A11-1037-8M-L180

TEXAS AGRICULTURAL EXPERIMENT STATION

A. B. CONNER, DIRECTOR

COLLEGE STATION, BRAZOS COUNTY, TEXAS

BULLETIN NO. 556 OCTOBER, 1937

DIVISION OF HORTICULTURE

Strawberry Varieties in Southwest Texas

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
T. O. WALTON, President

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Strawberry production in Southwest Texas amounts to almost a third of the state total. This crop is produced under irrigation, and plants are reset each fall from which the crop is harvested the following winter and spring.

Considerations in the choice of a variety for this section are (1) runner plant production, (2) heat resistance, (3) shipping quality, (4) season of ripening, (5) color, (6) frost resistance, (7) yields, (8) disease resistance, and (9) dessert quality.

During the period from 1932 to 1937 seventy-one varieties and strains have been tried at Winter Haven, Texas, and studied with the above characters in mind.

Missionary (Carolina strain), Klondike, Ettersburg 80, and "Banner" are recommended for commercial plantings, and others such as Ettersburg 121, Excelsior, Kalicene, and Narcissa might be grown for home use because of their high quality.

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STRAWBERRY VARIETIES IN SOUTHWEST TEXAS

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Strawberry growing under irrigation in Southwest Texas was attracting attention over twenty-five years ago. At that time, enough was grown in the Lower Rio Grande Valley to supply local markets (1). Later production has been mostly in the vicinity of Poteet, in Atascosa County, and near Carrizo Springs, in Dimmit County. Census statistics for 1929 and 1934 (12, 13) are given in Table 1 for Southwest Texas counties. The acreage

Table 1. Strawberry acreage and production in Southwest Texas

County	Acreage		Production (quarts)	
	1929	1934	1929	1934
Atascosa	277	659	567,625	878,670
Bee	3	2	2,682	4,975
Bexar	1	9	300	1,957
Brooks	*	2	200	2,511
Cameron	9	8	12,546	19,325
Dimmit	2	191	1,300	427,793
Frio	4	*	6,650	150
Hidalgo	19	26	56,065	39,701
Jim Wells	3	2	1,313	1,900
La Salle	1	1	900	20
Maverick	0	2	0	3,900
Medina	3	7	3,200	4,206
Nueces	*	1	150	3,385
San Patricio	5	3	5,922	9,345
Zavala	0	34	0	61,200
Totals Southwest Texas	327	947	658,853	1,459,038
Entire State	2,852	3,345	3,089,948	4,577,702

*Less than one.

increased in five years from one-ninth of the state total to over a fourth. The production increased from one-fifth of the state total in 1929 to almost a third in 1934.

Methods of Production in Southwest Texas

Strawberries are grown as an annual crop in the Southwest Texas area. The recommended practice on sandy soils is to set plants in October, 10 to 12 inches apart, on low ridges 4 to 5 inches high and 18 or 20 inches apart, requiring about 30,000 plants per acre. On heavier soils double rows are sometimes used, plants being set 12 inches each way. These plantings

begin to bear as early as December and continue until May unless severe frost intervenes. Heaviest production is usually in March and April.

Plants are produced in the summer from portions of the bearing acreage reserved for the purpose. It is usually estimated that one acre of old plants will produce enough runner plants to set ten acres of strawberries in the fall. The problem of high temperatures in the summer is met by the use of heat resistant varieties and by other means of reducing heat damage. Previous work on summer treatment (10) indicates that the best procedure to reduce the ill effect of high temperatures is frequent irrigation, sometimes as often as every third day during the hottest periods.

Irrigation is by means of furrows, and water is not permitted to reach the plants, thus keeping the fruit clean. Mulching with straw or other material is not practiced commercially.

Experimental Methods

Plants used in the tests were either obtained direct from nurserymen or grown from stock for sale by nurseries. As far as possible, plants with strong crowns and good root systems were selected for testing. An attempt was made to have at least 50 plants of each variety in each test.

Setting was usually done in the fall (about October 1) on ridges 18 inches apart and 12 inches apart in the row as illustrated in Figure 1.

FIG. 1. Commercial strawberry harvest in the Winter Garden. This illustrates the method of spacing plants as well as manner of harvest. Note the irrigation lateral cutting across the field.

Two men did this by hand. One man opened a hole with a spade and the second placed the plant at the proper level, avoiding doubling or crowding of the roots. The first man then removed the spade and firmed the ground with his foot.

Irrigation was by furrow with a slow stream. When the ground was dry, rows were irrigated ahead of planting, and irrigation always followed immediately after planting. After the plants were established they were irrigated according to a schedule based on accumulated evaporation records which were taken daily from a metal tank 10 feet in diameter set at the ground level (11). During the winter months the plants were irrigated after every 2 inches of accumulated evaporation. In March and April this was increased to every 1.5 inches. From May to October the plants were irrigated after each inch of accumulated evaporation (about twice a week).

Cultivation was shallow and done after each irrigation or rain. A three-row onion cultivator was used with 6-inch wing shovels.

Soils used were mostly Webb fine sandy loam and closely related types. These soils have a pH of from 6.0 to 7.0 showing them to be slightly acid. Soils with high lime content have not been successful for strawberries. Heavy soils are difficult to handle with frequent irrigations.

Fertilizers were used in 1932 and 1933 but not in 1934, 1935, 1936, and 1937. However, the strawberries were planted on land that had previously been fertilized for onions, and that also had a good supply of organic matter.

Harvests usually began about January first and unless interrupted by frost continued until the end of the marketing season, which was usually some time in April.

Records were taken of (1) first flowers, (2) first ripe fruit, (3) fruit yields, (4) fruit description, (5) runner plant production, (6) per cent of summer survival, and (7) susceptibility to leaf diseases.

Importance of Variety

Strawberry centers are usually developed around certain varieties. Florida is famous for Missionary; Louisiana for Klondike; other sections for Aroma, and so on. Plantings have been mostly limited to Missionary and Klondike in Southwest Texas. Experiments to increase the yield of both fruit and runner plants have indicated that often more differences exist between varieties than between various treatments. Hence, the choice of variety may make considerable difference in profit to the grower.

Consideration in choosing a variety for commercial purposes are (1) runner production, (2) heat resistance, (3) shipping quality, such as firmness of fruit, uniformity in size, toughness of skin, (4) color, (5) season, (6) yield, (7) frost resistance, (8) disease resistance, and (9) dessert quality.

RUNNER PLANT PRODUCTION

Since plants form a large part of the expense of growing strawberries in Southwest Texas, efficient runner plant production is very important. In general, runner plant production is affected by (1) inherent ability of the variety to produce runners, (2) heat resistance of the variety, (3) soil conditions, (4) irrigation treatments, (5) temperature, and (6) relative humidity.

Ability to form runner plants differs greatly among varieties. Some varieties are consistently poor runner plant producers, while others are generally good. Some of this low production, as in the case of Chesapeake, may be due to the formation of runners too late in the season. Weather conditions are usually more favorable for runner production in May and June than in July and August. Darrow (2) found that maximum growth occurs at mean temperatures from 68° to 79° F. at Washington, D. C. Mean temperatures well above 80° F. occur during July, August, and September in Southwest Texas. Hence, production of runner plants early in the summer is important unless the variety is exceptionally heat resistant. In the case of Fairfax and Premier, the failure to produce runners is very likely due to lack of adaptability to our length of day (5). Some varieties of the wild West-coast strawberry, *Fragaria chiloensis*, sometimes have been affected by leaf diseases which destroy young runner plants.

Table 2 presents the number of runner plants growing in the fall, which had developed from an original planting of mother plants of 50 or more in the spring. Because of varying numbers of mother plants, the figures are based on average runner plants per original mother plant. In 1932, methods of irrigation to overcome summer heat were improperly understood and production was low. In 1935 some varieties were affected by leaf diseases and some by being too near some mesquite trees outside the field.

In general, the following varieties may be considered reasonably good plant producers every year: Aroma, "Banner," Dunlap, Ettersburg 80, Klondike, and Missionary. Varieties good in some years but not in others are Blakemore, Excelsior, and Thompson. Varieties with good plant production with records for one year only are Bederarena, Cape Blanco, and Early Bird.

Generally poor plant producers are Aberdeen, Beaver, Bellmar, Big Joe, Brandywine, Catskill, Chesapeake, Cooper, Ellinore, Ettersburg 121, Fairfax, Fendalcino, Fruitland, Gibson, Goldengate, Gracillis, Marshall, McClintock, New Deal, New Oregon, Nor-J, Premier, Redheart, Red Sugar, St. Louis, Southland, and Wickson.

Only fair plant producers are Narcissa, Texas, Washington, Big Blossom, Champion Klondike, Culver, Dorsett, Evening Star, and Kalicene.

