be bought for an average of one-fourth the amount per acre that it costs in California. The preparing of the land, the planting and maintenance of the groves to commercial production can be done for one-third to one-half the sum it costs in California. The maintenance of the grove after it has reached production on an annual per-acre basis can be done at lower cost than in California, and the Florida grower may expect a yield of from two to three times per acre from his grove if it is of the right varieties, efficiently and properly cared for. Certainly with this picture, the Florida grower has a right to be encouraged.

The records disclose that less than one-half pound of avocados are consumed in the United States annually per capita. Even in Los Angeles, residents are only consuming 5 pounds per capita per year. In New York, the consumer is only eating 1 pound and a fraction per capita. Certainly we need have no great fear at present of overproduction. All we need do for years to come is to intelligently handle our distribution and selling, and cause those who now eat avocados to simply eat more, even though we develop no new consumers.

As the results of my California study, and being interested in the production of avocados and limes in Florida to the extent of nearly 100,000 trees, the strongest impression I have gained is the necessity for a full and close cooperation between the industry in California and Florida. Nature has endowed those two States with a difference of season that makes it easily possible to accomplish this. I strongly advocate the closest cooperation, even to joint marketing, distribution, promotional, and advertising programs. To that end, I am working very hard and pledge my support.

CONSUMER PACKAGING OF TAHITI (PERSIAN) LIMES

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The growing and marketing of Persian limes is a very important industry in southern Florida. Within a very short time, it has grown from a very small specialized industry to one of considerable size until in the season of 1944-45 it reached a peak of 218,693 boxes. The production has decreased considerably from that time until in the 1947-48 season only 161,687 boxes were produced. A large percentage of this decrease has been caused by hurricanes and floods, but the lack of a ready sale has also been an important factor in this decrease in production.

Even with this decrease in production, there has not been a ready sale for all the fruit produced since the war. Consumption has been less than production and every year a large amount of limes go to waste either after having been shipped or at the point of production. It is very important, therefore, that research be done to find ways and means of selling more and better limes.

Limes are sold in competition to lemons, especially during the summer months, which stand up better and for a longer period of time than do limes. Not only are most of these lemons cured before shipping, but they are also held in storage for a period before shipping in order to discard the fruit with a tendency to rot, thus only healthy non-infected fruit are shipped.

Limes are picked when very immature and thus tend to lose excessive moisture as the protective wax coating is not present to the extent on immature limes as it is on mature limes. In order to reach an early market, many limes are picked too green and in addition to having poor keeping quality do not contain as much juice as the more mature fruit. We have educated the public to demand a small green lime when this is not the natural state of a mature fruit. The lime is mature and has the highest percent juice just before it turns yellow. If the lime is allowed to mature normally, it is then too large and considered off color for the existing market. The tendency has been to pick smaller and greener fruit until we have reached a point where the fruit will not hold up for any length of time because of the initial low juice content and excessive drying out of the fruit. Until such a time when more mature limes will be accepted, we must find ways of lengthening the shelf life of limes we now send to market.

Blossom-end rot of Persian limes is also a big factor in the marketability of this fruit. It is very serious, especially during the summer months in Florida limes, and is another big factor causing the wholesale and retail buyers as well as the housewife to favor the purchase of lemons instead of limes. Blossom-end rot starts as a physiological disorder at the blossom end, with decay setting in the weakened tissues secondarily.

Even with the knowledge of the factors affecting the poor keeping quality of Persian limes, very little is done to correct them. Very few limes are refrigerated or packaged in such a manner as to give them a longer shelf life and thus a better sale.

It is with the above mentioned conditions in mind that research on the consumer packaging was undertaken by the University of Miami. We are hoping to find, through the present and additional research, better methods of growing, harvesting, packaging, and transportation of limes resulting in a bigger demand and larger industry. To prevent the excessive drying out, an extensive experiment on wrapping materials for limes was set up. It is evident that a whole new type of packaging and marketing is necessary to improve the salability of this fruit. A consumer package for limes will necessarily have to have a good moisture-proofness as well as an attractive appearance. It would have to hold up under various conditions of transportation and temperatures.

