

Varietal Tests of Sudangrass and Pearl Millet in Virginia, 1954-59



Two varieties of sudangrass (left) and one variety of Millet at the proper stage for grazing — about three feet tall.

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VARIETAL TESTS OF SUDANGRASS AND PEARL MILLET IN VIRGINIA,
1954-1959^{1/}

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The summary results of the sudangrass and pearl millet performance tests conducted since 1954 and the complete results of the tests in 1959 at 4 locations representing 3 principal agricultural regions of Virginia are discussed in this report.

Varietal recommendations, based on information obtained from tests conducted for several years, are made on the basis of many factors including yield, disease resistance, recovery, quality, and in some instances the availability of good seed.

Experimental Methods

Sudangrass and pearl millet each were seeded at the rate of 20 pounds per acre in 3-row plots, 20 feet long, spaced 1 foot apart. Four replications were used for each test and all plots were randomized completely within each replication. Seed used in the experiments was of known origin and was furnished by the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture. Lime and fertilizer applications were based on the needs of the crop on each particular soil. In most instances, fertilization consisted of 600 pounds

1/ Experiments were conducted at the following locations:
Piedmont Research Station, Orange, by G. D. Jones;
Virginia State College Research Station, Petersburg, by
M. T. Carter; Eastern Virginia Research Station, Warsaw,
by H. M. Camper, Jr.; and Virginia Agricultural Experiment
Station, Blacksburg.

2/ Professor, assistant professor of Agronomy and associate professor of Plant Pathology and Physiology, respectively.

per acre of 10-10-10 fertilizer, with additional nitrogen applied later if needed. All experiments were seeded about 2 weeks after the average date for planting corn in the particular area. Green weights were obtained from the center row of each plot and subsamples of approximately 2 pounds were taken to determine dry matter in the green weight. Samples were oven-dried at some locations and yields adjusted to 12% moisture. Air-dry weights were used at other locations. The number of cuttings varied with the current growing season. Usually 3 cuttings were made, the first 2 when the plants were at least 18 inches in height.

Sudangrass

Sudangrass, a valuable annual pasture plant, grows rapidly during the summer when other sources of pasture are short, furnishes hay practically equal in feeding value to other non-legume roughages, and makes acceptable silage when properly handled.

Sudangrass sometimes contains a glucoside called dhurrin which breaks down into prussic or hydrocyanic acid and is poisonous to livestock. The content of acid varies considerably depending upon variety and other factors. With a few exceptions, the common or dry stem varieties of sudangrass are very low in prussic acid potential, varieties of sweet sudangrass are intermediate in prussic acid potential, and the perennial grass sorghums are relatively high in prussic acid potential. Sudangrass contains more prussic acid if the soil is high in nitrogen and deficient in phosphorus and potash. Young plants are higher in prussic acid than those approaching maturity, and young second growth that follows clipping, drought, frost, or grazing contains more prussic acid than does the first growth. The grass should reach a height of 18

inches before it is safe to graze. Frosted or frozen sudangrass should not be grazed until it is completely dry with no evidence of new growth. If sudangrass is safe to feed before a frost or freeze, it may be cut within a day or two (before new growth starts) following frost damage and used for ensilage or hay. If it is not cut immediately after a freeze, the foliage should be allowed to dry completely before use. Under Virginia conditions there is very little danger of poisoning if the above practices are followed.

Sudangrass when used for hay or silage should be cut between the time of initiation of heading and when the crop is fully headed. For pasture, grazing management is based largely on the potential for cyanid poisoning, i.e. plants are not grazed until they have reached a height of 18 inches or more. In general, the yield is correlated inversely with the number of cuttings, the more cuttings the lower the yield.

Where weeds are not a serious problem, sudangrass may be broadcast or drilled at the rate of 25 to 30 pounds per acre. Where weeds are prevalent, planting in narrow rows, at the rate of 10 to 20 pounds per acre, allows for cultivation and weed control. Occasionally sudangrass when used for silage is planted in wide rows and cultivated similar to corn.

The ability of sudangrass to hybridize freely with other sorghum species has enabled plant breeders to develop many superior varieties characterized by increased disease resistance, higher yields, increased leafiness, sweet stems, and early or late maturity.

Diseases

Sudangrass is affected by several leaf diseases in Virginia. One of the most destructive diseases is leaf blight, caused by Helminthosporium turcicum, a fungus which is also destructive on corn, sorghum, and

johnsongrass. As the name implies, symptoms are characterized by a conspicuous blighted or scalded appearance of the foliage. In warm, moist weather, usually after midsummer, entire fields of sudangrass may become blighted and appear burned or frosted within a few days. The fungus which causes the disease may be observed in the blighted areas as a black fuzzy growth.