Normally a plant increase of less than 10 per original mother plant is considered insufficient from a commercial standpoint. In other words, one acre of plants should set 10 acres for fruit production in the fall.

Table 2. Runner plant increase per mother plant

(Based on 50 or more mother plants)

Variety	Date of securing records				
	1932	1933	1934	1935	1936
	Oct. 14	Dec. 1	Sept. 29	Oct. 1	Oct. 1
Aberdeen	1.5	1.2	.....	.....	.....
Alcatraz	.....	.....	.....	0.6‡	2.8
Aroma	8.2	28.4	5.0*	.....	6.1
"Banner"	.....	13.2	3.7*	.....	7.9
Beaver	.....	.....	4.4†	.....	0.4
Bederarena	.....	.....	.....	0.1‡	23.4
Bellmar	.....	3.5	.....	.....	.....
Big Blossom	.....	.....	.....	0.4‡	6.8
Big Joe	0.5	2.5	.....	.....	.....
Big Lagoon	.....	.....	.....	0.0§	.....
Blakemore	8.3	20.3	3.4*	.....	0.8
Brandywine	.....	.....	4.5†	.....	2.1
Cape Blanco	.....	.....	.....	6.6*	10.4
Cape Mendocino	.....	.....	.....	0.0‡	.....
Catskill	.....	.....	.....	5.1*	0.3
Champion Klondike	.....	6.9	.....	.....	.....
Chesapeake	.....	.....	.....	1.5*	2.0
Cooper	.....	.....	2.1†	.....	2.0
Culver	.....	.....	.....	9.9*	3.0
Dorsett	.....	.....	5.7†	.....	4.0
Dunlap	3.3	14.2	.....	.....	.....
Early Bird	.....	15.4	.....	.....	.....
Ellinore	.....	.....	.....	2.4‡	1.7
Ettersburg 80	.....	.....	.....	15.9*	14.1
Ettersburg 121	.....	.....	.....	2.0*	3.1
Evening Star	1.6	9.8	.....	.....	.....
Excelsior	2.7	12.6	6.9*	.....	4.4
Fairfax	.....	.....	few	.....	.....
Fendalcino	.....	.....	.....	3.4*	0.3
Ford	0.0	.....	.....	.....	.....
Fruitland	.....	3.6	.....	.....	.....
Gibson	0.8	4.4	.....	.....	.....
Gold Dollar	0.7	.....	.....	.....	.....
Goldengate	.....	.....	.....	1.5*	0.6
Gracillis	.....	.....	.....	1.2‡	0.0
Heceta Beach	.....	.....	.....	0.0§	.....
Heflin	0.0	.....	.....	.....	.....
Jupiter	0.0	.....	.....	.....	.....
Kalicene	.....	.....	.....	11.0*	6.4
Klondike (local)	4.9	.....	.....	.....	.....
Klondike (Okla.)	.....	10.7	5.0*	.....	9.9
Klondike (Ark.)	.....	22.3	.....	.....	.....
Marshall	.....	.....	.....	3.8*	3.9
Mastodon	0.5	.....	.....	.....	.....
McClintock	.....	.....	.....	4.1*	5.5
Missionary (local)	0.4	.....	.....	.....	.....
Missionary (Md.)	.....	5.5	.....	.....	.....
Missionary (Ark.)	.....	22.6	.....	.....	.....
Missionary (Carolina)	4.2*	19.2	9.2*	.....	25.3
Narcissa	.....	.....	.....	6.0	5.9
New Deal	.....	.....	.....	1.9	0.4
New Oregon	0.9*	5.5	.....	.....	.....
Nor-J	.....	.....	.....	0.5‡	2.8
Patrick Point	.....	.....	.....	0.0§	.....
Point Arena	.....	.....	.....	0.0§	.....
Premier (Howard 17)	0.0	.....	few	.....	.....
Progressive	0.0	.....	.....	.....	.....
Redheart	0.6	1.6	.....	3.7*	0.0
Red Sugar	.....	.....	.....	1.8*	0.0
Rose Ettersburg	.....	.....	.....	0.0§	.....

Table 2. Runner plant increase per mother plant—Continued

(Based on 50 or more mother plants)

Variety	Date of securing records				
	1932	1933	1934	1935	1936
	Oct. 14	Dec. 1	Sept. 29	Oct. 1	Oct. 1
St. Louis	0.0	3.6	.....	.....	.....
Southland	.....	.....	.....	2.9*	0.3
Texas	1.4	11.0	.....	.....	.....
Thompson	.....	17.5	5.4*	.....	5.3
Trebla	.....	.....	.....	0.0§	.....
Von Humboldt	.....	.....	.....	0.0§	.....
Washington	0.8	6.4	.....	.....	.....
White Sugar	.....	.....	.....	0.0‡	.....
Wickson	.....	.....	.....	0.5*	0.1
Yachats No. 1	.....	.....	.....	0.0§	.....
U. S. 195	.....	.....	.....	12.0*	1.1
U. S. 197	.....	.....	.....	0.0§	.....
U. S. 542	.....	.....	.....	0.0‡	.....
U. S. 652	.....	.....	.....	0.7‡	0.8
U. S. 824	.....	.....	.....	9.7*	0.8
U. S. 888	.....	.....	.....	4.8*	0.2

*Spring set mother plants.
†Counts on mother plants in fall, original not known.
‡Unfavorably located near mesquite trees.
§Died from disease.

HEAT RESISTANCE

Obviously, ability to produce runners is of little use if the variety is unable to withstand the summer heat. It is difficult to measure this factor accurately. Mortality of the mother plants is one measure. Attempts were made in the first and second years to take monthly counts of runner plants and show the effect of heat on mortality and runner plant development. It is possible for a variety to overcome considerable summer mortality by producing many plants early in the season before summer heat sets in.

Mortality of parent plants is given in Table 3 for 1932, 1933, and 1934. Records of mortality were not taken in 1935 and 1936. The Carolina strain of Missionary used as a check gives an excellent record of survival. Aroma, "Banner," Bellmar, Blakemore, and Thompson have fairly satisfactory records. A number of *F. chiloensis* varieties, such as Kalicene, Cape Blanco, Bederarena, Ettersburg 80, and Ettersburg 121 showed good survival, but no accurate records were obtained.

Table 3. Per cent mortality of parent plants during the summer

Variety	1932	1933	1934	Average	Missionary same period
Aberdeen	73	79	.....	76	15
Aroma	40	31	22	31	16
"Banner"	.....	29	12	20	13
Bellmar	.....	18	.....	18*	10
Big Joe	.....	54	.....	54*	10
Blakemore	25	33	24	27	16
Champion K	.....	37	.....	37*	10
Dunlap	30	47	.....	38	15
Early Bird	.....	42	.....	42*	10
Evening Star	71	23	.....	47	15
Excelsior	66	38	12	35	16
Ford	100	.....	.....	100*	21
Fruitland	.....	41	.....	41*	10
Gibson	62	29	.....	45	15
Gold Dollar	62	.....	.....	62*	21
Heflin	100	.....	.....	100*	21
Klondike (local)	38	.....	.....	38*	21
Klondike (Okla.)	.....	14	46	30	13
Klondike (Ark.)	.....	37	.....	37*	10
Mastodon	75	.....	.....	75*	21
Missionary (local)	76	.....	.....	76*	21
Missionary (Md.)	.....	17	.....	17*	10
Missionary (Ark.)	.....	6	.....	6*	10
Missionary (Carolina)	21	10	16	16	16
New Oregon	38	70	.....	54	15
Redheart	38	86	.....	62	15
St. Louis	.....	35	.....	35*	10
Texas	60	15	.....	37	15
Thompson	.....	21	12	16	13
Washington	61	27	.....	44	15

*One year only.

FROST RESISTANCE

Resistance to frost is also difficult to measure. That there are varietal differences is apparent but no reliable index has been devised. One important factor, aside from actual resistance of the blooms to damage, is leaf coverage. In some varieties, such as Bederarena, the blooms and fruit are completely covered and will resist severe frosts on this account. Varieties with their flowers and fruit fully exposed naturally suffer greater damage. Effective leaf coverage is governed in part by the length of stems. For example, Ellinore has long stems that expose the blossoms and fruit in spite of the fact that the leaves are sufficiently large to cover the fruit. Notes on leaf coverage taken only in 1937 are presented in Table 4.

In 1933, following a minimum of 18° F. on February 8, it was noted that Klondike and Thompson recovered in fruit production more rapidly than Missionary.

