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KENAF RESEARCH

Final Report - 1997
The University of Georgia

Studies carried out in 1996-97 at the University of Georgia included (1) kenaf separation trials, (2) studies of plant parasitic nematodes on kenaf and, (3) kenaf yields and other performance characteristics for various kenaf cultivars and germplasm, as well as Roselle germplasm. The following general assessments can be made from the studies.

We determined that the kenaf separator assembly, based on the Ankal/Amadas T72 X 20 Trommel Screening System can, when supported by the appropriate secondary cleaning systems, separate core fiber to a purity of nearly 100%, when the system is operated at a capacity of 1 ton per hour. With a shaker screen at least 3 times larger, the capacity of the system should also increase three fold while maintaining purity of core. The efficiency of bark separation was around 95% at a flow rate of just less than 1 ton per hour. Overall, it was shown that this type of separation system can efficiently separate kenaf into its bark and core components.

In the nematode trials, it was determined that yield losses were 29% on very sandy soils where kenaf was planted on land that had been planted to kenaf the previous year. On soils with more clay, yield losses the second year were 14%. On the sandy site, about half the yield losses could be recovered by use of the nematicides Telone and Temik.

Yields from the National Kenaf Variety Trial at Plains were low and in the range of 4.6 to 5.8 tons per acre. Insufficient irrigation was responsible for the reduced yields. Some advanced breeding lines yielded comparatively well, and deserve further evaluation. Yields of some Roselle entries were equal to the top kenaf varieties in the Roselle screening trials. These deserve further study also, since they will likely have resistance to root knot nematodes.

Separation Trials

Ankal/Amadas Trommel Screening System

David E. Kissel and Sidney Thompson

The success in establishing a commercial kenaf industry depends on the new system developed to separate kenaf fiber into its two components, bark fiber and core fiber. These two fibers have vastly different properties, and different commercial uses and markets as a result. An efficient commercial separator is therefore essential to the success of this new industry. The machinery system selected by the University of Georgia to separate chopped kenaf into its bark and core components was the Ankal/Amadas T72 X 20 Stationary Trommel Screening System. The separator, the first of its type, was built by Amadas Industries of Suffolk, Virginia (and Albany, GA) and was delivered to UGA earlier this year. Since the delivery of the separator and associated equipment (conveyors, chipper/shredders, baler, and bagger), it has been set up at the Farmers Cotton Exchange gin in Americus, Georgia and tested thoroughly to determine its optimum running conditions using kenaf grown in 1996. The most intensive work on the separator has been carried out over the past month with the intent of determining the proper equipment settings and arrangement of associated equipment to obtain the best purity possible for both the core and bark fiber while operating at a commercially acceptable rate of separation.

The University of Georgia enlisted the support of its commercial partners in setting up the separator. The test runs and equipment adjustments have been made on a trial and error basis by the staff of the Farmers Cotton Exchange Gin in consultation with Ankal, Inc., and with additional engineering and equipment modification assistance by American Gincorp of Greenwood, MS. A schematic diagram of the final separator assembly used to complete the separation of 16 modules (weighing approximately 6 tons each) of kenaf is given in the attached figure. Although not shown in the schematic, a suction line was installed at two locations in the process to remove bark from the core process stream. These suction lines were placed at the conveyor end and entrance into the small trommel and at the high end of the shaker screen assembly. The resulting system gave essentially 100 percent purity of core product when operating at a flow rate of chopped kenaf of approximately 1 ton per hour.

The shaker screen assembly was the limitation to a higher rate of separation and flow of product through the system. To enhance separation efficiency and rate, a shaker screen assembly of at least 3 times larger could have been used with the present separation system. The area of the present shaker screen is approximately 18 square feet.

Although the primary emphasis of the separation trials were for purity of core product, a check of bark purity from the trommel outlet, when operated at an approximate flow rate of 0.75 tons per hour of chopped kenaf, revealed a purity of approximately 95% bark fiber and 5% core. These values were obtained by removing 4 samples of bark from the conveyor to the fiber baler, hand separating the remaining core from the fiber, and weighing both. Visual observation of the baled fiber indicated that these values were representative.