We have conducted two separate tests at both room temperature and 45°F of 20 different types of wrapping materials to find the best possible protection for our Persian limes. One test was made with limes harvested during the winter months, January, February, and March, and the other made with limes harvested during the summer months, July, August, and September. All limes used in the two experiments were from the same grove having had the same cultural treatment and were of the same maturity, that state generally used and considered commercially mature yet actually quite immature. This maturity was chosen be-

TABLE I

EFFECT OF VARIOUS WRAPPING MATERIALS AND TEMPERATURES ON THE KEEPING QUALITY OF PERSIAN LIMES HARVESTED DURING WINTER MONTHS

WRAPPING MATERIAL	STORAGE TEMP.	AFTER 1 week		AFTER 2 weeks		AFTER 3 weeks		AFTER 4 weeks		AFTER 5 weeks		AFTER 6 weeks		AFTER 7 weeks		AFTER 8 weeks		AFTER 9 weeks		AFTER 10 weeks	
		M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss
Vinylite 20 ga P9V 3% tri-oxy-xenyl borate.	R.T.[2]	100	0.89	100	2.99	100	4.81	93.3	6.76	86.6	8.47	53.3		53.3		40.0		33.3		20.0	
	45°F.	100		100	0.78	100	1.17	100	1.57	100	1.58	100	1.93	100	2.43	100	2.71	87.5	3.10	75.0	3.36
	45°F-RT[3]									100	1.68	85.7	3.71	85.7	6.03	85.7	7.67	85.7	9.38	85.7	11.53
Pliofilm 75 ga N. F.	R.T.[2]	100	0.87	93.3	3.02		4.63	86.6	6.33		8.06	80.0		60.0		60.0				53.3	
	45°F.	100		100	0.27	100	0.58	100	1.02	100	1.15	87.5	1.42	87.5	1.77	75.0	1.99	62.5	2.39	62.5	2.63
	45°F-RT[3]									85.7	1.16	85.7	3.55	71.4	4.58	57.1	5.74	57.1	6.73	57.1	8.01
Lumarith (Cellulose acetate) (100P-912)	R.T.[2]	100	5.34	66.6	12.93	46.6	18.48	0	23.02		26.93										
	45°F.	100		100	1.60	100	2.75	100	5.39	100	6.49	100	8.19	100	10.13	100	11.54	62.5	13.50	12.5	14.33
	45°F-RT[3]									100	6.15	100	12.99	57.1	20.80	14.2	24.12	0	27.16		
Sylphwrap PB 6 DS	R.T.[2]	100	8.12	86.6	17.57		22.77	66.6	24.99		30.53	46.6				13.3		0			
	45°F.	100		100	0.48	100	0.75	100	1.00	100	1.90	100	2.81	87.5	3.28	87.5	3.89	87.5	4.58	75.0	5.21
	45°F-RT[3]									85.7	1.92	71.4	5.29	42.8	8.69	28.5	11.63	14.2	14.15	0	17.31
Cellophane 300 ga. No. 149 Exp. Film.	R.T.[2]	100	2.39	93.3	7.37	80.0	11.41	80.0	16.21	80.0	19.57	80.0		0							
	45°F.	100		100	0.81	100	1.38	100	2.60	100	2.79	100	4.00	87.5	4.86	75.0	5.21	75.0	6.35	75.0	7.00
	45°F-RT[3]									85.7	3.03	71.4	8.52	57.1	11.82	57.1	18.02	28.5	22.18	0	26.20
Check (No wrapper)	R.T.[2]	100	7.56	100	15.79	100	23.21	80.0	26.41	0	32.66		35.89		42.85		46.36				
	45°F.	100	2.52	100	4.59	100	5.96	100	9.75	100	11.51	100	14.03	75.0	16.07	50.0	18.02	25.0	20.30	0	22.13
	45°F-RT[3]									100	13.57	100	18.81	14.2	26.05	0	32.19				
Vinylite 20 ga P.9.V. (chem. treated)	R.T.[2]	100	2.01	86.6	4.75	73.3	8.02	66.6	9.77	66.6	12.13	53.3	13.73		15.69	20.0	17.44	0	19.54		
	45°F.	100	0.46	100	0.92	100	1.24	100	2.22	100	2.33	100	2.91	85.0	3.36	62.5	3.90	50.0	4.46	37.0	4.82
	45°F-RT[3]									100	2.68	57.1	5.84	57.1	9.03	57.1	9.04	57.1	13.50	42.8	16.10
Pliofilm 20 ga N1.	R.T.[2]	100	0.41	100	1.99	100	4.54	73.3	5.69	66.6	6.37	66.6	8.69	66.6	10.19	66.6	10.99	40.0	13.04	40.0	15.53
	45°F.	100	0.14	100	0.33	100	0.44	100	0.78	93.0	0.84	93.3	1.19	66.6	1.33	66.6	1.54	66.6	1.85	66.0	1.96
	45°F-RT[3]									100	1.07	62.5	2.48	62.5	4.28	62.5	5.39	62.5	6.25	62 5	8.64
Vinylite 20 ga P.9.V (Dowicide 6 –3%)	R.T.[2]	100	1.72	93.3	4.43	93.3	8.51	66.6	10.33	60.0	13.23	33.3	14.89	26.6	16.89	06.6	18.42	06.6	20.30	06.6	22.72
	45°F.	100	0.39	100	0.81	100	1.08	100	1.18	100	1.84	100	2.38	87.5	2.68	87.5	3.09	87.5	3.37	87.5	3.85
	45°F-RT[3]									100	1.96	85.7	4.29	85.7	6.74	85.7	10.05	71.4	12.68	71.4	15.83
Vinylite N2 20 ga (chem. treated)	R.T.[2]	100	1.87	100	5.20	100	9.30	86.6	11.06	73.3	14.25	33.3	16.01	06.6	18.86	0					
	45°F.	100	0.65	100	1.11	100	1.51	100		100	2.56	100	3.13	100	3.17	100	4.18	100	4.50	100	5.05
	45°F-RT[3]									100	2.68	100	6.03	85.7	9.55	85.7	12.62	71.4	15.85	71.4	15.55
Vinylite 20 ga P9V (Special Chem. Film)	R.T.[2]	100	2.46	86.6	6.10	86.6	9.97	66.6	11.65	60.0	14.41	40.0	16.27	33.3	18.61	0	20.28				
	45°F.	100	0.56	100	1.16	100	1.71	100	2.78	100	2.93	100	4.06	100	4.56	100	5.02	87.5	5.88	87.5	6.26
	45°F-RT[3]									100	3.29	85.7	6.77	85.7	10.42	57.1	12.59	42.8	15.35	42.8	18.52