Table 4. Degree of leaf coverage of fruit

None or slight	Moderate	Heavy or complete
Blakemore	Alcatraz	Bederarena
Brandywine	Aroma	Cape Blanco
Chesapeake	"Banner"	Fendalcino
Cooper	Big Blossom	Wickson
Culver	Ettersburg 80	U. S. 824
Dorsett	Ettersburg 121	U. S. 888
Ellinore	Excelsior	
Marshall	Goldengate	
McClintock	Kalicene	
Narcissa	Klondike	
New Deal	Missionary	
	Nor-J	
	Redheart	
	Southland	
	Thompson	
	U. S. 195	
	U. S. 652	

In 1935, an estimate was made of the freeze damage to plants on January 20 and 21 with a minimum of 19° F. Beaver, Excelsior, and Brandywine showed a little greater damage to plants from cold than did Blakemore, Missionary (Carolina), Thompson, Dorsett, Cooper, Klondike, Aroma, and Banner. It was noted that Missionary (Carolina), Thompson, and Excelsior recovered sooner after the freeze.

In 1936 an estimate was made of resistance to frost injury following a minimum temperature of 23° F. on January 20. Excelsior, Fendalcino, Kalicene, Narcissa, and Thompson seemed more resistant than Missionary (Carolina). Bederarena suffered no damage because of complete coverage by the leaves.

EARLINESS

There are two viewpoints with regard to earliness of production. One is that fruit in midwinter generally brings a higher price and therefore offsets greater production in the spring when prices are usually lower. The other viewpoint is that flowering and fruiting in midwinter is often cut short by freezing temperatures and plants produce less in March and April than varieties that did not flower and fruit so early.

Earliness from a commercial standpoint means the production of fruit before the regular season begins. This means that the variety must not only ripen fruits early but must produce it in paying quantities. In Table 5 are given the dates of first flower and first ripe fruit and in Table 6 the yields early in the season.

Table 5. Beginning dates of flowering and ripening

(Seasons ending in the years indicated)

Variety	Date of first flowers		Days after Mission-ary, Av.	Date of first ripe fruit						Days after Mission-ary, Av.
	1936	1937		1932	1933	1934	1935	1936	1937	
Aberdeen				2/21	3/24	3/12				3.3
Alcatraz	1/20	12/31	57.0					Mar.	2/22	55.0*
Aroma	11/29	12/22	23.0		3/24	3/ 2	1/11	1/13	1/27	12.2
"Banner"	12/13	12/24	31.0		3/24	3/ 2		Feb.	2/ 8	13.3
Beaver	11/11		0.0*				12/10	12/26		0.0
Bederarena	12/ 6	12/15	23.0					Feb.	1/25	27.0*
Bellmar					3/24	3/12				4.5†
Big Blossom	Mar.	1/ 6	43.0*					4/ 1	Mar.	96.0*
Big Joe					3/24					6.0*
Blakemore	11/11	11/ 6	9.0†	2/21	3/20	2/16	12/10	1/ 2	12/22	3.2†
Brandywine	11/11	12/ 6	6.0				12/21	1/13	1/25	18.7
Cape Blanco	1/20	1/ 4	55.5					Mar.	2/24	57.0*
Catskill	12/ 9		28.0*					Mar.		
Champion Klondike					3/20					2.0*
Chesapeake	12/13	12/26	32.0					Mar.	2/ 8	41.0*
Cooper	11/29	12/ 6	13.0				1/ 2	1/16	1/20	22.0
Culver	12/ 9	12/11	22.5					Feb.	2/ 8	41.0*
Dorsett	11/25	12/ 6	13.0					1/16	1/ 8	15.5
Dunlap				2/21	3/20	3/ 2	12/21			1.5
Early Bird					3/17	2/23				7.5†
Ellinore	12/ 6	12/29	30.0					Mar.	2/22	55.0*
Ettersburg 80	1/ 7	12/26	44.5					Mar.	2/15	48.0*
Ettersburg 121	12/ 6	12/22	26.5					Mar.	2/11	44.0*
Evening Star				3/19	3/22					15.0
Excelsior	11/ 7	11/12	8.0†	2/21	3/14	2/16	12/10	12/16	12/22	13.7†
Fendalcino	11/29	12/22	23.0					Feb.	2/ 4	37.0*
Fruitland					3/24	3/12				4.5
Gibson				2/21	3/24	3/12				3.0
Goldengate	Feb.	1/ 8	45.0*					Mar.	3/ 8	69.0*
Gracillis	1/17	1/ 6	55.0					Mar.	2/24	57.0*
Heflin				3/ 6						13.0*
Kalicene	12/ 6	12/11	21.0					Feb.	1/25	27.0*
Klondike (local)				2/27						6.0*
Klondike (Okla.)	11/25	12/ 6	13.0		3/18	3/ 9	12/28	Feb.	1/20	10.0
Klondike (Ark.)					3/17					1.0*

*One year only.
†Before Missionary.

Table 5. Beginning dates of flowering and ripening—Continued

(Seasons ending in the years indicated)

Variety	Date of first flowers		Days after Mission-ary, Av.	Date of first ripe fruit						Days after Mission-ary, Av.
	1936	1937		1932	1933	1934	1935	1936	1937	
Marshall	12/ 9	12/22	28.0					Feb.	1/27	29.0*
Mastodon				2/21						0.0*
McClintock	11/29	12/11	17.5					1/18	1/14	19.5
Missionary (local)				2/21						0.0*
Missionary (Md.)				3/17						0.0*
Missionary (Ark.)				3/18						0.0*
Missionary (Carolina)	11/11	11/24	0.0	2/21	3/18	3/ 9	12/10	12/26	12/29	0.0
Narcissa	11/25	12/ 6	13.0					1/ 7	1/ 6	10.0
New Deal	12/ 6	12/ 6	18.5					Feb.	1/27	29.0*
New Oregon				2/21	3/30	3/12				5.0
Nor-J	12/26	12/29	40.0					Mar.	2/19	52.0*
Redheart	12/ 6	12/11	21.0		3/28	3/12		1/18	2/ 8	21.7
Red Sugar	12/19		38.0*					Mar.		
St. Louis					3/22	3/12				3.5
Southland	12/ 9	12/24	29.0					Feb.	2/11	44.0*
Texas				2/21	3/20	3/14				2.3
Thompson	11/ 7	11/28	0.0		3/17	3/ 2	12/21	12/26	1/ 4	1.8
Washington					4/ 1					14.0*
Wickson	12/13	1/ 4	36.5					Mar.	2/22	55.0*
U. S. 195	1/20	1/ 2	54.5					Mar.	2/19	52.0*
U. S. 652	12/ 9	11/28	16.0					Mar.	1/22	24.0
U. S. 824		1/ 2	39.0*					Mar.	2/24	57.0*
U. S. 888	12/ 9	12/24	29.0					Mar.	2/15	48.0*

*One year only.

Table 6. Early season yields

Average in grams per plant*

Variety	1932 before Mar. 15	1933 before Mar. 31	1935 before Jan. 15	1936 before Mar. 18	1937 before Mar. 1	Per cent of Missionary same periods
Aberdeen	3.0	1.0	.....	.....	.....	34
Alcatraz	.....	.....	.....	0.7	1.1	3
Aroma	.....	2.2	0.0	2.0	8.9	10
"Banner"	.....	2.1	0.0	2.5	10.8	12
Beaver	.....	.....	10.8	4.4	.....	34
Bederarena	.....	.....	.....	22.0	23.9	41
Bellmar	.....	1.3	.....	.....	.....	23†
Big Blossom	.....	.....	.....	0.0	0.0	0
Big Joe	.....	0.7	.....	.....	.....	12†
Blakemore	2.5	3.9	16.4	10.9	40.8	56
Brandywine	.....	.....	3.0	2.6	38.3	36
Cape Blanco	.....	.....	.....	0.7	1.1	2
Catskill	.....	.....	.....	2.7	.....	8†
Champion Klondike	.....	5.6	.....	.....	.....	98†
Chesapeake	.....	.....	.....	1.8	15.7	16
Cooper	.....	.....	2.0	11.7	38.9	43
Culver	.....	.....	.....	5.7	21.4	24
Dorsett	.....	.....	0.7	10.4	34.0	37
Dunlap	12.1	1.2	.....	.....	.....	114
Early Bird	.....	4.2	.....	.....	.....	74
Ellinore	.....	.....	.....	2.6	5.2	7
Ettersburg 80	.....	.....	.....	2.8	6.6	8
Ettersburg 121	.....	.....	.....	4.9	8.9	12
Evening Star	0.0	1.3	.....	.....	.....	11
Excelsior	3.6	3.0	7.1	49.0	73.9	102
Fendalcino	.....	.....	.....	15.6	21.6	34
Fruitland	.....	2.9	.....	.....	.....	51†
Gibson	1.7	5.8	.....	.....	.....	64
Goldengate	.....	.....	.....	0.1	0.0	0
Gracillis	.....	.....	.....	0.5	0.0	0
Heflin	0.3	.....	.....	.....	.....	5†
Kalicene	.....	.....	.....	13.0	25.5	35
Klondike (local)	7.5	.....	.....	.....	.....	125†
Klondike (Okla.)	.....	3.5	1.1	10.7	46.6	49
Klondike (Ark.)	.....	5.9	.....	.....	.....	104†
Marshall	.....	.....	.....	6.0	17.9	22
Mastodon	2.3	.....	.....	.....	.....	38
McClintock	.....	.....	.....	6.2	29.9	33
Missionary (local)	6.0‡	.....	.....	.....	.....	100‡
Missionary (Md.)	.....	3.9	.....	.....	.....	68†
Missionary (Ark.)	.....	3.3	.....	.....	.....	58†
Missionary (Carolina)	3.0‡	5.7	10.8	33.6	77.2	100
Narcissa	.....	.....	.....	18.5	26.7	41
New Deal	.....	.....	.....	14.0	21.7	32
New Oregon	3.0	0.7	.....	.....	.....	32
Nor-J	.....	.....	.....	2.8	12.2	14
Redheart	.....	1.0	.....	3.7	24.3	25
Red Sugar	.....	.....	.....	0.9	.....	3†
St. Louis	.....	3.1	.....	.....	.....	54†
Southland	.....	.....	.....	20.3	21.8	38
Texas	7.1	3.3	.....	.....	.....	89
Thompson	.....	6.9	6.8	34.6	59.0	84
Washington	.....	0.0	.....	.....	.....	0
Wickson	.....	.....	.....	1.1	7.0	7
U. S. 195	.....	.....	.....	1.8	4.5	6
U. S. 652	.....	.....	.....	18.7	61.0	72
U. S. 824	.....	.....	.....	0.0	0.5	0
U. S. 888	.....	.....	.....	8.9	14.8	21