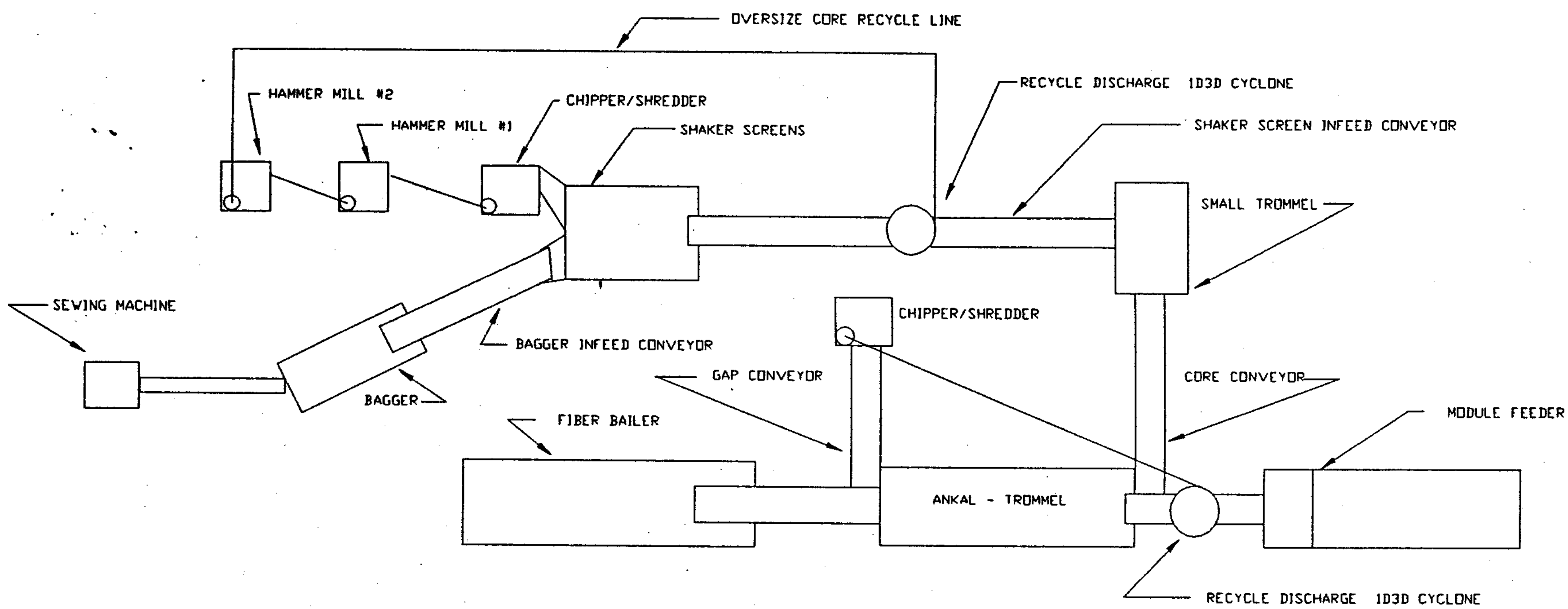
These trials show conclusively that the system developed for these trials can effectively separate chopped kenaf into its bark and core components. Data on system losses are available but could not be worked up for this report, since the separation of the 16 modules of kenaf was completed on August 23 and time has not been available to calculate from weight tickets, the percentages of chopped kenaf that were converted into separated core and bark product. This information will be presented in a more complete report at a later time.

Plant Parasitic Nematodes On Kenaf

Fengru Zhang and J. P. Noe

Summary: Yield losses in kenaf due to root-knot nematodes in the second year of kenaf planting (2-year monoculture) were estimated to be 29% (3 tons/A) in field plots located in Attapulgus, GA, and 14% (1.5 tons/A) in Athens, GA. Use of the nematicides 1,3-dichloropropene (Telone) and aldicarb (Temik) recovered about 50% of the yield losses due to nematodes in Attapulgus. Temik alone did not provide sufficient control of root-knot nematodes in kenaf. Nematode populations increased rapidly in field plots located in Attapulgus, Tifton, and Athens, resulting in end-of-season population densities of root-knot nematode that were greater than 1,500/ 100 cm^3 soil at all locations. In a comparison of soil types from 4 locations in Georgia, root-knot nematodes reproduced well in all soils, but the increase in nematode numbers was lower in sandier soils than in clay soils. This difference was due to the high levels of root damage to kenaf in the sandier soils, resulting in less host material for the nematodes to feed on in later generations. Southern root-knot nematodes reduced kenaf growth in all four soil types, but peanut root-knot reduced kenaf growth significantly only in the sandy clay soil. Generally, greater growth suppression in kenaf was observed with southern-root knot than with peanut root-knot nematodes. No nematode-resistant kenaf cultivars were found in either greenhouse or field studies, although some entries showed greater tolerance to nematode attack . Cultivars of closely-related roselle having high levels of resistance and cultivars of kenaf with good levels of tolerance to root-knot nematodes were identified for potential use in kenaf-breeding programs.

