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PERFORMANCE OF VEGETABLE VARIETIES IN TENNESSEE

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Performance

Of

Vegetable Varieties In Tennessee

James F. Brown, Homer D. Swingle, Charles A. Mullins and David L. Coffey*

INTRODUCTION

Each year many new vegetable varieties become available to growers from experiment stations and commercial seed firms throughout the United States and foreign countries. Variety tests are conducted at three University of Tennessee Experiment Stations to determine performance of new vegetable varieties under Tennessee conditions. These locations are the Main Station (KNOX) at Knoxville, the Plateau Station (PES) at Crossville, and the West Tennessee Station (WTES) at Jackson. Performance data from these stations provide information on the adaptability of varieties grown under the many different soil and climatic conditions found across the state.

Most varieties tested are available to growers, but some unnamed lines are included. The unnamed lines generally are not available to the public, but may become named varieties if they perform well.

Some older varieties are included as check varieties in each test. Since the number of entries in each test must be limited, some important older varieties and some newly introduced varieties may not be included in this report. The failure of any variety to appear in this report does not imply inferiority.

Where statistical comparisons were made, the least significant difference (L.S.D.) values at the 5% level are shown at the bottom of the table. The means for yield or any other variable of any two varieties being compared must differ by at least this amount in order for the varieties to be considered different in their performance.

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LIMA BEAN

Lima beans are grown for home use and fresh markets throughout the state and for commercial freezing in West Tennessee. All of the lima beans grown for commercial freezing are small-seeded bush types. Large-seeded types and climbing, or pole varieties are grown mostly in home gardens and for limited fresh market sales.

Jackson Wonder is the main variety grown for processing in Tennessee. This variety produces medium-sized, mottled, buff-colored seeds with purplish black markings. It is often referred to in the industry as a speckled variety. Speckled-seeded varieties are preferred in the South over the green-seeded varieties. However, several green-seeded varieties have been grown and processed successfully in Tennessee in recent years. Some of these small-seeded varieties are Thorogreen, Bridgeton, Kingston, and Mendoza Bush.

This report summarizes data from lima bean variety tests conducted at WTES in 1975 and 1976. All varieties tested were small-seeded bush types. Since lima bean variety tests have not been conducted on a regular basis, several standard varieties were included, as well as newer named varieties and unnamed breeding lines.

Procedure

Seeds of both speckled- and green-seeded lima varieties were planted in early May each year with tractor-mounted Planet Jr. seeders. Each plot consisted of one row 25 feet in length. Rows were spaced 38 inches apart and plots were replicated four (4) times. After emergence, plants were thinned to 3-4 inches in the row. Before planting, 500 pounds per acre (lb/A) of 12-24-24 fertilizer was applied broadcast and 0.5 lb/A trifluralin was incorporated for weed control.

A pest control program was initiated about 3 weeks after planting. Recommended rates of carbaryl (Sevin) and maneb (Manzate) were applied at 7-10 day intervals from this time until harvest for insect control and prevention of stem anthracnose (**Colleototrichum truncatum**).

All plots were hand harvested when 10-15% of the pods were dry.

Results

Because of the success of Jackson Wonder and due to limited interest in speckled varieties outside of the South, breeders have released very few speckled lima bean varieties. In these trials three unnamed speckled lines were evaluated in the 1975 test (Table 1). One of these, 7014-4-1, yielded well, but maturity was very late and

Table 1. Horticultural characteristics and yields of lima bean varieties at WTES, 1975-76

Variety	Plant type[1]	Days to maturity[2]	Seed color[3]	Yield of shelled beans		
				1975	1976	Avg.
				-------Cwt/A -------		
In trial 2 years						
Bridgeton	I	78	G	22.3	30.2	26.3
Kingston	C	76	G	22.8	24.8	23.8
Improved Kingston	C	73	G	31.6	29.7	30.7
Mendoza Bush	C	72	G	26.5	18.6	22.6
Thaxter	I	76	G	27.4	24.2	25.8
Thorogreen	C	72	G	27.2	24.5	25.9
Greener Baby Lima S-1	C	72	G	24.0	23.6	23.8
Greener Baby Lima S-4	C	75	G	22.3	26.5	24.4
Dixie Butterpea	I	78	G	23.4	28.5	26.0
B2C	I	77	G	20.4	26.5	23.5
7012-4-18-BB1	I	80	G	17.3	25.0	21.2
Jackson Wonder	I	75	S	30.6	26.8	28.7
In trial 1 year						
7014-4-1	V	95	S	27.7	–	–
7014-7-1	V	78	S	19.1	–	–
7014-7-2	V	95	S	22.7	–	–
S1475 DG	C	76	G	–	28.7	–
Celite	C	77	G	–	23.5	–
CREB-2BC	I	79	G	–	23.0	–
S-9-75-DG-M55	C	77	G	–	18.3	–
S-4-75-D-G	C	78	G	–	22.7	–
7012-4-18-BB	I	76	G	20.0	–	–
L.S.D. @ .05	–	–	–	5.8	5.1	–

[1]Plant Type Code: C = Compact; I = Intermediate; V = Vigorous.

[2]Days to Maturity Code: Average number of days from planting to 10% of pods reached dry stage of maturity.

[3]Seed Color Code: S = Speckled; G = Green.

not uniform. Because of excessive vine vigor, lack of uniformity in maturity, and some loss of color after blanching, 7014-4-1 does not have potential for commercial freezing. However, most of these characteristics would be desirable for a home garden bean. Characteristics of the other speckled lines tested were similar, but yields were lower.

Most of the green-seeded varieties evaluated in these trials yielded well and possessed characteristics desired in processing beans. Improved Kingston, an early-maturing variety, produced the highest yield of varieties tested 2 years. Seeds of Improved Kingston were very plump and tended to be light green or cream colored. Plants were compact; pods were well filled and matured uniformly. Other

early-maturing varieties that yielded well were Mendoza Bush, Thorogreen, and Greener Baby Lima S-1. Plants of all these varieties were compact with Mendoza being the smallest. Pod set and maturity of these varieties were quite concentrated.

Greener Baby Lima S-4 and B2C produced satisfactory yields, but plants were slightly more vigorous and later in maturity than varieties mentioned previously. Seeds of these lines and the early maturing varieties were variable in size and were typically green colored.

Plants of Dixie Butterpea, a variety widely used in home gardens and to some extent for commercial freezing, were intermediate in vigor. Pod set was fairly concentrated. Seeds were medium size, very plump, and light colored. Dixie Butterpea yielded as well as other standard varieties in the tests.

Summary

Twenty-one small-seeded lima bean varieties were evaluated during a 2-year period with emphasis on yield and characters desirable for mechanical harvesting and commercial freezing.

Most varieties yielded well and had concentration of pod maturity and plant type suitable for machine harvest. A few varieties matured pods unevenly on large vigorous plants; these varieties would be adapted only in home gardens.

In choosing a lima bean variety, many characteristics must be considered. These include plant type, pod characters, season and uniformity of maturity, market demands, and yield.

SNAP BEANS

Although plant breeders release several new snap bean lines for testing each year, many never become commercial varieties. Variety testing is necessary to determine the relative value of each line.

The snap bean is an important fresh market and processing vegetable crop in Tennessee. Snap beans contribute about $7.2 million from about 18,000 acres. Variety trials have been conducted for several years at PES. A report on varieties tested from 1972 through 1974 was made in University of Tennessee Agricultural Experiment Station Bulletin 543, (1975). Varieties tested in 1975 and 1976 are discussed in this report.

Procedure

A total of 62 varieties were included in the 1975 and 1976

trials. Eighteen were tested both years and will be included in this report. Promising new lines tested in 1976 will be included in future trials.

Two crops were grown each year. Plantings were made the third and fourth week of May and harvested the second and third week of July. The standard varieties—Bush Blue Lake (BBL) 274, Early Gallatin, and Slenderwhite—were used as checks. Fertilization was 500 lb/A of 8-12-6 banded in the row. Plots consisted of two rows 38 inches apart, and 30 feet long. The experimental design was a randomized complete block with four replications. Planters were calibrated to produce a stand of 6 to 8 plants per foot of row. Other production practices were those recommended by the University of Tennessee and common to the area. Harvest was with a Chisholm-Ryder two-row harvester. Harvesting was done when 25% of the pods reached a No. 5 sieve size.

Results

In recent years, plant breeders have placed much emphasis on developing Bush Blue Lake (BBL) varieties. The BBL type varieties have outstanding pod qualities which are usually desirable for processing. Their production on the Cumberland Plateau has been a problem due to excessive plant growth, lodging, and trash in the harvested product.

All of the new BBL lines except Blue Crop tested in 1975 and 1976 had higher mean yields than the check variety, BBL 274 (Table 2). Line Exp. 113-70 had outstanding yields. Greenpak, BBL GV 109, Lake Largo, and BBL Supreme outyielded BBL 274. Line BBL 47 had yields similar to BBL 274.

Plant type and pod characteristics of the BBL lines varied considerably (Table 3). Greenpak, BBL GV 109, Lake Largo, BBL Supreme, and BBL 47 had little plant lodging. Pods of Exp. 113-70 were lighter in color than pods of the other BBL varieties.

The non-BBL type varieties tested were primarily large-podded. All varieties, except Code 112, produced higher yields than the checks, Early Gallatin, and Slenderwhite (Table 2). In terms of yield, Torrent, XI 68-2988, E 4207, Raider, and White Seeded Provider appeared to be the most promising. Raider, E 4207, and White Seeded Provider are all white seeded selections of Provider, a dark seeded variety. These varieties show the most promise for fresh market.

Table 2. Yields of snap bean varieties at PES, 1975-76

Variety	Yields				
	1975		1976		
	Early	Late	Early	Late	Mean
	Bushels per acre				
BBL Type					
Exp. 113-70	211	118	253	247	207
Greenpak	150	135	172	230	172
BBL GV 109	157	128	221	169	169
Lake Largo	128	147	207	138	155
BBL Supreme	144	145	155	152	149
BBL 47	134	118	126	161	135
BBL 274 (ck.)	144	116	138	132	132
Blue Crop	122	94	120	138	118
Non BBL Type					
Torrent	169	142	212	149	168
XI 68-2988	196	123	166	144	157
E 4207	158	152	172	144	156
Raider	152	94	198	152	149
GP 71-135	141	123	172	138	144
Verde	132	116	175	138	140
White Seeded Provider	132	132	126	149	135
Early Gallatin (ck.)	111	111	115	138	119
Slenderwhite (ck.)	140	87	109	138	118
Code 112	126	92	103	141	116
L.S.D. @ .05	33	44	28	21	–

Summary

Most of the new lines tested had higher yields than the check varieties. Most of these have potential to become useful varieties. The value of each will depend on such factors as seed quality, performance under grower conditions, performance in transport, and processing or fresh market characteristics.