*To get the approximate yield in 24-pint crates per acre multiply the grams per plant by 4. This is based on a perfect stand (18x12 inch spacing).

†One year only.

‡Used local Missionary for check in 1932 because of late planting of Carolina strain.

Considering yields, there are few varieties that consistently equal Missionary for early production of fruit. Excelsior usually produces more fruit early in the season; other varieties approach Missionary production but not consistently. Blakemore, Texas, Thompson, Dunlap, Early Bird, and Beaver may be considered early varieties. Klondike, Gibson, Cooper, Brandywine, Narcissa, New Deal, St. Louis, Southland, Dorsett, Aberdeen, Fruitland, and Kalicene may be considered second early. An estimate of earliness for all varieties is given in Table 7.

Table 7. Relative Earliness of Varieties

Very Early	Early	Early Midseason	Midseason	Late
Beaver	Champion Klondike	Aberdeen	Aroma	Alcatraz
Blakemore	Dunlap	Bederarena	"Banner"	Big Blossom
Early Bird	Fruitland	Bellmar	Big Joe	Cape Blanco
Excelsior	Gibson	Brandywine	Chespeake	Catskill
Missionary	Gold Dollar	Cooper	Ettersburg 121	Ellinore
	Klondike	Culver	Fendalcino	Ettersburg 80
	Narcissa	Dorsett	Marshall	Evening Star
	St. Louis	Heflin	New Oregon	Goldengate
	Texas	Kalicene	Nor-J	Gracillis
	Thompson	Mastodon	Redheart	Red Sugar
	U. S. 652	McClintock	U. S. 888	Washington
		New Deal		Wickson
		Southland		U. S. 195
				U. S. 824

FRUIT YIELDS

The final measure of a variety is its yield of marketable fruit at a time when prices are profitable. Early production at high prices may be offset by high yields during the main part of the season, even though the price is lower. The harvesting cost is about the same per crate whether the net return is $1.00 per crate or $5.00 per crate. Therefore as large a proportion of the crop as possible should be produced at the time of higher prices. Frosts may interfere with these plans, but in general the earlier varieties have been more profitable during the six years of the test.

Early yields are given in Table 6. Total yields during the marketing season are given in Table 8. The later varieties often continue to produce heavily after the shipping season is over, and their full capacity for production is not shown in the table. These may, of course, be of value for home use or canning. Yield records were taken only as long as the marketing season extended. In 1937 the varieties were scattered throughout a planting of seedlings under test in the breeding work, and calculations of percentage are based on the nearest Missionary (Carolina) plot. These check plots were planted every seventh plot in the 1936-37 season.

Lack of knowledge of proper cultural and irrigation procedure doubtless accounts for the poor yields in 1932. The severe freeze on February 8, 1933 (18° F.), probably affected the yields in that year. Delay in setting the plants accounts for poor yields in 1934. Winter frosts occurred in 1935 and 1936 and interrupted fruit production for several weeks. No killing frost occurred in the 1936-37 season, and this season might be considered as ideal for strawberries.

Table 8. Total yields for market season

Average in grams per plant*

Variety	1932 Apr. 18‡	1933 May 10	1934 April 16	1935 April 20	1936 April 13	Per cent of Missionary	1937 April 24	Per cent of Missionary 1937
Aberdeen	2.4	19.1	12.8	.....	.....	54	.....	.....
Alcatraz	.....	.....	.....	.....	27.0	30	58.7	42†
Aroma	.....	19.0	17.9	47.8	48.5	65	106.6	58
"Banner"	.....	27.9	27.3	95.7	70.3	108	176.9	107
Beaver	.....	.....	.....	30.4	14.5	30	.....	.....
Bederarena	.....	.....	.....	.....	68.2	77	163.2	82
Bellmar	.....	18.3	10.6	.....	.....	52	.....	.....
Big Blossom	.....	.....	.....	.....	13.6	15	.....	.....
Big Joe	.....	12.8	.....	.....	.....	29	.....	.....
Blakemore	5.1	27.7	9.9	60.8	32.3	64	92.4	56
Brandywine	.....	.....	.....	28.8	25.6	36	62.5	40
Cape Blanco	.....	.....	.....	.....	23.8	27	93.9	60
Catskill	.....	.....	.....	.....	16.2	18	.....	.....
Champion Klondike	.....	28.5	.....	.....	.....	65	.....	.....
Chesapeake	.....	.....	.....	.....	27.1	31	47.4	30
Cooper	.....	.....	.....	37.2	36.2	49	69.1	44
Culver	.....	.....	.....	.....	32.0	36	75.0	48
Dorsett	.....	.....	.....	63.0	39.1	68	103.3	64
Dunlap	8.1	9.3	8.0	.....	.....	40	.....	.....
Early Bird	.....	15.1	8.2	.....	.....	42	.....	.....
Ellinore	.....	.....	.....	.....	39.5	44	192.4	122
Ettersburg 80	.....	.....	.....	.....	73.2	82	191.6	121
Ettersburg 121	.....	.....	.....	.....	63.2	72	156.8	99
Evening Star	3.0	15.9	.....	.....	.....	36	.....	.....
Excelsior	5.8	18.7	7.6	35.6	65.1	62	132.0	85†
Fendalcino	.....	.....	.....	.....	56.8	64	130.6	83
Fruitland	.....	15.6	11.5	.....	.....	48	.....	.....
Gibson	4.7	31.4	12.4	.....	.....	76	.....	.....
Goldengate	.....	.....	.....	.....	12.5	14	114.5	72
Gracillis	.....	.....	.....	.....	32.1	36	78.9	116†
Heflin	2.8	.....	.....	.....	.....	33	.....	.....
Kalicene	.....	.....	.....	.....	58.6	66	128.2	79
Klondike (local)	15.5	.....	.....	.....	.....	185	.....	.....
Klondike (Okla.)	.....	27.4	11.2	77.3	100.5	106	184.2	114
Klondike (Ark.)	.....	20.6	.....	.....	.....	47	.....	.....
Marshall	.....	.....	.....	.....	25.0	28	99.6	78
Mastodon	5.9	.....	.....	.....	.....	70	.....	.....
McClintock	.....	.....	.....	.....	55.3	62	77.9	46
Missionary (local)	9.3	.....	.....	.....	.....	111	.....	.....
Missionary (Md.)	.....	17.6	.....	.....	.....	40	.....	.....
Missionary (Ark.)	.....	26.4	.....	.....	.....	60	.....	.....
Missionary (Carolina)	8.4	43.9	11.7	60.3	88.8	100	156.4	100
Narcissa	.....	.....	.....	.....	52.7	59	85.9	47
New Deal	.....	.....	.....	.....	76.3	86	155.4	88†
New Oregon	5.8	7.5	12.5	.....	.....	40	.....	.....
Nor-J	.....	.....	.....	.....	61.0	69	219.9	129
Redheart	.....	17.4	13.3	.....	36.2	46	88.1	85†
Red Sugar	.....	.....	.....	.....	40.6	46	.....	.....
St. Louis	.....	18.2	6.8	.....	.....	45	.....	.....
Southland	.....	.....	.....	.....	58.8	66	134.1	130†
Texas	6.8	19.7	18.6	.....	.....	70	.....	.....
Thompson	.....	26.7	15.4	54.6	107.6	100	162.4	154
Washington	.....	15.1	.....	.....	.....	34	.....	.....
Wickson	.....	.....	.....	.....	26.3	30	205.9	134
U. S. 195	.....	.....	.....	.....	21.4	24	50.7	32†
U. S. 652	.....	.....	.....	.....	73.9	83	122.7	77
U. S. 824	.....	.....	.....	.....	44.8	50	60.3	38
U. S. 888	.....	.....	.....	.....	47.0	53	109.3	69

*To get the approximate yield in 24-pint crates per acre multiply the grams per plant by 4. This is based on a perfect stand (18x12 inch spacing).