Other important leaf diseases of sudangrass are bacterial spot, caused by Pseudomonas syringae, and bacterial stripe, caused by Pseudomonas andropogoni. Initial infection of the bacterial spot disease appears as circular to elliptical water-soaked areas on the lower leaves. These spots later become dry and have a tan paperlike center with a red border. This disease appears soon after seedlings emerge in the spring and progresses with plant development throughout the entire growing season, gradually spreading from the lower to the upper leaves. Bacterial stripe is characterized by elongated red streaks and blotches on the leaves, with red crusts of dried bacterial exudate on the lower surface. Severely infected leaves dry and wither. Stripe first appears about midsummer and continues until plant maturity. Both bacterial diseases are favored by warm, moist weather.

BRIEF DESCRIPTIONS OF IMPORTANT SUDANGRASS VARIETIES, AND THE
NEW HYBRIDS INCLUDED IN THE 1959 TESTS

Sudangrass Varieties

Piper is the result of a double-cross made in 1942 from Tift sudan and lines obtained from the Texas and Kansas Agricultural Experiment Stations. It is characterized by good vigor, early maturity, moderate disease resistance, and has a low level of prussic acid potential. It is well adapted to the northeastern United States, and has produced relatively high yields in all area tests in Virginia. Certified seed supplies are adequate. Recommended for Virginia.

Greenleaf is a late maturing, vigorous leafy variety developed by the Kansas Experiment Station in 1952. It contains a relatively high proportion of sweet plants and has moderate resistance to leaf blight and to some bacterial foliage diseases. It has a low to average prussic acid potential. Certified seed is available. Recommended for Virginia.

Sweet sudan (Texas SA 372) is a synthetic variety developed in 1932 by the Texas Agricultural Experiment Station in cooperation with the United States Department of Agriculture. It is characterized by broad leaves, heavy and tall stalks, is sweet and juicy, and is more palatable to livestock than Common sudangrass. It grows slower in early spring than Common sudan but remains green later in the summer and fall. Much of the seed on the Virginia market is not certified and is sold as Sweet common rather than Sweet 372. This variety will be dropped from the Virginia recommended list after 1960 because of its low yield and damage from disease.

Tift was developed at the Georgia Coastal Plain Experiment Station in 1936. It matures slightly later than other sudangrass varieties and tends to develop slower than Common sudan. It has a higher prussic acid potential than other dry stem varieties, is highly resistant to disease, and is best adapted to the humid southeastern United States and parts of Texas. In the Virginia tests it produced high yields at all locations. It matures slightly later than Piper. Certified seed is available.

Lahoma is a late maturing, drought resistant sweet type of sudangrass selected at the Oklahoma Agricultural Experiment Station in 1949. It is uniform in growth habits, has broad leaves, tillers well, and contains relatively more prussic acid potential than common types but no more than other sweet types. In the tests it produced high yields at Warsaw and Petersburg but relatively low yields at Blacksburg and Orange, and was highly susceptible to disease at all locations. Certified seed is available.

Georgia 337 is a sweet strain developed at the Georgia Coastal Plain Experiment Station. It is late maturing, has excellent disease resistance, and broad leaves. It also has a low prussic acid potential. In the Virginia tests, yields have been quite low at Orange and below Greenleaf and Piper at all locations. Seed of this strain has not been released.

Stoneville Selection was made at Stoneville, Mississippi, from a cross between a sudangrass and sorgho. It has a high percentage of sweet plants. Limited tests indicate that this strain has high disease resistance in Virginia. Seed of this variety has not been released.

DeKalb Sudax SX-11 is a cross between male sterile Kafir and Sweet and Greenleaf sudangrass. The seed is a sorghum type, but the plants tend more towards the sudan type. In the 1959 tests in Virginia it produced high yields at all locations. It is late in maturity, more stemmy with larger leaves than the regular sudangrasses, and has high disease resistance. A limited amount of commercial seed is available.

Texas A 3056-17 x R3061; Texas A 3056-15 x R3061; Texas A3054-20 x R3061. Three Texas experimentals included in the 1959 tests produced high yields at all locations. These strains were not intended for release purposes but were included primarily to see how male sterile sudangrass hybrids might perform on a regional basis. The female parents are grain-grass types and the male parent is a low prussic-acid strain of Sweet sudangrass.

Sudangrass-Johnsongrass Hybrids

Seed of these varieties are listed as prohibitive noxious weeds by the Virginia Department of Agriculture and cannot be sold legally in Virginia.

Sorghass (formerly called Perennial Sweet sudangrass) is a synthetic hybrid developed first at Cornell by crossing Common sudangrass with johnsongrass and later at the Texas Agricultural Experiment Station by allowing the progeny to cross-pollinate with Sweet sudangrass. Reports from several experiment stations indicate that the crop should be treated as an annual rather than as a perennial since yields are quite low the second year. It probably will not over-winter in most sections of Virginia. Sorghass was included in the Virginia tests in 1958 and 1959 and the yields were lower than those of Piper sudangrass.