Kenaf crop loss: Growth response of kenaf cv. Everglades 41 (*Hibiscus cannabinus* L.) In fields infested with southern root-knot (*Meloidogyne incognita)* and peanut root-knot nematodes *(Meloidogyne arenaria)* were conducted in three locations: Tifton campus, Tifton, GA; Plant Science Farm, Oconee County, GA; and Attapulgus Branch Experiment Station, Attapulgus, GA. Two fields infested with southern root-knot nematode from both Athens and Attapulgus were examined for two consecutive years. Plots with high and low levels of nematode infestation and were identified in each field. One additional field in Attapulgus was infested



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with southern root-knot and had cotton planted the previous year, and 2 fields in Tifton were infested with peanut root-knot nematode. The highest kenaf yields were in the fields located in Athens and the lowest yields were in fields located in Attapulgus in both 1995 and 1996 (Table 1). The yield in fields with kenaf following kenaf was decreased 14% in Athens and 29% in Attapulgus (Table 1) by the second year. High numbers of both southern and peanut root-knot nematodes were recorded in all fields by harvest, even where initial numbers were low.

Table 1. Kenaf yields in fields infested with southern or peanut root-knot nematodes in 1995 and 1996.

Location	Root knot nematode	Field	Year	Yield estimate (Kg)
Athens	Southern	1	1995	9.02
	Southern	1	1996	7.72 (*14% lower than 1995)
Tifton	Peanut	1	1995	6.96
	Peanut	2	1996	7.62
Attapulgus	Southern	1	1995	3.81
	Southern	1	1996	2.72 (*29% lower than 1995)
	Southern	2	1996	4.09

Effects of root-knot nematodes and nematicide application on kenaf growth was evaluated in two fields infested with southern root-knot, located in Attapulgus. One field had two consecutive years of kenaf and the other field was in the first year of kenaf (previous crop was cotton). Temik was also applied the one field consecutive two years for kenaf in Athens. Telone (1-3 dichloropropene), Temik (aldicarb), and a combination of both compounds were evaluated for control of root-knot nematodes. Telone was injected 12 inches below the soil surface at a rate of 5 gal/acre two weeks before kenaf planting. Five lbs/acre of Temik was applied in-furrow at planting. Both Telone + Temik and Telone alone significantly reduced the kenaf yield losses comparing to untreated control plots (Table 2). The nematode population at midseason was significantly lower in plots treated with either Telone alone or Telone and Temik in the field that had kenaf for 2 consecutive years. No significant differences were observed in Athens or Attapulgus for the plots treated with Temik alone as compared to untreated control plots for either yield or nematode population levels (Tables 2 & 3). At harvest nematode numbers were very high in all plots, at all locations, and for all treatments. Neither Telone nor Temik could control late-season increases in root-knot nematode populations on kenaf.

Table 2. Effects of southern root-knot nematodes on kenaf growth in Attapulgus with and without nematicide treatments.

	Field with kenaf for one year			Field with kenaf for two years		
	Nematodes /100 cm³ soil			Nematodes /100 cm³ soil		
Treatment	Midseason	Harvest	Yield kg	Midseason	Harvest	Yield kg
Telone+Temik	57	2,437	5.67a	30b	1,869	5.63a
Telone	205	2,702	5.16a	123b	1,553	4.48ab
Temik	246	1,759	4b	283ab	2,664	3.43bc
Control	313	2,514	3.9b	523a	1,966	2.72c

Data are means of ten replications. Telone 5 gal./acre, Temik 5 lb./acre
Means followed by the same letter are not different ($P \leq 0.05$) according to Waller-Duncan multiple-range test.

Table 3. Effects of the nematicide Temik on southern root-knot nematodes and kenaf growth in Athens.

	Nematodes /100 cm³ soil		
Treatment	Midseason	Harvest	Yield kg
Temik	17	1,801	7.75
Control	24	1,806	7.72

Data are means of ten replications. Temik 5 lb./acre.

Soil type: Effects of soil types on the reproduction and damage potential of southern and peanut root-knot nematodes on kenaf cv. Everglades 41 were determined in a greenhouse with 4 soil types collected from Athens (sandy loam soil, 78% sand, 10% silt, and 12% clay), Attapulgus (sand soil, 90% sand, 6% silt, and 4% clay), Plains (sandy clay soil, 62% sand, 14 silt, and 24% clay), and Tifton (loamy sand soil, 84% sand, 10% silt, and 6% clay). Two inoculum levels (Pi) of southern or peanut root-knot, 5,000 and 10,000 eggs/plant and a control treatment (no nematodes) were applied to each pot with 5 replications per treatment. The experiment was done twice. Plant growth parameters (plant height(PH) (cm), basal stem diameter (BSD) (mm), and fresh shoot weight (FSW) (g)) and the final nematode population densities (Pf) were recorded at the end of each experiment. Both southern and peanut root-knot nematodes reproduced well on kenaf in all of the soil types (Table 4). The reproductive factors (RF) of southern root-knot are lower in the sandy Attapulgus soil than in other soil types because the roots of kenaf were more severely damaged early in the experiment, thus limiting the availability of roots for nematode feeding later in the experiment. The relationship between initial population densities and plant growth (basal stem diameter and fresh shoot weight) varied among soil types. Kenaf yield losses were greatest in the sandy soil from Attalpulgus for both nematode species (Table 5), whereas the highest yields were in the soil from Plains. No differences were observed in plant growth between the two inoculation levels of these two nematodes. Southern root-knot nematodes reduced kenaf growth in all four soil types, but peanut root-knot reduced kenaf growth significantly only in the sandy clay soil. Generally, greater growth suppression in kenaf was observed with southern-root knot than with peanut root-knot nematodes.

