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A group of Smyrna (Calimyrna) figs.

Practical Fig Culture in Arizona

By W. H. Lawrence

Tucson, Arizona, June 1, 1916

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AGRICULTURAL EXPERIMENT STATION

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CONTENTS

ILLUSTRATIONS

PLATES

FIGURES

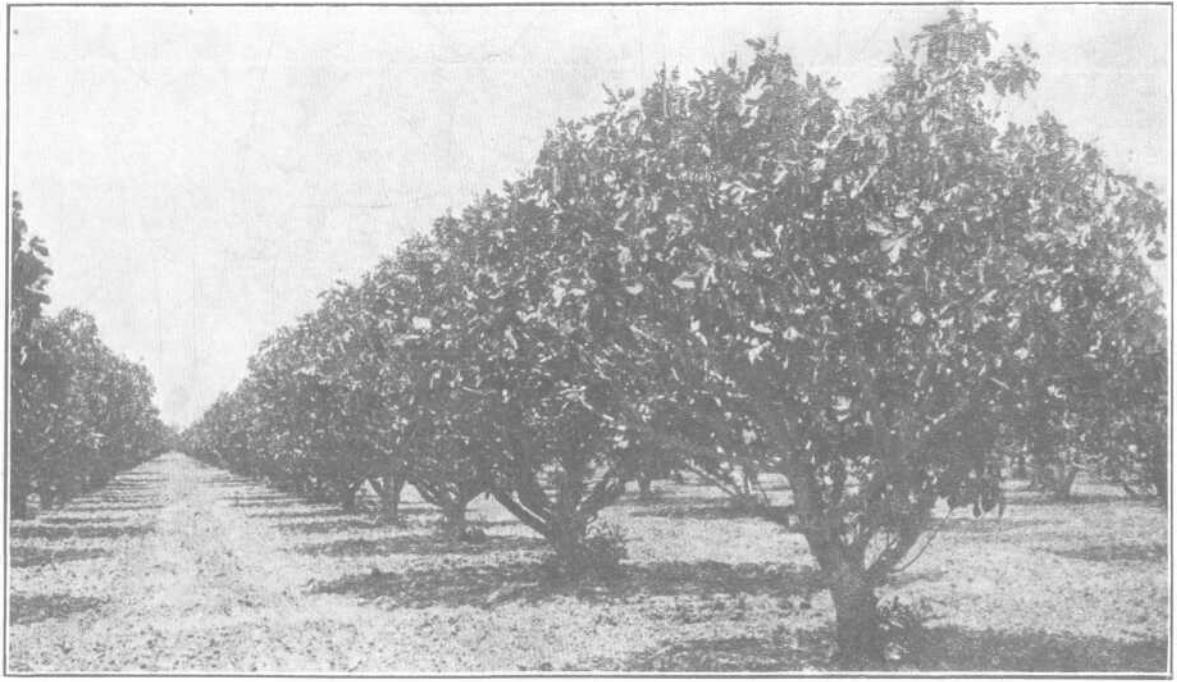

PLATE I.—A young but healthy fig orchard.

Practical Fig Culture in Arizona

By IF. *H Lawrence*

INTRODUCTION

The importance of the fig as a fruit crop in Arizona is shown by its presence in nearly all localities in which it will endure the winters and survive the frosts of spring. In addition to being a valuable fruit it serves as an excellent shade tree. The fig is a food fruit. Containing an average of more than 50 per cent sugar and 3.5 per cent protein, it is probably the most valuable of all dried food fruits, of which the fig, apple, peach, raisin, and date are the most common. The dried fig has a mildly laxative action and is not injurious when eaten in large quantities.

At the close of a study pursued during two consecutive years, the writer was impressed with the following facts* (a) A proper selection of varieties will make fig culture possible in a wide range of climatic, water, and soil conditions such as cover a large proportion of the agricultural area of the State. (6) Where limiting factors of production are almost nil and commercial production is possible, economic methods are not practiced in the growing or the distribution of the fruit on local and distant markets. (*c*) Few people appreciate the food value of the fruit and its many possible uses in either a fresh or a preserved condition.

This publication brings together the results of a general field survey, conducted by the writer in person and by correspondence, to determine the general distribution of the plant, to locate the hardy forms that have survived through a decade or more of planting, to determine the number of groups represented and the cultural management required. It also includes the results of a study pursued for three consecutive seasons on 60 trees representing a total of 43 horticultural forms belonging to 5 botanical varieties. This study was made primarily to determine the most desirable forms and varieties to be propagated and disseminated for the purpose of producing larger and more uniform yields of fruit for home use and for the market. The results of this study are given in

detail as experiments and observations, or appear as discussions and recommendations necessary to the intelligent propagation and economic management of the fig.

REASONS WHY FIG PLANTING SHOULD BE INCREASED

Arizona has a population of approximately two persons per square mile of territory. A large proportion of these live in towns and villages located many miles apart. Rural population outside the highly developed irrigated areas is scattered, usually as isolated families on ranches. Means of communication are, moreover, limited, except along the main-line railroads. With a fair proportion of the people widely scattered and for the most part long distant from shipping centers, the distribution of food products becomes an important problem. In many cases the method of transportation and distribution prohibits the handling of perishable products. This usually means a limited diet, for the greater portion of the year at least. In the absence of an adequate supply of fresh fruit during the season in which this kind of fruit should be used, the writer is convinced of the value of a study that may lead to a wider dissemination of the fig plant and to an increased use of its fruit both in a fresh and preserved condition.

CHARACTER OF FIG-PRODUCING SECTIONS

The greater portion of southeastern Arizona is comparatively low in elevation, with nearly parallel mountains extending northwest to southeast, ranging in height from 1,000 to 3,000 feet and separating comparatively level valleys lying between them. The soil of these valleys has been built up of alluvial deposits from the eroded mountains and is very fertile. The lower parts of this territory are the areas along the Colorado and Gila Rivers. In the broad valleys, low-lying mesas and their prolongations into the higher elevations of the southeastern and south central portions of the State, irrigation has made it possible to build a veritable paradise. The character of the soils and the application of water provide conditions suitable for the successful growth of many temperate and subtropical horticultural plants.

The eastern and more northern portions of the State form plateaus ranging in elevation from 4,000 to 6,000 feet, and in the northern part some of the mountains are much higher.

The varied topography induces perhaps the greatest diversity in climate of any State. Over the lower elevations intense heat

prevails, little precipitation occurs, sunshine is almost continuous, and the relative humidity is very low.

Temperatures.—Over the low elevations, which are confined mainly to the southwestern portion of the State, and which include the valleys of the lower Colorado and lower Gila rivers, the climate is arid and the range of temperature between day and night is considerable. The heat of summer is torrid, frequently rising above 100° F. and at rare intervals to as much as 120° F. in the shade. Over the lower portions of this area the temperature seldom reaches the freezing point and frosts are rare. At higher elevations, and especially in the plateau sections where air drainage is restricted, the clear sky intensifies radiation and the temperatures of spring frequently drop below the freezing point. At extreme elevations the temperature may fall below zero.

The following data are introduced in order to show the variations that occur from season to season or during a single season.

TABLE I.—MEAN, LOWEST, AND HIGHEST TEMPERATURES; EARLIEST DATE OF KILLING FROST IN AUTUMN AND LATEST IN SPRING; YEAR, AND RANGE OF DAYS IN GROWING SEASON IN EIGHTEEN WIDELY SCATTERED SECTIONS IN WHICH FIG TREES PRODUCE) CROPS.

Station	Highest temperature	Lowest temperature	Mean temperature	Earliest killing frost	Latest killing frost	Length of growing season			
						Year	Min no. of days	Year	Max. no. of days
Aztec	125	15	72.8	Nov. 17	Mar. 12	1909	254	1900	364
Mohawk	126	22	75.4	Dec. 5	Feb. 14	1908	308	1904	366
Parker	127	9	70.4	Oct. 26	Apr. 6	1897	223	1901	310
Yuma	120	22	72.1	.....	.....	all	365	all	365
Buckeye	121	11	67.7	Oct. 22	Apr. 6	1906	203	1910	307
Gila Bend	120	11	71.5	Nov. 16	Mar. 13	1899	227	1907	347
Phoenix	117	16	69.7	Nov. 9	Mar. 31	1897	222	1901	335
Mesa	119	9	68.6	Oct. 21	Apr. 2	1906	202	1900	317
Tempe	119	12	68.2	Oct. 23	Mar. 3	1910	308	1906	334
Tombstone	107	9	62.3	Oct. 22	Apr. 12	1906	235	1910	305
Nogales	110	10	62.0	Oct. 15	May 19	1902	189	1903	241
Willcox	110	2	59.0	Oct. 15	May 27	1906	166	1901	253
Huachuca	105	0	60.9	Oct. 17	May 9	1908	186	1903	279
Bisbee	101	8	60.0	Oct. 22	Apr. 30	1893	152	1910	306
Casa Grande	115	8	68.4	Oct. 8	Apr. 5	1906	189	1910	315
Maricopa	126	8	69.6	Oct. 22	Apr. 4	1909	246	1900	321
Thatcher	113	9	62.6	Oct. 6	May 7	1909	155	1906	207
Tucson	112	6	66.7	Oct. 19	Apr. 18	1897	208	1893	306

A study of the data shows the mean temperature to range from 59.0° at Willcox to 75.4° at Mohawk, the lowest temperature to range from 0° P. to 22° P.; the highest temperature to range from 101° P. to 127° P., with a general average of approximately 111° P.; the earliest date of killing frost in autumn to vary from October 6 at Thatcher to December 5 at Mohawk; general killing frosts rarely if ever occur except in the valley lands; the latest frost in spring varies from February 14 at Mohawk to May 27 at Willcox; and the length of the growing season varies at each station with wide ranges in duration of growing season at the same stations in different years.

Considering temperature as a limiting factor, the data in Table *I* show the Lower Colorado Valley and mesa country and the Salt River Valley to be quite free from dangerous temperatures; and for most years the growing seasons, measured in the number of days from the last killing frost in spring to the first killing frost in autumn, are phenomenally long. Within these areas are many thousands of acres of land well adapted to fig culture, being not only frostless but nearly rainless. Throughout these areas the Smyrna fig, when caprified, should produce satisfactory returns in most seasons. Throughout the higher elevations where the climate is more severe, with the possible exception of a few small isolated areas, the Adriatic type is the more desirable form.

Precipitation.—Precipitation occurs principally during two portions of the year, a summer maximum during July to September and a secondary maximum during the colder portion of the year. During April, May, and June the area is practically rainless and but little occurs during the late autumn months. In the eastern half of the State the rainfall varies from 10 to 25 inches per year, while in the western section "precipitation varies from 1 to 10 inches. Rainfall increases with the elevation. The character of the precipitation, the time of occurrence, the distribution during the several periods of the year, the amount each month, and the varying periods of heavy and light precipitation are questions of vital importance in the production of the fig. The following data compiled from various sources show the character of the precipitation occurring at several places in the State where the fig is being grown.

TABLE II.—LOCATION, ELEVATION, LENGTH OF RECORD, MEAN ANNUAL PRECIPITATION, AND RANGE OF VARIATION FROM LOWEST TO HIGHEST, AND THE YEAR IN WHICH THE EXTREMES OCCURRED FOR TWENTY WEATHER BUREAU STATIONS.

Station	Elevation (feet)	Length of record (years)	Range of variation						Mean annual precipitation (inches)
			Highest		Next highest		Lowest		
			Year	Inches	Year	Inches	Year	Inches	
Aztec.....	492	12	1905	13.57	1908	7.55	1901	1.12	4.35
Mohawk...	538	6	1905	6.49	1886	4.13	1895	0.10	3.17
Parker.....	353	19	1905	9 58	1912	6.55	1900	2 09	4.83
Yuma.....	141	35	1905	11.41	1909	8.63	1899	0.60	3.26
Buckeye...	980	23	1905	21.80	1896	9.50	1891	0 63	7.22
Gila Bend.	737	12	1896	10.21	1908	7.69	1900	2 55	5.67
Phoenix...	1,108	20	1905	19 73	1911	14.12	1885	3.77	7.39
Mesa.....	1,244	19	1905	20.31	1911	13.82	1900	5.10	9.10
Tempe——	1,165	11	1905	22.15	1911	14.45	1910	6.02	11.01
Benson....	5,532	12	1905	22.58	1896	16.78	1885	4.24	9.35
Tombstone	4,550	17	1905	27.84	1907	19.31	1910	11.77	14.54
Cochise....	4,250	7	1905	22.27	1896	16.03	1900	1.30	11.41
Willcox___	4,205	12	1905	23.52	1S84	18.38	1897	5.66	10.67
Huachuca..	5,100	30	1905	36.97	1907	16.96	1910	9.54	16.86
Bisbee.....	3,523	20	1898	25.87	1907	23.59	1910	12.85	18.05
Clifton ___	3,584	6	.....	.....	1898	16.14	1910	8.67	13.16
Casa Grande	1,396	....	1905	19.52	1899	10.21	1885	2.02	6.06
Maricopa..	1,180	13	1905	13.51	1912	8.89	1882	0.38	6.06
Thatcher..	2,800	17	1905	17.38	1913	12,83	1902	4.73	10.08
Tucson....	2,425	30	1905	24.17	1889	18.37	1885	5.26	11.58

Since nearly ripe fruit is usually ruined by moisture, no rainfall and dry air are desirable during the ripening and picking season. A glance at the above data shows that the annual rainfall varies greatly for each section and that occasional extremely wet seasons occur. Seasonal distribution of rainfall is the important factor in fig production. The normal annual rainfall chart appearing below, is useful in giving correct information concerning the usual distribution and precipitation for sections in which the Smyrna and less hardy forms may be grown.