Table 3. Horticultural characteristics of snap bean varieties at PES, 1975-76

Variety	Pod Description						
	Green-ness	Curva-ture	Rough-ness	Length (in.)	Touches soil	Concen-tration	Plant lodging
BBL Type							
Exp. 113-70	Medium	Very	Slight	5.3	Often	Sat.	Moder.
Greenpak	Dark	Very	Slight	5.6	Occas.	Sat.	Slight
BBL GV 109	Dark	Moderate	Slight	5.5	Occas.	Sat.	Slight
Lake Largo	Dark	Very	Slight	6.4	Occas.	Sat.	Slight
BBL Supreme	Dark	Very	Very	6.0	Occas.	Sat.	Slight
BBL 47	Dark	Moderate	Moderate	5.8	Occas.	Sat.	Slight
BBL 274 (ck)	Dark	Very	Very	5.9	Often	Sat.	Severe
Blue Crop	Dark	Moderate	Slight	6.0	Often	Sat.	Slight
Non BBL Type							
Torrent	Dark	Slight	Slight	6.2	Occas.	Sat.	Slight
XI 68-2988	Dark	Slight	Slight	5.3	Occas.	Sat.	Slight
E 4207	Dark	Slight	None	5.8	Seldom	Sat.	None
Raider	Medium	Moderate	Very	5.1	Occas.	Sat.	Slight
GP 71-135	Dark	Slight	Slight	4.8	Occas.	Sat.	Slight
Verde	Dark	Moderate	Slight	5.1	Seldom	Sat.	Slight
White Seeded Provider	Dark	Slight	None	5.6	Occas.	Sat.	Slight
Early Gallatin (ck)	Dark	Very	Slight	5.2	Seldom	Sat.	Slight
Slenderwhite (ck)	Medium	Slight	None	5.3	Occas.	Conc.	Slight
Code 112	Dark	Slight	Slight	5.4	Occas.	Sat.	Free

SWEET CORN

Sweet corn, although not a major vegetable crop in Tennessee, is grown by most gardeners and by many producers for local markets in the State. Hybrid varieties are most often used today because of their vigor, uniformity, quality, and high yields. These varieties result from the crossing of two inbred lines which are the property of individual seed companies. This encourages a multitude of varieties being released and presents a problem of selecting a manageable number for evaluation.

Tests were conducted in 1975 and 1976 to evaluate selected sweet corn varieties at KNOX, PES, and WTES. Since early-maturing varieties are usually lower in quality and more subject to ear worm damage and smut infestation, they were omitted. Only medium- to late-maturing (70-90 days) varieties were included. Data from tests at the three UT Experiment Stations at locations noted above are reported here.

Procedure

Varieties shown in Table 4 were planted in a randomized com-

Table 4. Plant characteristics of sweet corn varieties at three University of Tennessee Experiment Stations, KNOX .PES, and WTES, 1975-76

Variety	Plant characteristics[1]				
	Vigor[2]	Tillering[2]	Ear height	Days to maturity	
				1975	1976
			In.		
Silver Queen	4.1	3.1	31.7	81-88	85-95
White Delight	4.0	3.0	30.7	83-88	86-95
Comet	3.0	3.8	27.0	78-84	81-92
White Cross Bantam	4.2	3.1	31.0	78-88	83-96
Bi-Queen	4.0	2.9	31.5	81-84	83-93
Aristogold	4.1	3.5	29.9	81-84	83-93
Merit	3.7	3.4	29.9	78-84	81-91
Golden Queen	4.0	3.7	28.6	81-88	85-95
Bonanza	3.4	4.6	27.0	78-80	79-93
Valley Market	3 0	4.1	23.0	78-81	80-93
Table Joy	3.0	3.0	25.5	78-84	81-93
Sweet Tennessee	2.8	3.1	31.0	83-84	84-93

[1]All data are means for the three locations.

[2]Rating scale 1-5: 5 = most vigor, less tillering;
1 = least vigor, most tillering.

plete block experiment with four replications at each location. Planting dates were April 16 and 27 at WTES, April 24 and 21 at KNOX, and May 5 and April 29 at PES for 1975 and 1976, respectively Seeds were planted with hand planters in three-row plots, 30 feet long with plants spaced 12 inches apart in 42-inch rows. The center row of each plot was used for determining yields.

Recommended fertilization, insect, disease, and weed control practices of the University of Tennessee were followed. Applications of complete fertilizers were made broadcast before planting at all locations based on soil test analyses. Plots at all locations received 30-60 lb of nitrogen as a topdressing when corn was 12 inches tall.

Recommended rates of methomyl (Lannate) and/or carbaryl (Sevin) were applied at 3-4 day intervals during silking to control corn earworms. The number of applications per season varied from three at WTES to as many as six at PES.

Harvesting was done when ears reached the milk stage of maturity and was repeated at 3-day intervals until all ears were harvested.

Marketable yield data (ear number and weight) were obtained at each harvest and are reported in dozens and in hundredweight per acre (cwt/A). Length and diameter of ears and earworm damage were also obtained for each variety.

Subjective ratings were made on plant vigor, tillering, appearance of unhusked and husked ears, sweetness, and tenderness of the seed coat of raw ears. A rating scale of 1-5 was used, 5 being the most desirable rating for the various characteristics.

Results

Plant characteristics are shown in Table 4. With exception of days to maturity, these data are means for all three locations for both years of the tests. Vigor ratings for Sweet Tennessee were the lowest, followed closely by Comet, Valley Market, and Table Joy. The most vigorous white varieties were Silver Queen and White Cross Bantam, while Golden Queen and Aristogold were the most vigorous yellow lines. In general, the more vigorous varieties had less tillering. The ear height ranged from 23-32 inches; Silver Queen was the highest with 31.7 inches.

Temperature has a marked effect on the growth of sweet corn. In general, the higher the temperature between 40° and 90°F, the greater is the rate of growth and the shorter is the time necessary for the plant to attain a particular stage of maturity. This is quite apparent from the differences in days to maturity obtained between 1975 and 1976 (Table 4). The temperatures, particularly in May of 1976, were considerably lower than in 1975 resulting in a longer maturity period for all varieties. Days to maturity ranged from 78-88 in 1975 and from 79-91 in 1976 and this, of course, varied with location. All varieties had a slightly longer maturity period at PES where growing temperatures were slightly lower. Also, as would be expected, the taller, more vigorous varieties had a slightly longer maturity period. The length of maturity period for a given variety also varied. Most varieties fell in the range of 7-10 days or 10-14 days for 1975 and 1976, respectively. This would be quite favorable for use in home gardens. Since temperatures for the 1975 growing season were more nearly the normal mean, values from 1975 tests would probably be a more accurate index of days to maturity than those from 1976 tests.

Susceptibility to earworm damage is an important characteristic of a sweet corn variety, especially in home garden situations where a rigid spray program is not followed. The extent and frequency of earworm damage of the varieties are shown in Table 5. On all varieties except Bi-Queen, earworm damage was recorded at one of the three test locations. In practically all cases the overall damage was greater at KNOX than at either PES or WTES. Whether this was due to differences in pesticide programs, environmental conditions, or insect levels is unknown.

Table 5. Ear characteristics of sweet corn varieties at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Color	Ear characteristics[1]				
		Worm damage				
		Extent[2]	Frequency[3]	Length	Diameter	Weight
		- Inches from tip -		------ Inches ------		Lb.
Silver Queen	white	-1	1	7.9	1.8	.68
White Delight	white	+1	1	8.2	1.5	.58
Comet	white	-1	1	8.2	1.8	.63
White Cross Bantam	white	+1	1	7.4	1.9	.64
Bi-Queen	bicolor	-1	2	7.8	1.7	.65
Aristogold	yellow	+1	1	8.1	1.7	.66
Merit	yellow	+1	1	7.7	1.9	.71
Golden Queen	yellow	+1	1	7.8	1.7	.68
Bonanza	yellow	+1	1	8.6	1.8	.74
Valley Market	yellow	-1	1	8.7	1.9	.76
Table Joy	yellow	+1	1	7.8	1.8	.68
Sweet Tennessee	yellow	+1	1	7.5	1.8	.66

[1]Data are means for the three locations.

[2]Most severe earworm damage recorded at any location: + or - = more or less than 1 inch of ear tip damaged.

[3]Number of locations where earworm damage recorded.

Ear length among all varieties ranged from 7.4 to 8.7 inches (Table 5). The whites (White Delight and Comet) both produced ears greater than 8 inches in length. Of the yellows, Aristogold, Bonanza, and Valley Market had ears greater than 8 inches in length. Although the ears of White Delight were quite long, they were slender and weighed the least of all varieties. Ears from Merit, Bonanza, and Valley Market all weighed greater than .70 lb each. Ears from all other varieties except White Delight were in the range of .60-.70 lb. Large ear size is a desirable characteristic in many southern markets.

Organoleptic tests for sweetness were made by biting into the raw ears. Silver Queen was rated above all other varieties for sweetness (Table 6). It was followed not too closely by White Delight, another white variety, and Golden Queen and Bonanza, two yellow varieties. Bi-Queen was almost identical in sweetness to Golden Queen and Bonanza. Aristogold, Table Joy, and Sweet Tennessee were ranked lowest on sweetness and all had high levels of starch.

The same type of test ratings as above were made for seed coat tenderness. Silver Queen and Bonanza were most desirable in this test with identical ratings of 3.8. Sweetness and tenderness ratings tended to follow each other on most varieties. This is as expected because sweetness and tenderness are associated with free sugars,

Table 6. Certain quality characteristics of sweet corn varieties at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Quality characteristics[1]			
	Appearance[2]		Sweetness[2]	Seed-coat tenderness[2]
	Unhusked	Husked		
Silver Queen	4.2	4.4	4.5	3.8
White Delight	3.7	3.9	3.5	2.8
Comet	3.7	3.6	2.6	3.3
White Cross Bantam	3.6	4.1	2.9	2.6
Bi-Queen	4.2	4.3	3.7	3.5
Aristogold	4.1	4.0	2.6	2.8
Merit	4.4	4.7	3.1	2.9
Golden Queen	4.1	4.4	3.8	3.2
Bonanza	4.3	4.0	3.6	3.8
Valley Market	3.5	3.4	2.9	2.7
Table Joy	4.0	3.1	2.3	3.0
Sweet Tennessee	3.8	3.8	2.2	2.4

[1]All data are means for three locations.

[2]Rating scale 1-5: 5 = most desirable.

whereas opposite characteristics are associated with starch. All varieties with sweetness and tenderness ratings of 3 or above are quite acceptable.

The appearance of the husked and unhusked ears varied considerably among varieties and did not necessarily correspond with sweetness-tenderness ratings. For example, Merit, White Cross Bantam, and Aristogold had very attractive ears but rather low sweetness-tenderness ratings. Silver Queen had an attractive husked appearance but rated slightly lower than the yellow varieties (Merit and Bonanza) on the unhusked appearance. The tapering shape of the unhusked ear and the dull cast of the silks might have influenced the ratings for Silver Queen.

Yields of marketable ears from the three test locations are given in Table 7. Yields varied among varieties and locations. The overall mean yield at WTES was considerably greater than that of either KNOX or PES which differed little from each other. Comet, Merit, and Valley Market yielded about equally well at all locations. White Delight produced low yields at KNOX and PES, but much higher at WTES. Aristogold and Bonanza had extremely high yields at WTES; this tended to raise the means for these two varieties. Yields from 6 of the 12 varieties tested were greater than the U.S. average of 78 cwt/A for sweet corn for fresh market in 1973.