Table 4. Reproductive factors (RF) of southern and peanut root knot nematodes on kenaf growing in different soil types.

		Reproductive factor	
Source of soil	Inoculum level*	Southern root-knot	Peanut root-knot
Athens (sandy loam)	L	37	51
	H	46	41
Attapulgus (sand)	L	22	50
	H	22	28
Tifton (loamy sand)	L	71	40
	H	35	29
Plains (sandy clay)	L	65	55
	H	48	38

Data are means of eight replications.
*L: 5,000 eggs/plant; H: 10,000 eggs/plant. Reproductive factor = final nematode number ÷ inoculum level.

Table 5. Effects of southern and peanut root-knot nematodes on kenaf growth in different soil types.

	Fresh shoot weight (g)/plant			Nematode
Source of soil	Southern root-knot	Peanut root-knot	Control	LSD 0.05
Plains (sandy clay)	104.7a	135.1a	161.4a	13.5
Athens (sandy loam)	96ab	138.8a	128.5b	15.6
Tifton (loamy sand)	84.3b	125.3a	114.6b	18.8
Attapulgus (sand)	69c	115.4a	106.1b	23

Data are means of eight replications.
Means followed by the same letter within a column are not different ($\underline{P} \leq 0.05$) according to Waller-Duncan multiple-range test.

Resistance and tolerance to nematodes in kenaf and roselle: Screening of the kenaf and roselle germplasm collection for possible sources of resistance or tolerance to southern and peanut root-knot nematodes has been done in the greenhouse and in small field plots. Twenty-six entries of kenaf and three entries of roselle *(Hibiscus sabdariffa)* were screened for resistance to southern and peanut root-knot nematodes in a greenhouse trial. Everglades 41 was included in all screening experiments as a susceptible standard for comparison. Five replicates of each entry were inoculated with 5,000 eggs of each nematode. Nematode numbers were determined 45 days after planting. Reproductive efficiencies (RF = final nematode egg count/inoculum rate) differed significantly (P=0.05), but indicated that all kenaf entries were good hosts for both species (Table 6). RF's for peanut root-knot ranged from 14 for PI-468075 to 138 for PI-267666. While RF's for southern root-knot ranged from 13 for PI-468075 to 213 for PI-248895. Except for PI-256039 which had an RF of 5.5 for southern root-knot, roselle entries were resistant to both species. All of the kenaf RF's indicated a tremendous potential for nematode buildup. Plant growth parameters also differed significantly among entries when inoculated with either nematode species (Table 6). After inoculation with peanut root-knot, dry shoot weights ranged from 6.2 g for PI-267666 to 24.8 g for PI-538328; Everglades 41 was 16.8 g and roselle PI-256039 was 11.2 g. After inoculation with southern root-knot nematodes, dry shoot weights ranged from 7.0 g for PI-329186 to 25.6 g for PI-267666; Everglades 41 was 14.4 g and roselle PI-256039 was 10.4 g. These differences in plant growth parameters offer hope for development of kenaf cultivars more tolerant to root knot nematodes, but nematode reproduction will be too high to allow these cultivars in a crop rotation system.

Table 6. Response of kenaf and roselle entries to root-knot nematodes.

	Reproductive factor		Kenaf dry shoot weight (g)	
	Root-knot nematode species		Root-knot nematode species	
Entry/ kenaf PI no.	Southern	Peanut	Southern	Peanut
Everglades_41	63	80	14.4	16.8
Roselle_256039	6	0	10.4	11.2
Roselle_256038	0	0	3.1	3
Roselle_468413	1	0	16.4	13.8
248895	213	84	17.4	21.8
250362	13	32	8.4	10.6
267666_1	156	47	25.6	23.5
267666_2	31	139	8.6	6.2
267667	99	116	19.2	21.8
268083	172	48	23.6	14.5
268085	21	23	6.3	7.9
270108	150	73	20	19.4
270116	120	80	17.7	23.6
270117	72	101	14.8	18.7
318723	140	47	21.2	16.5
318726	19	68	9	9.3
324923	160	115	15.6	22.3
329186	17	39	7	7.7
329189	126	107	22.6	24.7
343137	100	63	14.3	21.1
343143	14	55	9.4	10.3
344100	102	127	20	19.8
376260	32	53	9.4	10.8
468075	13	14	5.3	7.7
468076	91	60	16.2	19.1
468077	79	69	17.9	18.8
532872	129	122	23.1	24.6
538258	119	118	19.2	24.8
LSD 0.05	103	80	8.3	10.9

Reproductive factor = number of nematodes at harvest ÷ inoculum rate.
Mean of 5 replications.

