

There are several reasons why the wholesale price of fresh Lychees will probably never fall to 25 cents per pound. In the first place the fruit is generally conceded to be one of the world's finest and almost universally liked. Secondly, the area in which the trees will bear fruit is extremely limited: in North America it is confined to a small section of Florida, in the world to small parts of China, India and South Africa, and in the United States land in the Lychee producing area is certainly not plentiful. Based on well known factors it is predicted that an oversupply of the fruit is practically impossible. And, of course, it is oversupply that brings ruinous prices. In the third place, all estimates and ratios have been based on the production and sale of fresh fruit only. Nothing

has been said and no consideration has been taken of the frozen, canned, preserved, spiced, dried or fermented fruit. It is also interesting to note that fresh Lychees are ready for the market from about the middle of June to the last of July during which time fresh northern fruits have not yet matured and Southern fruits have reached the point of declining availability.

In summary it may be said that the Lychee promises to be an exceedingly important agricultural venture for this state. It grows well here, it ships well, the demand is established and expanding rapidly, production costs are favorable and profits exceptional. It remains now for the growers to take advantage of this market and do it with planning and cooperation.

## A SURVEY OF DISEASES LETHAL TO TAHITI (PERSIAN) LIMES IN DADE COUNTY

C. M. GATES AND M. J. SOULE, JR.  
*University of Miami*  
Coral Gables

In recent years considerable concern has been felt by growers over the failure of groves of the common Tahiti and the Idemor variety of limes. The Idemor is variety in the Tahiti group but the two will be treated here as distinct varieties. Many of the groves in the Redlands district of Dade County have had as high as 50% of the trees die out in the last few years.

In 1934 Tisdale (2) described a bark disease of Tahiti limes caused by *Diplodia natalensis* Pole-Evans and *Diaporthe citri* Wolf. He described the disease as a yellowing of the foliage followed by the death of all or part of the tree. The bark of the trunk or the larger branches was found to be dead. The diseased bark was dark in color and, oc-

asionally, cracked longitudinally. There may or may not be gumming in the affected area. In 1936 (3) he recommended that trees affected with the disease be treated by cutting away the dead and diseased portion and treating the cut surface with a fungicide and then with a safe wound dressing. In 1943 Ruehle (1) described the symptoms of a disease believed to have a virus as its causal agent. The disease was characterized as causing a yellow to brown sectorial streaking of the fruit together with a breakdown of the oil cells and some of the albedo under the streaks, a mottled leaf chlorosis, and bark constrictions on the trunks of young infected trees. Longitudinal sections of young trunks showed gum soaked areas and gum pockets in the bark and wood under the constrictions.

The present survey was made to determine the amounts of lime bark dis-

ease and presumed virus disease present in Dade County and to attempt to correlate the presence of the virus disease to the severity of *Diplodia* and *Diaporthe* bark rots. Twenty-one groves in the Redlands district of the County were surveyed and sampled. Fifty trees from each grove were inspected by selecting two rows near the center of the grove and inspecting 25 trees in each row including two border trees. In some cases trees that had been replaced were counted and in others such replacements were ignored and a total of 50 trees were checked. The trees were checked for the presence of lesions on the trunk or large branches, and the fruit and foliage was inspected for the presence of virus symptoms as described by Ruehle. The presence of *Diaporthe* dieback on the smaller twigs was ignored as this is seldom a fatal disease on limes.

A majority of Dade County groves are on rough lemon root stock but one young grove on *Cleopatra mandarin* and two old groves topworked on grapefruit were included in the survey. Four Idemor and two mixed Idemor and common Tahiti groves were checked, the rest being all Tahiti.

A total of twenty isolations were made from the bark of diseased trees. Of these 14 yielded *Diplodia*, 3 *Fusarium*, 2 *Diaporthe*, and one an unidentified fungus of the anthracnose group.

The data collected in this survey are summarized in table 1. The first three groves, A, B, and C in the table, were not of bearing age. There was no lime bark disease in any of the three groves and only one tree in grove C showed virus symptoms. These groves will not be included in the discussion of the data.