Sorghum Alnum is a short-lived perennial similar in appearance to johnsongrass, and was introduced into the United States from Argentina, South Africa, Australia, Nigeria, and Algeria. The grass originated in Argentina and is believed to be a hybrid between johnsongrass and a sorghum. Plants are tall, robust, rather resembling johnsongrass in many ways. Stems are coarser, leaves often wider, and the plant often taller than johnsongrass. Plants in the same field may vary considerably in stalk size and height, leafiness, and degree of tillering. With the exception of an occasional plant, which is sweet and juicy, the plants are pithy and non-sweet. Sorghum alnum does not cross readily with sudangrass and other cultivated sorghums, but apparently crosses freely with johnsongrass. The seed will average larger than that of johnsongrass, although the sizes overlap and the seed covering of both grasses are the same color and shape.

Sorghum grass is a strain of Sorghum alnum released by the New Mexico Seed Farms, Inc., Clovis, New Mexico. Yields were significantly higher at 2 locations in Virginia in 1959, but growth characteristics were identical with Sorghum alnum.

Results

Table 1 shows the relative average yields, the number of test years, and the average disease susceptibility score for all entries at 4 locations in Virginia.

Tables 2, 3, 4, and 5 give the forage yields for each year and the average and relative yields at each location.

Table 6 shows the 1959 yields and relative rank at each location and the average yields, relative rank, and disease score at all 4 locations.

Table 7 shows the disease score for each location and average disease score for all locations.

Table 8 shows the plant height at each date of harvesting at all locations.

For several years Piper and Sweet sudangrass were the only named varieties recommended for Virginia. Piper has appreciable advantage over most other varieties in yield and disease resistance and remains on the recommended list (Table 1). Sweet sudangrass is considered one of the more desirable varieties because of its high palatability. However, in recent years high disease susceptibility has resulted in low yields, and for this reason it is being removed from the recommended list in 1961 (Table 1). Greenleaf contains a relatively high proportion of sweet plants, and is palatable to livestock. It produces as high yields as Piper, is equally disease resistant, and is on the recommended list (Table 1).

Although tests were conducted at 4 locations, representing 3 principal agricultural regions of the State, the performance of the varieties does not justify different varietal recommendations for the areas (Tables 2, 3, 4, and 5).

Several of the new hybrids included in the 1959 tests produced high yields and showed good disease resistance (Table 6). Most of these hybrids are experimental and commercial seed is not available.

Of the johnsongrass-sorghum hybrids, which are classified as noxious weeds and cannot be sold legally in the State, Sorgrass or Perennial Sweet has been included in the tests for 2 years with resulting yields significantly below the better sudangrasses. Sorghum alnum produced

yields below Piper sudangrass and was inferior to Piper in uniformity and quality; and sorghumgrass, a strain of Sorghum almum, produced high yields at 2 locations, was poor in uniformity, and quality was similar to the regular Sorghum almum (Table 6).

TABLE 1. RELATIVE FORAGE YIELDS AND DISEASE RATING OF SUDANGRASS VARIETIES IN VIRGINIA. 1954-1959

<u>Variety</u> ^{1/}	<u>Relative Yield</u> ^{2/} %	<u>Location Test Years</u> ^{3/} No.	<u>Disease Rating</u> ^{4/}
Piper*	100	24	4.8
Sweet 372*	84	24	6.7
Sweet 372 (S1)	77	24	7.0
Greenleaf*	102	24	4.3
Lahoma	84	24	6.7
Ga. 337	86	20	3.3
Tift	106	20	4.1
Stoneville Sel.	84	12	2.9
Stoneville Syn. #1	92	8	2.9
Sorghum (Perennial Sweet)	87	8	3.5
California 23	97	4	8.0
DeKalb X-1	109	4	3.3
DeKalb X-2	127	4	3.1
DeKalb Sudax SX11	129	4	3.1
Texas A3056-17 x R3061	145	4	3.7
Texas A3056-15 x R3061	140	4	3.7
Texas A3054-20 x R3061	120	4	3.5
Sorghum Alnum	94	4	3.7
Sorghum Grass	123	4	2.7

^{1/} Most of the seed was furnished by the Crops Research Division, Agricultural Research Service, U.S.D.A.

^{2/} The relative yield from Piper is figured as 100. The yield of the particular variety is divided by the yield of Piper in the same tests for the same years. The average hay yield of Piper for all tests was 3.06 tons per acre.

^{3/} The number of test years was determined on the basis of the total number of tests at all locations.

^{4/} 1 = least; 9 = most. Scores were not taken each year at all locations. The score is a rating of all leaf diseases but is primarily Helminthosporium turcicum.

* Recommended varieties. Sweet sudangrass is to be dropped from the list in 1961.

