height by mid summer and are drought resistant, this can provide a source of feed during the summer slump of pastures.

Feed Quality and Nutritional Value

Sorghum-Sudan grass hybrids fit best in summer feeding programs. They are thick stemmed and hard to dry for hay but they can supply ample yields of silage, green chop and pasture when perennial grasses are slowing down or going dormant. Once Sorghum-Sudan grass begins to head out, the quality and feeding value drop drastically. It is difficult to meet nutrient requirements of high production or early lactation milking cows when Sorghum-Sudan grass is a large part of the forage intake. It is more suited to rations for dry cows, replacement heifers over 12 months of age, and beef cows and calves.

As the crop matures, protein content drops rapidly, while fibre levels increase. This decreases the feed energy value and rumen digestibility. High NDF¹ levels increase the bulkiness of the feed and dramatically reduce dry matter intake potential. A comparison of nutrient value of Sorghum-Sudan grass with the more common forages is shown in the following Table. Sorghum-sudangrass can contain as much protein as mature alfalfa, but only if harvested at the vegetative stage. Energy levels in vegetative material are similar to corn and higher than alfalfa. Sorghum-Sudan grass forage should always be sampled and tested for feed composition because of the variability in nutrient value.

Table 1. Forage quality of silages from Sorghum-Sudan grass versus Alfalfa and Corn

Forage	% CP ¹	% ADF ¹	% NDF ¹	NE _l ¹ Mcal/kg	NE _m ¹ Mcal/kg	NE _g ¹ Mcal/kg	% TDN ¹
Alfalfa							
Bud	20	29	40	1.42	1.41	0.83	63

Full bloom	15	37	50	1.23	1.14	0.58	55
Sorghum-Sudangrass							
Vegetative	17	29	55	1.6	1.63	1.03	70
Headed	8	42	68	1.3	1.18	0.62	56
Corn silage							
Few ears	8.5	30	53	1.4	1.38	0.8	62
Well eared	8	28	51	1.6	1.63	1.03	70

¹CP is crude protein, ADF is acid detergent fibre, NDF is neutral detergent fibre, NE_l is net energy of lactation, NE_m is net energy of maintenance, NE_g is net energy of gain, TDN is total digestible nutrients. Analysis is on a dry matter basis.

Source: Nutrient Requirements of Dairy Cattle, 1989.

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Nutritional Concerns and Animal Health Hazards

Prussic acid poisoning is a concern in feeding Sorghum, Sudan grass, or Sorghum-Sudan grass hybrids. These species contain varying amounts of cyanogenic glucosides. In the rumen, these compounds are converted into prussic acid, which is readily absorbed into the blood. High blood levels of prussic acid interfere with respiration and cattle can soon die from respiratory paralysis. Horses should not be allowed to graze these plants as they may develop cystitis syndrome. This condition looks like colic with accompanying bloody urine and can be fatal to horses. Affected animals may show a staggering gait and urine dribbling. Pregnant mares may abort. There is no treatment for this poisoning and poor prognosis of recovery.

Some species and varieties contain low levels of cyanogenic glucosides (e.g. Piper sudan grass). The management practices below can reduce risk of prussic acid poisoning:

- Graze or green chop only when forage is greater than 45 cm tall (18 inches) for Sudan grass or greater than 55 to 65 cm (22-26 inches) for Sorghum, Sorghum-Sudan grass hybrids.
- Don't graze plants
 - during or immediately after a drought, or under conditions where growth has been reduced
 - on nights when a frost is likely. High levels of the toxic compounds are produced within hours after a frost occurs
 - after a killing frost until the plant is dry and brown as cyanogenic glucosides usually dissipate within 7 days.
 - after a non-killing frost until regrowth is at least 45 cm (18 inches) tall
- Don't green chop or ensile the forage for 3 to 5 days after a killing frost.
- Allow forage to ensile for at least 3 weeks before feeding.

Nitrate poisoning and formation of toxic silo gas can be a problem with Sorghum-Sudan grass. High nitrate levels are only a problem under abnormal growing conditions such as:

- High nitrogen fertilization caused by heavy fertilizer or manure applications or following legume plow down.
- Prolonged drought followed by rain.
- Any condition which kills the leaves while the roots and stems remain active will initiate accumulation of nitrates (frost, hail, grazing and trampling, or sometimes drought and overcast weather).

Under these conditions, plants accumulate high levels of nitrates. When animals eat these plants, the nitrates are converted rapidly to nitrites which are absorbed into the blood. Nitrite in the blood alters the way the blood carries oxygen. This causes rapid breathing, fast and weak heartbeat, muscle tremors, staggering and death if corrective steps

are not taken. The same precautions for prussic acid poisoning will help prevent nitrate poisoning.

High nitrate levels will persist in forages cut for hay, but will be reduced by 50% when ensiled for 30 to 60 days. When high nitrate forage is ensiled, deadly nitrogen dioxide gas (silo gas) can be produced within hours, and be a concern for at least 3 weeks. This gas can reach lethal levels in the silo soon after filling. It is heavier than air, so it settles in low points in the silage pack and in feed rooms at the base of the silo. The gas may be visible as a reddish to yellowish-brown haze around the silo base, and has a bleach-like odour. If you must enter the silo to level or cover the silage, do it immediately after filling and leave the blower running while anyone is in the silo.

If you suspect high nitrates in the forage, have it tested by a forage testing laboratory (sample after ensiling) and do not enter the silo for at least 3 weeks after ensiling.

In spite of these potential problems with Sorghum-Sudan grass, it is a good emergency forage during summer conditions. Its quality is variable, making its feeding value more suited to low producers, dry cows and heifer replacements. It provides an alternative feed source during the summer months when existing pastures may be producing less, or may be a valuable feed supplement until other forages are ready. As with all annual forages, the costs of establishment of tillage, seed and fertilizer must be returned in production during that first year rather than over the life span of a perennial forage. This usually makes annual forages a more costly feed source than perennial forages. They are, thus, used during times of feed shortages, winterkill of forages and for specific needs.

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