The next group of five groves ranged in age from 3 to 5 years. Grove D was of the Idemor variety on *Cleopatra* rootstock. The others were all Tahiti on rough lemon. Of a total of 244 trees in

this age group 15% showed trunk lesions and almost 45% virus symptoms. Those trees that were budded low, that is the bud union at or below the surface of the ground, had 19% with lesions while the high budded trees had 12%. Twenty-two percent of the trees with virus symptoms had trunk lesions and only 9.6% of the trees without virus had lesions. The range between these groves was very wide, varying from 8 to 34% total lesions and 0 to 91% total virus.

There were four groves in the age group 6 to 10 years. Two were Tahiti, one Idemor and one a mixed grove of Idemor and Tahiti. All were on rough lemon rootstock. Of a total of 186 trees 45% had trunk lesions and 48% virus symptoms. Here again the low budded trees had more lesions than those with high buds. Fifty-three percent of the trees with virus symptoms had lesions.

Five groves were surveyed in the age group 10 to 15 years. This group had the highest percentage (59%) of trees showing lime bark disease. Grove Q, Tahiti topworked on grapefruit, had 78% with lesions and 42% with virus. Grove N, Tahiti on rough lemon, had 76% with lesions and only 8% with virus. The group as a whole had 59% total lesions but virus symptoms dropped to 23% for the group. Seventy-seven percent of those trees having virus symptoms in this group also had trunk lesions, while 52% of the trees with no virus symptoms had lesions. Fifty-eight percent of the high budded trees and 74% of the low budded trees had lime bark disease.

The last group consisted of groves over 15 years old. All were Tahiti and one was topworked on grapefruit. In the group as a whole 36% of 175 trees showed lime bark disease but groves R and S had only 16 and 14% respectively. Grove U, a very old grove, had 72% lesions but no virus disease. This group of groves had only 7% virus. Thirty-three

TABLE 1.

A SUMMARY OF DATA COLLECTED IN A SURVEY OF DADE COUNTY LIME GROVES TO DETERMINE THE AMOUNTS OF LIME-BARK AND VIRUS DISEASE PRESENT.

Grove	Variety	Root Stock	No. of Trees	% Total Trunk Lesions	% Total Virus Sympt.	% High Bud Lesions	% Low Bud Lesions	% Virus With Lesions	% No. Virus With Lesions
Groves less than 3 years old									
A	I <sup>1</sup>	RL <sup>2</sup>	50	0.0	0.0	—	—	—	—
B	I	RL	50	0.0	0.0	—	—	—	—
C	T <sup>3</sup>	RL	50	0.0	2.0	0.0	0.0	0.0	0.0
Totals			150	0.0	0.6	0.0	0.0	0.0	0.0
Groves 3-6 years old									
D	I	Cleo <sup>4</sup>	44	34.1	91.1	21.1	48.0	40.5	0.0
E	T	RL	50	12.0	6.0	10.3	18.2	33.3	10.6
F	T	RL	50	14.0	72.0	15.2	0.0	16.7	7.1
G	T	RL	50	8.0	0.0	0.0	8.7	—	8.0
H	T	RL	50	8.0	60.0	3.8	12.5	3.3	15.0
Totals			244	14.8	44.6	11.9	19.1	22.0	9.6
Groves 6-10 years old									
I	I	RL	42	42.9	42.9	21.4	57.1	55.6	38.1
J	T	RL	50	18.0	0.0	12.5	19.0	—	18.0
K	T	RL	44	54.5	54.5	45.0	62.5	75.0	25.0
L	T & I	RL	50	44.0	94.0	43.8	44.4	40.4	100.0
Totals			186	44.6	47.8	36.5	42.0	52.8	26.6
Groves 10-15 years old									
M	T & I	RL	50	36.0	36.0	36.0	—	56.3	28.1
N	T	RL	50	76.0	8.0	81.4	42.9	75.0	76.1
O	T	RL	50	40.0	8.0	38.8	100.0	75.0	37.0
P	T	RL	39	69.2	20.5	60.7	90.9	100.0	45.0
Q	T	GF <sup>5</sup>	50	78.0	42.0	78.0	—	81.0	72.4
Totals			239	59.4	23.0	58.2	73.7	77.4	51.8
Groves over 15 years old									
R	T	RL	50	16.0	4.0	15.9	16.0	100.0	12.5
S	T	RL	50	14.0	18.0	15.6	0.0	55.6	7.3
T	T	RL	50	60.0	4.0	71.8	45.0	100.0	72.0
U	T	GF	25	72.0	0.0	72.0	—	—	58.3
Totals			175	36.0	7.4	32.7	27.3	69.2	34.0
Grand total			994	31.6	26.9	33.1	29.6	45.5	26.4
Total less A, B, & C			844	38.5	31.5	39.8	33.5	45.7	33.1