In those sections where Adriatic forms are adaptable for home use occasional summer rain does no appreciable injury, since immediate attention is given to the collection and use of the fruit. At higher elevations where the summer rainfall is considerable,

neglected plantings of a decade or so still survive and produce some fruit without care. In such localities a greater use of the fig would be possible if it were given attention and protection.

GENERAL FIELD SURVEY

Through correspondence and a personal general field survey, the approximate distribution of fig trees now growing throughout the State has been determined, as follows

In Nogales there are several small trees of a black variety that bear one crop each year

At Garces there are several large, fine trees of the so-called small

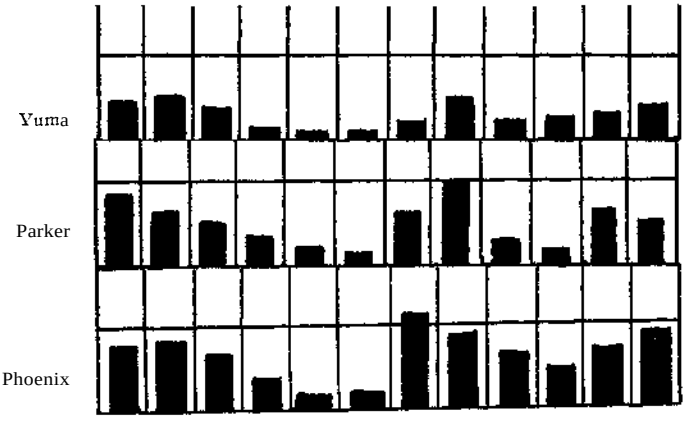

Fig 1.—Diagram showing the comparative monthly distribution of rainfall in fractions of an inch, for Yuma and Parker, located in the southwestern lowlands and Phoenix, in the middle section embracing the Salt River and Gila River Valleys

Black Mission. Brown Turkey is also being tested In this immediate locality the more or less protected places in the foothills and mountains, where air drainage is good, provide the best situations for fig growing.

At Roosevelt there are four small trees, five to six years old. These produce green fruit throughout the season, but the crop falls before it ripens. They are probably Smyrna trees.

At Tucson the Brown Turkey produces one good crop each year, ripening the fruit for approximately 40 days, during July and August. Both black and white forms of the Adriatic group, also quite common in this section, are less important. Winter weather severe enough to kill the younger growth, less frequently the entire top, occurs, yet pruning away the dead stems allows new wood to form on which a fair second crop of fruit may develop.

There is a small home-garden fig orchard at Hackberry on the Colorado River (Gregg's Ferry).

In the Gila River Valley at Solomonville and Thatcher both white and black fig trees are found. These plants range up to 30 years in age and bear two to three crops each year. The black variety is perhaps the more desirable since it produces fruit through a longer season of the year.

In Clifton and adjacent territory both black and white figs are grown. Even at this elevation (3,584 feet), two and occasionally three crops are produced, maturing over a period of 40 to 60 days, the first ripening early in August. Smyrna trees are also reported growing in Clifton. Well matured, locally grown figs are sold at 12 cents a pound wholesale.

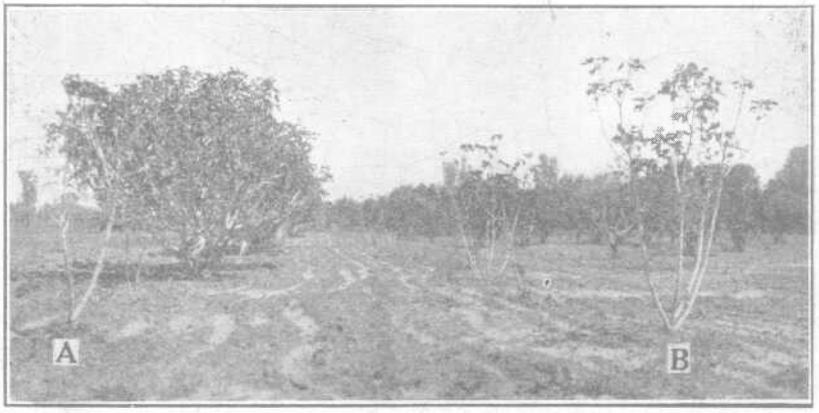

Fig. 2.—Results of the 1912-1913 freeze. View of the 60 trees planted in two rows on the Experiment Station Farm near Phoenix. Attention is called to the fact that the 30 trees located in row B were killed to the ground and but few of them have partially recovered. The row has the appearance of sticks set in the ground. Attention is also called to the presence of two specimens barely alive in row A while there are several large kealthy plants. Photograph by W. H. Lawrence.

At an elevation of 5,000 feet in the Dragoon Mountains, both black and white figs produce two and three crops annually, the ripening period continuing from July to November, while frosts destroy the fruit at lower elevations where air drainage is restricted.

Fig trees of a white variety, very old but thrifty and large, are also located in the Huachuca Mountains at elevations up to 5,000 feet. Stock from this variety has passed the winter successfully in the Sonoita Valley without protection, where even more severe winter weather occurs. In the Sonoita Valley there are also black and white fig trees several years old which produce fair crops.

Throughout the Sulphur Spring Valley the Mission and White Adriatic are the leading varieties. Old trees bear two crops each year, ripening until the advent of freezing weather. A purple fig grown and distributed from Safford also comes in two crops, ripening until the green fruit is destroyed by frost. A fine tree of the black variety is also reported from Tombstone. Smyrna figs have been planted at Gleeson, and while they endure the winter and set fruit, none matures due to lack of pollination. A small white variety about 10 years of age, located near Willcox, now bears two to three crops each year, producing almost continuously from the last frost in spring to the first frost in autumn.

Several large fig trees are standing in the streets of Bisbee.

Fig. 3.—View showing last 40 trees in rows A and B, Fig. 2. Note the poor condition of the trees in row B, also the vacant spaces; and the three weak trees in row A with a second group of healthy plants in the distance.

In the Lower Verde River country, at an altitude of 3,315 feet, a small-white fig endures the winter, while a black variety grown in the same location freezes to the ground. Two crops are produced each year.

Along the Upper Verde River, Angelique (white), San Pedro and Mission (black) bear annually, but usually both the earliest and latest figs of the first and last crops are destroyed by frosts The white variety endures the conditions up to 4,500 feet elevation, while the black sorts prove less hardy. With protection, plants are easily carried through the winter, even at an elevation of 5,800 feet.

The production of figs in both the valley and the mesa country near Yuma is limited to a few varieties of Adriatics. These include both light and dark-colored forms. Most of the plantings are old. The names of the varieties, dates of planting, and sources of stock have been lost through the exchange and sale of property. In both mesa and valley the fig believed to be the Black Mission is the leading sort, since it excels in carrying capacity, which makes it possible to ship the fruit long distances. Two crops are produced. The tree should bear commercial crops at 4 to 6 years of age. On the mesa, the first ripens 8 to 12 days earlier than on the valley floor, where picking begins May 20 to 25. The crop is in demand as fresh fruit in Los Angeles and San Francisco markets at prices ranging from 50 to 75 cents per pound. By the time the first fruit produced in the valley is ready for shipment, however, the price usually drops to 12 to 20 cents in these distributing centers. This fruit is shipped in 7-pound crates. A yield of 5 to 20 crates is secured per tree. The second crop begins to ripen July 7 to 12 and continues for about three weeks. The fruit is put up in two grades, selling at about 9 cents and 5 cents, respectively. On trees 10 to 15 years of age, the yield varies from 10 to 35 crates. Of the other varieties mentioned, both light and dark-colored, several are larger then the Mission but are too soft to ship, yet even these are of great value for canning or drying. Fig trees grown in this section of the State are mostly located along ditch banks, and receive no cultivation or irrigation, yet return enormous profits.

At Mesa, in the Salt River Valley, occurs the so-called Black Adriatic, which is the sole representative of commercial sorts grown in the immediate locality. This variety produces two crops, the first ripening about June 10. It is shipped to various markets—San Francisco, Denver, El Paso, and intermediate points. The grower receives 4 cents per pound. The second crop ripens July 25 to August 1. For the most part it is consumed locally for canning, selling as fresh fruit at 2 cents per pound. Trees grow without care along banks of irrigation canals.

On the Experiment Station Farm near Phoenix is a small orchard of approximately 60 trees of various varieties. Half the orchard was planted in 1904 and the balance in 1909. Details concerning these trees are given elsewhere in this paper.

SCOPE OF FIG GROWING

Figs, no doubt, have been grown in Arizona for more than a hundred years. Numerous forms have been generally disseminated

throughout the warmer portions of the State. Even the casual observer notes that many varieties find conditions congenial to vegetative growth, while many produce annual yields of well matured fruit. As early as 1899 fig production had become an important line of fruit raising. The Twelfth United States Census shows 4,325 trees of bearing age, and a yield of 949,140 pounds. The Thirteenth Census, however, shows a total of 3,848 trees in bearing, a decrease of nearly 10 per cent, with a much greater decrease in average yield per tree.

There are no commercial orchards in the State. Less than 400 farms have bearing trees, the average number of trees per farm being approximately 10. These trees are generally located in the home orchard, the lawn, or along the irrigation ditch.

The following data, adapted from the Thirteenth United States Census, is of more than usual interest and is introduced at this point to show clearly the success met with in planting trees at earlier dates, the results secured from older plantings, and the development of fig growing in sections where very promising returns have been realized.

TABLE III.—SHOWING THE NUMBER OF BEARING AND NON-BEARING FIG TREES, INCREASE IN PER CENT Off PLANTINGS, TOTAL AND AVERAGE YIELD FOR ALL COUNTIES, 1910.

Counties	Trees bearing	Total yield	Average yield	Trees non-bearing	Increase in last 10 years
	Number	*Pounds*	*Pounds*	*Number*	*Per cent*
Apache	.....	.....	.....	.....	.....
Cochise	76	785	10.3	5	6.6
Coconino	.....	.....	.....	.....	.....
Gila	37	10,655	287 9	.....	.....
Graham	190	3,236	17.0	215	113.2
Maricopa	2,628	96,540	36.7	44,694	1,700.7
Mohave	70	630	9.0	.....	.....
Navajo	.....	.....	.....	.....	.....
Pima	344	650	1.8	.....	.....
Pinal	164	5,800	35.4	113	70.1
Santa Cruz	2	200	100.0	.....	.....
Yavapai	60	3,100	51.6	58	96.6
Yuma	277	5,485	19.8	2,123	776.4
The State	3,848	127,081	33.0	47,208	1,226.8

The above table is Instructive since it shows that conditions in Apache, Coconino, and Navajo Counties inhibit the growing of the

fig plant. Also, while older plantings have endured the conditions of climate and soil, increased plantings in Gila, Mohave, Pima, and Santa Cruz Counties have not been successful, yet in some parts of Graham, Maricopa, Pinal, Yavapai, and Yuma counties conditions are favorable to production on a commercial scale. It is to be noted that of the four counties in which no young trees are reported, Santa Cruz and Gila counties report average yields of 100 to 287.9 pounds per tree. It is apparent that plantings can be increased through the use of hardy stock. An inspection of the data will show increased plantings of 6.6 per cent to 1,700 per cent for different counties.

INVESTIGATIONS IN SALT RIVER VALLEY

A major portion of the investigations was conducted in a small orchard of several varieties of figs located on the Experiment Station Farm at Phoenix. There were 60 trees; 30 were planted in 1904, the remainder in 1909. The following table gives data relative to the orchard and its condition at the close of the 1915 growing season.

