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Annual Summer Forage Production in Michigan

Michigan State University Extension Service

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Annual summer forages can be useful in many special cropping situations and serve as a valuable livestock feed. These forages can be harvested as hay, silage, greenchop, or grazed.

Annual summer forages that can be grown in Michigan include sudangrasses, sorghum-sudangrass hybrids, forage sorghums, and male sterile sorghums or corn. These grasses have many desirable characteristics: late planting date, rapid growth potential, drought resistance, good response to fertilizer, high feed value and harvest flexibility. The stubble can serve as a nurse companion for new seedlings and help control erosion.

Each of these grasses has different growth characteristics (*Table 1*) that must be properly managed to maintain maximum production. Select the type or variety of annual grass used based on adaptation to local conditions, yield potential, suitability for your cropping schedule and feeding value for your livestock program. The major disadvantage of annual grasses is the expense involved in planting annually. Sudangrasses and sorghum-sudangrass hybrids are better adapted to use as pasture forages, whereas forage sorghums and male sterile corn optimize production as silages. Maximum yields from sorghum-sudangrass hybrids occur when they're harvested as greenchop. The adaptability and harvest flexibility make annual forages some of the most versatile crops available in Michigan.

Varieties

Many commercial varieties of the annual grasses are available in Michigan. *Table 2* is a partial list of the varieties and suppliers of several types of annual forages. County Extension agents and local seed dealers can indicate which varieties are most productive under local conditions. The decision on variety selection will be determined by climate, harvest equipment available, storage facilities, available labor, intended purpose or use, and seed availability.

Sudangrasses

These grasses are fine-stemmed, leafy plants that provide a highly nutritious and palatable feedstuff. Total dry matter yield per acre is usually less than that of sorghum-sudangrass hybrids. These grasses are ideally suited for pasture or hay production. Sudangrasses provide quality forage during July, August and September, when cool-season grass pastures are less productive. Prussic acid content tends to be lower with sudangrasses than forage sorghums.

Hybrid sudangrass combines the desirable characteristics of sudangrass with greater yield potential, especially as greenchop or hay. Hybrid sudangrass tends to have a higher leaf-to-stem ratio than sudangrass.

Table 1. Comparison of growth characteristics and animal performance for the annual grasses.

Variety	Days from planting to harvest	Desirable stage of maturity at harvest	Plant height (inches)	Harvests per year	Forage quality ^a	Forage yield (tons DM/acre)	Beef production (lbs/acre)	Potential for prussic acid poisoning
<i>Sudangrass</i>								
Hay	25-50	Vegetative-boot	30-40	2-4	G-VG	3-5	650-1100	High ^b
Greenchop	25-50	Vegetative-boot	18-40	2-4	VG	4-6	950-1400	High ^b
Pasture	25-30	Vegetative	18-24	2-4	VG	3-5	775-1300	High ^b
<i>Hybrid sudangrass</i>								
Hay	25-50	Vegetative-boot	30-40	2-4	G-VG	4-6	860-1300	High ^b
Greenchop	25-50	Vegetative-boot	18-40	2-4	VG	4-7	950-1650	High ^b
Pasture	25-30	Vegetative	18-24	2-4	VG	4-6	1000-1550	High ^b
<i>Sorghum-sudangrass</i>								
Greenchop	40-60	Vegetative-boot	35-45	2-4	VG	5-7	1020-1400	High
Silage	100-110	Soft dough	70-90	1	G	8-10	1350-1700	Low
<i>Forage sorghum</i>								
Greenchop	55-65	Vegetative-boot	40-60	2	VG	4-6	860-1300	High
Silage	130-140	Soft dough	70-90	1	G	6-9	1300-1950	Low
<i>Pearl millet (not well adapted to Michigan conditions)</i>								
Hay	40-60	Vegetative-boot	18-35	1-3	VG-E	2-4	725-1100	Low
Greenchop	25-60	Vegetative-boot	25-40	2-4	VG-E	3-5	750-1150	Low
Pasture	25--35	Vegetative	15-20	1-3	E	2-4	600-1000	Low
Silage	100-110	Soft dough	55-70	1	G	6-8	1150-1500	Low
<i>Male sterile grain sorghum</i>								
Silage	100-140	†	70-90	1	G	4-6	775-1150	Low
<i>Male sterile corn</i>								
Silage	90-120	†	70-90	1	VG-E	5-8	1100-1800	Low

^a Forage quality (expressed as % digestible organic matter): Excellent = 66+; Very Good = 60-65; Good = 55-60.

^b Certain varieties may contain very low amounts.