TABLE 2. FORAGE YIELD OF SUDANGRASS VARIETIES, ORANGE. 1954-1959

Variety	<u>Yields of Cured Forage in Tons per Acre</u>							Relative ^{3/} %
	<u>1954</u> ^{1/}	<u>1955</u> ^{1/}	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>Average</u>	
Piper	2.20	5.98	6.15	1.69	4.41	5.29	4.29	100
Sweet 372	1.81‡	5.37‡	4.93‡	1.27‡	2.88‡	3.71‡	3.33	78
Sweet 372 (S1)	1.96	5.20‡	4.25‡	1.30‡	2.67‡	3.59‡	3.16	74
Greenleaf	1.94‡	6.06	5.54	1.22‡	3.77‡	4.70	3.87	90
Lahoma	2.01	6.03	3.69‡	0.70‡	2.72‡	3.04‡	3.03	71
Ga. 337	1.44‡	--	4.52‡	0.72‡	3.74‡	4.73	3.03 ^{2/}	71 ^{2/}
Tift	2.08	6.03	--	1.26‡	3.85‡	4.93	3.63 ^{2/}	93 ^{2/}
Common	1.92‡	4.53‡	6.31	1.52‡	--	--	--	--
Common Sweet	2.13	5.80	4.95‡	1.42‡	--	--	--	--
Wheeler	2.00	4.85‡	--	1.43‡	--	--	--	--
Stoneville Sel.	--	--	--	0.84‡	2.72‡	4.10‡	--	--
Stoneville Syn.	--	--	--	1.13‡	2.87‡	--	--	--
California 23	--	--	--	1.45‡	--	--	--	--
DeKalb X1	--	--	--	--	2.98‡	--	--	--
DeKalb X2	--	--	--	--	3.57‡	--	--	--
DeKalb Sudax SX11	--	--	--	--	--	6.75†	--	--
Texas A3056-17 x R3061	--	--	--	--	--	7.08†	--	--
Texas A3056-15 x R3061	--	--	--	--	--	6.87†	--	--
Texas A3054-20 x R3061	--	--	--	--	--	5.77	--	--
Sorghum (Perennial Sweet)	--	--	--	--	3.41‡	3.73‡	--	--
Sorghum Alnum	--	--	--	--	--	5.81	--	--
Sorghum Grass	--	--	--	--	--	6.58†	--	--

^{1/} Average of 2 tests

† Significant (0.05) above check (Piper).

‡ Significant (0.05) below check (Piper).

Significant differences are based on Duncan's multiple range test.

^{2/} 5 years only.

^{3/} Yields of Piper were used as checks and assigned the relative value of 100.

TABLE 3. FORAGE YIELDS OF SUDANGRASS VARIETIES, BLACKSBURG. 1954-1959

Variety	<u>Yields of Cured Forage in Tons per Acre</u>							Relative ^{3/} %
	<u>1954</u> ^{1/}	<u>1955</u> ^{1/}	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>Average</u>	
Piper	1.92	3.34	1.52	1.99	1.66	4.06	2.42	100
Sweet 372	1.94	2.29‡	1.32	1.52‡	1.51	3.07‡	1.94	80
Sweet 372 (S1)	1.92	2.51‡	1.22	1.48‡	1.31	2.89‡	1.89	78
Greenleaf	2.16	2.86	1.43	1.91	2.01	4.30	2.45	101
Lahoma	2.20	2.06‡	1.54	1.00‡	1.76	2.60‡	1.86	77
Ga. 337	1.38‡	--	1.21	1.61	1.58	4.21	2.00 ^{2/}	90 ^{2/}
Tift	2.23	3.08	--	2.34	1.84	5.23	2.94 ^{2/}	113 ^{2/}
Common	1.64	2.25‡	1.75	2.12	--	--	--	--
Common Sweet	2.31	2.50‡	1.56	1.79	--	--	--	--
Wheeler	1.89	2.70‡	--	1.75	--	--	--	--
Stoneville Sel.	--	--	--	2.65	1.67	2.83‡	--	--
Stoneville Syn.	--	--	--	2.81	1.78	--	--	--
California 23	--	--	--	1.96	--	--	--	--
DeKalb X1	--	--	--	--	2.32†	--	--	--
DeKalb X2	--	--	--	--	2.67†	--	--	--
DeKalb Sudax SX11	--	--	--	--	--	5.10	--	--
Texas A3056-17 x R3061	--	--	--	--	--	5.96	--	--
Texas A3056-15 x R3061	--	--	--	--	--	6.37†	--	--
Texas A3054-20 x R3061	--	--	--	--	--	5.48	--	--
Sorghum (Perennial Sweet)	--	--	--	--	1.90	3.55‡	--	--
Sorghum Alnum	--	--	--	--	--	3.95‡	--	--
Sorghum Grass	--	--	--	--	--	6.20†	--	--

^{1/} Average of 2 tests.

† Significant (0.05) above check (Piper).

‡ Significant (0.05) below check (Piper).

^{2/} 5 years only.

^{3/} Yields of Piper were used as checks and assigned the relative value of 100.