Table 7. Marketable yield of sweet corn varieties at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Marketable yield				
	KNOX	PES	WTES	Average	
	Dozen/acre			Doz/	Cwt/A
Silver Queen	868	936	1073	959	78.2
White Delight	750	657	1095	835	58.1
Comet	927	933	1138	999	74.9
White Cross Bantam	908	1053*	935*	951	66.8
Bi-Queen	748	757	1158	888	68.9
Aristogold	916	960	1383	1086	88.1
Merit	1073	997	1193	1088	91.6
Golden Queen	966	903	1080	983	89.3
Bonanza	1250	818	1410	1159	91.3
Valley Market	994	1161*	1195*	1086	91.7
Table Joy	886	741	860	829	67.9
Sweet Tennessee	873	632	900*	802	62.8
Overall mean	930	879	1118		

*In tests 1 year only. All other data are means for 1975-76.

Summary

Several varieties of sweet corn appeared to be adapted to the varied growing conditions in Tennessee. Selection is often made on the basis of color preference, yield, sweetness, tenderness, and plant vigor. Considering these factors, Silver Queen appeared to be the outstanding white variety. The high sugar content, tender seed coat, and its holding of these qualities for several days make it desirable for both home garden and local market.

White Delight was vigorous with few tillers. Ears were long but slender, and kernels were tender and sweet.

Bi-Queen with white and yellow kernels performed well at all locations. It was rated slightly lower than Silver Queen but equal to the better yellow varieties in several categories.

Several yellow varieties rated high in vigor, ear appearance, and yield. Bonanza and Golden Queen were judged the best of the yellow varieties when sweetness and tenderness ratings were combined.

CUCUMBERS FOR PICKLING

Although cucumbers for pickling have not been widely grown in Tennessee, recent interest has been expressed in their commercial production on the Cumberland Plateau. Some commercial production began in 1976. As no data were available on variety performance in

the area, a variety trial was initiated at PES in 1975. Results from trials conducted in 1975 and 1976 are summarized in this report.

Procedure

Thirteen varieties were evaluated in the 2 years of testing. Varieties were hand-seeded the last week of May each year. Seeds were planted every 4 inches in rows 3 feet apart in 1975 and in rows 18 inches apart in 1976. The 18-inch rows are similar to commonly used spacings for once-over machine harvest.

Fertilization was 500 lb of 8-12-6 per acre banded at planting each year. Herbicides used were bensulide (Prefar) and DCPA (Dacthal) in 1975 and 1976, respectively. Insect and disease control was provided by use of chemicals recommended by the University of Tennessee.

Harvest was once-over by hand. Records of fruit number and weight were taken on each plot. Fruit size for each grade is shown in Table 8. Attempts were made to harvest at about 20% grade 4. Ratings of fruit firmness, color, and seed development were made and length-to-diameter ratio was calculated on fruit of grade 3 size.

Table 8. Standard for grades of pickling cucumbers used in variety trials at PES, 1975-76

Grade[1]	Fruit diameter
	Inches
No. 1	1 1/16 and less
No. 2	1 1/12 to 1 1/2
No. 3	1 1/2 to 2
No. 4	2 to 2 1/4

[1]These are a processor's standards for determining the quality of cucumbers for pickling and vary somewhat from U.S. Grade Standards.

Results

Greenpak produced the highest mean yield for the 2 years (Table 9). Earlipak, Tamu Triple Cross, Premier, and Green Star also yielded well. Chipper and Sumter, which are the only open-pollinated varieties tested, yielded well compared to the hybrids in 1975. These two varieties performed poorly in 1976. This difference, along with the mean difference in yield of about a ton per acre between years, was attributed to weather differences. The 1976 season was much cooler than the 1975 season. The cooler weather seemed to create a greater span in blooming which resulted in fewer mature cucumbers for harvest at one time. Percentage grade distribution by weight is

Table 9. Total yield of pickling cucumbers at PES, 1975-76

Variety	Yields		
	1975	1976	Mean
	Tons per acre		
Greenpak	4.4	5.7	5.0
Earlipak	6.4	2.4	4.4
Premier	3.4	4.1	3.8
Tamu Triple Cross	3.7	3.9	3.8
Green Star	3.4	3.6	3.5
Explorer	4.4	2.1	3.2
Chipper	4.8	1.2	3.0
Sumter	3.7	1.3	2.5
Green Spear 14	1.9	2.9	2.4
Carolina	2.4	2.3	2.4
Pioneer	3.5	1.1	2.3
Score	1.7	1.9	1.8
Perfecto Verde 14	1.9	1.2	1.6
Mean	3.5	2.6	3.0
L.S.D. @ .05	1.8	2.0	

shown in Table 10. Although harvest maturity on such small plots was difficult to predict, most varieties were close to the desired 20% grade 4.

Days to maturity varied from 52 to 57 days for the 13 varieties (Table 11). The variation between years was as important as the variety differences. The 1975 crop averaged 51 days, whereas the 1976 crop averaged 56 days. Greenpak and Explorer had fruit that were much lighter green in color than the other varieties. Premier, Sumter, and Pioneer were lighter green than the darkest colored varieties.

Only Greenpak, Earlipak, and Perfecto Verde 14 produced fruit that were rated significantly (.05 level) different in respect to firmness. Firm fruit is very desirable for pickling cucumbers. Greenpak and Explorer were significantly higher (.05 level) in seed development than all other varieties. A slow rate of seed development is desired for highest pickling quality. Long slim cucumbers are desired for pickling. Most of the varieties were similar in length-to-diameter ratio. Pioneer fruit were least desirable in this aspect of fruit quality.

Summary

Several varieties produced satisfactory yields of high-quality fruit. Performance varied greatly due to different weather conditions each year. More tests are needed to determine the effect of various seasons on variety performance. Processing characteristics of most of the varieties are known or are being tested. No new variety should be grown until it has been found suitable for processing.

Table 10. Grade distribution by weight of pickling cucumbers at PES, 1975-76

Variety	Grade[1]			
	1	2	3	4
	Percent by weight			
Greenpak	7	35	32	26
Earlipak	12	14	60	14
Premier	8	20	50	22
Tamu Triple Cross	10	23	41	26
Green Star	10	23	55	12
Explorer	10	16	55	19
Chipper	14	24	50	12
Sumter	15	25	36	21
Green Spear 14	17	28	34	21
Carolina	13	30	41	16
Pioneer	12	29	50	9
Score	20	27	42	11
Perfecto Verde 14	14	30	44	12

Table 11. Horticultural characteristics of pickling cucumber varieties at PES, 1975-76

Variety	Days to maturity	Ratings*			Length-to-Diameter ratio
		Color	Firmness	Seed dev.	
Greenpak	52	3.4	4.0	3.6	2.7
Earlipak	52	5.0	4.2	5.0	2.5
Premier	54	4.4	4.4	5.0	2.7
Tamu Triple Cross	54	5.0	5.0	5.0	2.5
Green Star	53	5.0	5.0	5.0	2.7
Explorer	53	3.8	5.0	4.8	2.6
Chipper	56	5.0	5.0	5.0	2.8
Sumter	57	4.6	4.4	5.0	3.1
Green Spear 14	54	4.8	4.4	5.0	2.9
Carolina	52	5.0	4.8	5.0	2.8
Pioneer	52	4.4	4.4	5.0	2.2
Score	54	5.0	4.4	5.0	3.0
Perfecto Verde 14	52	4.8	4.3	5.0	2.6
L.S.D. @ .05	–	0.4	0.6	0.2	0.6

*Ratings: 1 = least desirable; 5 = most desirable.

CUCUMBERS FOR FRESH MARKET

Production of cucumbers in the United States traditionally has been that of ground culture where vines are allowed to trail on the ground. Controlling weeds, diseases, insects, and harvesting present problems under ground culture. Trellis production in greenhouses is widely used for high yields of quality fruit, and in recent years this type of culture has met with success in the open field.

Selected cucumber varieties were evaluated at KNOX and PES in outdoor trellis production during 1974 and 1975.

Procedure

The eight slicing hybrid cucumber varieties listed in Table 12 were evaluated for yield and fruit characters. Two of these, Tasty Green 26 and Green King 29, were of the burpless type. Others were of the standard slicer type.

Fertilizers based on soil tests were applied to well-drained plots and incorporated along with the herbicide bensulide (Prefar). Additional nitrogen at 30 pounds per acre was used as a side dressing when runners were a foot long and once more during the harvest period.

Seeding dates for 1974 and 1975 were June 4 and May 15 at KNOX and May 29 and May 12 at PES, respectively. Varieties were arranged in a randomized complete block design with four replications. Individual plots consisted of one row 10 feet in length with a spacing of 5 feet between rows. Seeds were spaced 9 inches apart. Irrigation was applied as needed to supply 1 inch of water per week. A fungicide-insecticide program was maintained throughout the season at both locations. Cultivation was done as needed.

For trellising, 7.5 foot posts were set every 12.5 feet along each row. A top wire 6 feet above the ground and binder twine 6 inches off the ground were run parallel to the ground surface the length of each row. A length of binder twine was tied to the overhead wire for plant and dropped to the bottom twine and tied to it at the base of each plant. Plants were trained by intertwining the main stem with the vertical twine, allowing the stem to grow over the top wire. Lateral stems or "suckers" were removed from the first 18 inches of the plants much as tomatoes are pruned. Lateral branches above 18 inches were allowed to intertwine.

Harvesting was done 2 or 3 times weekly. Fruits were graded by USDA standards for fresh market cucumbers. Weight losses on waxed and unwaxed cucumbers were determined at KNOX. A vegetable wax was applied to freshly harvested fruits and stored at room temperature (74°F) along with unwaxed fruits for a 5-day period. Percent loss of weight was recorded midway and at the end of the period.

Table 12. Marketable yield of trellis-grown cucumbers at KNOX and PES, 1974-75

	EARLY					SEASON				
	KNOX		PES			KNOX		PES		
Variety	1974	1975	1974	1975	Avg.	1974	1975	1974	1975	Avg.
	Bushels per acre*									
High Mark II	339	969	203	324	459	1607	1751	1029	1180	1392
Saticoy	486	922	351	381	535	1696	1666	1255	1166	1446
Triumph	361	919	318	299	474	1455	1593	1051	1110	1302
Victory	620	905	350	490	591	1733	1284	1231	1268	1379
Tasty Green 26	632	826	240	284	496	2190	1345	878	997	1353
Green King 29	629	1324	355	477	696	1904	1886	1332	1299	1605
NK 840	481	619	264	377	435	1293	932	1063	910	1050
Get Set 14	506	1081	313	317	554	1721	1717	1208	1088	1434
L.S.D. @ .05	179	209	NS	NS	—	417	463	NS	211	—

*48 lb/bu.

Results

Marketable yields by location and by years for early production and for the season are listed in Table 12. Early yields were those in the first 4 weeks of harvest. The harvest seasons were about 8 weeks long.

Varieties differed little in early production at PES, but varied considerably at KNOX. Green King 29, a burpless type, had the highest average early yield when both years at the two locations are considered. At KNOX, where significant differences were obtained, this variety had the highest early yield in 1975 and one of the highest in 1974. Characteristics of the burpless type are drastically different from standard slicer types and will be discussed later. These are seldom found in local markets, but with proper handling and promotion may become of greater importance.

Victory was one of the earliest varieties to flower and fruit and ranked second in early production when all crops were averaged. Get Set 14, a hybrid slicer type of American and Japanese parent plants, was a vigorous grower, but it yielded slightly less than Victory during the early period.