† Harvest before the plant discolors (or turns brown).

Table 2. Suppliers and varieties of sorghums, sudangrasses and male sterile corn in Michigan.

<i>Company</i>	<i>Sudangrass</i>	<i>Hybrid sudangrass</i>	<i>Sorghum-sudangrass hybrid</i>	<i>Forage sorghum</i>	<i>Male sterile corn</i>	<i>Male sterile sorghum</i>
Agway, Inc.	Piper	Monarch	BR44	Y120A Y200A		
Asgrow Seed			Grazer N-2 Sweet-N-Green	Titan R Beefbuilder T	Surgraze	
Cargill Seed Division			SS100 SS110 SS120 Blend	200F FS455 FS466	HS50A	250S
Central Indiana Supply Co.	Piper		Supergraze II	99C		
Dairyland Seed Co., Inc.			Sweet Dan	DFS-900		
DeKalb-Pfizer Genetics				ST6E SX17	FS5	
Funk Seeds International			83F Faster Pasture-4 (FP-4)	102F G-1990 G-1991		
Garst Seed			757	333		
Great Lakes Hybrids			Cattle Grazer			
Northrup King Co.		Trudan 8	Sordan 79	NK300 NK326 NK367		
PAG Seeds		Monarch	Su-Chow 33 PAG33 Honey-Chow	FS466 (Late for Michigan)		Mor-Cane
Paymaster Seeds			Sweet Sioux IV S99 Sioux-Dan HS33 3 Little Indians R	250S FS401R FS466 FB44		
Pioneer Hi-Bred International			877F 855F	947		931
Pride Seed/Whitney Dickinson			Su-ghum 60 Hay-R-graze			
Research Seeds Land O'Lakes	Piper	Monarch	Greentreat II	Sweettreat SorGo 10		
Stauffer Seeds			HiDan 36	333F HiKane		
Voris Seeds			Drip-O-Honey	Ho-K		Sterile Honey

Table 2. (Continued) *Suppliers of sorghums, sudangrasses and male sterile corn in Michigan.*

Agway, Inc.

Frank Lipenski
11729 M-37
Buckley, MI 59620
(616) 269-4040

Asgrow Seed

Richard Warchuck
7658 Priemer Rd.
Harbor Beach, MI 48441
(517) 479-9335

George Wilcox
16397 Cement City Rd.
Cement City, MI 49233
(517) 592-6804

Cargill Seed Division

Box 5645
Minneapolis, MN 55440
(612) 475-6742

Central Indiana Supply Co.

Washburn Acres
Union City, MI
(517) 741-3775

Litchfield Grain
Litchfield, MI
(517) 542-3763
or 542-2328

Lone Spruce Farm
Box 264-Fawn River Rd.
Sturgis, MI 49091
(616) 651-2266

Dairyland Seed Co., Inc.

Scott Mast
954-64th St.
Box 191
Zeeland, MI 49464
(616) 688-5825

Phil Kaatz
P.O. Box 5
Lapeer, MI 48446
(313) 793-6190

Jerry Simpson
4321 Chapel Dam
P.O. Box 63
Gladwin, MI 48624
(517) 426-5298

Lehr Welch
3570 Martel Road
Monroe, MI 48161
(313) 269-6052

DeKalb-Pfizer Genetics

Contact local DeKalb-Pfizer Genetics dealer

Funk Seeds International

Steve Boldt
4780 Stauffer S.E.
Kentwood, MI 49508
(616) 281-2827

Bob Dongvillo
2419 Ridgewood Drive
Stevensville, MI 49127
(616) 428-2796

Bob Hubbard
3104 Thornridge Drive
Grand Blanc, MI 48439
(313) 695-1808

Garst Seed

Rick Sutherland
4637 E. Lansing Rd.
Apt. 3, Box 285
Bancroft, MI 48414
(517) 634-9970

Great Lakes Hybrids

Michigan State Seed Co.
717 North Clinton
Grand Ledge, MI 48837
(517) 627-2164

Northrup King Co.