TABLE IV.—NUMBER OF STANDARDS, HEIGHT AND SPREAD OF TOPS, CONDITION Off THE PLANT, GROWTH OF NEW SHOOTS AND SUCKERS Off 43 VARIETIES Off ffIGS, 1915.

Variety	Number of stems	Height of top	Spread of top	Condition of plant	Growth new shoots	Average length suckers
		Feet	*Feet*		*Inches*	*Inches*
Cernica	1	4 5	2	Good	2.5	12
Mission Black	1	22	30	Very good	12	.....
Mission, Black	3	17	19	Good	5	.....
Rose Blanche	1	11	14	Fair	8	.....
Bourjassote Panache	2	12	7	Good	30	48
Magnolia	1	7	7	Very poor	1	.....
Magnolia	3	8	6	Pool	2.5	.....
Bardajic	1	17	22	Very good	15	.....
Capri Milco	1	10	7	Good	12	72
Capri Milco	4	10	8	Fair	10	.....
Capri Milco	4	2	3	Fair	12	6
Capri Milco	1	8	5	Good	6	4
Capri Milco	4	8	5	Good	.....	.....
White Adriatic	2	15	23	Good	5	.....
White Adriatic	1	15	26	Very good	4	.....
Capri No 1	1	16	26	Very good	3	.....
Capri No. 1	1	12	15	Very good	8	.....

TABLE IV.—NUMBER OP STANDARDS, HEIGHT AND SPREAD OF TOPS, CONDITION OF THE PLANT, GROWTH OF NEW SHOOTS AND SUCKERS OF 43 VARIETIES OF FIGS, 1915—Continued.

Variety	Number of steins	Height of top	Spread of top	Condition of plant	Growth new shoots	Average length suckers
		Feet	*Feet*		*Inches*	*Inches*
Capri No 2	1	10	8	Good	4	48
Capri No 3	1	10	7	Good	15	84
Capri No 3	2	9	9	Good	6	[illegible]
Capri Magnissalis	2	5	3	Good	7	60
Capri Magnissalis	4	7	3	Good	6	42
Capri Magnissalis	4	5 5	3	Good	8	30
Maslin Capri No. 143	4	.....	.....	.....	.....	.....
Maslin Capri No, 91	4	.....	.....	.....	8	80
Capri Elanford	1	8	6	Good	12	48
Agen	2	8	7	Good	6	.....
White Endich	4	8	6	Good	30	.....
San Pedro White	5	8	6	Fair	5	.....
Checker Injir	3	11	7	Good	24	.....
Black Smyrna	1	14	19	Very good	6	.....
Slack Smyrna	1	14	19	Very good	10	.....
Lob Injir	1	15	19	Very good	12	.....
Lob Injir	1	15	9	Very good	15	.....
Lob Injir	1	15	9	Very good	15	.....
Bellona	1	8	3	Very good	6	.....
Black Ischia	3	11	8	Good	30	[illegible]
Green Ischia	3	6	4	Good	3	[illegible]
Madeleine	4	8	5	Good	18	[illegible]
Doree	4	8	3	Good	24	54
Genoa	3	13	10	Good	15	[illegible]
Blue Genoa	1	10	5	Good	[illegible]	36
White Genoa	4	7	4	Good	[illegible]	30
Negro Largo	3	9	5	Good	12	48
Lemon	1	13	10	Good	3	48
Royal Vineyard	4	7	5	Good	6	36
Verdal Longue	3	.....	.....	.....	.....	.....
Angelique	4	11	7	Good	6	24
Coldi Signora Nigra	4	8	4	Good	10	24
Drap d'Or	6	4	3	Good	6	36
Dauphine	3	10.5	8	Good	15	48
Ronde Violette Hative	4	7	4	Good	10	60
Ringo Del Mel	1	9	7	Good	12	60
Hirta du Japon	2	7	4	Good	8	36
Salmo Sambach	3	17	22	Good	.....	.....
Bulletin Smyrna	1	32	43	Very good	.....	.....
Black Adriatic	1	13	16	Good	.....	.....
Black Adriatic	1	13	16	Good	.....	.....

The table does not show the missing trees. The varieties that have Been removed are White Neri, Salmo Sambach, Celestial, Maslin Capri No. 43, and one tree each of Maslin Capri No. 91, Capri Milco, and Capri Elanford.

The orchard had been trained to a single standard. There are at this time the Cernica, Mission, Rose Blanche, Magnolia, Capri No. 3, Capri Milco (two trees), Bardajic, Capri No. 2, Salmo Sambach, Capri No. 1, Lob Injir, Black Smyrna, Lemon, Bulletin Smyrna, and Black Adriatic that have not been killed back to the root. The remaining varieties are now producing two to six standards—mostly three to four. Table IV gives the number of stems for each plant, condition of the plant, together with height and spread of top, and length of new growth. These data give a good idea of the comparative hardiness of individual trees.

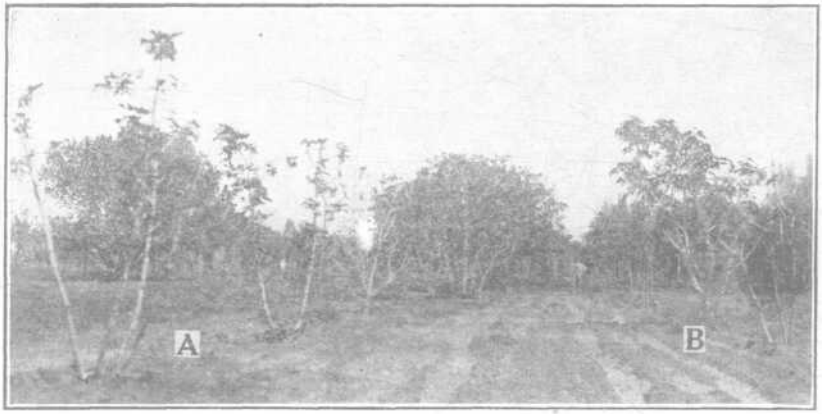

Fig. 4.—View of the third section of 20 trees. Note condition of the trees in row B, and group of weak trees with a third lot of healthy plants. To the left of row A and in the background may be seen a large specimen of Bulletin Smyrna which is also free from winter injury. From photograph taken by W. H. Lawrence.

Influence of temperature.—The condition of the plants is largely due to the severe weather occurring from December 26, 1912, to January 15, 1913, which was conspicuously abnormal. The following table shows the character of the weather for that period.

TABLE V.—SHOWING THE HOURLY TEMPERATURES, HOURLY WIND VELOCITY, AND HOURLY WIND DIRECTION FROM DECEMBER 26, 1912, TO JANUARY 15, 1913, INCLUSIVE

Date		A. M												P M										
		1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9	10	11	Mid-night
1912 Dec. 26	Temperature.	41	43	47	41	43	41	36	39	43	48	53	54	55	57	58	58	57	53	49	48	47	43	43	38
	Velocity ..	2	3	8	6	6	2	5	2	4	3	4	3	4	4	4	4	3	5	4	2	2	1	2	3
	Direction	SW	W	N	N	N	SE	S	E	N	W	W	SW	W	NW	NW	NW	W	NW	NW	NW	SW	SW	E	NW
27	Temperature.	37	43	39	43	44	38	32	36	43	53	57	60	63	64	65	64	63	60	55	53	53	52	48	46
	Velocity. ...	1	2	4	4	5	4	3	2	3	2	7	8	7	1	6	4	2	1	2	4	7	6	3	5
	Direction....	NW	NW	NE	NE	NE	NE	NW	NW	SW	NW	NE	NE	NE	NE	E	E	E	E	E	E	E	E	E	E
28	Temperature.	46	46	46	44	34	38	32	35	42	50	55	57	60	58	61	61	58	55	52	48	46	45	43	40
	Velocity.. ..	5	4	5	4	2	1	2	1	2	4	7	5	3	2	3	2	3	2	2	3	1	2	2	4
	Direction ..	E	E	E	E	W	W	W	NW	E	E	E	E	SE	W	NW	SW	W	W	W	W	N	W	S	NW
29	Temperature.	37	38	33	30	31	34	30	31	33	42	46	52	57	59	60	61	59	56	50	48	40	43	40	39
	Velocity.....	2	1	2	2	2	3	5	2	1	3	3	2	2	2	4	3	2	2	2	3	1	2	3	4
	Direction....	W	E	E	N	E	E	E	E	E	E	SE	SE	N	S	SW	W	W	W	E	N	E	E	E	E
30	Temperature.	37	37	36	36	36	36	33	34	37	42	48	53	57	60	61	62	60	56	53	49	45	43	40	39
	Velocity.....	6	5	4	6	5	5	4	2	2	5	1	3	2	2	3	2	1	2	2	2	2	2	3	3
	Direction....	E	NE	E	E	E	SE	E	SE	NE	E	SE	S	SE	SE	SE	S	SW	W	W	NE	NE	E	SE	SE
31	Temperature.	37	37	35	32	35	36	33	34	39	45	54	57	60	63	62	64	61	58	55	50	47	46	44	41
	Velocity....	3	3	3	3	5	5	5	3	6	4	4	4	4	2	2	3	2	1	1	2	1	2	2	4
	Direction ...	E	E	SE	NE	NE	E	E	E	E	E	E	SE	E	SE	SW	SW	S	S	NW	N	NW	E	E	SE
1913 Jan. 1	Temperature.	41	42	38	36	37	38	35	34	38	45	54	57	62	63	65	65	63	59	57	53	52	48	44	43
	Velocity.....	4	5	2	4	3	4	2	4	2	2	2	2	3	3	3	3	3	3	4	1	3	2	2	3
	Direction...	E	E	E	E	SE	E	E	SE	E	NE	SE	SW	W	SW	W	W	W	W	N	NE	E	SW	SE	E

TABLE V.—SHOWING THE HOURLY TEMPERATURES, HOURLY WIND VELOCITY, AND HOURLY WIND DIRECTION FROM DECEMBER 26, 1912, TO JANUARY 15, 1913, INCLUSIVE.—Continued.

Date		A. M.												P. M											
		1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9	10	11	Midnight
1913	Temperature.	43	42	40	41	40	40	41	40	43	48	57	60	62	63	64	65	64	60	57	52	49	49	44	42
Jan.	Velocity.....	3	3	2	3	2	3	2	2	3	1	2	4	2	5	4	3	2	1	2	2	3	4	3	2
2	Direction....	E	S	S	SE	N	NW	W	S	SW	NW	SW	SE	NW	W	W	W	W	W	E	S	NE	NE	E	E
	Temperature	40	39	39	39	39	36	34	32	40	46	56	60	63	64	67	65	64	62	56	54	49	47	46	44
3	Velocity.....	2	6	4	3	1	2	1	3	4	4	5	4	3	2	3	4	3	1	3	2	2	4	5	5
	Direction....	SE	E	E	E	E	SE	E	NE	E	E	E	E	E	N	W	NE	NW	NW	N	SE	SE	E	E	E
	Temperature.	40	42	40	39	38	35	35	34	38	46	52	57	59	62	63	61	60	56	52	50	48	45	43	42
4	Velocity....	7	8	6	4	5	2	3	2	5	3	7	5	4	3	6	10	15	14	13	12	16	12	11	9
	Direction....	E	E	E	E	E	N	N	SE	E	E	E	E	NE	NW	W	W	W	W	NW	W	W	W	W	W
	Temperature.	40	39	37	35	34	33	28	29	30	34	37	38	39	39	41	40	39	37	34	33	30	28	27	27
5	Velocity.....	8	7	7	6	6	6	5	6	8	9	7	7	9	8	8	7	7	4	3	2	4	2	1	1
	Direction....	W	W	W	W	W	W	SW	W	SW	SW	SW	W	SW	W	SW	SW	SW	W	SW	SW	SW	W	W	SW
	Temperature.	25	23	21	19	17	18	17	18	20	26	30	34	36	38	39	39	36	34	31	31	29	27	26	24
6	Velocity.....	3	2	3	4	4	1	1	1	2	3	5	6	6	7	8	9	10	6	4	4	3	3	2	2
	Direction....	SW	E	E	E	E	SE	NE	W	SW	SW	W	W	W	SW	SW	SW	SW	SW	SW	SW	SW	E	NE	NE
	Temperature.	21	23	18	19	19	20	16	17	23	29	35	36	38	39	40	41	39	37	31	32	31	30	28	23
7	Velocity.....	2	1	3	3	2	2	2	1	3	3	2	3	3	4	3	3	3	3	3	3	2	3	1	3
	Direction....	N	NW	E	NE	E	E	E	NE	NE	S	S	SW	NW	SW	W	NW	W	W	W	W	SW	SW	SW	N
	Temperature.	24	23	22	21	19	22	23	21	27	34	40	47	49	50	52	52	51	49	45	42	39	39	39	38
8	Velocity....	2	2	1	1	3	2	2	3	2	1	4	10	10	10	6	4	2	1	1	1	2	1	5	6
	Direction ..	S	E	E	N	NE	N	S	S	SE	S	NW	NE	E	E	E	E	NE	SE	S	S	E	E	E	SE