†Incomplete for whole season.

‡Dates given indicate end of marketing season.

Yields are given in grams per plant but tests are on a basis of 50 to 1,000 plants. Multiplying the number of grams per plant by 4 will give the approximate yield in 24-pint crates per acre.

Only a few varieties outyielded Missionary during the commercial harvest period in the six years of the test. "Banner," Klondike, Missionary, and Thompson bore consistently good yields of fruit. Blakemore and Excelsior bore well early in the season but failed to maintain good production into the main season. "Banner" and Klondike are midseason varieties but bear heavily in March and April.

Ettersburg 80, Ettersburg 121, and New Deal gave promising yields. New Deal is a poor variety, however, and is not recommended.

SHIPPING QUALITY

A good shipping variety must have a firm fruit, with a skin not easily bruised. It must also be able to hold its color well after picking. Another quality important for shipping is uniformity in size and shape.

From the standpoint of shipping quality, Klondike, Blakemore, Missionary (Carolina), Aroma, "Banner," and Ettersburg 80 are the leading varieties tried. Excelsior and Narcissa are good but vary in size so much that a uniform pack is difficult to maintain. All varieties vary somewhat in size from one picking to another but some become so small that they are not marketable.

COLOR OF FRUIT

The color of a variety helps to sell it. The most desirable color from a commercial standpoint is a bright red that does not darken after picking. Missionary tends to darken after picking while Klondike and Blakemore hold their color well.

For canning a very pale variety is not desirable but in the case of Blakemore the pale color is not objectionable because it is firm and holds its color after canning. A uniform interior color is also desirable.

Another factor in color is uneven coloring when ripening. Some varieties may color on the tip end and leave a zone of white at the base that gives an unattractive fruit; others leave a white tip. Excelsior, Blakemore, Dorsett, Klondike, and Narcissa color evenly.

Redheart, Goldengate, U. S. 824, and U. S. 888 are very dark-colored berries, sometimes becoming almost black when fully ripe.

DISEASE RESISTANCE

In climates such as Southwest Texas, leaf diseases are unimportant during the fruiting season because of cool weather, but in the summer months leaf diseases may become severe and cause considerable damage. Differences in resistance to such diseases have been noted among the varieties under test. Missionary is one of the most resistant while some wild *F. chiloensis* selections are very susceptible.

Notes taken in 1935 when leaf diseases were severe are summarized in Table 9. Leaf diseases do not occur every year and are never serious in Southwest Texas except in plant beds. Klondike plants when crowded sometimes suffer severe damage from leaf diseases.

Table 9. Severity of leaf disease in summer, 1935

Mild	Moderate	Severe
Aroma	"Banner"	Alcatraz
Blakemore	Bederarena	Beaver
Cooper	Brandywine	Big Blossom
Culver	Cape Blanco	Big Lagoon
Excelsior	Catskill	Cape Mendocino
McClintock	Chesapeake	Goldengate
Missionary	Dorsett	Heceta Beach
Redheart	Ellinore	Nor-J
Thompson	Ettersburg 80	Patrick Point
	Ettersburg 121	Point Arena
	Fendalcino	Red Sugar
	Gracillis	Trebla
	Klondike	U. S. 197
	Marshall	Von Humboldt
	Narcissa	White Sugar
	New Deal	Wickson
	Southland	Yachats No. 1
	U. S. 195	
	U. S. 652	
	U. S. 824	
	U. S. 888	

DESSERT QUALITY

Flavor is an important consideration for strawberry varieties intended for home use or local market but so far has not been an important factor in shipping. Some of the newer varieties like Dorsett may create a demand for better quality berries.

There are two main types of flavor in strawberries. One is represented by Excelsior which is the more acid type that is greatly preferred by many people. The other main type is the mild flavor with low acid content represented by "Banner" and Ettersburg 80. Choice of flavors among individuals divides about equally between these two types. Flavor-rating is therefore likely to vary considerably between individuals. In Table 10 is given an indication of flavor as determined in these tests.

Table 10. Dessert Quality

Good to Excellent	Fair to Good	Poor to Fair
"Banner"*	Aberdeen	Beaver
Bederarena*	Alcatraz*	Brandywine
Blakemore	Aroma	Catskill
Cape Blanco*	Bellmar	Champion Klondike
Chesapeake	Big Blossom*	Culver
Dorsett	Big Joe	Dunlap
Ellinore*	Cooper	Evening Star
Ettersburg 80*	Early Bird	Gibson
Ettersburg 121*	Fendalcino*	Gracillis*
Excelsior	Fruitland	Klondike
Goldengate*	Marshall	New Deal*
Kalicene*	McClintock	Texas
Narcissa	Missionary	Thompson
Nor-J*	New Oregon	
Southland	Redheart	
U. S. 824	St. Louis	
U. S. 888	U. S. 195*	
	U. S. 652	
	Washington*	
	Wickson*	

*Mild or "low acid" varieties.

Table 11. Fruit characteristics

Variety	Size	Shape	Color		Texture	Seeds	Calyx	Flavor
			Exterior	Interior				
Aberdeen	large	conical	medium red	medium red	firm	.....	small	fair
Alcatraz	large	short conical	light red	pink	firm	sunken	large	fair, mild
Aroma	large	conical	medium red	pink	firm	semi-exposed	medium	fair to good
"Banner"	medium	short conical	dull red	light red	firm	exposed	large	good, mild
Bederarena	medium	short conical	bright red	light red	fair	sunken	medium	good, mild
Bellmar	large	long conical	medium red	medium red	firm	.....	large	fair
Big Blossom	small	conical	bright red	light red	soft	exposed	medium	fair to good
Big Joe	medium	long conical	medium red	medium red	firm	.....	medium	fair
Blakemore	medium	conical	light red	light red	very firm	exposed	menium	good
Brandywine	large	wedge	dark red	red	firm	semi-exposed	large	fair
Cape Blanco	medium	short conical	dark red	dark red	soft	exposed	large	good, mild
Champion Klondike	large	round	medium red	medium red	soft	.....	medium	fair
Chesapeake	medium-large	long conical	medium red	medium red	firm	exposed	medium	good
Cooper	small to large	wedge	medium red	light red	fair	exposed	medium	fair to good
Culver	medium	conical	dark red	light red	fair	exposed	medium	poor to fair
Dorsett	medium	conical	bright red	medium red	very firm	semi-exposed	medium	fair to good
Dunlap	small	conical	medium red	medium red	firm	.....	medium	fair
Early Bird	medium	long conical	medium red	medium red	firm	.....	large	fair
Ellinore	large	wedge	faint pink	white	soft	sunken	large	very good
Ettersburg 80	medium	short conical	medium red	light red	very firm	semi-exposed	large	very good
Ettersburg 121	small	round	dark red	medium red	firm	semi-exposed	medium	very good
Evening Star	large	conical	medium red	pink	soft	semi-exposed	large	fair
Excelsior	small to medium	short conical	dark red	dark red	firm	semi-exposed	medium	very good
Fendalcino	medium	short conical	medium red	medium red	soft	sunken	medium	good
Fruitland	large	short conical	light red	.....	firm	.....	medium	good
Gibson	large	conical	medium red	.....	firm	.....	medium	fair
Goldengate	medium to small	conical	dark red	medium red	firm	exposed	large	excellent
Kalicene	large to medium	con. to wedge	dark red	light red	firm	sunken	medium	very good
Klondike	medium	short conical	medium red	medium red	firm	sunken	medium	fair
Marshall	small to medium	conical	medium red	light red	fair	semi-exposed	medium	fair-good
McClintock	large to medium	long conical	light red	medium red	firm	semi-exposed	medium	fair
Missionary	medium to large	long conical	medium red	medium red	firm	exposed	medium	fair to good
Narcissa	medium	short conical	dark red	dark red	very firm	sunken	small	very good
New Deal	small	short conical	glossy red	light red	fair	sunken	small	fair to poor
Nor-J	medium	conical	medium red	.....	firm	.....	small	fair
Nor-J	medium	conical	light red	pink	fair	semi-exposed	large	good
Redheart	medium to large	rough conical	dark red	dark red	very firm	semi-exposed	medium	very good
St Louis	medium to large	long conical	light red	.....	firm	.....	medium	fair to good
Southland	medium	conical	medium red	medium red	firm	semi-exposed	medium	very good
Texas	medium	short conical	medium red	.....	firm	.....	medium	fair
Thompson	medium	short conical	medium red	pink	fair	semi-exposed	medium	fair
Washington	medium	short conical	medium red	.....	firm	.....	small	good
Wickson	small	wedge	medium red	pale red	firm	semi-exposed	medium	very good

DISCUSSION OF VARIETIES

Brief notes on variety characters are given for fruits in Table 11 and for plants and flowers in Table 12. The descriptions given are based on their behavior in Southwest Texas and should be used only as a guide to their performance under similar conditions. The growth and development of a variety is influenced by temperature, length of day, and season. Thus a variety grown in the South does not always look like the same variety grown in the North, because of climatic differences. Descriptive notes were not taken in every year and therefore are not complete for some varieties. Brief discussions are given below for each variety grown.