Leslie Co-op
304 E. Bellevue
Leslie, MI 49251
(517) 589-8248

The Granary
361 West Chicago
Jonesville, MI 49250
(517) 849-2111

Emmet Elevator Co.
10730 Mary Street
Emmet, MI 48022
(313) 384-6519

Fricke Grain Service
4666 W. Garfield Rd.
Middleton, MI 48856
(517) 236-7380

PAG Seeds

Berny Balkonis
3939 South Arrowhead
Allegan, MI 49010
(616) 673-5744

Paymaster Seeds

Ted Winzenreid
1500 W. North St.
Apartment A38
Jackson, 49202
(517) 784-1679

Pioneer Hi-Bred International

100 West Jefferson
Tipton, IN 46072
(317) 675-2101

Pride Seed/Whitney Dickinson

Mark Klett
2010 Chase Care Rd.
Howell, MI 48832
(517) 546-5874

Brian Martindale
8106 Lennon Road
Corunna, MI 48817
(517) 288-2131

Research Seeds Land O'Lakes

Settler's Co-op, Inc.
Bruce Crossing, MI 49912
(906) 827-3430

Scott Farm Seed
Box 26
Mechanicsburg, OH 43044
(513) 834-2232

Stauffer Seeds

Clare Boughton
115 Webb Drive
Dewitt, MI 48820
(517) 669-5005

Voris Seeds

Wayne Honke
13349 S. Reed Rd.
Byron, MI 48418
(313) 266-4300

Sorghum-sudangrass

Sorghum-sudangrass is a high-yielding cross (hybrid) between forage sorghum and sudangrass. This grass grows extremely tall with larger stems than sudangrass. More than 50 percent of the weight of the plant is in the stem, which results in a lower nutritive value. This grass is poorly suited for hay production because the extended drying periods required may permit extensive regrowth before baling. Cattle grazing sorghum-sudangrass tend to gain less weight than cattle grazing its leafier counterparts.

Sorghum-sudangrasses have rapid growth potential, which results in a lower leaf-to-stem ratio. Though the nutritive value is lower, total beef produced per acre may be greater because of the higher dry matter yields with this hybrid.

Sorghum-sudangrass hybrids must be wilted before ensiling because of the high moisture content. Significant regrowth can occur before a proper ensiling moisture is achieved, and this makes chopping the windrows difficult. An alternative to wilting is to add dry grain or feed by-products to direct-cut sorghum-sudangrass to reduce the moisture levels and allow proper fermentation and preservation. Sorghum-sudangrass is well suited to a greenchop program, which maximizes yield of high quality forage.

Forage sorghums

Forage sorghums are utilized as a one-cut silage crop. When forage sorghums are harvested as silage, total animal products produced per acre will generally be greater with forage sorghum than with sudangrasses or sorghum-sudangrass hybrids. Forage sorghums do not tolerate frequent cuttings and produce less gain per acre than grain sorghum varieties or corn. In some years, forage sorghums produce almost no grain, particularly in northern Michigan. If you want grain, plant an early-maturing variety.

Male sterile corn or sorghum

Male sterile corn or sorghum makes good quality silage with 70 to 90 percent of the feed value of corn silage. Male sterile corn plants deposit energy as sugars in the stem instead of starch in the kernel. This may permit a later harvest date because the elevated sugar levels in the stems may make the plants more tolerant of lower temperatures. Very few ears will be produced by male sterile corn plants. Generally the silage will be higher in moisture content (70 to 75 percent), though dry matter yields usually exceed those of well-eared corn varieties.

Hybrid pearl millet

Though it's not well adapted to northern U.S. conditions, hybrid pearl millet has been grown in Michigan for livestock feed. In areas better suited to growth of pearl millet, this species will have the highest leaf-to-stem ratio and greater nutritive value than the other annual grasses. Total dry matter yield per acre may be less than that of other annual grasses, but the greater nutritive value and palatability may allow pearl millet to be competitive with sudangrass as a pasture forage.

Cultural practices for annual grasses

Planting date

Annual grasses should be planted in late spring after soil temperatures have warmed to 65 degrees F. Early planting (in April) can delay emergence and seeds can be attacked by soil microorganisms. Annual forage sorghums or sudangrasses should be planted May 1-25 in southern Michigan and June 1-15 in northern Michigan. Later planting shortens the growing season and may result in low yields due to summer droughts and fall frosts.

Planting rates

Recommended planting rates depend on row spacing (Table 2). Broadcast and narrow-row spacings are preferred for sudangrass and sorghum-sudangrass hybrids because they result in shorter plants with finer stems. Total forage yield will be similar for dif-

Table 3. Recommended planting rates

for forage sorghums, sudangrass and sorghum-sudangrass hybrids with various seeding methods.

Seeding method	Planting rate (lbs/A)
Broadcast (sudangrass, sorghum-sudangrass)	20-30
7- to 20-inch rows	10-20
20- to 40-inch rows (forage sorghums)	6-10

ferent row spacings because sorghums and sudangrasses tiller. Removing the primary growing point at the first cutting enhances tillering. First-cut yields are usually higher for broadcast or narrow-row seedings than for 20- to 40-inch rows.