When marketable yields for the season were considered (Table 12), Green King 29 was the leader. NK 840 appeared to be less well adapted than others in the trials. Although performance differed with test location and with years, Victory was a more consistent, high-yielding variety and NK 840 a more consistent, low-yielding variety among the standard slicer types. Several varieties performed well with significant differences in yield from crop to crop.

Fruits grading fancy and U.S. No. 1 ranged with varieties from 63 to 68% of the total. High Mark II and Triumph had the highest percentage of fruits making these grades. Standards for fancy and No. 1 grades require that fruits be at least 6 inches in length and not more than 2 3/8 inches in diameter. Fruit characteristics of the marketable grades are shown in Table 13. Fruits of the two burpless varieties, Tasty Green 26 and Green King 29, were the longest and were the least in diameter. Maximum quality occurs with the burpless types if they are harvested before they reach maximum size. All standard varieties in the trials were well within the grade standards for length and diameter of fancy and No. 1 grades. Get Set 14 had the longest fruits of the standard varieties but tended to exhibit a slightly lighter color at the blossom end. This was not enough to be objectionable and all varieties were considered within a desirable range of size and color for market acceptance.

Table 13. Average fruit characteristics of the marketable grade of trellis-grown cucumbers, KNOX, 1974-75

Variety	Length	Diameter	Average weight	Color rating*
	---------- Inches----------		Lb.	
High Mark II	7.3	1.8	.54	3.6
Saticoy	7.2	2.0	.53	3.5
Triumph	6.9	2.0	.52	3.6
Victory	7.0	2.0	.50	3.4
Tasty Green 26	12.0	1.5	.68	3.6
Green King 29	13.2	1.6	.64	3.5
NK 840	7.0	1.8	.50	3.5
Get Set 14	7.6	1.8	.56	3.4

*Color rating 1-5: 1 = light green;
5 = very dark green.

Loss of weight during a holding period after harvest varied greatly between varieties and with waxed and unwaxed fruits (Table 14). Waxing reduced weight loss by more than 50% in most varieties. Greatest losses of weight were with the two burpless types and Get Set 14 which contains a Japanese line in its pedigree. The other standard varieties did not differ greatly in weight loss. This loss is largely due to transpiration of water vapor with respiration accounting for only a small part. A reduction in storage temperature to 50°F with a high humidity soon after harvest should materially reduce losses below those reported here. A practice with the very thin skin European cucumber type is to encase each fruit with a tight-fitting plastic wrap. This appears necessary for the burpless types. The very mild flavor, tenderness, and high yields of the burpless types have made them popular with home gardeners and with a few large scale producers. Growers have emphasized that success with these types requires that they be harvested when they are 9 to 12 inches long, waxed, and displayed at a cool (50°F), but not chilling (35°) temperature. Burpless fruits from the study conducted at KNOX were in low demand compared to the standard slicer types when offered by a local merchant who did no promotion. Promotion is probably needed for widespread consumer acceptance of this type of cucumber.

All cucumbers tested were hybrid varieties and varied in dominance of staminate flowers. Victory, High Mark II, and NK 840 seed lots contained pollinator varieties to insure staminate flowers for adequate pollination. Honeybees are essential for this purpose, and at least one strong hive per acre is recommended.

High yields of high-quality cucumbers produced in these tests

Table 14. Average weight loss after storage of waxed and unwaxed trellis-grown cucumbers at KNOX, 1974-75

Variety	Loss after storage*			
	2-3 days		5 days	
	Waxed	Unwaxed	Waxed	Unwaxed
	Percent			
High Mark II	0.4	1.7	2.0	3.2
Saticoy	0.7	1.8	1.5	3.4
Triumph	0.9	2.2	2.0	4.5
Victory	0.7	2.1	1.8	4.1
Tasty Green 26	2.0	3.5	5.5	8.2
Green King 29	2.0	4.1	5.2	8.1
NK 840	0.7	2.5	1.8	4.9
Get Set 14	2.3	5.3	5.8	8.4

*Storage at room temperature 74°F.

suggest trellised cucumbers are a high-value vegetable crop much like staked tomatoes or pole beans. This type of intensive culture may fit the needs of growers with limited land and available family labor.

Summary

Eight varieties of hybrid cucumbers were grown on trellises at two locations for 2 years. Yields varied among varieties and all produced well above U.S. averages reported for ground grown culture. Quality was excellent due to uniform color, shape, and size. Standard slicing types had less weight loss during a 5-day holding period after harvest than did the burpless types. Waxing of fruits often reduced this loss by 50%.

MUSKMELON

Muskmelons are grown in Tennessee mostly for home use or local markets. Commercial muskmelon production consists of less than 400 acres. Since the quality of the older, open-pollinated varieties has been quite variable, they have not attained a good reputation from the consuming public. This is due partly to the weather conditions, particularly rainfall and sunshine, which in Tennessee are quite variable during fruit maturation and ripening.

In recent years, many high-quality hybrid varieties of muskmelons have been released. In order to evaluate some of these hybrids under Tennessee conditions, trials of nine hybrid muskmelon varie-

ties were conducted at three locations during 1975 and 1976. Results from these tests are summarized in this report.



Procedure

Cultural practices recommended by the University of Tennessee were followed. At WTES and at KNOX, seeds were planted in peat pots or Jiffy 7 containers in greenhouses during the last week of April. Plants were set in the field May 8 to 20. At PES, seeds were planted directly in the field on May 28 and June 9, 1975 and 1976, respectively.

Plots were 21 feet long with rows spaced 8 feet apart. Within rows, plants were spaced 3 feet apart with two per hill. Each variety was replicated four times in a randomized complete block design. A thorough spray program consisting of carbaryl (Sevin), methomyl (Lannate), maneb (Manzate), or chlorothalonil (Bravo) was used throughout the season. Plots were irrigated as needed.

Results

Considerable yield differences occurred among locations and among varieties within a location (Table 15). Mainrock yielded the fewest number of fruits in most all tests; however, the weight of individual fruits was less from Chaca (Table 16). When all locations were considered, the higher-yielding varieties were Harper, Classic, Gold Star, and Burpee.

With the exception of Mainrock, Harper, and Chaca, fruits from the other varieties averaged over 4 pounds each (Table 16). In most instances, fruits were smallest in the PES trials and largest in the WTES trials.

Table 15. Numbers of marketable muskmelons per acre at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Marketable fruits			
	KNOX	PES	WTES	Average
	Number per acre			
Burpee	9985	6871	4712	7189
Gold Star	9271	7813	4908	7331
Canada Gem	8687	5025	4163	6125
Harper	11025	8717	4641	8128
Mainerock	6135	4897	1058	4030
Samson	9145	6321	2710	6059
Classic	10542	7391	4561	7498
Chaca	9855	5349	2042	6010
Saticoy	7324	5024	4839	5729

Table 16. Fruit weight of muskmelons at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Fruit weight			
	KNOX	PES	WTES	Average
	Pounds			
Burpee	4.4	3.1	5.1	4.2
Gold Star	5.1	2.8	5.4	4.4
Canada Gem	4.5	3.0	5.3	4.3
Harper	4.3	2.7	4.7	3.9
Mainerock	3.9	3.0	3.6	3.5
Samson	4.6	3.0	5.2	4.3
Classic	5.0	2.6	5.6	4.4
Chaca	3.0	2.5	3.1	2.9
Saticoy	5.8	3.1	5.5	4.8

Ratings for cavity size, firmness, and cracking are shown in Table 17. Samson had the smallest fruit cavity, and therefore, the thickest edible portion. Harper and Chaca also ranked high in this category. Most all varieties rated acceptable in flesh firmness with Mainerock being the softest and Samson and Chaca the firmest. Cracking at the stem end was excessive only in Mainerock and Chaca. This occurred usually in the late part of the season. Classic, Canada Gem, and Saticoy were almost free of this disorder.

Table 17. Average cavity size, flesh firmness, and stem end cracking of muskmelons at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Cavity size[1]	Flesh firmness[2]	Stem end cracking[3]
Burpee	3.0	2.9	3.7
Gold Star	3.1	3.0	3.9
Canada Gem	3.3	2.5	4.1
Harper	3.7	3.4	2.8
Mainerock	2.6	2.0	1.7
Samson	4.1	4.5	3.8
Classic	3.0	3.0	4.2
Chaca	3.5	4.5	2.2
Saticoy	3.3	3.5	4.5

[1]Rating scale 1-5: 5 = small; 1 = large.

[2]Rating scale 1-5: 5 = good; 1 = poor (soft).

[3]Rating scale 1-5: 5 = few; 1 = many.

Flavor, sweetness, and personal preference varied with location partly due to growing conditions and partly due to the evaluator's judgment (Table 18). Based on average scores for all locations, flavor and sweetness were acceptable for all varieties with Mainerock and Burpee ranking lowest in flavor. Gold Star and Saticoy were the sweetest.

A personal preference rating took into consideration fruit quality, yield, and vine vigor. This is shown for each location in Table 18. Those with the highest ratings were Gold Star, Classic, Canada Gem, Burpee, and Samson.

Summary

Results from these trials indicate that several hybrid muskmelon varieties can be expected to perform well in various parts of Tennessee. High yields were obtained with adequate, dependable quality. It is essential that a thorough pest control program be maintained throughout the growing season in order to develop the potential of the crop.

Table 18. Flavor, sweetness and personal preference of muskmelon varieties at three University of Tennessee Experiment Stations, KNOX, PES, and WTES, 1975-76

Variety	Flavor[1]				Sweetness[1]				Personal preference			
	Knox-ville	Cross-ville	Jack-son	Avg.	Knox-ville	Cross-ville*	Jack-son	Avg.	Knox-ville	Cross-ville	Jack-son	Avg.
Burpee	2.1	2.5	3.6	2.7	2.4	2.7	3.9	3.0	2.9	3.8	3.8	3.5
Gold Star	2.9	3.6	3.8	3.4	3.0	4.1	3.9	3.7	4.2	4.0	3.5	3.9
Canada Gem	3.6	3.3	3.4	3.4	3.6	2.5	3.4	3.2	4.3	3.5	3.4	3.7
Harper	3.2	2.5	3.9	3.2	3.7	2.9	3.9	3.5	3.4	2.5	3.9	3.3
Mainerock	3.3	2.7	1.4	2.5	3.3	3.8	2.2	3.1	2.8	2.2	1.5	2.2
Samson	3.4	3.0	3.4	3.3	3.7	3.0	3.3	3.3	3.4	3.5	3.6	3.5
Classic	3.8	3.2	3.2	3.4	3.2	2.8	3.4	3.1	4.7	3.8	3.2	3.9
Chaca	3.6	2.7	3.5	3.3	3.8	3.0	3.5	3.4	3.0	2.7	3.4	3.0
Saticoy	2.5	3.5	3.7	3.2	3.4	4.1	3.5	3.7	1.6	3.2	3.5	2.8

[1]Rating scale 1-5: 5 = good; 1 = poor.

*Data for 1976 only.

SOUTHERN PEA

Southern peas are grown in many areas of the South for commercial processing, home garden use, stock feed, and as a soil improving crop. In Tennessee, southern peas are grown throughout the state for home use, for fresh market, and in West Tennessee for the frozen food industry. Several groups and types of peas are grown including purple hulls, blackeyes, browneyes, and creams. In each of these groups there may be both crowder and non-crowder types. The only difference between a non-crowder and a crowder type is that the seeds are tightly crowded in the pods of crowder types.