TABLE V.—SHOWING THE HOURLY TEMPERATURES, HOURLY WIND VELOCITY, AND HOURLY WIND DIRECTION FROM DECEMBER 26, 1912, TO JANUARY 15, 1913, INCLUSIVE—Continued

Date		A M												P M										
		1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9	10	11	Midnight
9	Temperature	37	36	36	35	36	36	35	32	39	44	48	50	53	56	57	59	57	51	48	45	43	42	36	39
	Velocity....	6	5	4	5	3	6	7	4	2	5	8	5	4	4	5	4	3	5	2	1	1	3	2	4
	Direction...	SE	E	E	E	E	SE	E	E	E	SE	SE	SE	SE	SE	SE	SE	SW	W	W	W	SW	SE	E	NE
10	Temperature.	40	43	42	37	37	39	40	41	41	47	48	50	52	50	50	49	43	41	40	40	40	40	40	39
	Velocity...	5	5	3	8	3	3	2	4	3	4	4	8	10	7	6	4	8	10	6	4	2	2	2	2
	Direction..	NE	E	NW	W	SE	N	E	E	E	E	SW	SW	SW	SW	SW	SW	SW	NW	NW	N	E	SE	S	E
11	Temperature.	39	38	37	35	32	34	32	33	35	37	40	43	49	46	47	49	46	45	43	41	37	37	36	35
	Velocity...	1	2	3	5	2	2	3	2	2	2	4	4	3	3	4	4	3	4	2	3	2	4	4	3
	Direction....	SW	SW	W	W	NW	SW	NW	N	N	SW	SW	SW	SE	SE	E	SE	SE	E	E	E	E	NE	NE	E
12	Temperature	32	32	31	30	29	29	27	28	28	34	40	46	48	50	52	53	52	50	45	43	42	40	39	36
	Velocity....	2	1	1	3	1	3	2	1	1	3	3	3	3	2	3	3	2	2	2	3	1	1	1	2
	Direction ...	E	SW	SW	W	W	W	NE	SE	E	SE	E	NE	SW	N	NE	N	NE	W	NW	N	NW	NW	NW	W
13	Temperature.	32	32	31	30	29	29	27	28	28	34	40	46	56	61	63	64	61	57	54	52	50	47	45	43
	Velocity....	1	1	1	2	2	2	4	2	1	1	2	1	4	3	3	5	4	3	3	3	3	2	2	2
	Direction..	NE	NE	E	SE	SE	SE	E	E	E	E	SW	SW	E	SE	S	SW	W	W	NW	N	N	N	N	E
14	Temperature.	43	45	44	42	40	39	36	37	40	46	54	58	60	61	62	64	63	61	57	56	55	52	49	46
	Velocity...	2	3	4	2	2	2	2	2	6	5	8	6	7	7	5	3	2	1	2	1	2	1	2	2
	Direction...	E	E	E	E	SE	SE	NE	E	E	E	E	E	E	E	SE	SE	SE	E	NE	N	N	SE	S	N
15	Temperature.	46	45	42	41	40	42	41	43	44	46	52	53	55	57	57	56	55	53	50	48	47	45	44	43
	Velocity....	3	4	5	4	7	5	4	4	5	6	5	5	2	2	2	1	2	2	1	2	1	2	4	6
	Direction....	E	E	E	E	E	E	E	E	E	E	E	E	SE	SE	SE	S	S	SW	SW	W	NW	NW	SE	E

The temperatures during the 24 hours of the first and last dates more nearly represent the average and usual winter weather, the range being from 40° F. to 60° F. A study of these data shows the temperature of the air to vary from 32° F. to 65° F. during a period of 8 hours on December 27, with very variable, and lower, degrees during December 29, and from January 5 to January 13, 1913, inclusive and respectively. The lowest temperature occurring during the period was 16° F. The recurrence of low temperatures was followed by periods in which all signs of frost disappeared. Alternate freezing and thawing was undoubtedly responsible for the severe injury occurring during the interval of 21 days included in the chart.

Attention is also directed to the hourly direction and velocity of the wind. During many hours of dangerous temperatures the velocity was greater than would warrant an attempt to heat an orchard by the use of smudge pots.

This period is the coldest that has occurred here since the recording of temperature by modern methods, and as it is perhaps the coldest that will occur for many years, the conclusions drawn will be a fair guide to the influence of temperature on fig production,

Temperature has been the limiting factor in the determination of the varieties we now recommend as hardy. These forms are represented by both Capri and edible forms, and of the last named one or more forms of each type of the several groups endure the conditions. This has made it necessary to study the entire field of fig growing.

The varieties but slightly damaged by the 1912-1913 freeze are again in good condition and bearing fruit. The White Adriatic, Black Ischia, and Madeleine have this year (1915) borne fair yields of fruit, while the remaining varieties have produced none or a very light crop. Observations show that dying-back of trees year after year stunts them, while the very tender ones killed to the ground each winter do not produce fruit.

Yield of edible fruit.—Accurate yields have not been available for use except those computed from the data given in the 1900 and 1910 United States Census and those kept at the Experiment Station Farm at phoenix. In 1899 the approximate yield per tree for 4,325 specimens of bearing age was 219 pounds. In 1910 it was 33 pounds per tree. This yield, however, is the average for all bearing trees of all ages and all varieties. A further calculation shows a range from 1.8 pounds to 287.5 pounds per tree. Taking into account only the yield from old and well established trees, the returns vary

from 100 pounds to the maximum stated. These data, for our purpose, are not misleading. Careful records of the yield of mature fruit from all the heavy yielding varieties grown in the Station orchard gave the following data:

TABLE VI. — THE 1914 AND 1915 YIELDS OF FRUIT PRODUCED BY FIVE HARDY VARIETIES GROWN IN THE STATION ORCHARD

Variety	Number of trees	1914	1915
Mission	2	200	759
Lob Injir	3	350	356
Bulletin Smyrna	1	450	615
White Adriatic	2	25	400
Black Smyrna	2	150	300

As will be observed, there are no yield records for 1913 following the severe freeze. The data taken the following years show conclusively, however, that certain varieties are not injured permanently, but recover and produce full yields after one or two years.

While the above table does not show the edible fruit (including sour fruit), the comparison does show the recovery of the tree as well as the comparative frost injury of the more hardy forms of figs.

In order to show the dates of picking and the yield per picking for the more important varieties investigated, the following table is included·

TABLE VII.—VARIETY, DATE OF PICKING, YIELD OF FRUIT PER PICKING, AND TOTAL YIELD FOR THE SEASON OF 1915

Date of picking	Varieties									
	Mission		Lob Injir			Bulletin Smyrna	Black Adriatic	White Adriatic	Black Ischia	Madeleine
	(1)	(2)	(1)	(2)	(3)					
July										
19	.....	57.5	34.5	.....			.....	14	.....	2
21	11	13	.....	.....	.....	.....	23 5	.....	.....	.....
22	40	20	10	4	6.5	.....		25.5	2	16.2
23	.....	7	4.5	18.5	.....	.....	3	.....	.....	.....
26	39	44	54	29.5	36	.....	9	31	7.5	1.5
27	146.5	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	22	32	50	14.5	13.5	.....	.....	.....	.....	.....
30	74	13.5	.....	.....	.....	.....	30	.....	7	.....
31	57.5	28,5	.....	3.5	1 5	25	.....	.....	.....	.....
Aug.										
2	28	.....	.....	.....	.....	33.5	.....	.....	3.5	5
4	25	4.5	21	.....	8.5	11.5	.....	.....	.5	.....
6	8	.....	.....	.....	.....	72.5	.....	.....	.....	1.0
7	.....	....	16	.....	.....	.....	.....	.....	.....	.....
9	24	5 5	11.5	5	5 5	118	.....	.....	1.5	.. ..
10	19	13	.....	.....	.....	50 5	.....	2 5	.....	.. ..
11	.....	.....	9	1.5	2	21	18	.....	.....	.....
13	15	10	.....	.....	.....	.....	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.. ..
19	.....	.....	.....	.....	.....	20	.....	.....	.....	.. ..
20	.....	.....	.....	.....	.....	14	.....	.....	.....	.....
23	.....	.....	.....	.....	.....	97	.....	.....	.....	.. ..
26	.....	.....	.....	.....	.....	35	.....	.....	.....	.. ..
Sept.										
1	.....	.....	.....	.....	.....	35	.....	.....	.....	.. ..
2	.....	.....	.....	.....	.....	55	.....	.....	.....	.. ..
Later	.....	.....	.....	.....	.....	25	.....	.....	.....	.. ..
TOTAL	509	248.5	210.5	76.5	73.5	616	83 5	73	22	21.2

In the above table especial attention is directed to the use of the Mission and Bulletin Smyrna as a combination of two forms of figs that produce heavily and continue to bear for many weeks.

Decrease in size of fruit during picking season.—During the process of harvesting the 1915 crop, the specimens of many varieties gradually decreased in size during subsequent pickings, the exact decrease being given in the following table

TABLE VIII.—DECREASE IN SIZE OF FRUIT FOR SUCCESSIVE PICKINGS OF 13 VARIETIES, 1915 CROP, INDICATED BY THE NUMBER OF FIGS WEIGHING ONE POUND.

Variety	Dates of picking							
	July			August				
	19	22	26	3	3	9	10	21
Rose Blanche	....	....	11	....	....	25	....	38
Bourjossote Panche	10	....	12	....	....	17	....	....
Magnolia	....	....	17	....	....	40	....	....
Magnolia	....	....	12	21	....	20	....	24
White Endich	....	....	11	13	....	14	....	26
San Pedro White	....	....	8	6	....	7	....	21
Genoa	....	....	....	20	56	....	....	106
Madaleine	11	....	....	19	16	....	....	....
Doree	....	....	....	36	....	16	....	48
Negro Largo	....	....	....	9	48	20	....	....
Lemon	....	....	....	26	112	32	....	....
Angelique	....	....	....	64	27	....	....	....
Cal di Signon Nigra	....	....	....	124	64	26	....	....

In is interesting to note in this connection that the varieties included in this table fall into three groups: (1) those decreasing in size during the season; (2) those decreasing during mid-season; and (3) those increasing during the season.

Size of fruit in different crops.—One, two, and three crops were produced by different varieties, the number being determined very largely by low temperatures occurring during the winter. The first crop usually matures about the middle of July or later. Specimens found in autumn on the tips of young wood pass the winter on the naked branches of the tree and mature the following spring and are known as the Brebas. They are usually of good size and are distinguished from the second and third crop with certainty by their position on the wood of the previous season.

Only a few of the varieties on the Experiment Station Farm produced two crops in 1915. The Mission (two trees) produced 85 pounds, while the Magnolia, Black Ischia, Green Ischia, Doree, Genoa, Negro Largo, Lemon, Drap d'Or, Dauphine, and Ronde Violette Hative each produced very light crops.

Yield of Capri figs,—During the summer of 1915 all the Capri trees produced figs.

Capri Milco produced one crop, all of which fell, due to lack of caprification, and no second crop formed; Capri Magnissalis dropped a full crop from April 1 to 10; Capri No. 2 did not produce a second crop and the first fell about July 1; Capri No. 3 was represented by a good crop of figs which all fell except one specimen in which *Elastophaga* had found an entrance; and Capri No. 1 set a light second crop by July 1.