Selected entries were further evaluated in small field plots to determine levels of tolerance to nematode attack (tolerance = ability of kenaf to produce acceptable yields even though nematodes were feeding and reproducing). Plant introductions (PI) 376260 and 248895 showed good tolerance to both southern and peanut root-knot nematodes (Table 7). Several other entries showed moderate levels of tolerance to either southern or peanut root-knot, but not to both species. The yields of these breeding lines were generally lower than the yield of Everglades 41 in plots without nematodes, but the two lines with relative tolerance to both nematode species would be useful in a kenaf breeding program to improve the tolerance of released cultivars.

Table 7. Tolerance to root-knot nematodes in kenaf breeding lines.

	Tolerance index*	
Kenaf entry	Southern root-knot	Peanut root-knot
PI 376260	72	64
PI 248895	62	91
PI 267666	23	0
PI 242141	0	11
C305-90	10	0
C304-93	0	17
SF 495	19	0

Data are means of 5 replications.
* Tolerance index is a comparison of yields in the presence of nematodes to the yields obtained in uninfested control plots in the field. 0 = no tolerance, 100 = no relative yield loss, compared to yield losses on kenaf cv. Everglades 41.

1997 Growing season: Although the 1997 growing season is less than half over, early and midseason nematode counts again indicate good nematode control resulting from a combined application of the nematicides Telone and Temik. Root-knot nematode population levels at midseason in the plots receiving both nematicides were 87% lower than untreated control plots. Plots receiving either Telone or Temik alone had root-knot nematode population levels 50-55% lower than untreated control plots. Other experiments will be analyzed after the completion of the growing season.

GERMPLASM EVALUATION AND DEVELOPMENT

Anton E. Coy and Paul L. Raymer

National Kenaf Variety Test Results

The National Kenaf variety test was grown at the Southwest Georgia Branch Experiment Station at Plains, Georgia in 1996 as a continuation of efforts begun in 1995 to evaluate a broader sampling of kenaf varieties in Georgia. Six named varieties and seven advanced breeding lines from Dr. Charles Cook, USDA Weslaco, Texas, were included. Results are summarized in Tables 1 through 3.

Planting was May 16 at 10 lbs.seed/ac in 30" rows. Plots were 4 rows X 20 ft. Prowl at 1 pt/ac ppi and one cultivation controlled weeds. A base fertilizer of 300 lb/ac was applied in February, 40 lbs/ac N as ammonium nitrate was applied at planting time and 120 lbs/ac N as ammonium nitrate was side-dressed June 19 when plants were 18-24" tall. Rain fall of 16.8 inches was supplemented with 3.1 inches of irrigation. The crop did stress severely in mid-July and again in early to mid-September because of irrigation machinery problems. A heavy frost on Nov. 6, stopped growth and killing frost on Dec. 12 killed the crop. The crop was allowed to field dry until harvest Jan.23, 1997. Percent dry matter at harvest averaged 85.2%.

One sample of 6 row feet containing 31 plants $\pm$ 1 (90,000 plants/ac) from one of the center plot rows was harvested, weighed and the number of stems or branches longer than 3 ft were counted. A 6-plant sub-sample was used to determine dry matter percent, stem diameter and plant height. The sub-samples were processed through a stationary ensilage chopper and the core and bark portions were manually separated.

Dry matter yields averaged 5.3 tons/acre as compared with an average of 8.3 tons/ acre in a similar test in 1995. The reduced yield level is due in part to the two periods of severe drought stress mentioned above. The varieties SF192, EV41, SF459 and TA2 were not significantly different in yield and some promising but still segregating breeding lines were indicated. Dry matter yields appear to be associated with variety, population, stem diameter, and plant height with some degree of interaction. Core percentage was associated with variety but influenced by stem diameter and plant height. Plant height was measured at approximately weekly intervals during the growing season after differences among varieties became apparent. Growth essentially stopped between July 22 and July 26 because of dry conditions but continued when water was applied. More detailed analysis of this type of data over crop years could be valuable in establishing growth models and have commercial application as yield predictors and managerial tools.

Advanced Kenaf Evaluation and Roselle Screening Results

The advanced kenaf variety test and the roselle screening tests were planted and managed in the same manner as the national kenaf variety test except that due to limited seed supplies the plots were only 2 rows x 10 feet. Sample plots were 3 row feet and population sampled was less consistent. The crop was harvested March 7, 1997. Yield is reported as field weight as all entries contained a stable moisture.

Eight kenaf accessions selected from the 1995 germplasm screening trial were grown with four commercial kenaf varieties. Yield information from the advanced kenaf variety test was inconclusive due to variability in plant populations but it is noted that the accessions selected were comparable to the check varieties in yield and tended to be taller. These should be reevaluated if seed is available.