Evaluation of new varieties of southern peas in the south is accomplished through the Southern Cooperative Testing Program. The WTES is one of several locations where advanced breeding lines and new varieties are tested in this program. This report summarizes data from tests conducted in 1975 and 1976.

Procedure

All tests at WTES were planted on Memphis silt loam soils which tested high in phosphorus and potassium. The pH of the soils ranged from 6.1 to 6.4. Varieties were planted in one-row plots, 25 feet long. Plants were spaced 3 inches apart in 42-inch rows. Plots were arranged in a randomized complete block design and replicated four times. No fertilizer was applied on any of the plots. Trifluralin was applied at 0.5 lb/A ppi for weed control. Recommended fungicides and insecticides were applied as needed for disease and insect control. All varieties were harvested in the mature green stage. Multiple hand harvests were made at 2-3 day intervals during the harvest season. A mechanical roller type sheller was used to determine percent shellout of mature green pods.

Pinkeye Purple Hull, Mississippi Silver, and Texas Cream 40 were grown in each test as check varieties for the different groups. Descriptive characteristics and horticultural evaluations made on the varieties are shown in Table 19.

During this test period, two varieties were released by breeders in the program. Coronet, tested as G70-90B, was released by the Georgia Agricultural Experiment Station. Coronet is a pinkeye purple hull pea which matures about 2-3 days earlier than the standard Pinkeye Purple Hull variety. It develops a low bushy plant with considerable extension of basal runners.

Results

In three tests at WTES from 1973-75 the yield of Coronet was slightly less than that of the Pinkeye Purple Hull check variety, but

Table 19. Horticultural characteristics of southern pea varieties evaluated at WTES, 1975-76

Variety	Horti-cultural group[1]	Plant type[2]	Seed characteristics			
			Color[3]	Pattern[4]	Size[5]	Class[6]
Pinkeye Purple Hull	PHRdE	LB	Cr	SE	L	NC
Coronet	PHRdE	LB	Cr	SE	M	NC
Au B71.2	PHRdE	E	Cr	SE	L	NC
Au B71.4	PHRdE	E	Cr	SE	M	NC
Au B70.4	BE	E	Cr	SE	M	NC
Au B71.1	BE	E	Cr	LE	M	NC
Ar 74-7-9B	PHBrE	E	Cr	SE	S	NC
Texas Cream 40	Cr	HB	CR	S	S	NC
Exmore	Cr	E	Cr	S	S	NC
Mississippi Silver	Br	HB	DB	S	L	C
Colossal	Br	LB	DB	S	VL	C

[1]Horticultural Group Code: PHRdE = Purple Hull Red Eye; PHBrE = Purple Hull Brown Eye; Cr = Cream; Br = Brown.

[2]Plant Type Code: LB = Low Bushy; E = Erect; HB = High Bushy.

[3]Seed Color Code: Cr = Cream; DB = Dark Brown.

[4]Seed Pattern Code: SE = Small Eye; LE = Large Eye; S = Solid.

[5]Seed Size Code: S = Small; M = Medium; L = Large; VL = Very Large.

[6]Seed Class Code: NC = Non crowder; C = Crowder.

the harvest period was more concentrated (Table 20).

Exmore, evaluated as Va 69-13, was released by the Virginia Truck and Ornamentals Research Station, Norfolk, Virginia. Exmore is a cream type pea with concentrated pod set. Plants are erect, with no basal runners, and well adapted for machine harvest. It yielded well in an observational trial in 1974 and in the advanced test in 1975. In 1976, a season in which moisture was limited, it did not yield as well as Texas Cream 40, the check variety for the cream group. Exmore matured about 5 days earlier than Texas Cream 40.

Pinkeye Purple Hull has consistently yielded well under West Tennessee conditions and continues to be the most important processing variety. Its main disadvantages are lack of concentrated maturity and excess runner production on fertile soils.

Au B71.4, evaluated in 1975 and 1976, is similar to Pinkeye Purple Hull in appearance, but plants are less viney and more erect. Yields have been slightly, but not significantly less than Pinkeye Purple Hull yields.

Au B71.1, a blackeye variety, has also been evaluated in two tests. It produces attractive, cream-colored peas with large black eyes. Plants are erect and well adapted to machine harvest, but maturity has not been concentrated well enough for machine picking.

Table 20. Time of maturity, length of harvest period, and yields of southern pea varieties at WTES, 1975-76

Variety	Days from planting to green pod maturity	Length of harvest period	Yield of shelled peas		
		days	1975	1976	Mean
			Pounds per acre		
Pinkeye Purple Hull	63	14	3540	3520	3530
Coronet	61	14	3240	–	–
Au B71.2	61	19	2565	–	–
Au B71.4	65	14	3270	3010	3140
Au B70.4	66	17		2500	
Au B71.1	66	19	2950*	1875	2413
Ar 74-7-9B	63	14	2780*	2960	2870
Texas Cream40	73	12	1830	2645	2238
Exmore	68	15	2425	1570	1998
Mississippi Silver	72	10	3110	2920	3015
Colossal	70	13	2765	–	–
L.S.D. @ .05	–	–	870	795	–

*Data from observational test, 1975; not included in statistical analysis.

Au B71.2 and Au B70.4 have each been evaluated in one test. Further testing is needed on these varieties.

Mississippi Silver and Colossal are brown-seeded crowder types. Mississippi Silver has been utilized extensively in many areas for processing. In these trials, it has produced acceptable yields of large well-filled pods and is fairly well adapted to machine harvest. Colossal, a very large-seeded type was released by the South Carolina Experiment Station, Clemson, S. C. in 1973. It produces a low, bushy-type plant with basal runners extended. It yielded well in trials at WTES from 1972-75. Only the 1975 yield data are included in this report. At present it has not been used extensively for processing in Tennessee. It has usually been scored lower on frozen quality than Mississippi Silver.

Summary

Several southern pea varieties have performed well in multiple hand harvested trials. Plants of most new varieties are more erect and better adapted to machine harvest than standard varieties. Promising new varieties are Coronet and Au B71.4, pinkeye purple hull types; Exmore, a cream type, and Au B71.1, a blackeye. These varieties appear to be worthy of trial by both fresh market and processing growers when seed becomes available.

SWEET POTATO

Although the sweet potato has declined in popularity over the years, it remains as one of the important vegetable crops in the South. Sweet potato acreage in Tennessee was estimated to be 2,900 acres in 1976 with a value of approximately $2.7 million. Centennial is presently the most widely-grown variety in Tennessee.

Since 1950, the University of Tennessee has cooperated with the USDA and other state experiment stations in a variety evaluation program. As a result of these tests, Goldrush was introduced into the state as a wilt resistant variety in 1951, and was followed by Centennial in 1960. Some of the other varieties released after being evaluated in these trials are: Allgold, Nugget, Gem, Jewel, Julian, and Jasper.

In comparison with other vegetables, relatively few new sweet potato varieties are available for testing. Since very few private companies are involved in sweet potato breeding, almost all new lines are developed by experiment station breeders.



The cooperative variety evaluation program includes both preliminary screening trials and an advanced testing program. New breeding lines are placed in the screening trial the first year. In Tennessee, the screening program is conducted at WTES.

Promising lines are selected from screening trials to go into the advanced tests. In Tennessee advanced sweet potato variety trials are conducted each year at the KNOX and WTES. In 1976 the advanced test was also conducted at PES. This report summarizes results of the advanced tests at these three locations in 1975-76.

Procedure

Plots at WTES were on a Memphis silt loam while those at KNOX were on a Sequatchie loam and those at PES were on a Hartsells loam. Fertilizer was applied broadcast before bedding according to recommendations resulting from soil test. Fertilizer rates ranged from 400-500 pounds per acre of 12-24-24. Recommended herbicides were used for weed control followed by cultivation as needed. Each variety was planted in three-row plots 30 feet in length and replicated four times. Rows were 42 to 48 inches apart with plants spaced 12 inches apart in the row. Plants were field set the second and third week of May except in 1975 when planting at WTES was delayed until June 23 and PES tests were set in late May in 1976.

Roots were harvested the first week in October, graded according to U.S. Standards, and weighed within 2 days following harvest. U.S. Number 1 grade roots were 2.0 to 3.5 inches in diameter and 2 to 7 inches long. The Jumbo grade was made up of roots that exceeded the diameter or length requirements of the above grade. Roots 1.0 to 2.0 inches in diameter and 2 to 7 inches in length were classified as Canners. The U.S. Marketable grade was comprised of the Number 1, the Canners, and the Jumbo grades.

Results

The most promising variety evaluated during 1975-76 was L1-207. L1-207 produced a significantly higher yield of marketable roots than Centennial in two tests at KNOX and in one test at PES (Table 21). In another experiment at WTES, it yielded as well as Centennial. Roots harvested from these tests were shaped well and matured early. Jewel was equal to or superior in yield performance to Centennial in all tests. Jasper yielded about like Centennial. VP9-51 has recently been released by the Virginia Truck and Ornamentals Research Station and given the name Painter. VP9-51 yielded as well as Centennial in a screening test at WTES in 1974 and in advanced tests at WTES and KNOX in 1975. Painter is a long-

Table 21. Yields of marketable sweet potatoes at three University of Tennessee Experiment Stations, WTES, KNOX, and PES, 1975-76

Variety	WTES			KNOX			PES
	1975	1976	Mean	1975	1976	Mean	1976
	Bushels (55-pound) per acre						
Centennial	380	410	295	408	383	396	211
Jewel	382	481	432	514	391	452	268
Jasper	332	—	—	431	344	388	251
L1-207	—	416	—	697	571	634	365
LO-69	435	—	—	436	—	—	—
VP9-51	401	—	—	419	—	—	—
NC-320	—	373	—	—	377	—	143
Ti 1885	—	507	—	—	272	—	—
Rose Centennial	—	—	—	409	387	398	274
L.S.D. @ .05	N.S.	65	—	88	77	—	79

season variety. Ti 1885 and NC-320 were evaluated in the advanced trial in 1976. NC-320 did not yield quite as well as Centennial at any of the three test sites. Ti 1885 yielded more than Centennial at WTES but less than Centennial at KNOX. Evaluation of these lines will be continued. L0-69 was dropped from the trials following the 1975 tests. Rose Centennial has been retained in tests at KNOX and has yielded about like Centennial.

Early-maturing varieties like Centennial and Jewel may produce a greater yield of Jumbo or oversize roots if harvest is delayed. Jumbo grade potatoes have a limited demand, but may be sold for canning or through local stores and restaurants. Profits from Jumbo grade potatoes are almost always less than from the Number 1 grade; therefore, it is important to harvest varieties at the optimum time for maximum yield of Number 1 grade sweet potatoes. In these trials, L1-207 produced a significantly higher yield of Jumbo grade potatoes than Centennial when both varieties were planted and harvested on the same dates (Table 24).

Smaller size roots are valuable in areas where a cannery market exists. In such areas small roots command the highest price because they are used in the whole pack which is the top Cannery grade. In 1975-76 trials, Centennial generally produced as many canning size roots as other entries. At WTES, Ti 1885 produced more roots in the Canning grade than other varieties tested in 1976 (Table 23).

Yield of marketable roots grading Number 1 varied between varieties and between years (Table 22). At KNOX and PES, L1-207 yielded significantly more potatoes in the Number 1 grade than other varieties. Jewel produced a greater yield of Number 1 grade potatoes than Centennial in 1975 at KNOX and in 1976 at WTES.