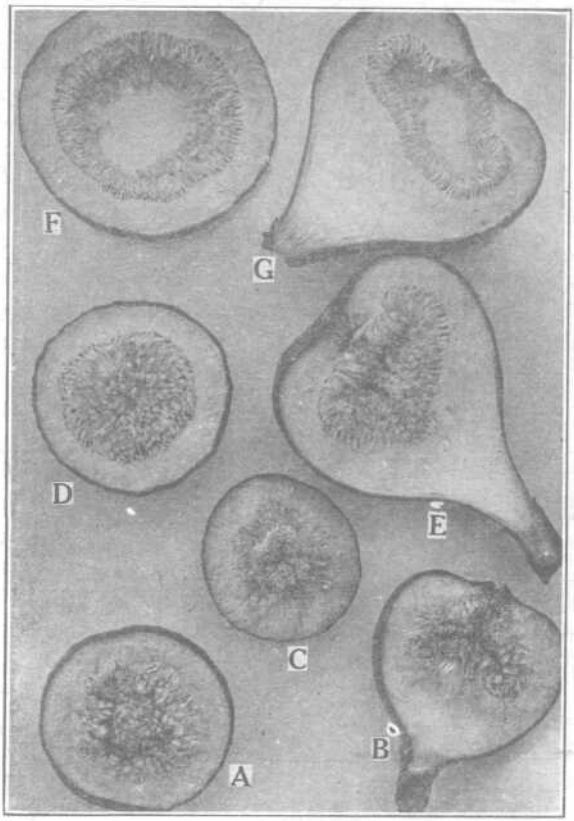

Fig. 5.—*A*, *G* and *C*, sections of fruit of Capri No. 1. *G*, fruit split lengthwise, showing the large number of plump gall flowers lining the bottom and sides of the cavity. Above, the staminate flowers surround the "eye," through this opening the fig wasp (*Blastophaga psenes*) makes its escape on emerging from the ovaries of the gall flowers in which the insect passes its life cycle. *A*, upper portion of fruit, showing a few gall flowers with the staminate ones grouped in the center. *C*, interior view of the apex, showing grouping of staminace flowers through which the *Blastophaga* must force its way in order to escape from the syconium.

***D* and *E* are cross and longitudinal sections of the fruit of a Smyrna variety, showing the large, plump, and rather coarse pistillate flowers lining the entire cavity of the syconium.**

***F* and *G* are sections of an Adriatic type of fig. showing character of the chaff-like mule flowers.**

Observations on Capri figs show no yield of insect-bearing figs from varieties other then Capri No. 1. It is apparent, however, that this Capri produces figs the year through, since *Blastophaga*

has been present during the past three successive seasons. The yield of the winter crop is sufficient to reestablish the colonies of wasps in the Capri figs and to provide for caprification of edible forms.

RESULTS OF THE SURVEY AND INVESTIGATION

Observations have convinced us that fig growing has passed the experimental stage. The survey has also shown that there are no extensive plantings. The home orchard usually consists of from one to several trees with an average not to exceed 15 or 20 for each farm on which trees of bearing age occur. An estimate of 6,000 trees bearing satisfactory yields of fruit would be a liberal one. All types of edible figs comprising the 600 or more horticultural forms occur among these plantings, these forms and varieties being widely disseminated throughout the warmer portions of the State. It is evident that many varieties find the soil and climate congenial, producing a satisfactory growth of foliage and yielding fair crops of fruit. This is also evidence that some varieties have been grown for many years and have produced good yields of fruit annually.

An inspection of the fruit from various parts of the State has convinced the writer that there are many desirable varieties quite generally distributed. Certain varieties show a great range of adaptability, while the individuals of these varieties show much greater variation. Furthermore, definite proof has been secured showing that far greater yields would be realized if the operator understood the nature of the plant and the method of handling it. Inquiries concerning increased plantings emphasized the fact that general information concerning the true value of the fruit for food, the large range of uses to which it might be placed, and the method of propagating the plant, would not only be appreciated but would be of great assistance in the development of the new home orchard. The survey has shown that the fig grower should have such information and explanations with reference to the nature of the types and varieties, as well as general instructions for planting, tilling, irrigating, and pollinating. It is generally conceded by the orchardist that fig growing is profitable, the entire crop being utilized as fresh, canned, or bottled fruit.

THE FIG PLANT

Originally the fig was represented by a single species known botanically as *Ficus carica*. It is from this species that all common edible forms have been developed. The forms producing edible fruit

now number several hundred. The varieties of this group, while semitropical in nature, are all deciduous, yet they usually carry a small crop of fruit through the winter on their naked branches.

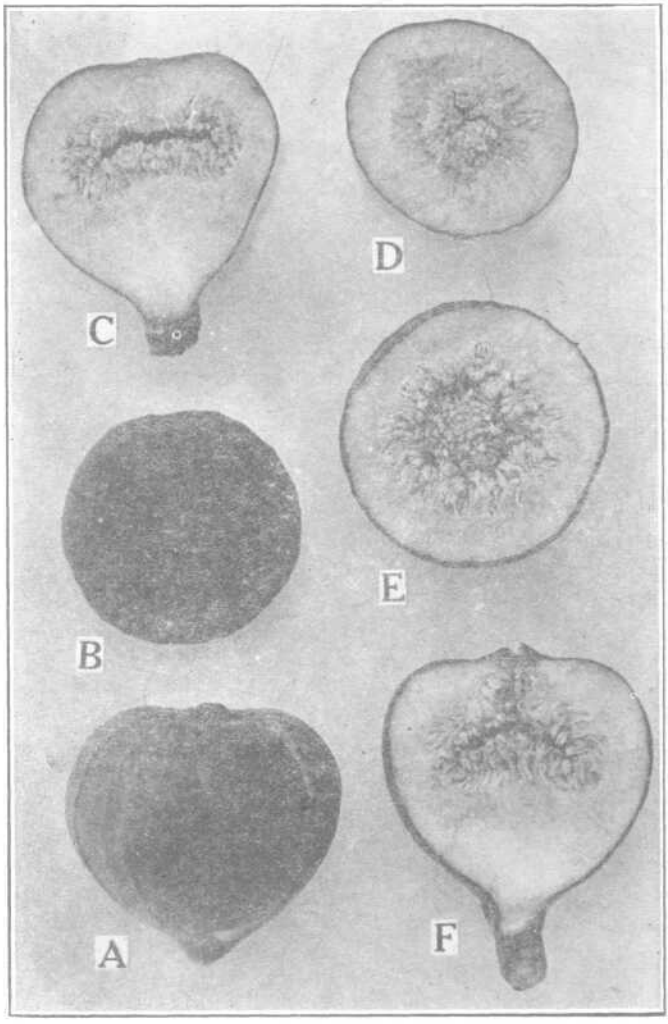

Fig. 6.—Side, apical, longitudinal, and cross section views of Capri figs. *A* and *B* are excellent views oi the "eye"; *F* and *C* illustrate the structure while *E* and *D* show the location and relative proportion of staminate to gall flowers. From a photograph by W H Lawrence.

Groups of figs.—Among the cultivated forms we now recognize five distinct groups which for convenience may best be arranged under both common and botanical names. These groups are:

(1) Capri *(Ficus carica* var. *silvestris).*
(2) Smyrna *(Ficus carica* var. *smyrnica).*
(3) San Pedro *(Ficus carica* var. *intermedia).*
(4) Common or Adriatic *(Ficus carica* var. *hortensis).*
(5) Cordelia *(Ficus carica* var. *relicta).*

The fruit of the fig.—While these groups vary greatly in habits and character they do agree closely with respect to the general nature and appearance of the fruit. The fruit of the fig consists of a fleshy receptacle called a syconus. This body is the deeply concave axis of the inflorescence on the inner surface of which the flowers and subsequently the fruit is borne, the entire body becoming edible at maturity. The cavity is closed by small bracts. It is the detailed information concerning the fruit and crops that the grower most needs to guide him in handling the fig intelligently.

Kinds of flowers.—There are four kinds of flowers produced by the fig: (1) staminate, (2) pistillate, (3) mule, and (4) gall. All the flowers are borne on the inner wall of the fleshy receptacle or syconus, commonly called the fruit. The fruit is a succulent, hollow stem with an eye at the apical end, hollow in the center with the wall lined with a thick coat of flowers. The five varieties of figs are grouped according to the kind of flowers borne in the receptacle,

(1) Staminate flowers, erroneously called male flowers, are rarely found except in the Capri fig. They may also occasionally appear in Smyrna figs. The flowers are minute and rather inc cnspicuous, consisting largely of four anthers borne on short filaments.

(2) Pistillate flowers, erroneously called female flowers, are common in the edible figs but may also occur in small numbers in the Capri fig. The pistillate flowers are small and consist largely of thc ovary, style and stigma, the essential organ being the most conspicuous.

(3) Mule flowers are rudimentary or degenerate pistillate flowers that do not require pollination to induce edible maturity of the fruit. This case may be termed horticultural maturity, since botanical maturity would involve the production of viable seeds. Mule flowers are common and characteristic of Adriatic or common figs. They may be associated with pistillate flowers which not infrequently occur in this group.

(4) Gall flowers are probably degenerate pistillate flowers which have become modified through long use by *Blastophaga psenes,* the fig wasp, as a place in which to pass its life cycle. These flowers are found with rare exceptions only in the syconus of the Capri fig.

CROPS OF FRUIT

The fig is usually a profuse bearer, producing one to three crops of fruit each year. Since the staminate and pistillate groups vary greatly, separate discussions are introduced.

The *Capri fig* naturally produces three crops each year, none of which are edible. These crops are known as the winter or mamme, spring or profichi, and summer or mammoni. Certain forms of Capri figs produce one, two, and three crops, the number varying with the species. The presence of well developed but dormant fruit on the naked branches throughout the winter is essential to the propagation of *Elastophaga psenes*, the fig wasp, the life history, habits, and use of which insect are discussed later in this paper.

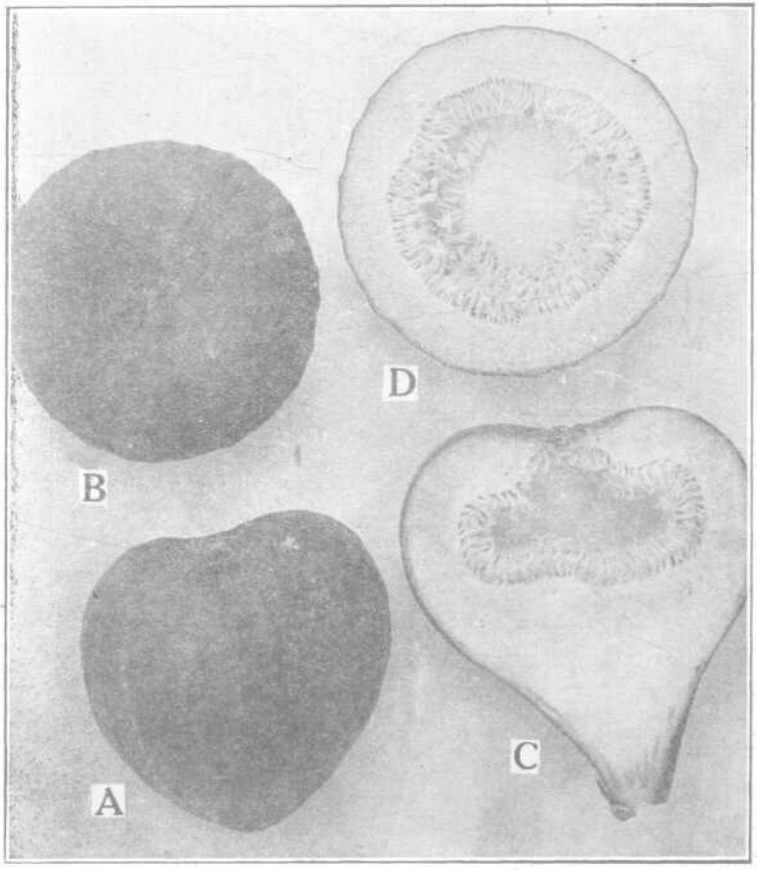

Fig. 7.—Adriatic type of fig. *A*, side view; *B*, apical view; *C*, view of the fruit cut into section lengthwise, showing the cavity lined with flowers, with eye leading to the outside; *D*, cross section of the fruit through the larger portion of the cavity. Photograph by W. H. Lawrence.

The *edible fig*, which includes all forms of figs producing edible fruit, sometimes produces three crops. In this group there is no sharp distinction, in many cases at least, to be drawn between the second and third crops. The first crop, or Brebas, is easily distinguished by its position on the old wood and the date of maturity. It may be said, however, that this crop is composed of the late maturing forms of autumn that have passed the winter in the green stage, ripening in early spring. There are two distinct crops in the San Pedro group, the first characterized by mule flowers, while the second bears pistillate flowers.