TABLE 6. SUMMARY OF SUDANGRASS VARIETY TESTS. 1959

Variety	<u>Orange</u>		<u>Blacksburg</u>		<u>Warsaw</u>		<u>Petersburg</u>		<u>Average</u>		<u>Disease^{1/} Score</u>
	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	
Texas A3056-17 x R3061	1	7.08†	3	5.96	1	3.57	1	4.01†	1	5.16†	3.7
Texas A3056-15 x R3061	2	6.87†	1	6.37†	4	3.26	2	3.52†	2	5.01†	3.8
Sudax SX11	3	6.75†	6	5.10	2	3.52	3	3.05†	3	4.61†	3.1
Sorghum Grass	4	6.58†	2	6.20†	6	2.92	8	2.31	4	4.50†	2.7
Texas A3054-20 x R3061	6	5.77	4	5.48	3	3.32	5	2.57	5	4.29	3.5
Tift Sudangrass	8	4.93	5	5.23	8	2.68	7	2.36	6	3.80	4.4
Greenleaf Sudangrass	10	4.70	7	4.30	5	3.09	4	3.04†	7	3.78	5.0
Piper Sudangrass	7	5.29	9	4.06	7	2.91	9	2.02	8	3.57	5.3
Sorghum Alum	5	5.81	10	3.95‡	12	2.06	13	1.59	9	3.35	3.7
Georgia 337 Sudangrass	9	4.73	8	4.21	10	2.37	15	1.21‡	10	3.13‡	2.9
Sweet 372 Sudangrass	13	3.71‡	12	3.07‡	9	2.43	6	2.46	11	2.92‡	7.2
Stoneville Selection Sudangrass	11	4.10‡	14	2.83‡	11	2.35	10	1.87	12	2.79‡	2.6
Sorghum (Perennial Sweet Sudangrass	12	3.73‡	11	3.55‡	13	1.86	14	1.41‡	13	2.64‡	3.5
Sweet 372(S1) Sudangrass	14	3.59‡	13	2.89‡	14	1.77‡	12	1.71	14	2.49‡	7.6
Lahoma Sudangrass	15	3.04‡	15	2.60‡	15	1.69‡	11	1.86	15	2.30‡	6.9

† Significant (0.05) above check (Piper).

‡ Significant (0.05) below check (Piper).

Significant differences are based on Duncan's multiple range test.

^{1/} Average disease score at 4 locations; 0 = none; 9 = severe. The score is a rating of all leaf diseases but is primarily Helminthosporium turcicum.

TABLE 7. DISEASE INCIDENCE OF SUDANGRASS VARIETIES AT VARIOUS LOCATIONS IN VIRGINIA. 1959^{1/}

Variety	Blacksburg		Orange	Petersburg	Warsaw	Average
	Aug. 22	Oct. 16	Sept. 9	Aug. 24	Sept. 9	
DeKalb Sudax SX 11	1.2	3.0	3.5	4.0	3.7	3.1
Texas A3056-17 x R3061	2.5	3.0	4.0	4.0	5.2	3.7
Texas A3054-20 x R3061	3.0	3.7	3.5	3.7	3.5	3.5
Texas A3056-15 x R3061	2.7	3.5	3.7	4.2	4.6	3.7
Sorghum (Perennial Sweet Sudangrass)	2.2	4.2	3.0	4.0	4.0	3.5
Piper Sudangrass	3.2	7.2	5.2	5.0	6.0	5.3
Greenleaf Sudangrass	3.7	6.2	4.7	5.0	5.2	5.0
Georgia 337 Sudangrass	2.0	4.0	2.5	3.0	3.2	2.9
Sweet 372 Sudangrass	7.0	8.0	7.0	7.5	6.7	7.2
Sweet 372 (S-1) Sudangrass	7.0	8.2	7.5	7.5	7.7	7.6
Stoneville Sel. Sudangrass	1.7	2.2	2.5	3.2	3.2	2.6
Tift Sudangrass	3.0	5.7	3.7	5.2	4.2	4.4
Lahoma Sudangrass	6.5	7.5	6.7	6.2	7.5	6.9
Sorghum Alnum	3.2	3.7	4.0	3.5	4.2	3.7
Sorghum Grass	2.2	2.0	3.0	2.7	3.7	2.7

^{1/} Average disease score based on 0-9; 0 = none; 9 = severe. The score is a rating of all leaf diseases but is primarily Helminthosporium turcicum.

Brief Descriptions of Pearl Millet Varieties

Gahi-1 is a hybrid developed at the Georgia Coastal Plain Experiment Station. Four inbred lines are involved in production of this variety. It is characterized by good seedling vigor, leafiness, high total yields, late maturity, and good recovery. In the Virginia tests it produced higher yields and was superior to Common pearl millet both in quality and recovery. It is not as leafy as Starr millet but starts off faster, recovers faster after cutting, and yields considerably more forage per acre. Certified seed is available. Recommended for Virginia.

Common pearl millet, not a specific variety, is a commercial seed with no varietal identity. Different seed lots may vary in yield and other characteristics. In the Virginia tests it ranked high in yield but showed considerable variation in other characteristics for the different years. Recommended for Virginia.

Starr millet, a synthetic variety of pearl millet developed and released by the Georgia Coastal Plain Experiment Station, is characterized by broader leaves, shorter internodes and stems, more leaves per stem than Common pearl millet, and matures 4 to 6 weeks later. In the Virginia tests it ranks first in quality but yields have been considerably less than for several other varieties. Certified seed is available.