Table 12. Plant characteristics

Variety	Size of plant	Leaves			Covering of fruit	Flowers Av. diameter, mm.
		Size	Shade of green	Texture		
Alcatraz	med.-large	large	dark	leathery	partial	25
Aroma	medium	medium	medium	thin	partial	27
"Banner"	large	medium	dark	leathery	partial	32
Bederarena	large	large	dark	leathery	complete	29
Big Blossom	medium	medium	dark	leathery	partial	40
Blakemore	medium	small	light	thin	exposed	20
Brandywine	small to large	large	medium	thin	exposed	21
Cape Blanco	large	large	dark	leathery	complete	40
Chesapeake	small	medium	medium	thin	exposed	25
Cooper	small to large	medium	light	thin	partial	25
Culver	small to medium	small	medium	thin	exposed	20
Dorsett	small to medium	small	medium	thin	exposed	22
Ellinore	medium to large	small	dark	leathery	exposed	30
Ettersburg 80	medium to large	large	dark	leathery	partial	40
Ettersburg 121	medium to large	large	light	leathery	partial	35
Excelsior	medium	large	light	thin	partial	25
Fendalcino	medium	medium	medium	leathery	complete	22
Goldengate	medium	medium	dark	leathery	partial	30
Kalicene	medium	medium	medium	leathery	partial	25
Klondike	medium	medium	medium	thin	partial	30
Marshall	small to medium	small	light	thin	exposed	17
McClintock	small to medium	small	light	thin	exposed	22
Missionary	medium	small	light	thin	partial	19
Narcissa	small to medium	small	medium	thin	exposed	18
New Deal	medium	small	dark	leathery	exposed	30
Nor-J	large	large	dark	leathery	partial	27
Redheart	medium	small	medium	thin	partial	20
Southland	medium	large	dark	thin	partial	26
Thompson	medium	medium	medium	thin	partial	25
Wickson	medium to large	large	dark	leathery	complete	26

Aberdeen originated in New Jersey (6). It is not recommended for Southwest Texas because of its low yields of fruit and low runner plant production. Dessert quality is only fair.

Alcatraz was originated by Albert F. Etter, California, from the cross "Red Sugar x Duchesne." As yields are poor to fair because of its late season, it is not recommended for general planting.

Aroma (Fig. 2) originated in Kansas (6). It is a good shipping variety but is excelled by Missionary and Klondike in this section. It is a good plant producer.

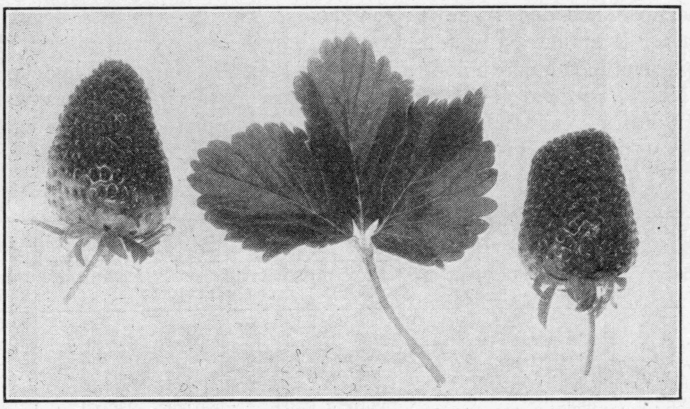

FIG. 2. Aroma

"Banner" (Fig. 3) was received under this name from California but is not the true Banner. It is very similar to Ettersburg 80, showing the characteristics of the wild west coast strawberry, *Fragaria chiloensis*, but satisfactory identification has not yet been made. It is well adapted and a good yielder. It is recommended for Southwest Texas as a market variety.

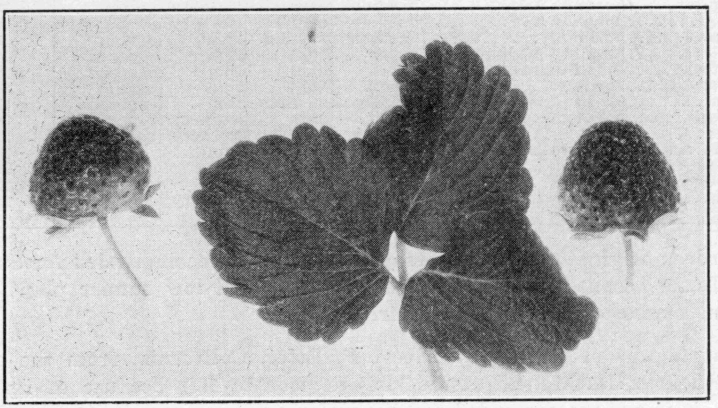

FIG. 3. "Banner"

Beaver (Fig. 4) originated in Wisconsin and is poorly adapted to Southern conditions. It is very early but cannot be recommended.

Bederarena originated with Albert F. Etter, California, and is from a cross of Point Arena and Bederwood. Although it has some good qualities such as complete leaf coverage, it is very susceptible to disease and is recommended only for home use.

FIG. 4. Beaver

Bellmar resulted from a cross of Missionary and Howard 17, made by the U. S. Department of Agriculture in Maryland (6). It is later than Missionary and is not productive enough to recommend for Southwest Texas.

Big Blossom is a wild selection of *Fragaria chiloensis* of no commercial importance. It is of little value for home use and is chiefly interesting for its very large blossoms.

Big Joe originated in New Jersey (6) and like most northern varieties is not well adapted to southern conditions.

FIG. 5. Blakemore

Blakemore (Fig. 5) is the result of a cross of Missionary and Howard 17, made in Maryland by the U. S. Department of Agriculture (3). It is a smaller plant than Missionary and is quite heat resistant. It tends to produce fruit late in the season and is therefore often low in plant production. It is subject to an obscure disease called "yellows" which seems to affect only this variety, which therefore is not recommended for commercial planting, although the fruit has excellent shipping qualities.

Brandywine (Fig. 6) originated in Pennsylvania (9) and is an old shipping variety now displaced by others with smoother fruits. It is not fully adapted to southern conditions and is not recommended.

FIG. 6. Brandywine

Cape Blanco (Fig. 7) is a wild selection of *Fragaria chiloensis* from California and is of no commercial value. It is late in season.

Carolina is considered to be a strain of Missionary.

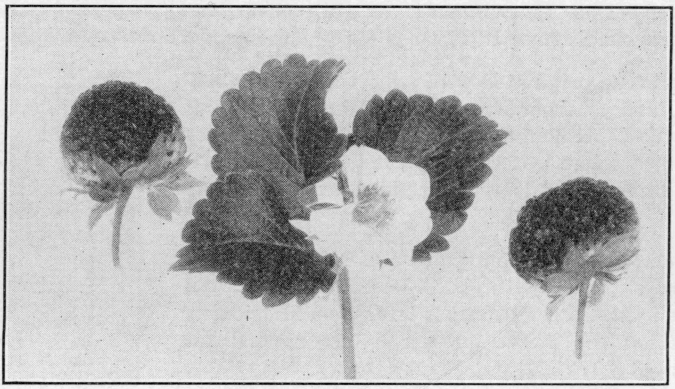

FIG. 7. Cape Blanco

Catskill originated at the New York Experiment Station from a cross of Marshall and Howard 17. It is not adapted to southern winters.

Chesapeake originated in Maryland (6). Although the fruit is high in quality, it is not adapted to our seasons and is not recommended.