[1] M.F.—Marketable Fruit. [2] R.T.—Room Temperature (65-75°F). [3] 45°F-RT—Fruit held 4 weeks at 45°F. then removed to R.T. (65-75°F).

TABLE I—Continued

EFFECT OF VARIOUS WRAPPING MATERIALS AND TEMPERATURES ON THE KEEPING QUALITY OF PERSIAN LIMES HARVESTED DURING WINTER MONTHS

WRAPPING MATERIAL	STORAGE TEMP.	AFTER 1 week		AFTER 2 weeks		AFTER 3 weeks		AFTER 4 weeks		AFTER 5 weeks		AFTER 6 weeks		AFTER 7 weeks		AFTER 8 weeks		AFTER 9 weeks		AFTER 10 weeks	
		M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss	M.F.[1] %	%wt loss
Pliofilm 100 ga N 1.	R.T.[2]	100	0.26	100	1.20	73.3	2.12	73.3	2.70	60.0	3.65	60.0	4.44	53.3	4.90	53.3	5.58	53.3	6.62	40.0	7.64
	45°F	100	0.16	100	0.37	100	0.41	100	0.66	75.0	0.71	62.5	0.85	62.5	0.89	50.0	0.94	50.0	1.07	50.0	1.26
	45°F-RT[3]									71.4	0.67	71.4	1.58	71.4	2.51	57.1	2.65	57.1	3.34	28.5	4.15
Aluminum Foil (coated) (Thin gauge)	R.T.[2]	100	0.23	93.3	0.77	93.3	1.99	66.6	2.24	60.0	3.29	60.0	4.22	60.0	5.80	60.0	7.47	60.0	9.66	60.0	11.38
	45°F	100	0.24	100	0.28	100	0.31	100	0.50	100	0.59	100	0.68	87.5	0.95	75.0	1.17	75.0	1.56	62.5	1.86
	45°F-RT[3]									100	0.55	71.4	1.51	71.4	2.83	71.4	4.73	71.4	6.59	71.4	9.30
Cellophane Exp. Film No. 146	R.T.[2]	100	2.84	86.6	8.91	86.6	16.32	60.0	19.57	0	23.73		26.43								
	45°F.	100	0.83	100	1.70	100	2.45	100	4.13	100	4.56	87.5	5.75	87.5	6.79	87.5	7.71	87.5	8.81	75.0	9.73
	45°F-RT[3]									100	4.62	100	10.96	71.4	16.22	28.5	16.29	14.2	22.98	0	25.59
Sylphwrap 330 ga PMB 6 CSX	R.T.[2]	100	1.09	86.6	3.44	66.6	6.51	53.3	7.49	53.3	10.16	53.3	11.75	53.3	14.16	53.3	16.13	40.0	18.68	26.6	21.94
	45°F	100	0.31	100	0.75	100	1.23	100	2.18	100	2.60	100	3.15	87.5	3.86	87.5	4.43	87.5	5.02	87.5	5.56
	45°F-RT[3]									100	2.48	85.7	5.27	85.7	7.46	85.7	9.38	85.7	11.52	57.1	13.81
Cellophane 300 ga MSAT.86	R.T.[2]	100	0.40	100	2.28	86.6	3.20	80.0	4.14	73.3	6.40	73.3	7.84	73.3	9.86	66.6	11.23	46.6	13.83	46.6	15.98
	45°F.	100	0.07	100	0.36	100	0.70	100	1.15	100	1.43	100	1.76	87.5	2.20	87.5	2.55	75.0	3.09	75.0	3.46