Texas No. 7, selected by the J. R. McNeil Seed Co., Spur, Texas, is a tall, mid-leafy, mid-early, large variety with large, compact heads. Yields have been good in Virginia but quality is not equal to Gahi-1. No formal release has been made and certified seed is not available, although it is in commercial production.

Hybrid Cattail S.J., selected by the J. R. McNeil Seed Co., Spur, Texas, was developed from a single plant that was sweet and juicy by the Texas Agricultural Experiment Station from material (Plant Introduction) furnished by the U.S.D.A. This plant progeny then was crossed with numerous lines of pearl millet.

In Virginia tests it has shown considerable stemminess. Yields have been slightly below Common pearl millet at Orange, Blacksburg, and Petersburg, and above at Warsaw. Certified seed is not available although it is in commercial production.

Results

Table 9 shows the relative average yields, the number of test years, and the average disease susceptibility score for all varieties at 4 locations in Virginia.

Table 10, 11, 12, and 13 show the forage yields for each year and the average and relative yields at each location.

Table 14 shows the 1959 yields and relative rank at each location and the average yields, relative rank, and disease score at all 4 locations.

Table 15 shows the disease score for each location and the average disease score for all locations.

Table 16 shows the plant heights at each date of harvesting at all locations.

For several years Common pearl millet was the only millet recommended for Virginia. New and more desirable varieties are being developed, but until seed of these new varieties are made available and until these varieties can be evaluated, Common pearl millet will remain on the recommended list. It ranks third in yield over the past 6 years in the uniform tests (Table 9).

Gahi-1 produces the highest yields, is superior to Common pearl millet both in quality and recovery, and is recommended for Virginia (Table 9). Gahi-1 gives greater yields and more efficient production because of hybrid vigor. Second-generation Gahi-1, like second-generation hybrid corn, yields much less than the first-generation and should not be grown. Gahi-1 should be planted at 25 to 30 pounds per acre when drilled or broadcast to obtain maximum yields.

Texas No. 7 produced the second highest yields in the uniform tests (Table 9). This variety shows many desirable characteristics. However, quality has not been equal to Gahi-1.

TABLE 9. RELATIVE FORAGE YIELDS AND DISEASE RATING OF PEARL MILLETS
IN VIRGINIA. 1954-1959

<u>Variety</u> ^{1/}	<u>Relative Yield</u> ^{2/} %	<u>Location Test Years</u> ^{3/} No.	<u>Disease Rating</u> ^{5/}
Commercial Pearl*	100	24	1.8
Texas #7	105	24	1.7
Starr	89	24	2.0
Gahi-1*	107	23	1.7
Hybrid Cattail S.J.	98	12	1.6
Improved Starr	74	4	-
German Strain 8 ^{4/}	74	4	-

^{1/} Most of the seed was furnished by the Crops Research Division, Agricultural Research Service, U.S.D.A.

^{2/} The relative yield from Common pearl millet is figured as 100. The yield of the particular variety is divided by the yield of Common in the same tests for the same years. The average hay yield for all tests of Common pearl millet was 3.18 tons per acre.

^{3/} The number of test years was determined on the basis of the total number of tests at all locations.

^{4/} German (Foxtail) millet was included in tests at each location for one year.

^{5/} Disease score based on 0-9; 0 = least; 9 = most. The score is a rating of leaf diseases taken in 1959 at all locations.

* Recommended varieties.

TABLE 10. FORAGE YIELDS OF PEARL MILLET, ORANGE. 1954-1959

<u>Variety</u>	<u>Yields of Cured Forage in Tons per Acre</u>						<u>Average</u>	<u>Relative^{4/}</u> <u>%</u>
	<u>1954^{1/}</u>	<u>1955^{1/}</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>		
Common	1.91	5.72	3.90	2.06	3.59	3.7 ⁴	3.49	100
Texas #7	2.05	5.55	4.18	2.03	3.47	3.81	3.52	101
Starr	1.62‡	5.45	4.23	1.82‡	2.97	3.25	3.22	93
Gahi-1	1.96	7.40†	4.47	1.03‡	3.27	4.21	3.72	107
Hybrid Cattail S.J.	--	--	--	1.67‡	3.10	4.00	2.92 ^{3/}	94 ^{3/}
Improved Starr	--	--	--	1.70‡	--	--	--	--
German Strain 8 ^{2/}	1.50‡	--	--	--	--	--	--	--

^{1/} Average of 2 tests.

^{2/} Foxtail millet.

† Significant (0.05) above check (Common).

‡ Significant (0.05) below check (Common).

Significant differences are based on Duncan's multiple range test.

^{3/} 3 years only.

^{4/} Yields of Common pearl millet were used as checks and assigned the relative value of 100.