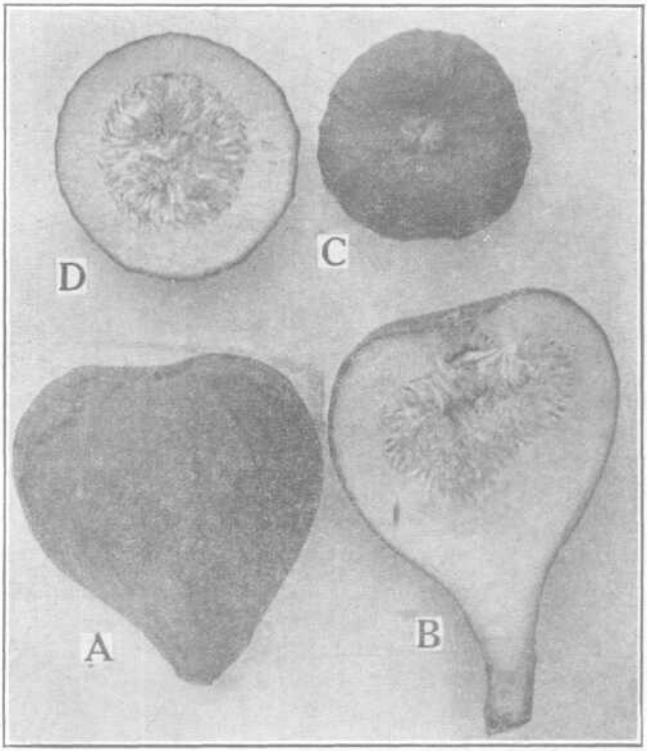

Fig. 8.—External views and interior longitudinal and cross section views of the Smyrna fig, showing the relatively small cavity well filled with a dense lining of large, plump, and coarse pistillate flowers. From a photograph by W. H. Lawrence.

Classification of figs.—Two main divisions might be made of the five varieties: (I) pollen producing forms and (II) nonpollen producing forms.

(I) The pollen producing forms would include the Capri and Cordelia figs. This group may be further subdivided by noting

that the Capri figs bear gall and staminate, while the Cordelia figs is characterized by the presence of pistillate and staminate flowers.

(II) The nonpollen producing forms include three varieties—the Smyrna, San Pedro, and Adriatic. The further subdivisions of these groups permit the following arrangement

Smyrna—producing mainly pistillate flowers, all crops.

San Pedro—producing both mule (first crop) and pistillate (second crop) flowers.

Adriatic—producing mainly mule flowers, all crops.

New type of fig.—A new type of fig grown from seed is described by Swingle* as " . . . a sort of hermaphrodite tree that had enough of the qualities of a Capri fig to support the *Blastophaga* and enough of those of the fertile tree to produce an abundant crop of summer generative buds just as the spring generation Capri figs were ripening. It also bears numerous fertile seeds mingled with insect-bearing galls. By planting this variety among other Capri figs the *Blastophaga* will be able to breed uninterruptedly throughout the year and not, as is now the case, almost completely die out in midsummer."

Characteristics of varieties.—There are five varieties of *Ficus carica*, as explained on an earlier page.

The *Capri fig* (*Ficus carica* var. *silvestris*) is a wild fig that has been brought under cultivation. There are about thirty forms grown in California and the Southwest. The fruit produced by this group can not be considered edible. One, two, or three crops of fruit are produced each year.

There are two forms of Capri figs, the pistillate and the staminate. Ths pistillate form is very rare and needs only brief mention It is perhaps the parent form of the Smyrna group. The staminate form is the more important since it is the host for the fig wasp and produces the pollen for use in the caprification of pistillate figs.

The three crops produced by the Capri figs show marked differences in structure. These crops are known as the mamme, profichi, and mammoni. The mamme, or first crop, forms in the fall and matures in early summer about the same time that the brebas, or first crop of edible figs, ripens. In this crop the syconus is only provided with gall flowers, possibly a few pistillate ones, yet no seeds are matured, the staminate flowers are absent or very rare. hence no pollen is produced by this crop. The sole office of the crop, therefore, is to carry the fig wasp through the winter. The crop matures on the wood of the previous season.

*The Fig in California Separate, California State Commission of Horticulture, p. 8.

The profichi, or second crop, ripens before the second crop of edible figs. It appears in May, or earlier, and matures in June or July. This crop matures large numbers of gall and staminate flowers, no pistillate flowers occurring. It is from this crop that pollen is carried to the Smyrna and second-crop San Pedro. An examination of a syconus shows the gall flowers arranged in the lower portion of the receptacle, while the staminate are grouped around the eye at the apical end.

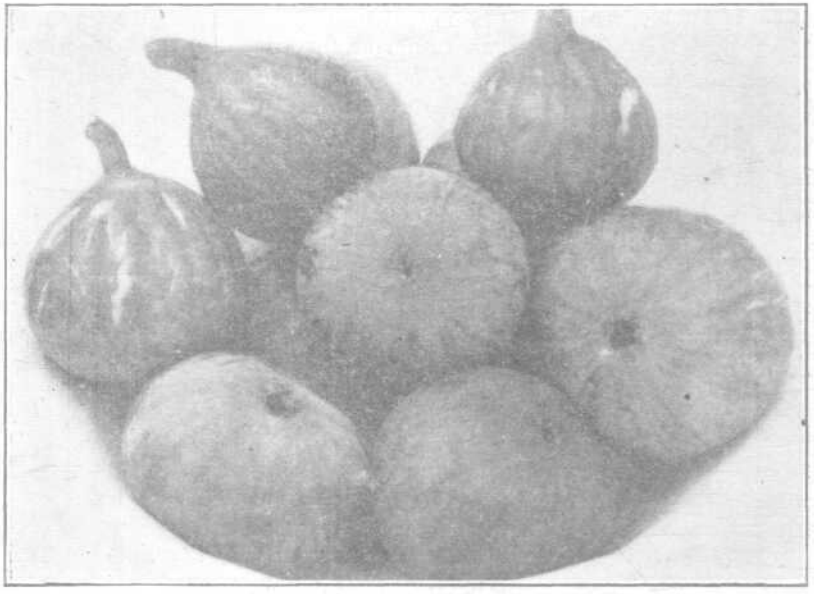

Fig. 9.—Group of Black Smyrna figs that have reached edible maturity. Note the large and open "eye," which makes it possible for insects, fungi, bacteria, and water to enter the fruit before and during the ripening period, causing the fruit to sour. From photograph, horticultural files, Arizona Agricultural Experiment Station.

The mammoni, or third crop, appears before the last of the profichi has disappeared. This crop contains a few each of staminate and pistillate, but a large number of gall flowers. This crop may occasionally produce a few seeds. Pollination takes place by the fig wasp carrying the pollen from the profichi to the mammoni syconia at the time the wasp leaves the crop of profichi, which has matured and is failing, to enter the mammoni crop. The primary use of this crop is to furnish a home for the fig wasp until the mamme form permits the establishment of the fig wasp in winter quarters. Mammoni figs are produced on the wood of the present season.

The *Cordelia* and allied forms (*Ficus carica* var. *relicta*) differ from the true Capri in producing both pistillate and staminate flowers. The arrangement and position of both sexes of flowers correspond to that of the Capri fig. The fruit of this form remains dry and inedible in the zone occupied by the staminate flowers, while below, the pistillate flowers, that produce seeds, develop into perfect edible maturity. This form represents the true Capri fig in the presence of staminate flowers, and the Smyrna by the occurrence of pistillate flowers capable of fertilization and the production of seeds.

Perhaps the best known of this group are the Bellona, Drap d'Or, Corsica, and Cordelia.

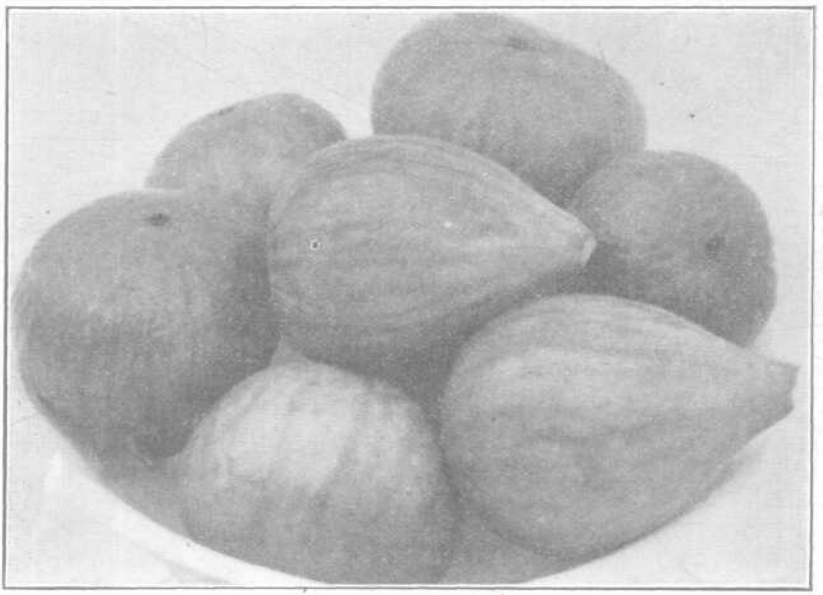

Fig. 10.—A group of well matured White Adriatic figs. Note character of the "eye." From photograph, horticultural files, Arizona Agricultural Experiment Station.

The *Bellona* and *Drap d'Or* were studied by the writer at a time when the supply of fruit was limited. The three available specimens of Bellona all presented an abundance of flowers with the pistillate grouped in the basal portion, and the staminate occupying the apical portion. Of four specimens of Drap d'Or, three presented the same structure as described for Bellona, while the fourth did not contain staminate flowers. Both these varieties are characterized by the basal portion of the syconia reaching edible maturity, while the upper portions remain dry, leathery, and develop little or no flavor.

The *San Pedro* group (*Ficus carica* var. *intermedia*) produces two main crops of edible figs. The first crop contains mule flowers that are not susceptible to fertilization, hence pollination is of no value to the horticultural maturity of the fruit. The second crop, however, contains pistillate flowers only, and in the absence of pollen the syconia drop before reaching edible maturity, which is only induced through fertilization and botanical maturity of the pistils. This group is intermediate between the Smyrna on the one hand and the Adriatic on the other. Yellow, White, and Black San Pedro, Gentile, Pitontoni, and Portuguese are perhaps the best known forms of this group.

The *Adriatic or common fig* (*Ficus carica* var. *hortensis*). To this group belong the common figs grown so extensively throughout the Southern States. The syconia contain large numbers of mule flowers and occasionally a few pistillate ones susceptible of fertilization. Pollination is not necessary, however, to the production of fruit, since horticultural maturity is perfect in this case This fig is perhaps a form in which rudimentary pistillate flowers occur not susceptible to pollination, having lost their character of reproduction by seed, yet maturing the fruit horticulturally.

The *Smyrna fig* group (*Ficus carica* var. *smyrnica*). This group undoubtedly originated from the pistillate Capri fig. The syconia bear true pistillate flowers and these require pollination to induce edible maturity. It is this very large and important group and the lesser important San Pedro group that require the growing of the staminate Capri fig to furnish the pollen necessary to the setting and maturity of the fruit,

FIG CULTURE

CLIMATIC REQUIREMENTS

The fig is subtropical. A summer temperature of 90° P. to 110° F. in the shade, from July to October, accompanied by a comparatively dry atmosphere and no rain, is quite ideal. Cold nights in summer, or rainy weather during the ripening period are very objectionable and destructive, causing much of the ripening fruit to sour before reaching edible maturity. Winter temperatures of 12° F. to 14° F. for short durations are not apt to do serious damage, yet these temperatures may be dangerous when the trees are not given winter protection.

SOIL

The fig grows well on all types of soil. A well drained, moist but mellow, sandy loam, well filled with humus is most desirable.

While the fig is not exacting, it is notable that a very light sandy soil with a low water-holding capacity is not as desirable as a heavier and more compact one in which a larger proportion of moisture is present during the earlier portion of the growing season. Sandy soils are especially undesirable where nematodes are abundant. Ozonium-infested soil is likewise objectionable since this fungus may attack and destroy or badly weaken the trees.

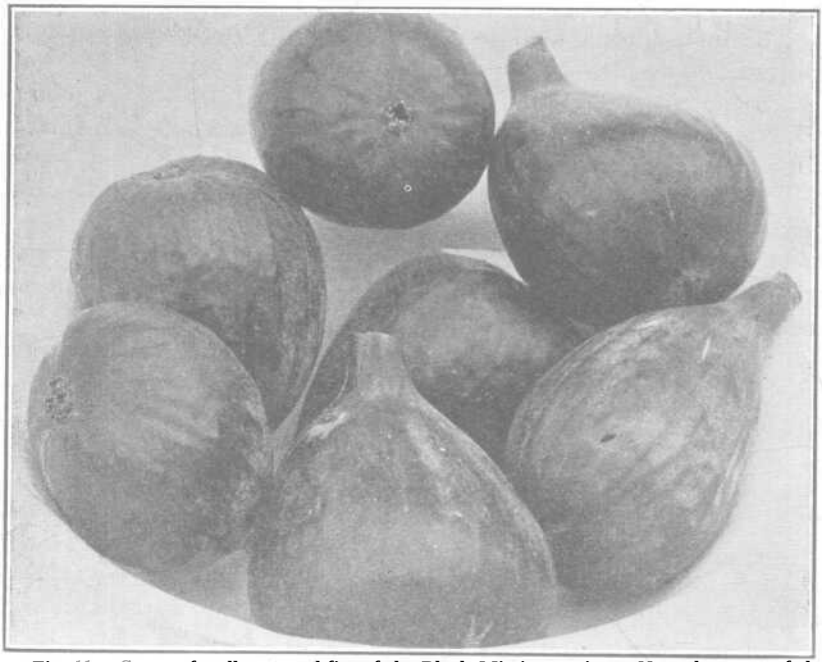

Fig. 11.—Group of well matured figs of the Black Mission variety. Note character of the "eye." From photograph, horticultural files, Arizona Experiment Station.