Forty seven roselle plant accessions were sceened against three kenaf check varieties. Agronomic type was a main consideration in identifying accessions as substitutes for kenaf <u>per se</u> or as possible genetic sources of nematode tolerence for possible intorgression into kenaf. Yields from the roselle screening test are also inconclusive but a combination of yield information and plant growth information indicates that entries 88-93, 102, 107, 108, 116, 124, 134, 135, 139 and 140 warrant further investigation.

TABLE 8. Yield, lodging, plant height, plant population, stem diameter, and percent fiber type in the National Kenaf Variety Test, Plains, GA 1996.

ENTRY	VARIETY	DM YLD TN/AC	LDG %	HT IN	PLANT/AC 1000	STEM DIAM (mm)	BARK %	CORE %
95	C118-92	5.8	12.8	129.8	91.5	20.2	25.5	74.5
4	SF 192	5.8	12.1	133.0	89.3	19.1	25.5	74.5
100	C304-93	5.7	14.3	132.8	90.8	19.0	23.5	76.5
94	C305-90	5.7	9.2	138.8	95.1	19.9	22.0	78.0
2	EV 41	5.5	10.8	135.0	85.7	19.2	26.4	73.6
96	C122-92	5.4	10.3	130.8	91.5	18.3	28.7	71.3
5	SF 459	5.3	11.2	130.8	90.8	18.5	27.2	72.8
7	TA 2	5.2	12.0	133.5	90.8	19.7	25.6	74.4
97	C430-92	5.1	14.6	133.3	89.3	19.6	27.0	73.0
3	EV 71	4.9	9.2	132.8	87.1	18.3	27.2	72.8
98	C531-92	4.9	9.1	133.5	88.6	18.9	25.0	75.0
8	7 N	4.7	4.9	131.5	88.6	19.5	25.4	74.6
99	C615-92	4.6	11.2	130.3	90.0	18.0	25.3	74.7
AVERAGE		5.3	10.9	132.7	89.9	19.1	25.7	74.3

TABLE 9. Plant height at various dates for entries in the National Kenaf Variety Test, Plains, GA 1996

		DATE									
ENTRY	VARIETY	7/12	7/17	7/22	7/26	8/1	8/6	8/22	8/30	9/13	10/2
		Days After Planting									
		60	65	70	74	80	85	101	109	122	141
		Height in Inches									
95	C118-92	64.0	69.0	77.0	77.0	86.0	90.5	103.0	110.5	125.5	130.0
4	SF 192	63.0	67.5	75.5	75.5	85.0	89.5	101.0	109.0	126.0	140.0
100	C304-93	64.0	68.5	74.5	74.5	84.0	88.5	101.0	112.0	127.0	130.0
94	C305-90	66.0	71.0	76.0	76.0	87.0	90.5	103.0	111.5	129.3	130.0
2	EV 41	61.0	66.5	73.5	73.5	85.5	92.3	102.5	112.0	127.5	132.0
96	C122-92	64.0	67.5	75.0	75.0	85.5	88.5	103.0	112.0	129.0	144.0
5	SF 459	60.0	66.0	72.0	72.0	85.0	88.0	98.5	107.5	123.0	124.0
7	TA 2	65.0	67.0	75.0	75.0	82.0	88.0	98.0	106.5	120.8	130.0
97	C430-92	66.0	69.5	74.5	74.5	85.0	89.0	100.5	114.5	128.5	144.0
3	EV 71	62.5	67.0	74.5	74.5	83.0	88.5	98.5	106.5	122.5	120.0
98	C531-92	64.5	69.5	76.5	76.5	87.0	90.5	104.0	112.0	126.0	130.0
8	7 N	61.5	65.0	69.5	69.5	80.0	85.0	94.5	102.5	119.5	120.0
99	C615-92	66.0	68.5	74.0	74.0	84.0	88.0	100.0	108.5	121.5	124.0
AVERAGE		63.7	67.9	74.4	74.4	84.5	89.0	100.6	109.6	125.1	130.6

TABLE 10. Leaf shape, date of first flower, and flower stage in the national Kenaf Variety Test, Plains, GA 1996

ENTRY	VARIETY	LEAF SHAPE	FIRST FLOWER	10/2 FLOWER STAGE	10/16 FLOWER STAGE
95	C118-92	Okra	8/20	Flower	Flower
4	SF 192	Okra	10/10	Just Bud	Flower
100	C304-93	Okra	9/20	Flower	Flower
94	C305-90	Okra	10/10	Bud	Flower
2	EV 41	Entire	10/10	Just Bud	Flower
96	C122-92	Okra	10/10	Bud	Flower
5	SF 459	Okra	10/2	Bud	Flower
7	TA 2	Okra	10/10	Bud	Flower
97	C430-92	Okra	9/20-	Flower	Flower
3	EV 71	Okra	10/10	Bud	Flower
98	C531-92	Okra	8/20	Flower	Flower
8	7 N	Entire	10/10	Bud	Flower
99	C615-92	Okra	9/20	Flower	Flower