Planting depth

The recommended planting depth is 1 to 2 inches, depending on soil moisture conditions. Seeds planted too deep may not emerge, and reduced stands can result.

Fertilization

These annual grasses have fertilizer requirements similar to those of corn silage. They grow rapidly, so

Table 4. Equations

for determining phosphorus and potassium requirements for summer annual forages.

Phosphorus	$p = 24 + 5.26 \times YG - 2.25 \times ST$
Potassium	<i>Sandy loams and loamy sands</i> $K = 171 + 6.58 \times YG - 1.00 \times ST$
	<i>Loams, clay loams and clays</i> $K = 182 + 8.23 \times YG - 1.25 \times ST$
<i>K = pounds of K₂O / acre</i>	<i>p = pounds of P₂O₅ / acre</i>
<i>YG = yield goal, tons / acre</i>	<i>ST = soil test, pounds / acre</i>

apply sufficient nitrogen (N) at planting to ensure establishment and high first-cutting yields. Apply 40 to 80 pounds of N per acre at planting and an addition-

al 50 pounds per acre after first cutting. Apply phosphorus and potassium according to a soil test, using the equations in Table 4. No starter fertilizer (other than initial N) needs to be applied because planting dates are late enough that cool, wet soils are usually not a problem. Forage sorghums can withstand acid soils better than corn, but lime should be added if the pH is below 5.5. The ideal pH for these crops is 5.5 to 7.5.

Weed control

Weed control should not be a big problem. Forage sorghums, sudangrass and sorghum-sudangrass hybrids are vigorous plants and should be very competitive with weeds. When seed is broadcast or planted in narrow rows (7 to 14 inches), herbicides will usually not be necessary. When seed is planted in rows, especially rows 30 inches wide or more, some weed control measures may be needed. One option is cultivation, which will control the weeds between rows. Chemical weed control options are also available. Atrazine can be used as a preemergence application in forage sorghums or sorghum-sudangrass hybrids (refer to an atrazine label for details on method and rate of application). Other options include Lasso or Dual for grass control. Use of these herbicides, however, requires treating seed with a protectant. In some cases, weeds that are harvested along with the forage may be as palatable and nutritious as the forage crop itself.

Forage sorghums, sudangrass and sorghum-sudangrass hybrids are good choices for fields where high levels of atrazine were applied the previous year. Of the three, forage sorghum is the most tolerant and sudangrass is the least tolerant. Sorghum-sudangrass hybrids are intermediate.

Harvesting annual forages

Pasture

With proper management, annual grasses can provide nutritious summer pasture. The heat and drought tolerance of annual grasses provides forage when permanent perennial grasses, such as Kentucky bluegrass, are dormant and the feed supply is

short. The annual grasses with higher leaf-to-stem ratios are more palatable and nutritious for grazing cattle than species with more stems. The sudangrasses and hybrid sudangrasses make excellent pasture.

With sudangrass and sorghum-sudangrass hybrids, rotational grazing using a three- or four-pasture system is recommended to minimize the danger of prussic acid poisoning from young regrowth. Staggered planting dates may be necessary to keep forage in the proper stage of maturity. Grasses in the vegetative stage of growth are the most palatable and nutritious. Beyond the boot stage, the leaf-to-stem ratio decreases, reducing palatability and digestibility. At this stage, excessive trampling and waste can occur.

Summer annual forages are not recommended for horses.

Sudangrass, sorghum-sudangrass and forage sorghum can also provide late fall feed for grazing beef cows. The forage should be planted so that it doesn't reach maturity before the first killing frost. This will enhance the protein content and total digestibility of the forage. Cattle should be allowed to graze only small portions of the forage acreage at a time to prevent trampling and waste.

Greenchop

In an emergency, any of the annual grasses can be harvested as fresh greenchop. The mechanized harvest of annual forages as greenchop adds considerable expense and makes this method of harvest cost effective for intensive, high producing livestock operations only. The rapid growth pattern of the grasses makes it difficult to maintain a consistent quality forage throughout the growing season. Harvesting for greenchop will maximize total yields because it reduces field losses and maintains the grasses in a highly nutritious, vegetative stage of growth.

Sorghum-sudangrass hybrids are well adapted for greenchop forage. These hybrids have rapid regrowth and give high yields of nutritive forage if harvested in the vegetative or boot stages. Forage sorghums do not withstand multiple cuttings and

therefore are not well suited to a continuous greenchop operation. Sudangrass can be harvested as greenchop, but dry matter yields will be lower than those of sorghum-sudangrass.