Table 22. Yields of U.S. Number 1 grade sweet potatoes at three University of Tennessee Experiment Stations, WTES, KNOX, and PES, 1975-76

	WTES			KNOX			PES
Variety	**1975**	**1976**	**Mean**	**1975**	**1976**	**Mean**	**1976**
	Bushels (55-pound) per acre						
Centennial	171	217	194	230	274	252	129
Jewel	265	303	284	372	321	346	212
Jasper	194	—	—	283	252	267	152
L1-207	—	228	—	427	340	383	287
LO-69	233	—	—	249	—	—	—
VP9-51	197	—	—	249	—	—	—
NC 320	—	208	—	—	257	—	66
Ti 1885	—	221	—	—	178	—	—
Rose Centennial	—	—	—	274	264	269	161
L.S.D. @ .05	N.S.	57	—	54	57	—	71

Table 23. Yields of canning grade sweet potatoes at three University of Tennessee Experiment Stations, WTES, KNOX, and PES, 1975-76

	WTES			KNOX			PES
Variety	**1975**	**1976**	**Mean**	**1975**	**1976**	**Mean**	**1976**
	Bushels (55-pound) per acre						
Centennial	151	164	157	133	52	92	48
Jewel	66	115	90	97	58	77	51
Jasper	118	—	—	140	71	105	70
L1-207	—	90	—	58	55	56	42
LO-69	178	—	—	180	—	—	—
VP9-51	179	—	—	167	—	—	—
NC 320	—	121	—	—	113	—	76
Ti 1885	—	245	—	125	55	—	60
Rose Centennial	—	—	—	125	55	90	60
L.S.D. @ .05	N.S.	32	—	28	32	—	N.S.

Table 24. Yields of jumbo grade sweet potatoes at three University of Tennessee Experiment Stations, WTES, KNOX, and PES, 1975-76

	WTES			KNOX			PES
Variety	**1975**	**1976**	**Mean**	**1975**	**1976**	**Mean**	**1976**
	Bushels (55-pound) per acre						
Centennial	58	29	43	45	57	51	35
Jewel	51	63	57	45	12	28	4
Jasper	20	—	—	8	21	14	30
L1-207	—	98	—	212	176	194	36
LO-69	24	—	—	7	—	—	—
VP9-51	25	—	—	3	—	—	—
NC 320	—	44	—	—	7	—	1
Ti 1885	—	41	—	—	5	—	—
Rose Centennial	—	—	—	11	59	35	53
L.S.D. @ .05	N.S.	25	—	56	46	—	34

The skin color of all varieties tested in bronze to copper except Rose Centennial and Ti 1885. Skin color of these varieties is rose to red. Flesh color of all these varieties is shades of orange. Jewel is slightly lighter than Centennial in both skin and flesh color. Roots are smooth and usually have a desirable fusiform, tapered shape. L1-207 has a dark copper skin and deep orange flesh. Roots are smooth and fusiform shape with some elongation. Jasper has a copper skin with a shade or tinge of rose. Roots are generally well-shaped and smooth. Jasper is resistant to soil rot and tolerant to root-knot nematodes, but has a shorter storage life than other varieties. Roots of VP9-51 have a reddish copper skin and bright orange flesh. They are very smooth, plump, and uniform in shape. All of the varieties are resistant or tolerant to fusarium wilt.

Summary

In sweet potato trials in 1975-76, L1-207 appeared the most promising of new lines. It matured early and produced a significantly higher yield of marketable roots than Centennial in several tests. VP9-51, released as Painter, also performed well in 1975 tests. Jasper continues to produce acceptable yields of well-shaped, attractive potatoes. Shorter storage life of this variety may prevent its being grown except where soil rot is a problem. Other varieties in the tests generally yielded well, but were not superior in performance to the presently grown varieties, Centennial and Jewel.

VEGETABLE SOYBEAN

Vegetable soybeans have several characteristics which make them more desirable for human consumption than the field varieties. They are somewhat larger than field-type soybeans with seed of most varieties weighing in excess of 20 grams per 100 seeds. Varieties preferred for use in the green mature stage or for production of home-prepared dishes should be milder in flavor and should possess a minimum of the strong "grassy" taste characteristics in field varieties. They should have a slightly nutty flavor and contain less oil than field-type soybeans which are used for oil production.

Vegetable-type soybeans may be harvested for cooking as green mature beans when the pods are bright green and plump or harvested later as dry soybeans. Each pod usually contains two to four beans. The pods have a pubescent surface and are not edible.

Tests were conducted at the West Tennessee Experiment Station, Jackson, and at the Main Experiment Station, Knoxville, in 1974-75 to evaluate several edible soybean varieties for production in Tennessee.

Procedure

Varieties were planted May 23 in 1974 and the first week in June in 1975. Plants were spaced 2 inches apart in 42-inch rows. Each variety was replicated four times in a randomized complete block design.

Plots were fertilized with 400 lb/A 12-24-24 broadcast before planting. Trifluralin was incorporated at 0.5 lb/A for weed control in the Jackson plots. Plants from the center two rows of each plot were cut at ground level and dry soybeans threshed with a Swanson plot thrasher in late September and early October each year.

Results

Yields are shown in Table 25 as 60-lb bushels per acre converted to 13% moisture. Kim was the highest yielding variety at WTES with a 2-year average of 37.0 bu/A. It also produced the largest seeds (Table 26) and had the latest maturity date. Seeds of Kim were dull green in color. Yield differences among other varieties tested at WTES were not large, but Disoy produced less because of severe shattering of pods before and during harvest (Table 26). Practically no lodging was observed in plots of Peterson 4 or Prize; lodging was moderate with Kim, and severe in Disoy and Kanrich plots in 1975 at Jackson.

Varieties grown at KNOX generally responded about like those grown at WTES. Pod shattering was serious with Disoy in the KNOX test and very severe with Okuhara. The Soylima variety was grown only at KNOX and yielded well.

Table 25. Yields of vegetable type soybean varieties at WTES and KNOX, 1974-75

Variety	WTES			KNOX
	1974	1975	Mean	1975
	Bushels (60-pound) per acre			
Prize	34	21	27.5	28.1
Peterson 4	31	22	26.5	24.8
Disoy	29	17	23.0	25.4
Kanrich	36	23	29.5	29.5
Kim	40	34	37.0	29.1
Soylimas	–	–	–	37.7
Okuhara	–	–	–	3.1
L.S.D. @ .05	4.7	4.3	–	7.2

Table 26. Characteristics of vegetable type soybean varieties WTES and KNOX, 1974-75

Variety	WTES			KNOX
	Plant lodging at harvest	Seed size grams/100 seed	Pod shattering*	Pod shattering*
	%	No.		
Prize	5	24	1.8	1.5
Peterson 4	6	23	1.0	1.0
Disoy	51	22	5.0	3.0
Kanrich	91	24	1.3	1.5
Kim	33	27	1.0	1.0
Soylimas	–	–	–	1.0
Okuhara	–	–	–	5.0
L.S.D. @ .05	26	–	.5	–

*Rating Scale: 1 = no shattering; 5 = severe shattering.

Summary

Results of trials with several vegetable type soybean varieties suggest that they may be grown successfully in Tennessee. Two varieties, Kim and Soylimas, yielded well in tests at KNOX and WTES. Quality evaluations were not included in these studies.

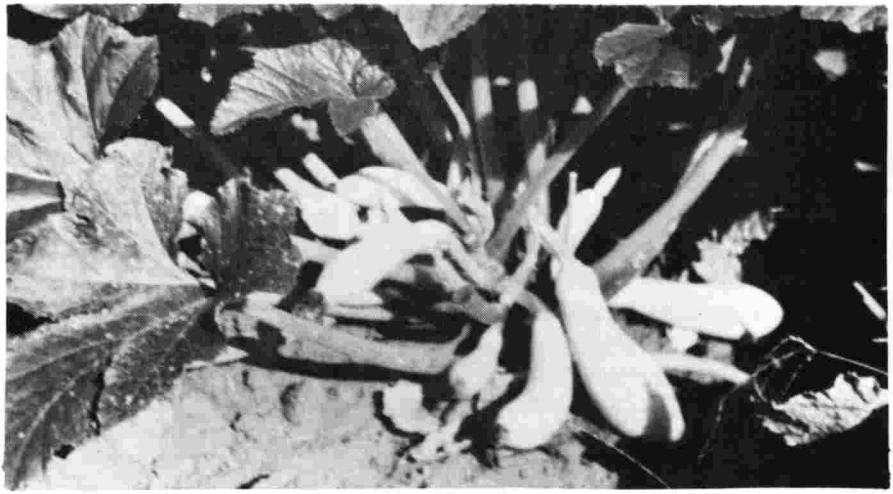
SUMMER SQUASH

Production for the frozen food industry continues to provide an outlet for summer squash grown on the Cumberland Plateau and in West Tennessee. Processor demands in terms of volume and product specificity cause acreage to fluctuate considerably from year to year.

Several varieties of summer squash are commercially available and many new varieties, mostly hybrids, are continually being released. Trials were conducted on several zucchini and yellow varieties in 1973 and 1974. Results were reported in Bulletin 543 of the University of Tennessee Agricultural Experiment Station. Results of trials continued in 1975-1976 on certain recommended and additional newly released varieties are reported here.

Procedure

Plantings were made in early May each year. Fertilization was 600 lb per acre of 5-10-5 broadcast with an additional 30 lb of nitrogen sidedressed in late June. Plots were 21 feet long, with rows



spaced 3.5 feet apart. Within rows, plants were two per hill spaced 3 feet apart. Varieties were replicated four times in a randomized complete block design. Maneb (Manzate) and carbaryl (Sevin) were used on a 10- to 14-day schedule for disease and insect control. Weed control was by cultivation.

Harvests were made three times per week. Attempts were made to harvest fruit between 1.5 and 2.5 inches in diameter. In addition to yield data, ratings were made on fruit curvature, smoothness, uniformity, and shape.

Results

Slendergold, Dixie, Butterpak, and Hyrific are standard varieties These have been widely grown in Tennessee. All four yielded well (Table 27). Dixie was more curved and produced more smooth, uniform and well-shaped fruit than the other three varieties (Table 28). Dixie, for these reasons, has been more desirable for fresh market production. Slendergold, Butterpak, and Hyrific have been used mainly for processing in Tennessee. The degree of curvature of the fruit along with internal color and firmness have been very desirable for processing. Fruit smoothness, uniformity, and shape are not as important in processing as in fresh market squash.