TABLE 11. FORAGE YIELDS OF PEARL MILLET, BLACKSBURG. 1954-1959

<u>Variety</u>	<u>Yields of Cured Forage in Tons per Acre</u>							<u>Relative^{5/} %</u>
	<u>1954^{1/}</u>	<u>1955^{1/}</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>Average</u>	
Common	2.71	2.87	1.59	3.66	3.15	5.29	3.21	100
Texas #7	3.37	3.21	1.68	3.47	3.21	5.08	3.34	104
Starr	2.57‡	1.89‡	1.08	3.17	3.10	5.06	2.81	88
Gahi-1	2.93	--	1.54	2.35‡	3.28	5.32	3.08 ^{3/}	94 ^{3/}
Hybrid Cattail S.J.	--	--	--	3.86	2.99	4.91	3.92 ^{4/}	98 ^{4/}
Improved Starr	--	--	--	2.45‡	--	--	--	--
German Strain 8 ^{2/}	1.94‡	--	--	--	--	--	--	--

^{1/} Average of 2 tests.

^{2/} Foxtail millet.

† Significant (0.05) above check (Common).

‡ Significant (0.05) below check (Common).

Significant differences are based on Duncan's multiple range test.

^{3/} 5 years only.

^{4/} 3 years only.

^{5/} Yields of Common pearl millet were used as checks and assigned the relative value of 100.

TABLE 12. FORAGE YIELDS OF PEARL MILLET, WARSAW. 1954-1959

Yields of Cured Forage in Tons per Acre

<u>Variety</u>	<u>1954</u> ^{1/}	<u>1955</u> ^{1/}	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>Average</u>	<u>Relative</u> ^{4/} <u>%</u>
Common	2.13	4.88	3.63	2.92	2.59	3.98	3.36	100
Texas #7	2.12	4.59	3.63	2.87	4.61†	4.02	3.64	108
Starr	1.41‡	4.65	2.96	2.47‡	2.41	3.56	2.91	87
Gahi-1	2.77	6.59	3.43	2.77	2.74	4.04	3.72	111
Hybrid Cattail S.J.	--	--	--	2.57‡	3.17	4.12	3.29 ^{3/}	104 ^{3/}
Improved Starr	--	--	--	2.48‡	--	--	--	--
German Strain 8 ^{2/}	1.36‡	--	--	--	--	--	--	--

^{1/} Average of 2 tests.

^{2/} Foxtail millet.

† Significant (0.05) above check (Common).

‡ Significant (0.05) below check (Common).

Significant differences are based on Duncan's multiple range test.

^{3/} 3 years only.

^{4/} Yields of Common pearl millet were used as checks and assigned the relative value of 100.

TABLE 13. FORAGE YIELDS OF PEARL MILLET, PETERSBURG. 1954-1959

Variety	<u>Yields of Cured Forage in Tons per Acre</u>							Relative ^{4/} %
	<u>1954</u> ^{1/}	<u>1955</u> ^{1/}	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>Average</u>	
Common	2.19	2.79†	3.15	2.64	2.37	2.99	2.69	100
Texas #7	2.33	2.88‡	3.40	2.79	2.47	2.64	2.75	102
Starr	1.93	3.11	2.87	2.40	2.15	2.39‡	2.48	92
Gahi-1	2.69†	3.75	4.32†	2.12	2.07	3.09	3.01	112
Hybrid Cattail S.J.	--	--	--	2.55	2.54	2.50	2.53 ^{3/}	95 ^{3/}
Improved Starr	--	--	--	1.79	--	--	--	--
German Strain 8 ^{2/}	1.81‡	--	--	--	--	--	--	--

^{1/} Average of 2 tests.

^{2/} Foxtail Millet.

† Significant (0.05) above check (Common).

‡ Significant (0.05) below check (Common).

Significant differences are based on Duncan's multiple range test.

^{3/} 3 years only.

^{4/} Yields of Common pearl millet were used as checks and assigned the relative value of 100.

TABLE 14. FORAGE YIELD SUMMARY OF PEARL MILLET VARIETIES. 1959

Variety	Orange		Blacksburg		Warsaw		Petersburg		Average Disease ^{1/}		
	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	Rank	Tons/A	Score
Gahi-1	1	4.21	1	5.32	2	4.04	1	3.09	1	4.17	1.7
Commercial	4	3.74	2	5.29	4	3.98	2	2.99	2	4.00	1.8
Texas #7	3	3.81	3	5.08	3	4.02	3	2.64	3	3.89	1.7
Hybrid Cattail S.J.	2	4.00	5	4.91	1	4.12	4	2.50	4	3.88	1.6
Starr	5	3.25	4	5.06	5	3.56	5	2.39	5	3.57	2.0

^{1/} Average leaf disease score at 4 locations; based on 0 = none; 9 = severe.