Hay

Sudangrass and sorghum-sudangrass can produce good quality hay when harvested at the correct maturity. The forage should be cut before heavy stems develop and prior to heading. Six to eight inches of stubble is necessary for rapid regrowth. Crimping or crushing stems to remove moisture will promote sufficient and timely drying. Even the crushed material will require several days to dry. After 7 to 10 days of wilting, the rapid regrowth may interfere with harvest. Forage sorghums can have large, thick stems that make them less ideal for hay production.

Silage

Maximum dry matter yield and animal production per acre from annual forages are realized in a silage harvest system. Male sterile corn, forage sorghums and sorghum-sudangrass hybrids are well suited as silage crops. Harvesting forage sorghums in the soft dough stage will maximize beef produced per acre. Sorghum-sudangrasses can be harvested as silage in the vegetative stage, but the dry matter content will be less than 24 percent and fermentation losses will be high. In addition, high-moisture silages tend to be less palatable than silages with less than 68 percent moisture. It is recommended that a dry feedstuff, such as grain or beet pulp, be added to this material to reduce the moisture level below 68 percent. Another alternative to reduce the moisture level is allowing the crop to wilt before ensiling.

Male sterile corn can be harvested as silage much later in autumn than regular corn. Silage dry matter yields for male sterile corn silage tend to be greater than those of normal corn silage, but the nutritive value is less (85 to 90 percent). Total beef production per acre will be 90 to 100 percent of the level achieved with silage made from grain corn.

Prussic acid poisoning

Cellular damage to sorghums and sudangrasses from frost, wilting, bruising, drought, excessive soil nitrogen, or deficiencies in soil phosphorus or potassium can result in prussic acid poisoning in cattle. Prussic acid (hydrocyanic) poisoning consists of the following sequence of events: plant cells rupture and cyanic acid (HCN) forms from cyanogenic glucosides; cattle consume forage with elevated HCN levels; HCN is absorbed from the rumen; HCN binds to hemoglobin; asphyxiation and death occur. Poisoning is most likely after a frost when animals consume the leafy regrowth. Regardless of season, plants less than 18 to 24 inches tall should not be grazed. Suspect forage should be harvested as dry hay or silage. Both harvest methods tend to reduce hydrocyanic acid levels.

Because of the rapid sequence of events, death is usually the first sign of prussic acid poisoning. The early signs of poisoning include labored breathing, excitability and staggering, followed by paralysis, convulsions, coma and death. The rumen contents of animals that succumb to prussic acid poisoning have a benzaldehyde or acetone smell. A sodium nitrite-sodium thiosulfate solution can be used as a treatment if administered in the early stages. Contact your veterinarian for the proper dosages of this solution.

Nitrate poisoning

High dietary nitrate levels can overload the animal's ability to detoxify this chemical and can result in death due to asphyxiation. In the rumen, nitrate is reduced to ammonia, which is absorbed into the bloodstream or converted into microbial protein. High dietary nitrate levels that overload this microbial reduction system cause an accumulation of nitrite in the rumen. This nitrite is then absorbed into the bloodstream where it binds to hemoglobin in place of oxygen. This deprives the tissues of oxygen and causes abortions and asphyxiation.

Sorghums and sudangrasses can accumulate high levels of nitrate during environmental conditions that decrease plant growth rate, including water stress, lack of sunshine and high nitrogen fertilization. Plants usually absorb nitrogen as nitrates and synthesize protein. However, during stress, the synthesis rates decrease and nitrates accumulate.

Forages suspected of high nitrate levels should be ensiled or fed only in limited quantities. Cattle fed grain diets can tolerate higher nitrate levels than cattle fed high forage diets. Forages containing greater than 1 to 2 percent nitrate should be fed with grain or another forage. Do not feed forages with nitrate levels greater than 2 percent. Nitrate analysis can be obtained from commercial laboratories.

The Cooperative Extension Service has many other publications available on forage production and other related subjects. **Call or write your county Cooperative Extension Service office** for a catalog of available publications, or write to:

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P.O. Box 6640
Michigan State University
E. Lansing, MI 48826-6640

Following is a partial list of publications available:

- E-427, Re-establishment of Pasture and Hay Fields in One Year (free)
- E-441, Easy Moisture Test for Forages and Grains (free)
- E-752, Pastures for Northern Michigan (40 cents)
- E-802, Effect of Nitrogen Fertilizer on Corn Yields (free)
- E-1013, Harvest Management: Prevent Forage Harvesting Losses (free)
- E-1027, Preservatives for Silages and Hay (free)
- E-1029, Harvesting, Storing Crops for Silage (free)
- E-1139, Corn Silage (50 cents)

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