Line E 520 produced satisfactory yields. The amount of neck curvature and ratings of fruit characteristics were equal to those of the processing varieties. Slenderella yielded well. The fruit greatly resembled Slendergold with the exception that Slenderella fruit were essentially straightnecked. Sundance yielded slightly less than Dixie. Fruits were curved like Dixie and ratings of other characteristics were similar to ratings of the processing varieties. Line XP B32 had

Table 27. Yields of summer squash varieties at PES, 1975-76

Variety	1975	1976	Mean
	Tons per acre		
Slendergold	9.2	7.6	8.4
Dixie	8.4	6.2	7.3
Butterpak	4.6	8.7	6.6
Hyrific	5.0	7.1	6.0
E 520	4.3	8.9	6.6
Slenderella	–	7.6	–
Sundance	–	5.8	–
XP 1132	–	5.2	–
Lemon Drop	–	4.1	–
L.S.D. @ .05	2.8	1.8	–

Table 28. Horticultural characteristics of summer squash varieties at PES, 1975-76

	Ratings*			
Variety	Curvature	Smoothness	Uniformity	Shape
Slendergold	3	4	4	4
Dixie	4	5	4	5
Butterpak	3	3	3	3
Hyrific	3	4	2	3
E 520	3	4	3	4
Slenderella	2	5	4	4
Sundance	4	4	3	4
XP 1132	2	5	4	4
Lemon Drop	2	4	4	2

*Ratings: Curvature: 1 = straight, 5 = very curved;
Others: 1 = undesirable, 5 = very desirable.

fair yields and good fruit characteristics. Fruit were straight necked. Lemon Drop produced a low yield. Fruits were short and had very poor shape.

Summary

The standard varieties performed well with none of the new lines outperforming them. Lines E 520 and Slenderella showed considerable promise. Sundance and XP 1132 were acceptable. Lemon Drop performed poorly.

TOMATO

Tennessee farmers have been growing about 2,000 to 2,500 acres of tomatoes each year during the last 10 years for local and distant markets. Several vegetable crops in the state rank above tomatoes in acreage, but none has a higher dollar value. The crop takes on more importance when the value of tomatoes produced and used by home gardeners is added to that from the commercial growers. It is interesting to note that of the leading tomato varieties grown in 1976, practically none of them were in existence 10 years ago. Due to this rapid change, tomato variety evaluation is carried on every year at one or more locations in the state. This report concerns the evaluations at KNOX and at WTES for the 1975 and 1976 season.

Procedure

Each year, seeds were sown in the greenhouse between March 10-15. Seedlings were transferred to 3-inch peat pots in late March or early April. These were taken from the greenhouse and planted in the field in late April. Planting dates for KNOX in 1975 and 1976 were April 28 and April 27, respectively. Those at WTES in 1975 and 1976 were April 22 and April 15, respectively.

Plots at Knoxville were on an Etowah silt loam soil testing high in both P & K and having a pH of 6.6. Previous to each crop, 800 lb/A of 6-12-12 fertilizer was broadcast followed by an application of 30 lb/A of N when first fruits were 1 inch in diameter. Plots at WTES were on a Dexter loam testing high in P and K. Previous to



each crop, 450 lb/A of 12-24-24 was broadcast followed by 30 lb/A of N sidedressed. Diphenamid (Enide) was used at Knoxville and trifluralin (Treflan) was used at WTES for weed control.

Test plots were one row 20 feet in length, replicated four times. Plants were spaced 2 feet apart in rows 3.5 feet apart at WTES and 4 feet apart at KNOX. Weekly applications of pest control materials were made throughout the growing period.

Determinate (self-topping) varieties were unpruned and supported on stakes by the Florida weave system at KNOX. These were unpruned at WTES but were tied to individual stakes. Indeterminate varieties at both locations were pruned to two stems, and each plant tied to a stake.

Fruits were harvested in the breaker and pink stage usually two or three times per week. Grading was on the basis of U. S. standards. The marketable grade included fruits grading Number 1 and Number 2 and known as the U. S. combination grade. Size determinations were based on the Number 1 grade.

Results

Tables 29 and 30 list varieties by location and year tested and show the marketable yield for the entire season and that for the first 2 weeks, respectively.

Over a period of years, yields have generally been comparable at the two locations. Data for 1975 and 1976 show lower yields at WTES than at KNOX (Tables 29 and 30). This was due to adverse weather conditions, a severe storm in the early part of the 1975 season and extremely dry conditions in 1976. Plots at KNOX were irrigated as needed both years.

The first five varieties shown in Table 29, with the exception of Bigset, have been previously tested, and all have been used successfully in certain parts of the state. Setmore and Big Seven have had consistently high yields but have had limitations. Setmore fruits are somewhat flattened and tend to decrease in size rapidly in the latter part of the season. These two have led in early fruit production (Table 29), but both are lacking in firmness for shipping tomatoes (Table 31). Better Boy has proven to be one of the leading home garden tomatoes and is used some for local markets. It is not firm enough for shipping. Walter has been the leading variety used by growers who ship to distant markets. This variety has performed better at KNOX than at WTES over the years and is widely used by growers in East Tennessee and on the Cumberland Plateau. Bigset, a recent release that is determinate in growth habit, outyielded Walter in three of the four crops. It is earlier but slightly less firm than Walter.

In the group of varieties that have been in the trials three times, Early Big yielded well and rated high in fruit firmness but was rated

Table 29. Yields of marketable tomatoes at KNOX and WTES, 1975-76

Variety	Vine* type	KNOX 1975	KNOX 1976	KNOX Mean	WTES 1975	WTES 1976	WTES Mean	Overall mean
		Tons per acre						
In trial 4 times								
Setmore	D	34.0	31.2	32.6	11.9	18.0	15.0	23.8
Big Seven	I	27.1	31.6	29.4	11.8	22.8	17.3	23.3
Bigset	D	25.0	32.2	28.6	10.8	21.1	16.0	22.3
Walter	D	26.8	22.2	24.5	9.6	9.6	9.6	17.1
Better Boy	I	23.0	19.3	21.2	7.2	18.6	12.9	17.0
In trial 3 times								
Early Big	D	28.2	31.7	30.0	—	21.0	—	27.0
Ultra Boy	I	26.7	27.3	27.0	—	21.9	—	25.3
Ultra Girl	I	29.0	21.0	25.0	—	20.4	—	23.5
Bonnie FN	D	19.5	21.7	20.6	—	17.4	—	19.5
Royal Flush	D	—	30.0	—	11.9	16.8	14.4	19.6
Big Boy	I	—	25.7	—	7.2	17.0	12.1	16.6
Wonder Boy VF	I	25.4	—	—	8.1	15.8	12.0	16.4
Manapal	I	—	16.7	—	6.5	16.3	11.4	13.2
Red King	D	—	18.3	—	8.0	11.9	10.0	12.7
In trial 2 times								
Floradel	I	24.8	25.3	25.1	—	—	—	—
Homestead	D	27.9	21.3	24.6	—	—	—	—
Jet Star	I	—	—	—	12.3	21.6	17.0	—
Supersonic B	I	—	—	—	9.6	23.1	16.4	—
Early Girl	I	—	—	—	9.9	19.1	14.5	—
Peto 6339	D	—	29.3	—	—	20.7	—	25.0
Oh Boy	I	—	23.4	—	—	25.4	—	24.4
Floramerica	D	—	35.3	—	—	13.2	—	24.3
Big Girl	I	—	28.2	—	—	17.7	—	23.0
Red Glow	D	—	22.1	—	—	19.8	—	21.0
L.S.D. @ .05		6.0	4.7	—	2.8	5.6	—	—

*Vine type: I = Indeterminate; D = Determinate (self-topping).

medium in earliness. Royal Flush was a producer of firm and large size fruits with medium to high yields.

From the group in trials two times, Floramerica and Big Girl were impressive at the Knoxville Station in vigor of plant and in yield of marketable fruit. Floramerica fruits were firm at both locations.

Claimed disease resistances or tolerances are shown in Table 32.

Summary

Many acceptable tomato varieties are available. In choosing a variety, one should consider the purpose or the market demand, plant characters, yield, earliness, and disease resistance or tolerance.

Table 30. Yields of early marketable tomatoes at KNOX and WTES, 1975-76[1]

Variety	KNOX			WTES			Overall mean
	1975	1976	Mean	1975	1976	Mean	
	Tons per acre						
In trial 4 times							
Setmore	12.3	6.3	9.3	6.6	10.3	8.5	8.9
Big Seven	13.8	4.6	9.2	7.5	5.8	6.7	7.9
Bigset	8.6	4.4	6.5	7.6	10.1	8.9	7.7
Better Boy	10.4	2.7	6.6	3.9	4.0	4.0	5.3
Walter	7.9	2.5	5.2	2.9	3.7	3.3	4.3
In trial 3 times							
Ultra Girl	15.9	3.8	9.9	—	5.6	—	8.4
Bonnie FN	12.4	6.0	9.2	—	6.6	—	8.3
Ultra Boy	12.8	3.7	8.3	—	6.0	–	7.5
Early Big	7.3	2.0	4.7	—	5.9	–	5.1
Royal Flush	—	3.0	—	9.5	7.2	8.4	6.6
Red King	—	6.1	—	6.3	6.7	6.6	6.4
Wonder Boy VF	9.8	—	—	4.1	2.8	3.5	5.6
Big Boy	—	1.1	—	3.0	2.5	2.8	2.2
Manapal	—	0.4	—	1.4	2.6	2.0	1.5
In trial 2 times							
Early Girl	—	—	—	7.2	7.4	7.3	—
Jet Star	—	—	—	4.5	6.6	5.6	—
Supersonic B	—	—	—	3.6	4.4	4.0	—
Floradel	5.1	2.6	3.9	—	—	—	—
Homestead	4.3	0.9	2.6	—	—	—	—
Red Glow	—	2.2	—	—	6.4	—	4.3
Floramerica	—	2.1	—	—	5.8	—	4.0
Big Girl	—	1.5	–	—	3.7	—	2.6
Peto 6339	—	0.8	—	—	3.6	—	2.2
Oh Boy	—	1.8	—	—	1.9	—	1.9
L.S.D. @ .05	2.5	1.2	—	1.8	1.9	—	—

[1]First 2 weeks of harvest.

Table 31. Firmness ratings and average size of U.S. Number 1 tomato fruit at KNOX and WTES, 1975-76

Variety	Firmness rating*			Avg. size of no. 1 fruit		
	KNOX	WTES	Mean	KNOX	WTES	Mean
				---------- Ounces ----------		
Royal Flush	4.1	5.0	4.6	9.1	8.6	8.8
Walter	4.0	5.0	4.5	6.9	6.7	6.8
Red King	3.9	5.0	4.5	6.4	6.1	6.2
Bigset	3.8	4.0	3.9	7.2	7.3	7.3
Early Big	3.8	4.0	3.9	7.8	8.9	8.2
Floramerica	3.5	4.0	3.8	8.8	8.3	8.6
Peto 6339	3.1	4.0	3.6	8.3	8.3	8.3
Big Girl	2.9	4.0	3.5	9.6	8.1	8.9
Red Glow	3.0	4.0	3.5	8.3	7.4	7.9
Ultra Boy	2.8	4.0	3.4	8.4	7.6	8.1
Big Seven	2.9	3.5	3.2	8.6	7.5	8.1
Better Boy	2.9	3.5	3.2	9.5	8.0	8.8
Manapal	2.8	3.5	3.2	8.0	6.5	7.0
Setmore	3.2	3.0	3.1	7.5	7.0	7.3
Ultra Girl	3.0	2.5	2.8	8.5	7.5	8.2
Bonnie FN	2.7	2.5	2.6	7.9	7.3	7.7
Oh Boy	2.9	1.5	2.2	8.8	8.7	8.8
Big Boy	2.4	2.0	2.2	9.1	8.2	8.5
Early Girl	–	4.0	–	–	5.1	–
Wonder Boy VF	–	3.5	–	–	7.6	–
Jet Star	–	3.5	–	–	7.5	–
Supersonic B	–	3.5	–	–	8.0	–
Floradel	3.3	–	–	8.3	–	
Homestead	3.2	–	–	6.6	–	–

*Firmness rating scale 1-5: 1 = soft; 5 = most firm.