Alkali soils are not profitable for fig production. According to Hilgard, healthy fig plants have been observed on soil containing as much as 6,600 pounds per acre-foot, of mixed alkali sulphates, and 200 to 300 pounds, of carbonates and chlorides. However, much larger amounts of alkali salts have been found in soils occupied by figs which did not show any injurious effects on vegetative growth. For productive returns, however, it is perhaps advisable to avoid soils carrying more than the minimum amount the plant endures without visible signs of injury.

SELECTING VARIETIES

A study of those varieties of figs grown in the Salt River Valley shows the most hardy and prolific varieties to be the Lob Injir,

Bulletin Smyrna, Black Mission, Black Adriatic, Bardajic, Rose Blanche, Dauphine, and Ronde Violette Hative. Other named varieties that can be recommended are the White Adriatic, White Mission, Angelique, Brown Turkey, Black and White San Pedro, Magnolia, and White Endich.

The selection of varieties that have proved themselves in a locality safeguards the grower in securing desirable trees.

PROPAGATION OF THE FIG

The fig is propagated from seeds, shoots, hardwood cuttings, and grafts, and may be budded or grafted.

Propagation by seeds is apt to be disappointing, since the seedlings do not come true to type. This method is only possible in those groups that produce viable seeds. The practice is to be condemned except when it is the purpose to originate new and more desirable sorts.

Reimer* in discussing the cause of premature dropping of figs, said: "At least 95 per cent of the figs examined were seedlings of the true Smyrna fig. Most of the seedlings bear fruit similar to that of the Capri fig, very rarely is it like that of the true Smyrna fig. . . . These seedling figs as a rule are absolutely useless as far as the fruit is concerned."

According to Swingle,† of the 139 seedling trees in the Maslin orchard in bearing in 1908, 74 were Capri figs and 65 Smyrna. Of the former, 20 or more are valuable for planting in the Capri orchard; of the latter, 1 in 10 was worthy of a trial with a view to its introduction as a commercial sort. He states further, however, "at least two and possibly more of them show a very valuable characteristic not known in any fig of the Smyrna type now cultivated—the fruits becomes sealed automatically as they ripen." Self-sealing is due to a pellucid gum filling and then hardening in the eye, preventing entrance of moisture, bacteria, fungi, and insects

Selecting stock for propagation. — The safest and surest way to secure trees adapted to local conditions in the State is to grow them from hardwood cuttings. Elsewhere in this paper mention is made of both named and unknown forms that are adapted to local conditions.

Reference is sometimes made to orchards that came into full bearing and produced good yields but have since disappeared. The Thirteenth Census of the United States shows a decrease in bearing

*Cause of Premature Dropping Bull 208, N C Exp Sta p 204

†The Maslin Seedling Fig Orchard at Loomis, California, and rt« bearing on the Smyrna Fig Industry of the Country Separate, California State Commission of Horticulture, p 3,

trees and yield of fruit during the preceding ten years. This decrease was no doubt due to an inadequate or intermittent supply of irrigating water, the destruction of varieties by low temperatures occurring at rare intervals, and the discarding of undesirable forms which sour upon the trees before ripening, or which lack flavor and quality, and varieties which are too soft for shipping. The decrease in number of trees has been most fortunate as far as the selection of stock for propagating purposes is concerned, since undesirable forms have largely disappeared.

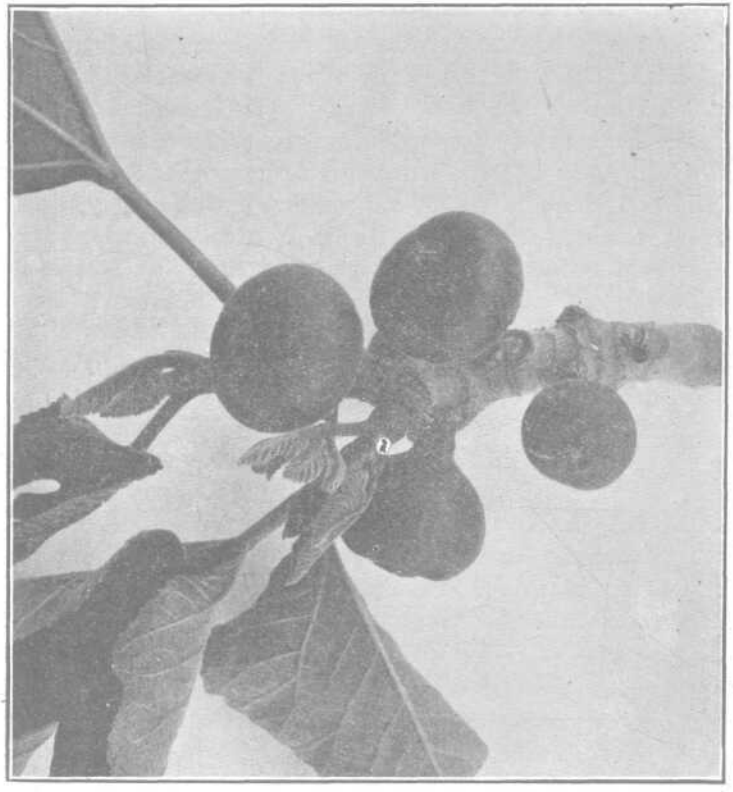

Fig. 12.—Terminal branch from Capri No. 1, showing four Capri figs making normal growth due to parasitism by *Blastophaga psenes*, the fig wasp. From photograph, horticultural files, Arizona Experiment Station.

The representatives of Adriatic types growing in nearly every portion of the State where winter temperatures rarely fall below 15° F. to 18° F., except for periods of short duration, and the surviving specimens of earlier introduction from Old Mexico, California, and other fig producing sections, give a large assortment of varieties

and an immense supply of propagating stock adapted to the immediate local conditions Even then careful selection of the individuals of a variety should be made. This is essential to the securing of a form that will produce fruit of good quality, and a good yield, and which will give a regular annual production. Perhaps even as great care should be paid to the selection of forms that will endure extremes of weather. This is particularly true in the selection of Smyrna varieties. In the Salt River Valley, where the Capri fig is being grown, the influence of temperature on the production of Capri figs is very noticeable, since there is but a single form that carries mamme through the winter.

Vegetative propagation by the use of mature wood cuttings is the most practical method, especially where the work is done upon the farm. Mature or hardwood cuttings should be made in winter, when the least sap is flowing, using well ripened wood free from winter injury. The length of the cuttings depends upon the size and age of the wood. They range from 1 to 14 inches in length, the average being 4 to 6 inches. In the preparation of the cuttings the wood should be sectioned exactly at the node, so that no visible pith will show at either end. Planting may be done at once with two eyes exposed, or the cuttings may be heeled-in in soil well tamped to exclude the air and prevent drying. Planting may be done in late winter or early spring; it may be done directly in the field or in the nursery where the stock is grown for a season before being set in the orchard. One should avoid wet soils, since the roots make a very succulent growth and are extremely susceptible to injury at the time of transplanting. The soil should, however, be moist. In the case of too rapid rooting the cuttings may be dried slightly before planting. Desiccated cuttings should be revived by soaking them in water for a short time. After planting avoid covering.

Propagation by shoots is easily accomplished. The suckers arising on the roots and lower portion of the trunk will soon take root and may then be removed with a small portion of the parent tree and set in the field.

Unproductive and undesirable varieties of vigorous growing capacity may be grafted or budded. Grafting usually gives the best results and may be done conveniently by cutting off the stem, notching the side, then cutting a V-shaped slit about 1¼ inches long into which a scion of two buds is inserted, tied, and waxed* Two-year old wood is used for grafting.

ARRANGEMENT OF VARIETIES IX THE ORCHARD

Varieties may be arranged to suit the fancy of the grower. In the selection, care must be taken to secure the right varieties and forms.

Edible figs.—An orchard of edible figs may include any or all forms. Should the area include forms requiring pollination as well as those not requiring pollination, it is desirable to group together the pistillate forms in order to facilitate orchard caprification. When either Smyrna or San Pedro figs are grown it becomes necessary to include Capri figs in the planting.

Capri 01 chard —There are about 30 varieties of Capri figs which differ greatly in bearing habits, producing from one to three crops each year. The selection must include varieties that will produce a continuous crop of figs the year through. The loss of a crop of the series at any time means a loss of the fig wasp. Since the insect requires shade and a cool place, best results are secured by growing the Capri trees rather closely together and in a more or less protected and shaded place. Furthermore, in the care of the tree during the year one should avoid pruning, since this group of varieties will give the best results when the tops are dense. The Capri orchard should be placed within easy access of the edible fig-bearing orchard.

While Capri figs grown in the Salt River Valley produce crops in summer they do not carry a crop through the winter with the exception of Roeding No. 1, which usually carries a sufficient number of mamme to reinfect the spring crop of Capri figs.

Assortment of Capri trees.—Capri figs are a class by themselves. The sole purpose of this variety is to provide a home for the fig wasp. Some varieties produce three continuous crops each year, while others produce only one or two, Capri trees do not produce a succession of crops until they are four years old. The collection of Capri figs should then include as many varieties as will supply a continuous crop of figs to carry the wasp through season after season and year after year.

Capri No. 1 seems to be the ideal form. The remaining varieties, however, do produce good crops and will, when pains are taken to caprify them, produce a large number of wasp-bearing figs. With Capri No.1, bearing practically the year through, the ideal combination would be this form grown with *Ficus pseudocaypa.* The overwintering crop of the latter species is provided with stamens and will pollinate the first crop of Smyrna. It seems to be more hardy than other Capri figs and bears mamme and profichi crops.

The proportion of Capri trees.—The general practice is to grow

two Capri trees for each acre of Smyrna or San Pedro, yet the writer recommends twice this number for use in the Salt River Valley. The number of trees must be varied since the size of the fruit varies greatly, in some instances each specimen producing only 500 while the larger forms may produce 2,000 or more wasps. The profichi crop is the one that concerns the orchardist.

Providing winter protection.—The problem of providing winter protection consists in the growing of one or more varieties of Capri trees in a more or less protected place. The growing of the Capri tree in the bush form, making it possible to cover the plant during severe winter weather and when spring frosts occur, would undoubtedly make it possible to carry a larger number of Capri figs through a winter destructive to the mamme crop. The Capri varieties are apparently less hardy than many of the edible fruit-producing ones, since the fruit is very easily destroyed by freezes and frosts. The problem of carrying the *Blastophaga* through the winter is a problem so important that an attempt should be made to protect the Capri trees in order that they may carry the fruit through the winter months.

Even in the most favorable localities, conditions at times may occur that will kill the mamme crop, thereby destroying the fig wasps. Experimental work done in collecting Capri figs late in the season, packing them in damp mud and damp sphagnum in fruit jars and similar vessels and storing them in outbuildings, shows that the fruit will pass the winter in good condition and the wasps will emerge in April from figs gathered late in December.*

PLANTING AND CARE OF THE YOUNG ORCHARD

The fig plant has a spreading habit and Is a surface feeder. The average distance for planting is 28 by 28 to 30 by 30 feet. On sandy soils where top growth is limited, 25 by 25 feet is good space, yet when they grow large,35 by 35 feet gives the trees none too much room after they come into full bearing.

Great care is required in transplanting the fig. At the time the trees are dug from the nursery row the roots must not be exposed to the sun or dry air, since slight exposure will injure and possibly kill them. While planting, the same precautions must be taken, Puddling the roots is the best method of handling previous to the removal of mutilated and discolored branches at the time of setting. When planting is done, the soil must be moist or a sufficient quantity of water applied to settle the soil around the roots. The moist or

*Rixford G P Requirements and Possibilities of Fig Culture in California Preserving Mamme Capri figs Reprint, Monthly Bulletin California State Commission of Horticulture Feb 1915, Vol IV, No 2, p 5

wet soil should be covered with a mulch of dry soil about 4 inches deep.