	45°F-RT[3]									100	1.49	71.4	3.55	42.3	4.92	42.3	6.45	42.3	8.53	42.3	10.42
Sylphwrap 300 ga DO627PDS	R.T.[2]	100	1.46	93.3	4.79	66.6	8.73	66.6	10.17	66.6	13.38	53.3	15.23	40.0	18.17	26.6	20.61	06.6	21.68	0	
	45°F	100	0.41	100	0.69	100	1.04	100	1.86	100	1.92	100	2.84	100	3.38	87.5	4.08	75.0	4.91	75.0	5.61
	45°F-RT[3]									100	2.25	85.7	6.00	85.7	9.68	71.4	12.47	57.1	15.80	42.8	18.85
Pliofilm 75 ga F.F.	R.T.[2]	100	0.99	100	2.82	86.6	5.22	86.6	6.73	73.3	9.23	73.3	10.65	73.3	11.88	73.3	13.43	73.3	15.18	66.6	16.83
	45°F.	100	0.30	100	0.56	100	0.86	100	1.39	100	1.54	100	2.05	87.5	2.45	87.5	2.73	87.5	3.27	87.5	3.58
	45°F.RT[3]									100	1.58	85.7	3.89	85.7	5.93	85.7	7.75	85.7	9.60	85.7	11.43
Pliofilm 20 ga P 9	R.T.[2]	100	1.78	100	6.23	93.3	10.33	93.3	12.78	80.0	16.28	80.0	18.87	46.6	23.82	13.3	26.74	13.3	—	0	—
	45°F.	100	0.81	100	1.35	100	1.83	100	3.02	100	3.37	100	4.30	87.5	5.07	87.5	6.50	50.0	6.69	37.5	7.43
	45°F-RT[3]									100	3.48	85.7	7.70	85.7	11.97	71.4	15.16	57.1	17.87	0	21.41
Vitafilm 20 ga P.5.	R.T.[2]	100	1.73	93.3	6.06	80.0	10.40	73.3	13.04	73.3	16.81	40.0	20.23	20.0	20.88	06.6	26.47	0	—		—
	45°F.	100	0.64	100	1.44	100	1.54	100	2.62	100	3.05	100	4.41	87.5	4.59	87.5	5.14	75.0	5.90	75.0	6.56
	45°F-RT[3]									100	2.85	57.1	6.97	42.8	11.19	42.8	14.51	14.2	17.93	0	20.17
Vinylite 20 ga P9V (chem. treated)	R.T.[2]	100	1.74	80.0	5.97	80.0	10.31	73.3	12.47	73.3	15.82	46.6	17.70	20.0	20.71	20.0	24.19	13.3	27.97	0	29.71
	45°F.	100	0.64	100	1.30	100	1.74	100	2.87	100	3.30	100	4.13	100	4.88	100	5.59	100	6.28	75.0	6.98
	45°F-RT[3]									100	3.13	71.4	7.28	57.1	11.23	42.8	14.73	28.5	17.15	28.5	20.69

[1] M.F.—Marketable Fruit. [2] R.T.—Room Temperature (65-75°F). [3] 45°F-RT—Fruit held 4 weeks at 45°F. then removed to R.T. (65-75°F).

cause it is now the general practice of the growers and shippers to pick at this stage because of the public demand for small green limes.