<sup>1</sup> I—Idemor<sup>2</sup> RL—Rough lemon<sup>3</sup> T—Tahiti<sup>4</sup> Cleo—*Cleopatra mandarin*<sup>5</sup> GF—Grapefruit

percent of the high budded trees and only 27% of the low budded trees had trunk lesions. Sixty-nine percent of the trees with virus symptoms had trunk lesions and 34% of those without virus had lesions.

Taking into consideration only the bearing groves, of a total of 844 trees in 18 groves 38.5% had trunk lesions and 31.5% showed virus symptoms. The prevalence of lime bark disease increased sharply with the age of the groves up to 15 years. At the same time the percentage of virus symptoms decreased in groves over 10 years old.

The percentage of trees with no virus symptoms but with trunk lesions increased with age at about the same rate as the percent total lesions. The percentage of trees with virus symptoms that had trunk lesions increased with age more rapidly and was consistently higher. This indicates that the presumed virus disease is a contributing factor to the prevalence of lime bark disease. Whether or not the virus disease is a predisposing factor for *Diplodia* bark rot, the losses accrued through reduced quality of the fruit and

the general unthriftiness of the diseased trees may be serious.

The height of the bud union seemed to be more of an important factor in lime bark disease in trees under ten years old. In the younger groves the low budded trees had consistently more trunk lesions than the high budded trees. In some of the older groves there was as much or more bark disease among the trees with high buds.

This survey did not indicate that there is any difference between the Idemor and the common Tahiti varieties of limes as far as susceptibility to lime bark disease is concerned.

Factors which should be studied as to their possible contribution to the disease are stock scion compatibility, planting depth, budding procedures, and fertilized and cultural practices.

#### LITERATURE CITED

1. RUEHLE, G. D. A new disease of Persian (Tahiti) lime transmitted through budwood. *Fla. State Hort. Soc. Proc.* 56: 126-128. 1943.
2. TISDALE, W. B. Diseases of Lime Trees. *Fla. State Hort. Soc. Proc.* 47: 123-127. 1934.
3. .... Present status of lime bark diseases. *Fla. State Hort. Soc. Proc.* 49: 148-149. 1936.

## PACKAGING AND STORAGE OF PERSIAN LIMES<sup>1</sup>

MARGARET J. MUSTARD  
*University of Miami*  
Coral Gables

During the past twenty years, the commercial production of Persian limes has rapidly increased in Florida. In 1929 only 8,000 boxes (1-3/5 bushels) were produced in the entire state, whereas, in 1949 there were 250,000 boxes produced (6). The rapid growth of this industry has increased the competition for exist-

ing and potential markets, thus focusing attention upon the need for additional information pertaining to the handling and storage of this fruit. The following investigation was undertaken to determine the effect of packaging, surface treatments, and storage temperature upon the period of marketability of Persian limes.

The selection of materials for packaging and surface treating the fruit as well as the storage temperature was directed toward reducing the rate of respiration and subsequent ripening, decreasing moisture loss, and minimizing pathologi-

<sup>1</sup> The material for this paper was taken from the thesis of the author presented to the Graduate School of the University of Miami in partial fulfillment of the requirements for the degree of Master of Science.