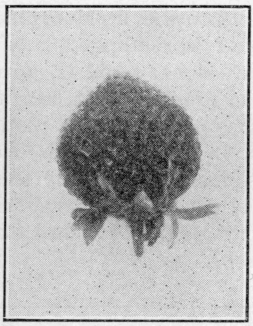

FIG. 8. Cooper

Cooper (Fig. 8) is another northern variety that sometimes does reasonably well but in general is not adapted. It sometimes produces exceptionally large fruits. It is not recommended.

Culver originated from a cross of Marshall and Howard 17 at the New York Experiment Station. Although better adapted than Catskill, it is not recommended for planting.

Dorsett (Fig. 9) originated from a cross of Royal Sovereign and Howard 17, made by the U. S. Department of Agriculture in Maryland (4). Because of its high dessert quality and good shipping qualities, it is unfortunate that it is not quite at home in our climate. It cannot be recommended for commercial plantings.

Dunlap is another northern variety, originating in Illinois (6), that is not quite well enough adapted to recommend for general planting.

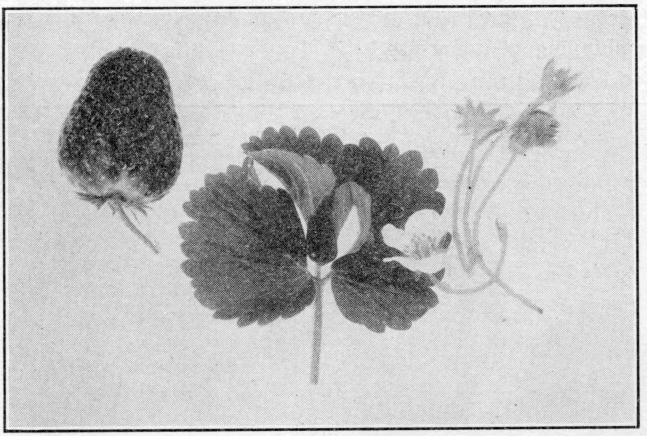

FIG. 9. Dorsett

Ellinore (Fig. 10) was received from Albert F. Etter as a "Duchesne-Trebla hybrid." It has soft fruits but might be of some value for home

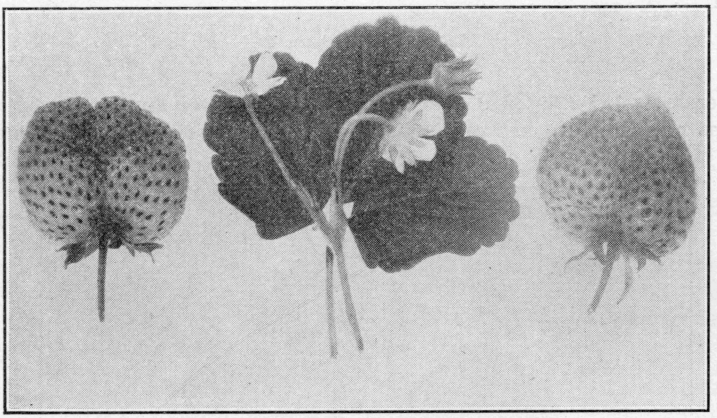

FIG. 10. Ellinore

plantings since it produces fairly well. It has long stems that completely expose the fruit. The fruit is a very pale pink color and is sweet when only white.

Ettersburg 80 (Fig. 11) is another California variety bred by Albert F. Etter. It is a *Fragaria chiloensis* hybrid and has strong plants with heavy

crowns. It is well adapted to southern winters and is a good shipping variety. Although a late variety it is a heavy yielder and is recommended for either shipping or home use.

FIG. 11. Ettersburg 80

Ettersburg 121 (Fig. 12) also came from Mr. Etter and originated from a cross of Alpine with Cape Mendocino. It is earlier than Ettersburg 80

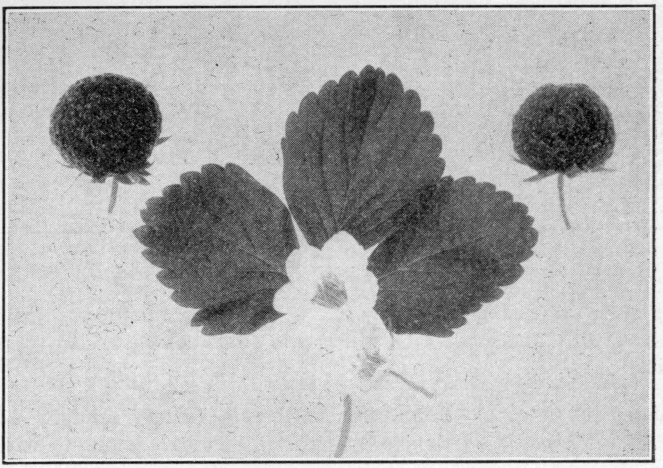

FIG. 12. Ettersburg 121

and has small well colored fruits. It has been a poor plant producer and therefore is not recommended for commercial plantings, although it seems well adapted.

Evening Star originated in Missouri. Because of its late season and soft fruit it is not recommended for Southwest Texas.

Excelsior (Fig. 13) originated in Arkansas from a Hoffman-Wilson cross (9). It is the earliest variety tried at Winter Haven and produces heavily early in the season. Later the fruits become so small that a large percentage are culls. It should be planted only to a limited extent for very early markets or home use.

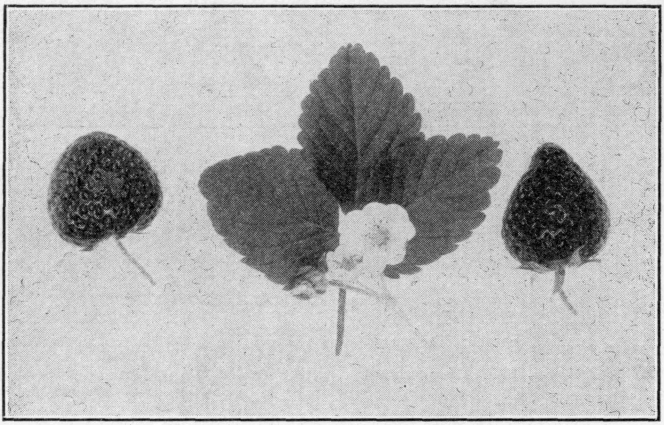

FIG. 13. Excelsior

Fairfax originated in Maryland, probably from a cross of Howard 17 and Royal Sovereign made by the U. S. Department of Agriculture (4). The plants are weak and produce few runners. Very few flowers are produced and the resultant fruit is very poor in flavor. It is not adapted to Southwest Texas although it is reported to be an excellent variety in the North (6).

Gibson was received under this name although the preferred name is **Parsons** (6). It originated in Maryland. It is not recommended for general planting because several other varieties are much better adapted.

Goldengate (Fig. 14) is another introduction from California by Etter, who reports it to be a selection "from a cross of Ettersburg 80 and

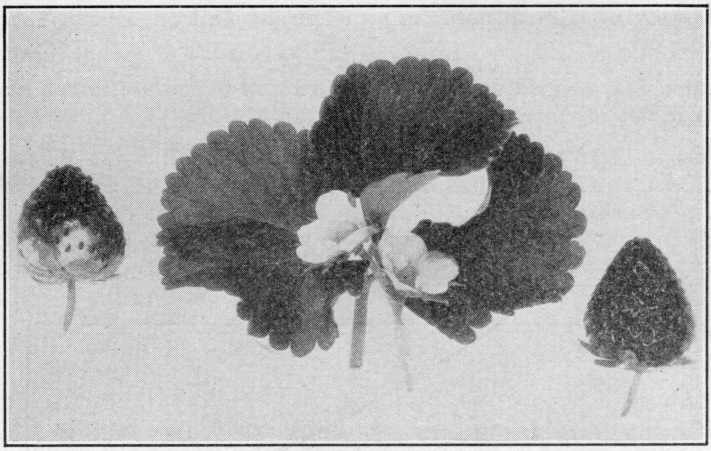

FIG. 14. Goldengate

Duchesne." It is quite susceptible to leaf diseases and because it is very late is not recommended for planting. It grows well during the winter months and bears a very good flavored fruit.

Howard 17 is the preferred name for Premier.

Kalicene (Fig. 15) originated in California with Albert F. Etter and seems to be quite heat resistant. The fruits tend to be irregular and

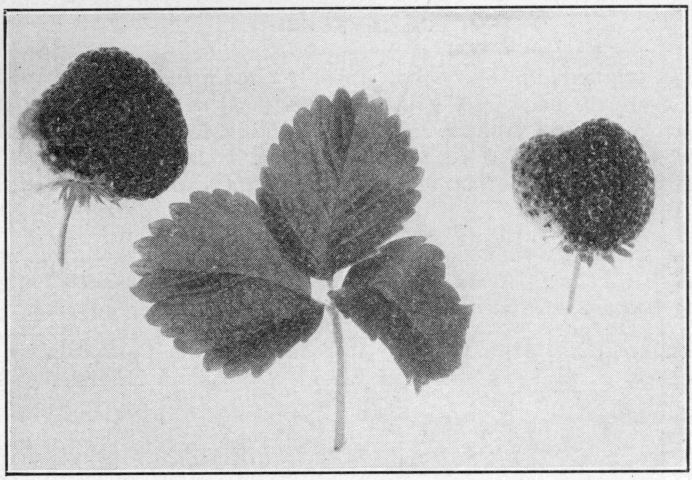

FIG. 15. Kalicene

the color is not always uniform. The flavor is very good and the variety would be of value for home use.