The limes were wrapped and placed in storage the same day as picked. At no time was the interval between picking and storing more than 24 hours. The fruit was stored on shelves in the storage rooms on the South Campus of the University where the temperatures were maintained to within one degree of that desired. The humidity was held between 65 and 75 percent. Fifteen fruit, taken at random, were wrapped in each of the 20 wrappers and weighed individually every week as well as the 15 unwrapped fruit used as control. Observation as to appearance, marketability, and color were also made once every week.

A preliminary experiment was also set up on the reaction at room temperature to several types of wrapping material on limes picked at different degrees of maturity. A group of fruit was picked at maximum juice content, or just at the time of color break, which would be fruit averaging 150 days from setting. Another group of limes were picked while still immature, averaging about 125 days from setting, which is a stage of maturity slightly below that used in the present commercial handling. Ten fruit of each maturity were wrapped in four various types of wrappers and 10 fruit left as check. Wrapping materials used were: pliofilm 20 gauge N.1, vinylite 20 gauge P9V, MSAT cellophane, and lumarith 100 P-912.

Observations were made on these every few days and it was very outstanding that the mature fruits, both wrapped and unwrapped, lasted from one to two times as long in a marketable state as did the immature ones. Taste was also determined by making up a 5-to-1 limeade every week and in every case the more mature fruit produced the best ade. There was a definite off-flavor in the immature fruit after the first week. The bouquet or accumulation of taste esters was very marked in the mature fruit and lacking in the immature fruit. The pliofilm and vinylite wrappers were superior to the cellophane and lumarith wrappers on limes of both maturities.

Table I gives the percentage loss in weight and the percentage marketable fruit after each week for the fruit harvested during the winter months and wrapped in the 20 wrapping materials and those not wrapped. The figures indicate that a few of the wrappers were superior in retaining quality and appearance to the others at room temperature, while quite a number reacted very favorably and kept the limes in very good condition under refrigeration. Firmness, wrinkling, case hardening, pitting, color, and percent decay were all considered in determining the percent marketable fruit at any one time. Those wrapping materials found best for fruit held at room temperature were the 20-gauge vinylites and 20-gauge pliofilm. The figures show an enormous difference in the moisture proofness of the wrappers, which of course showed up in the effect on the fruit. Some fruit, even though wrapped, showed as much loss in weight due to moisture loss as those not wrapped. The cellulose acetate films gave no protection to the limes as far as retaining moisture or preventing shriveling or case hardening is concerned. The aluminum foils gave good results, but here it was necessary to remove the film each time the fruit was inspected. The foil did not stand up under the excessive handling but cracked and tore.

All of the fruits stood up well and for a long period of time when wrapped in moistureproof wrappers and held at 45°F. Here the respiration was slowed down so that the diffusion of CO^2 gas which is given off by the fruit was no problem. Even those fruit not wrapped lost little weight in refrigeration and were marketable for many weeks. Those fruit removed from refrigeration to room temperature broke down rapidly at the warmer temperatures, indicating that the fruit held in refrigeration for any length of time should be sold soon after removal from refrigeration as large losses were indicated if the fruits are held 1 week or longer. The percent decay is high in those fruit taken from refrigeration during subsequent storage at room temperature. The fungi growth appears to be stimulated upon the removal of the fruit from refrigerated storage to higher storage temperature. The figures do not show excessive losses until the second week after removal, indicating that there would be ample time, that is, of 1 week to 10 days for sale of limes so refrigerated. The figures show that some wrappers are superior at both room temperature and refrigeration (45°F), while some are only good under refrigeration. The wrappers of the former group are those which are both moistureproof and have high CO_2 and O_2 diffusion rates, whereas, those only good at 45°F are moistureproof but low in CO_2 and O_2 diffusion ability. Those wrappers having both moistureproofness and high diffusibility for CO_2 and O_2 were the ones which gave the best results on those fruits removed from refrigeration to room temperature.

Generally speaking, the following films were oustanding among those tried of their type: Cellophanes-M.S.A.T. 300 gauge; pliofilms-75 gauge FF; vinylites-20 gauge P9V; aluminum foil, heavy gauge; sylphwrap-330 gauge PMB 6 CSX.

Table II gives the percentage loss in weight and the percentage marketable fruit after each week for the fruit harvested during the summer months of July, August, and September and wrapped in the 20 wrapping materials and those not wrapped. The experiment was repeated in order to get the reaction of fruit during the hot summer months when there is high production and readier sales but when conditions are such to cause more decay and more rapid drying out.