Usually a single tree is set in a place, yet under conditions where low bush forms are desirable for ease in covering during the winter, three to five plants are set in a group. The stems should be protected from sunscald.

After setting, the group needs little or no attention. The single plant should be headed not to exceed 24 inches, except when frost is apt to occur, killing the stems, under which condition very low heading is practiced to induce the formation of several standards. Subsequent pruning for three or four years should be done to form the framework. Young trees come into bearing very early and special attempts should be made to have the tree properly prepared. After fruiting begins the pruning should be done merely to remove weak or dead wood and to shape the top advantageously for the gathering of the fruit. The first year after setting, this method of pruning consists in saving three to four scaffold branches, shortening them not to exceed 12 inches in length, and so arranging them as to grow a vase-shaped top. The following season two branches, each cut back about two-thirds its length, are left on each scaffold, with the removal of all drooping ones. The third season the growth is shortened about one-third, and thereafter the top is merely thinned to provide good space for the bearing Wood.

On the fig all the fruit is borne on one-year-old wood. In training it is well to bear this in mind and to avoid the removal of too large a proportion of the bearing surface of the plant.

THE PRUNING OF BEARING TREES

Due to the small size of second-crop figs an attempt was made to influence the development of the fruit and growth of new wood on Lob Injir, Black Smyrna, and Black Adriatic. Practically one-half of the bearing wood was removed in each specimen pruned on February 3, 1914. Heavy pruning done to thin the fruit apparently has a tendency to reduce the yield and shorten the picking season and does not influence the size of the fruit, yet replaces the old with a larger proportion of bearing fruit.

CULTIVATION AND IRRIGATION

Fig trees are shallow rooted but gross feeders. Clean cultivation is perhaps the best method of caring for young trees. They should at least be given good care until they become well established. Injury to the top, or adverse climatic or soil conditions while the tree is young and especially before the root system is established,

usually dwarfs the tree permanently. It is therefore advisable to apply water sparingly, yet abundantly enough during the early development of the plant to induce deep rooting. Since many of the feeding roots occur near the surface, shallow tillage is essential. Mulching the ground is known to be very beneficial. Application of barnyard manure when top growth is not satisfactory induces the development of new wood. Commercial fertilizers carrying potash, phosphoric acid, and lime are generally recognized as valuable on old and more or less depleted soils.

WINTER PROTECTION FOR FIG TREES

No attempt is made to protect the trees from injurious temperatures except in those sections where the fig plant will not endure exposure until two or three years of age. In most places where protection would carry the tree through the winter, the cost of necessary attention is so slight that one could afford to prepare the trees for cold snaps by wrapping the stems in straw, old stalks, or other materials, or by covering with straw and dirt so that the trees, when of a bush form, may be bent over and covered conveniently.

CAPRIFICATION

Pollination of the fig is commonly termed "caprification." This is an important practice and requires detailed instruction, since only accurate work will give satisfactory results. It becomes necessary at this point to consider methods of caprification.

The operator of the Smyrna and San Pedro fig orchards must thoroughly understand the habits and life history of the fig wasp, since this insect is the sole means by which pollen can be conveyed from the staminate to the pistillate flowers. This insect is a parasite in the fruit of the Capri fig and can not live under other conditions or in other kinds of fruit. This wasp is found native only in sections where fig growing has been practiced for centuries or where the Capri fig is native. It must therefore be introduced where needed to insure pollination of the fig. These conditions make it mandatory to propagate the wasp.

The development of three crops on the Capri fig each year makes it necessary for the insect to change quarters the same number of times each growing season. Unless the crops are available to provide suitable quarters the wasp will perish, notwithstanding the fact that climate and other conditions may be ideal*

Plants requiring caprification.—Attention has previously been called to the necessity of the caprification (pollination) of Smyrna and second-crop San Pedro figs. Frequently the orchardist overlooks

the fact that the Capri fig must also be caprified, since some forms of Capri figs do not produce continuous crops. There is also almost a break between the profichi and mammoni, since nearly all the insects escape from the former crop before the earliest fruits of the latter crop are old enough to accommodate the fig wasp. This is a wise provision, considered from a natural point of view, and is also very important commercially. While the profichi crop is useful in the caprification of edible figs, the mamme and profichi crop are used in the caprification of Capri figs, and especially in perpetuating the fig wasp.

Methods of caprification.—To intelligently caprify an orchard the operator must become familiar with the general appearance of the Capri fig when the wasp has developed to the stage of emergence. By opening and examining a few, one soon is able to determine the date the fruit is mature for caprification, by the external appearance, especially the color, of the fig.

Mature figs are either hand picked or when out of reach are knocked from the trees with light bamboo poles. Picking is done in pails and begins at daylight while the figs are cool, since the wasps begin flight as soon as the fruit warms up. Emergence continues with interruptions for several hours each day for about ten days.

Distribution of the crop is done usually by means of cone-shaped baskets about 3 inches wide at the opening and 10 inches long. Six to fifteen specimens of average size are required for trees 4 to 6 years old, while 20 to 100 are needed to caprify trees 10 to 40 years old. For small trees one basket is used, while in large ones two or three hung in different locations in the top of the tree may be necessary. Caprification is done 7 to 10 days apart and should continue until the entire crop is pollinated.

How caprification is accomplished.—During June, Smyrna figs mature to the size of marbles, the flowers presenting a waxy appearance. At this stage of maturity pollination will take place. The profichi crop of Capri figs should now also be mature with the fig wasp ready to emerge. Attention has been directed to the fact that the profichi crop contains both gall and staminate flowers. With the gall flowers in the lower end of the cavity, and the staminate above, forming a dense mass of flowers full of loose pollen surrounding and covering the eye—the only means of exit—the female wasp in forcing her way through the stamens becomes well coated with the pollen, which, however, she unsuccessfully attempts to remove on reaching the opening and before flight. On entering the pistillate syconia the pollen is scattered thoroughly over the

pistils while the female works vigorously searching for a place to deposit her eggs. The caprification of a crop maturing through a month or more is possible, since the syconia of the profichi crop mature in the same manner with insects emerging from the crop for about 30 days, with further distribution of a crop of wasps emerging from the individual syconia for a period of about 10 days.

Life history of the wasp.—As has previously been suggested, there are three generations of the fig wasp each year. All stages of transformation from the egg to the adult take place within the ovary of the gall flowers. Both sexes of the insect develop under the same conditions, a single individual occupying an ovary. When they are ready to emerge the males appear first. They are wingless, smaller than the females, light brown, and are provided with strong jaws, useful in liberating themselves and the females

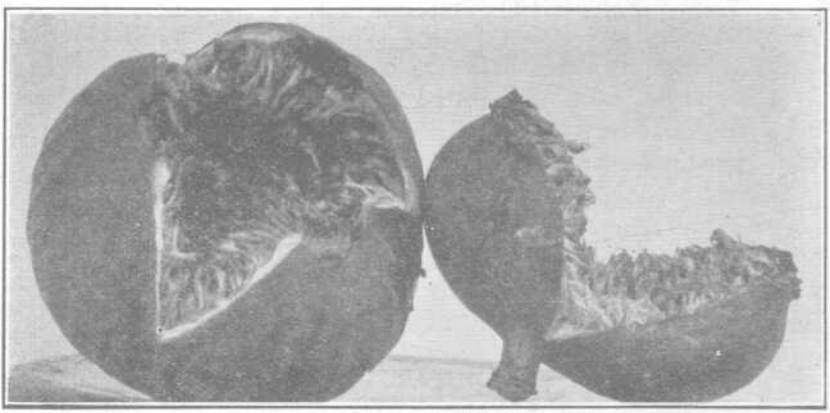

Fig. 13.—Smyrna figs that have been split open before reaching edible maturity. From photograph, horticultural files. Arizona Experiment Station.

from their quarters. On emerging, the males seek out the females and impregnate them, after cutting a small opening in the wall of the ovary enclosing them. The female, otherwise unable to escape, is strong enough to enlarge the opening in the wall of the fig ovary, made by the male, and makes her escape. The female immediately leaves the fig in which she has developed, in search of a suitable place to deposit her eggs. The males never leave the syconia in which they mature. Fortunately for the fig grower, the female wasp does not have the ability to discriminate between Capri pistillate and other buds of the fig, but enters any and all in search of a place to deposit eggs, vigorously working among the flowers.

Emergence of Blastophaga.—The dates of emergence of the *Blastophaga* (fig wasp) vary with the locality and seasons. There is but

slight variation in the Salt River Valley during successive years. The following dates are approximate and are those recorded for 1915. The *Blastophaga* began to emerge June 1 and were approximately all out by June 15. The mammoni crop was well formed by August 5, having matured enough to provide quarters for a few of the fig wasps. The emergence of the three generations of the wasp during a period of several days, and the overlapping of the three crops of Capri figs, make it possible for the wasps to find quarters for each generation.

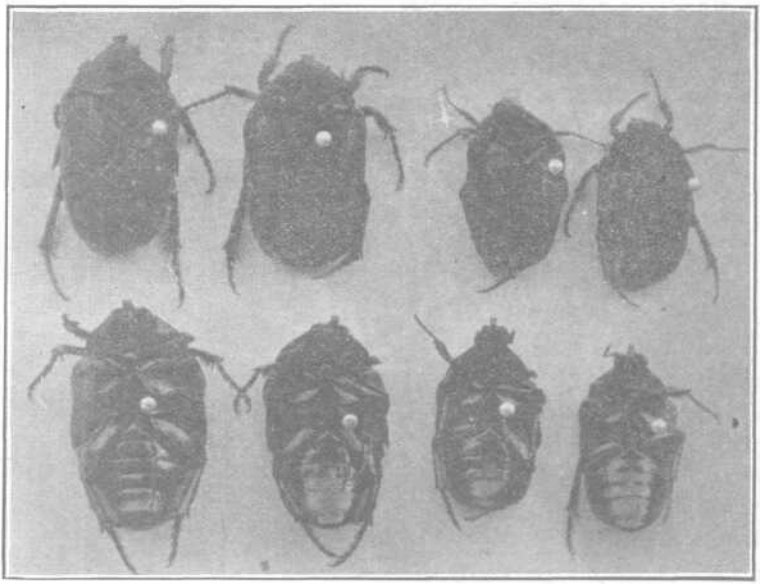

Fig. 14.—Dorsal and ventral views of the "June Bug." Natural size, from photograph horticultural files, Arizona Experiment Station.

SPLITTING AND SOURING OF THE FRUIT

Cold weather and rains cause all or a portion of the fruit of some" forms to sour upon the tree just previous to picking time. Attention has been called earlier in this publication to self-sealing forms that are not susceptible to injury by rain, since, on approaching edible maturity, a pellucid gum is deposited in the eye, sealing it against the entrance of bacteria and fungi and against invasion by insects. Cracking, splitting, and souring of the fruit may occur in the same specimen under certain conditions.

During the 1915 season, a large percentage of the Black Smyrna and White Adriatic cracked and soured while ripening. The estimated yield from the former (two trees) was 300 pounds,

with 36.5 pounds edible, and the latter (two trees) 400 pounds with 86 pounds edible. In this instance the White Adriatic did not mature its fruit properly since during the ripening period hardly two figs showed the same flavor or firmness of flesh.

Both the Royal Vineyard and Lob Injir produced split fruit during 1915. Splitting is undoubtedly due to increased growth of the fruit following a period in which the tissues grew slowly or ceased growth and became more or less woody, under which condition rupturing takes place to accommodate the growing portions. The solution of the problem lies in properly tilling and irrigating the orchard to induce a uniform growth of tree and development of fruit, or the use of nonsplitting and self-sealing forms in localities adapted to their growth.

PESTS

The June Bug is the one serious pest. In 1914 the damage done was somewhat later but more serious than in the following season. In 1915 they made their first appearance July 20 and seriously damaged the ripening fruit of White Adriatic, Bulletin Smyrna, Lob Injir, and Black Adriatic.

Their method of feeding makes it impossible to combat this insect by spraying.

They may be collected quite rapidly by using a long, home-made tin tube with a wide flaring end; and a light but broad bat. When disturbed the insect usually drops some distance before taking flight. By holding the above mentioned tin tube below the beetle, then exciting it to flight and directing its course by use of the bat, it drops into the bell-like apex of the "bug catcher" and slides down the tube, where it is caught in a sack tied over the lower end. The beetles are then destroyed by pouring them into a pail of kerosene or crude oil.

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IF. *H. Lawrence.*