Klondike (Fig. 16) originated in Louisiana from a cross of Pickerproof and Hoffman (9). This is the leading commercial variety in Louisiana and Texas, and is one of the two varieties planted for commercial production.

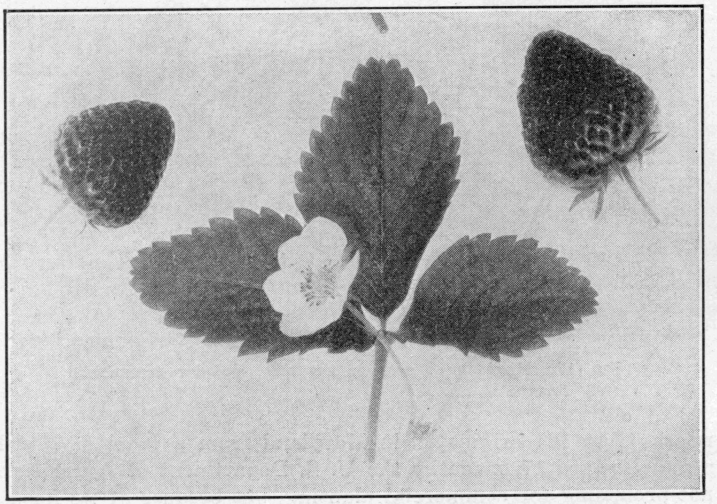

FIG. 16. Klondike; one of the two leading commercial varieties.

The crop is produced mostly during March and April and the season is shorter than for Missionary. Production is usually high. Because its color does not darken or fade readily it is a good shipping and preserving variety. Unfortunately the flavor is only fair. It is well known on the markets and may be safely planted for commercial production.

Marshall originated in Massachusetts (6). Since it is not adapted to southern climates it has not done well.

McClintock originated at the Tennessee Agricultural Experiment Station as an Aroma seeding (8). Although better adapted than most northern varieties it is not recommended for planting in Southwest Texas.

Missionary (Fig. 17) is a standard commercial variety originating in Virginia (6). It is the leading variety for winter strawberries and produces over a long period, sometimes as long as six months. The fruit darkens sooner than Klondike or Blakemore, but since it is mostly mar-

keted in the winter and early spring this does not prevent Missionary from being an important commercial variety. The Missionary used in these tests was one purchased as "Carolina" and was grown in Oklahoma.

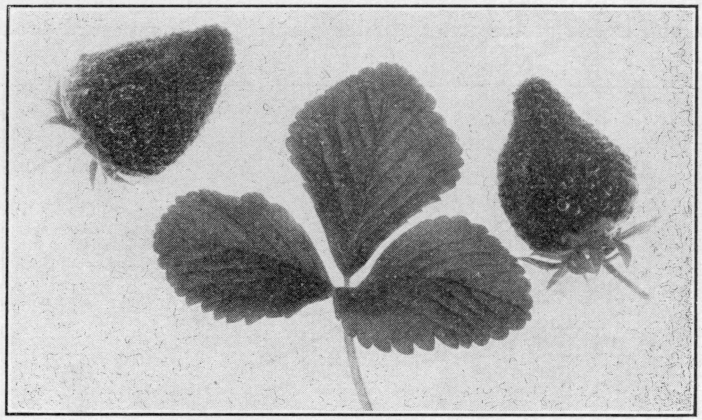

FIG. 17. Missionary; perhaps the most popular commercial variety for the South.

Narcissa (Fig. 18) originated in Maryland from a cross of Royal Sovereign and Howard 17, made by the U. S. Department of Agriculture (4). It is not promising for commercial planting, but because of its good flavor and color could be planted in home gardens. Though not a heavy yielder it produces over a long season.

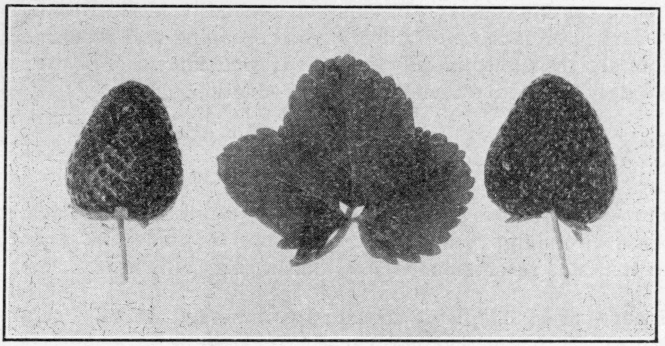

FIG. 18. Narcissa

New Deal is a variety from California originated by Albert F. Etter. It is a heavy yielder but the fruits are small and the flavor only fair to poor. It is not recommended for Southwest Texas.

New Oregon is similar to Marshall (6). It makes few plants and is low in yield and therefore not recommended.

Nor-J. is a *Fragaria chiloensis* hybrid received from Albert F. Etter. It is a heavy yielder but not suitable for shipping and should be planted only in home gardens.

Parsons is the same as Gibson.

Premier (Howard 17) is a leading northern variety received under this name, although Howard 17 is the preferred name (6). The plants are weak and failed to produce fruit under Southwest Texas conditions.

Redheart is a variety originated by the U. S. Department of Agriculture from a Portia-Euresko cross (7). It is the firmest variety tried at Winter Haven and is suitable for canning. It tends to bear irregular, rough fruits and is not recommended for commercial planting.

Southland is from a cross of Ettersburg 80 and Howard 17, made by the U. S. Department of Agriculture (7). In spite of the good quality fruit, Southland is not recommended for other than home gardens because of its poor plant production.

Texas originated in Arkansas and is not generally grown now. It is well adapted to Southwest Texas but is excelled by other varieties.

Thompson originated in North Carolina (6). It is well adapted to Southwest Texas and is a heavy producer but is somewhat soft and therefore not as suitable as some varieties for commercial production.

Washington is a variety from the northwestern part of the United States. It is too late to be of value in Southwest Texas.

Wickson is an Etter introduction from California and apparently a *Fragaria chiloensis* hybrid. It is late and the fruits are too small for commercial use and bruise easily. It might be of value in the home garden because of its good flavor and fair to good yields.

RECOMMENDATIONS

Of the 71 varieties and selections under test, Missionary (Carolina), Klondike, Ettersburg 80, and "Banner" are recommended for commercial production. Others such as Ettersburg 121, Excelsior, Kalicene, and Narcissa might be grown for home use because of their high quality and general adaptability.

SUMMARY

Approximately one-third of the Texas strawberry crop was produced in Southwest Texas in 1934, with centers of production in Atascosa and Dimmit counties.

Seventy-one varieties and selections have been tried during the period from 1932 to 1937.

Best varieties for runner plant production were Aroma, "Banner," Dunlap, Ettersburg 80, Klondike, Missionary, Blakemore, Excelsior, and Thompson.

Best varieties for heat resistance as measured by summer mortality were Aroma, "Banner," Bellmar, Blakemore, Missionary, and Thompson. Kalicene, Bederarena, Ettersburg 80, Cape Blanco, and Ettersburg 121 also seem good.

Bederarena, Excelsior, Fendalcino, Kalicene, Narcissa, and Thompson appear to be most frost resistant.

Earliest varieties were Excelsior, Missionary, Blakemore, Early Bird, and Beaver.

Highest yields of fruit during the marketing season were produced by "Banner," Klondike, Missionary, and Thompson.

From the standpoint of shipping quality, Klondike, Missionary, Blakemore, Aroma, "Banner," and Ettersburg 80 are the leading varieties tried.

Excelsior, Blakemore, Dorsett, Klondike, and Narcissa color evenly and are attractive.

Missionary is the most disease-resistant variety. Aroma, Blakemore, Cooper, Culver, Excelsior, McClintock, Redheart, and Thompson also show resistance to leaf disease.

Leading varieties for flavor and dessert quality are "Banner," Blakemore, Chesapeake, Dorsett, Ellinore, Ettersburg 80, Ettersburg 121, Excelsior, Goldengate, Kalicene, Narcissa, and Southland.

Recommended varieties for commercial shipping are Missionary (Carolina), Klondike, Ettersburg 80, and "Banner."

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