Table 32. Claimed disease resistance for tomato varieties in 1975-1976 trials

	Resistant or tolerant to:		
None	Fusarium	Verticillium and fusarium	Verticillium, fusarium, and nematode
Big Boy	Floradel	Big Girl	Better Boy
Early Girl	Homestead	Early Big	Bigset
	Manapal	Floramerica	Big Seven
	Red King	Jet Star	Bonnie
	Walter	Oh Boy	Red Glow
		Peto 6339	Royal Flush
		Setmore	Ultra Boy
		Supersonic B	Ultra Girl
		Wonder Boy VF	

THE POTENTIAL FOR GROWING TOMATOES IN WIRE CAGES

The practice of supporting tomato vines in cylindrical wire cages as an alternative to trellising or staking has been in limited use for more than 20 years. Recent releases of tomato varieties resistant to fusarium wilt and root knot nematodes coupled with more effective pest control methods extending the life of tomato plants have stimulated renewed interest in cage production by home gardeners. Commercial producers have also used cages to a limited extent.

Plants in cages hold their fruits above the soil making them less susceptible to attack by soil-borne organisms than non-supported plants. Unlike trellised or staked tomatoes, there is no pruning or tying of stems with the cage method. The initial cost for wire cages is considerable, but they will last for several years when properly stored.

The potential for growing tomatoes in wire cages was evaluated in several experiments from 1971-1974 at KNOX. Experiences with caged tomatoes will be discussed in this report.

Procedure

Wire cages used in these experiments were made from number 8 gauge concrete reinforcing wire 60 inches wide with 6- x 6-inch mesh. Cages 18 inches in diameter and 60 inches high were placed over the plants soon after transplanting to the field. A wooden stake was driven alongside each cage for anchoring. No pruning was done but new growth was confined inside the cages by pulling it upright occasionally. During the period of rapid growth, this was done twice a week. The data presented here are from a series of individual experiments where a randomized, complete block experimental design was used. Each treatment was replicated four times. A single plot consisted of five plants spaced 4 feet apart in the row with 5 feet between rows. Data from 1971-1973 were from irrigation experiments and include only the data from the treatment watered with a twin-wall plastic tube. This irrigation treatment was used in variety evaluation trials in 1974 and 1975.

Soils were fertilized with N, P, and K prior to transplanting according to recommendations based on soil test. Additional nitrogen sidedressings were applied at 3-week intervals beginning after the first fruits were 2 inches in diameter. Thirty pounds of nitrogen per acre were applied at each application. Throughout the growing season recommended fungicides and insecticides were applied every 7 to 10 days. Fruits were harvested two or three times weekly and graded according to USDA Standards.

Results

The first experiments were encouraging for the use of wire cages in home garden tomato production (Table 33). Manapal, a popular variety in 1971, produced fruit until frost. Its marketable yield of 35 pounds per plant compared favorably to a yield of 6.7 pounds (18 tons/A) on adjacent plots grown under the conventional 2-stem staked system. This latter yield is considered medium to high for commercially grown tomatoes. Average fruit size from the conventional grown plants was 7.4 ounces, somewhat larger than the average caged fruits.

Table 33. Yield and fruit size of three tomato varieties grown in wire cages at KNOX, 1971-73

Date	Variety	Total yield	Marketable yield	Size of fruit
		---------- Pounds per plant ----------		Ounces
1971	Manapal	47	35	6.3
1972	Better Boy	39	38	6.4
1973	Better Boy	36	28	7.4
	Average	41	34	6.7

Better Boy, a wilt- and nematode-resistant variety, was used in 1972 and 1973. Yields were again high compared to those usually received from pruned plants. Fruit from Better Boy were larger than from Manapal and approached the size of those produced on staked and pruned plants.

In 1974 and 1975, five varieties showing promise especially for home gardens were evaluated under cage culture. These were classed as vigorous-growing varieties with medium- to large-size fruits (Table 34). Manapal was the only non-hybrid variety. Better Boy, Big Seven, and Beefmaster all have resistance to verticillium wilt, fusarium wilt, and to nematodes (VFN).

Yields of all varieties over the 2-year period were much above those generally obtained under conventional cultural systems. They ranged from an average total yield of 39 pounds per plant for Manapal to 48 pounds for Ramapo (Table 34). Most of these fruits would be usable by a home gardener. The absence of cracked fruit was especially noticeable. All varieties except Beefmaster had a high proportion of marketable fruits.

Beefmaster bore many fruits that were double and rough on the blossom end (catface). This appears to be a variety association. Eating quality of fruit and vigor of vine were rated as excellent. Fruits

Table 34. Yield and fruit size of five tomato varieties grown in wire cages at KNOX, 1974-75

Variety	Total yield			Marketable yield			Mean fruit weight		
	1974	1975	Avg.	1974	1975	Avg.	1974	1975	Avg.
	Pounds per plant						Ounces		
Manapal	41	37	39	36	27	32	6.7	6.9	6.8
Better Boy	44	42	43	39	30	35	7.5	8.2	7.9
Ramapo	49	47	48	43	34	39	7.7	8.4	8.1
Big Seven	46	44	45	41	34	38	6.7	7.2	7.0
Beefmaster	50	37	44	24	14	19	11.4	11.8	11.6
Average	46	41	44	37	28	33	8.0	8.5	8.3

were very large and tender, making this an excellent home garden variety, but too soft for market use.

Ramapo had slightly less vine vigor and fruit size than Beefmaster. It was also the latest of the group to ripen, and produced the largest yield. Big Seven ranked next to Ramapo in yield and was the earliest-maturing variety. Better Boy showed adequate yield potential and was easy to maintain in the cages. Fruits were very uniform in size during the entire season.

Observations

Experience with the wire cages led to several observations. If vigorous-growing varieties are used such as those included in these trials, larger diameter cages would be desirable. Cages between 20 and 24 inches in diameter would reduce crowding of branches and make harvesting easier. To make these would require a 5¼ to 6¼ foot length of wire. At present prices, materials for a 20-inch diameter cage would cost $1.20 if made from Number 10 gauge wire and $1.70 if Number 8 gauge wire is used. Several of the cages in the early experiments were well rusted and weakened by the fifth year. A paint-dip or non-toxic asphaltum coating would extend the cage life. It is possible to make cages from galvanized, large mesh, standard fence wire. These are not as sturdy but with care can be used.

Little difficulty was experienced in keeping the cages upright. This was partly due to the construction of the cage. The bottom wire running parallel to the ground was cut away from the vertical wires. This allowed the bottom 6-inch vertical member to be inserted into the ground (Figure 1). Instead of the wooden stake being driven into the ground alongside each cage as in these trials, one may anchor the bottom wire on either side with 14-inch steel rods having a hook or loop at the upper end. These rods should be driven into the ground.

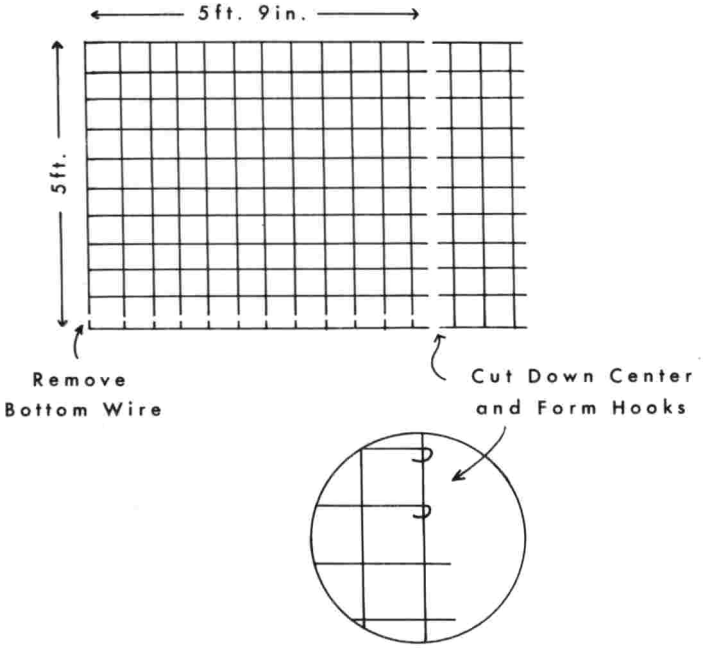
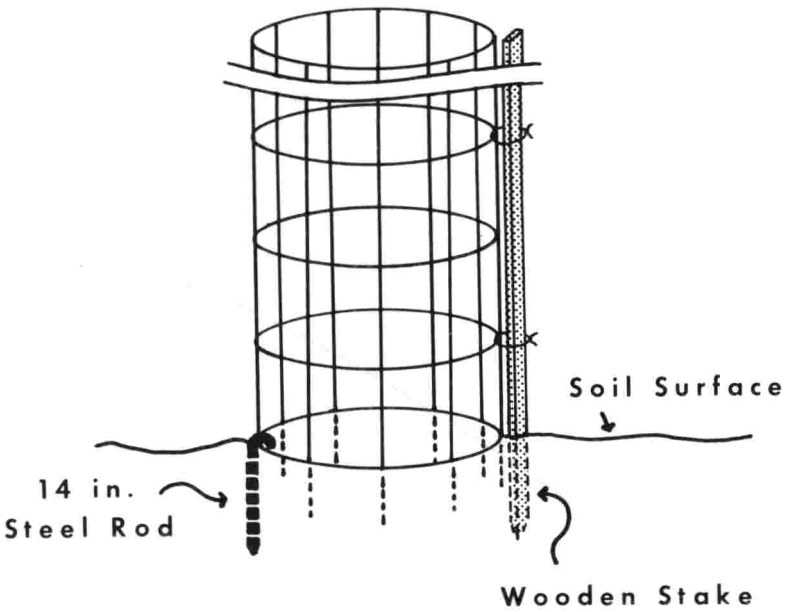


Figure 1. Details for forming 21-inch diameter wire cages, ↑ and two types of anchors. ↓



If stems and leaves are allowed to get too long before training, breakage occurs when an attempt is made to confine them inside the cages. It is best to do the training after midday or when plants are most pliable and will not snap as easily. Vine growth should be allowed to topple over the top of the cages late in the season. Plants in these trials often had tips of branches touching the ground, but still fruiting at the first frost.

Tomatoes in cages ripened more uniformly than those pruned or ground grown and with less green shoulders and with significantly fewer fruits with cracks and sunscald defects. Very few cull fruits were borne by the caged plants. Maturity of unpruned plants in cages was delayed from 10 days to 2 weeks as compared to staked and pruned plants.

In observational trials it was found that determinate (self-topping) type varieties could be supported with cages one-half as high, reducing the cost of this type support. Such varieties did not continue bearing over as long a period, but concentrated their harvest in a relatively short period. Two successful self-topping varieties were Walter and Campbell 1327.

Summary

Over a 5-year period, tomatoes supported by wire cages performed well. Several vigorous growing varieties had a yield of more than 40 pounds per plant. Tomatoes in cages need not be pruned. Unpruned caged tomatoes ripen later than fruits from pruned plants, but often continue bearing over a longer period of time. Caged tomatoes produce medium to large fruits relatively free of cracks and sunburn.

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