TABLE 15. DISEASE INCIDENCE OF PEARL MILLET VARIETIES AT VARIOUS LOCATIONS IN VIRGINIA. 1959^{1/}

<u>Variety</u>	<u>Blacksburg</u>		<u>Orange</u>	<u>Petersburg</u>	<u>Warsaw</u>	<u>Average</u>
	<u>Aug. 22</u>	<u>Oct. 16</u>	<u>Sept. 9</u>	<u>Aug. 24</u>	<u>Sept. 9</u>	
Common	1.5	2.2	2.0	2.2	1.2	1.8
Gahi-1	1.0	1.7	1.7	3.2	1.0	1.7
Texas #7	1.5	2.2	1.5	2.5	1.0	1.7
Hyb. Cattail S.J.	1.2	2.0	1.5	2.2	1.2	1.6
Starr	1.0	3.7	1.5	2.7	1.0	2.0

^{1/} Leaf disease score based on 0-9; 0 = none; 9 = severe.

TABLE 16. AVERAGE HEIGHT OF PEARL MILLET VARIETIES AT VARIOUS LOCATIONS
IN VIRGINIA. 1959

Average Height in Inches at Time of Harvesting

<u>Variety</u>	<u>Orange</u>			<u>Warsaw</u>			<u>Petersburg</u>			<u>Blacksburg</u>		
	<u>7/15</u>	<u>8/5</u>	<u>10/5</u>	<u>7/29</u>	<u>8/20</u>	<u>9/14</u>	<u>7/10</u>	<u>7/30</u>	<u>8/31</u>	<u>7/2</u>	<u>7/22</u>	<u>10/16</u>
Common	30	22	48	41	32	36	35	29	36	13	26	28
Gahi-1	28	21	45	37	36	28	25	28	27	12	20	31
Texas #7	34	19	45	42	29	31	37	32	32	12	22	24
Hyb. Cattail S.J.	34	22	42	38	36	34	33	32	33	12	23	27
Starr	22	21	46	35	30	24	22	28	24	11	17	21

Summary and Conclusions

Sudangrass and pearl millet are high yielding annual summer grasses well adapted as supplementary forage crops for Virginia, and are suited for summer grazing during periods of drought when pastures normally produce little growth. They furnish hay practically equal in feeding value to other non-legume roughages, and make acceptable ensilage when properly handled.

New varieties of sudangrass and pearl millet are being developed and introduced by the U.S.D.A. and state agricultural experiment stations as well as commercial companies in different regions of the United States. Only by a continuous evaluation program can adequate information be obtained on the adaptation of these varieties to Virginia conditions.

A brief discussion has been given on the potential prussic acid content of sudangrass, hay and pasture management for both sudangrass and pearl millet, rates and methods of seeding, and the diseases affecting the 2 crops.

A description of the more important varieties also has been given. Forage yields from varietal trials at 4 locations in the State have been presented in tabulated form. From the data obtained to date, the following conclusions have been reached:

(1) Although there was wide variation in yields between varieties within each crop and between crops according to location and growing seasons, the better varieties of both sudangrass and millet yielded about the same. For all 24 test years, Piper sudangrass averaged 3.06 tons per acre of cured hay and Common pearl millet 3.18 tons. Pearl millet was slower growing in the seedling stage and slightly coarser than sudangrass.

(2) In 2 years, or 8 test years, the crops were harvested under hay (2 or 3 cuttings) and pasture (3 or 4 cuttings) management. Higher yields were obtained under hay management, i.e. with fewer cuttings. These crops should be harvested only once or twice, depending upon the growing season when used for hay or ensilage in order to get maximum yields. In normal growing seasons pasture management requires not more than 3 cuttings.

(3) There is considerable difference in yield and disease resistance between different varieties of sudangrass. Some of the newer varieties are superior in both yield and disease resistance to older varieties. Sweet sudangrass, of high palatability, is an important variety in areas of slight disease. However, it is being removed from the Virginia recommended list because of its high disease susceptibility under State conditions. Sudangrass is affected by a number of diseases but the only one of much importance to date in Virginia is leaf blight, a fungus caused by Helminthosporium turcicum, Pass, a very damaging disease under warm humid conditions.

(4) Some of the newer varieties of pearl millet are more vigorous, more leafy, higher yielding, and later maturing than Commercial pearl millet. Of these, certified Gahi-1 is the only one that has been placed on the recommended list. None of the millet varieties shows any appreciable damage from disease.

(5) In the 1959 tests, DeKalb Sudax SX-11 and the 3 Texas experimental hybrids produced high yields at all locations. The leaves were larger and the stalks coarser than the standard sudangrasses.

(6) Three perennial sudangrasses (sorghass and 2 strains of Sorghum alnum) were included in the 1959 tests. All 3 hybrids produced yields and quality below the better varieties of sudangrass and pearl millet

with the exception of Sorghum grass, a strain of Sorghum alnum, which produced high yields at 2 of the 4 locations. Virginia seed law prohibits sale of seed of any of these perennial types.

(7) Until further evaluation is made and seed of newer varieties becomes commercially available, only the following varieties are recommended for Virginia:

Sudangrass

Piper
Greenleaf
Sweet Sudan^{1/}

Pearl Millet

Commercial Pearl
Gahi-1

^{1/} To be dropped from the recommended list in 1961 because of disease susceptibility resulting in low yields.