TABLE 11. Yield, percent lodging, plant population, leaf shapes, and date of first flower in the advanced kenaf evaluation trial, Plains, GA 1996

ENTRY	VARIETY	FLD WT TON	LDG% AVG	POP 1000/AC	LEAF SHAPE[1]	10/16 FLOWER STAGE
2	EV41	4.3	3.6	120.5	e	f
3	EV71	4.2	3.9	106.0	o	f
5	SF459	4.4	5.4	91.5	o	f
7	TA2	4.6	8.8	90.0	o	f
34	270106(G14)	3.8	4.1	87.1	e	f
38	270111(G32)	4.8	2.2	129.2	o	f
42	270122(G58)	4.2	8.5	77.0	o	f
49	323091(H.C.583)	5.7	13.9	52.3	e	f
54	329185 (MASTER FIBER)	5.0	3.0	97.3	o	f
55	329186(PUNA)	4.7	3.4	97.3	o	f
60	341990	5.2	3.6	79.9	e	b
72	344098(HC01)	4.3	4.2	108.9	o	f
AVERAGE		4.6	5.4	94.7		

[1]e=entire; o=okra

TABLE 12. Plant height on various dates of entries in the advanced kenaf evaluation trial, Plains, GA 1006

ENTRY	VARIETY	DATE									
		7/12	7/17	7/22	7/26	8/1	8/6	8/22	8/30	9/13	10/2
		Days after Planting									
		60	65	70	74	80	85	101	109	122	141
		Plant Height in Inches									
2	EV41	53.0	61	67	67	74	78	89	98	109	119
3	EV71	54.0	58	64	64	72	77	83	91	104	121
5	SF459	50.0	55	63	63	72	75	84	90	110	122
7	TA2	57.0	65	73	73	81	84	94	101	112	127
34	270106(G14)	55.0	62	66	66	74	81	90	99	114	131
38	270111(G32)	54.0	63	71	71	80	86	90	98	119	127
42	270122(G58)	54.0	60	67	67	75	77	83	94	110	118
49	323091(H.C.583)	61.0	64	75	75	77	80	92	99	110	128
54	329185(MASTER FIBER)	60.0	64	70	70	77	82	93	101	117	126
55	329186(PUNA)	54.0	59	68	68	75	81	87	82	114	125
60	341990	57.0	65	74	74	82	87	92	105	118	138
72	344098(HC01)	52.0	57	66	66	74	78	88	94	119	130
AVERAGE		55.1	61.1	68.7	68.7	76.1	80.5	88.8	96.0	113.0	126

TABLE 13. Yield, plant population, plant height, percent lodging, leaf shape, and flowering characteristics for entries in the Roselle Screening Test, Plains, GA 1996

ENTRY	DESIGNATION	YIELD TON/AC	PLANT/AC 1000	PLANT HT in.	LODGE %	LEAF SHAPE	10/16 FLOWER
2	EV 41	7.3	98.7	127	0.0	e-o	flower
5	SF459	4.6	90.0	116	3.1	o	f
7	TA 2	7.1	145.2	134	0.0	o	f
88	256038 (A59-56)	3.3	66.8	119	0.0	e-o	veg
89	256039 (A59-56)	4.9	55.2	124	4.2	o	v
90	265319 (A60-234)	6.0	40.7	120	0.0	o	v
91	468409	5.3	40.7	115	0.0	g	v
92	468412	3.5	31.9	114	10.0	g	v
93	468413	5.4	87.1	120	3.6	g	v
101	295592	1.3	5.8	91	50.0	o	v
102	468411 (3208)	5.9	55.2	97	0.0	e	v
103	500696	2.7	72.6	82	0.0	o	cut/out
104	500698	2.8	31.9	79	8.3	o	f
105	500699	3.8	63.9	73	0.0	o	b
106	500701	3.8	61.0	82	0.0	o	f
107	500705	7.6	52.3	94	0.0	o	f
108	500706	6.6	31.9	99	0.0	o	b
109	500710	4.3	40.7	90	0.0	o	f
110	500713	5.4	75.5	92	3.6	o	f
111	500715	2.3	72.6	78	0.0	o	f
112	500716	3.6	87.1	82	0.0	o	f
113	500718	4.2	78.4	80	5.6	o	f
114	500719	4.8	55.2	89	0.0	o	f
115	500720	3.1	49.4	90	0.0	o	f
116	500721	4.5	49.4	101	4.2	o	f
117	500723(01)	3.7	49.4	82	7.7	o	f
118	500723(02)	2.9	37.8	84	2.8	o	f
119	500724	2.9	72.6	84	3.8	o	f
120	500726	4.6	92.9	92	7.9	o	b
121	500727	2.8	107.4	66	0.0	o	b
122	500729	3.9	75.5	73	0.0	o	f
123	500731	3.6	69.7	68	0.0	o	f
124	500732	5.7	49.4	75	0.0	o	f
125	500734(9583)(1)	3.1	78.4	75	0.0	o	f
126	500734(2)	4.1	63.9	75	0.0	o	f
127	500735	3.4	52.3	80	0.0	o	f
128	500736	3.2	75.5	77	0.0	o	f
129	500737	3.0	58.1	89	0.0	o	f
130	500739(1)	3.4	98.7	78	3.8	o	b
131	500739(2)	2.8	75.5	71	0.0	o	b
132	500740	4.8	63.9	91	4.5	o	b
133	500741	4.4	78.4	78	3.6	o	b
134	500742	5.5	78.4	85	3.3	o	b
135	500743	3.8	52.3	102	0.0	o	b
136	500746	2.3	61.0	73	3.8	o	b
137	500747	2.9	78.4	88	0.0	o	b
138	500748	2.8	78.4	75	0.0	o	b
139	500751	6.4	63.9	87	0.0	o	b
140	500752	6.3	61.0	85	0.7	o	b
141	591551	4.6	78.4	73	0.0	o	f
AVERAGES		4.2	65.8	90	2.7		

o=okra; e=entire; g=ginkgo
f=flowering; v=vegetative; cut/out=finished flowering; b=buds visible

TABLE 14 Plant height at various dates for entries in the Roselle Screening Test, Plains, GA 1996

ENTRY	DESIGNATION	PLANT GROWTH AS REPRESENED BY HEIGHT							
		7/22	7/26	8/1	8/6	8/22	8/30	9/13	10/2
		Days after Planting							
		69	73	79	84	100	108	121	140
		Height in Inches							
2	EV 41	62	62	68	72	82	88	98	126
5	SF459	64	64	70	74	84	94	106	116
7	TA 2	68	68	72	76	88	107	121	130
88	256038 (A59-56)	64	64	68	76	83	96	110	124
89	256039 (A59-56)	62	62	70	76	84	104	110	124
90	265319 (A60-234)	56	56	60	72	88	94	108	122
91	468409	56	56	74	73	81	94	111	124
92	468412	52	52	62	64	64	96	105	126
93	468413	64	64	72	76	83	96	120	132
101	295592	26	26	34	42	46	78	72	101
102	468411 (3208)	48	48	54	62	75	78	96	106
103	500696	38	38	42	45	57	68	82	89
104	500698	34	34	36	42	52	58	79	92
105	500699	34	34	38	44	48	56	66	74
106	500701	38	38	42	46	53	58	72	88
107	500705	42	42	50	56	60	67	82	99
108	500706	36	36	42	46	61	64	72	92
109	500710	38	38	44	50	56	64	74	86
110	500713	42	42	46	52	61	69	84	92
111	500715	32	32	38	42	48	56	68	78
112	500716	32	32	38	48	52	60	73	82
113	500718	36	36	42	48	54	62	76	82
114	500719	42	42	46	52	63	68	88	96
115	500720	38	38	44	50	56	56	68	82
116	500721	48	48	54	59	68	77	92	100
117	500723(01)	44	44	48	56	59	69	81	96
118	500723(02)	38	38	42	48	56	62	78	86
119	500724	38	38	44	48	56	62	74	84
120	500726	42	42	44	48	56	64	74	86
121	500727	30	30	38	40	46	50	58	70
122	500729	38	38	44	46	50	56	70	78
123	500731	28	28	34	36	42	48	58	68
124	500732	30	30	36	38	50	54	64	72
125	500734(9583)(1)	36	36	42	46	52	58	66	74
126	500734(2)	32	32	42	46	52	58	72	78
127	500735	34	34	42	46	54	59	74	82
128	500736	34	34	42	46	52	60	70	82
129	500737	42	42	50	56	62	69	79	93
130	500739(1)	34	34	42	48	56	64	72	84
131	500739(2)	26	26	36	42	47	53	66	74
132	500740	38	38	46	50	58	64	80	86
133	500741	32	32	38	42	46	51	62	68
134	500742	42	42	48	54	62	68	80	92
135	500743	42	42	44	50	62	70	84	92
136	500746	30	30	36	46	50	56	68	75
137	500747	40	40	46	52	62	68	80	90
138	500748	38	38	44	46	52	60	68	76
139	500751	38	38	46	48	59	66	78	88
140	500752	38	38	46	48	58	66	72	83
141	591551	34	34	46	50	56	62	70	78
AVERAGES		41	41	47.44	52.38	60.04	68.5	80.62	91.96