The results were the same but only more pronounced. It was even more evident here that those films which were both moistureproof and had a high CO_2 and O^2 diffusion rate gave the best results throughout. These were the vinylites and pliofilms in the thin gauges.

Here again the figures indicate the value of refrigeration in the transportation and holding of limes. It was not possible to hold the limes in good condition for as long a time as those harvested in the winter months as there was a higher percent decay and a higher respiratory rate due to increased room temperature. When held at the same refrigerated temperature, there was no difference in the reaction of the fruit which was harvested during the winter to that harvested in the summer. Normal room temperatures were higher, however, during the summer months (80°-90°F) as compared to those of the winter months (65°-75°F)

TABLE II

EFFECT OF VARIOUS WRAPPING MATERIALS AND TEMPERATURES ON THE KEEPING QUALITY OF PERSIAN LIMES HARVESTED DURING SUMMER MONTHS

WRAPPING MATERIAL	STORAGE TEMP.	AFTER 1 week		AFTER 2 weeks		AFTER 3 weeks		AFTER 4 weeks		AFTER 5 weeks		AFTER 6 weeks	
		M.F.[1] %	% WT. loss	M.F.[1] %	% WT. loss	M.F.[1] %	% WT. loss	M.F.[1] %	% WT. loss	M.F.[1] %	% WT. loss	M.F.[1] %	% WT. loss
Vinylite 20 ga	R.T.[2]	93.3	3.19	73.3	5.96	60.0	9.95	26.6	11.52	0	13.60	0	
P9V 3% tri-ozy-	45°F.	100	0.76	100	1.27	100	2.06	100	2.72	85.7	3.08	85.7	3.58
xenyl borate	45°F-RT[3]					100	3.97	100	5.88	100	9.02	26.6	11.82
Pliofilm 75 ga	R.T.[2]	100	2.04	93.3	3.43	73.3	5.32	60.0	6.30	60.0	8.01	46.6	9.64
N. F.	45°F.	100	0.36	100	0.75	100	1.26	100	1.56	100	1.75	100	2.37
	45°F-RT[3]					100	2.55	57.1	3.91	42.8	6.29	42.8	7.81
Lumarith	R.T.[2]	93.3	7.95	60.0	13.03	0	17.61	0	—	0	—	0	—
100P-912 (Cel-	45°F.	100	2.20	100	3.98	100	5.83	100	7.98	87.5	8.94	50.0	10.64
lulose Acetate)	45°F-RT[3]					100	10.65	0	—	0	—	0	—
Sylphwrap	R.T.[2]	100	3.64	100	6.82	66.6	10.32	53.3	12.52	0	14.96	0	
PB 6 DS	45°F.	100	0.61	100	1.35	87.5	1.87	87.5	2.63	62.5	3.05	62.5	3.73
	45°F-RT[3]					100	5.28	57.1	—	0	14.65	0	—
Cellophane	R.T.[2]	93.3	6.04	73.3	10.98	33.3	15.57	0	16.21	0	—	0	—
300 ga (Exp.	45°F.	100	1.01	100	2.00	100	3.21	100	4.37	100	5.01	100	5.84
Film No. 149)	45°F-RT[3]					100	7.48	85.7	11.01	0	—	0	15.80
Check	R.T.[2]	100	8.63	73.3	14.69	0		0		0		0	
(no wrapper)	45°F.	100	2.80	100	4.06	75.0	7.73	75.0	10.55	37.5	11.89	0	13.71
	45°F-RT[3]					85.7	12.49	0	25.46	0	—	0	—
Vinylite 20 ga	R.T.[2]	93.3	3.42	86.6	5.65	53.3	8.36	40.0	9.69	06.6	11.71	06.6	13.03
P9V (chem.	45°F.	100	0.99	100	1.82	100	2.55	100	—	100	4.17	75.0	5.96
treated)	45°F-RT[3]					100	5.21	57.1	—	0	11.13	0	—
Pliofilm	R.T.[2]	86.6	1.39	86.6	2.69	80.0	4.80	73.3	5.82	33.3	7.82	20.0	10.09
20 ga N 1.	45°F.	100	0.29	100	0.56	100	0.78	100	1.17	100	1.40	100	1.58
	45°F-RT[3]					100	1.91	85.7	2.98	42.8	5.03	28.5	6.66
Vinylite 20 ga	R. T.[2]	100	3.17	80.0	5.98	60.0	9.89	46.6	11.44	0	13.74	0	—
P9V (Dowicide 6	45°F.	100	0.71	100	1.28	100	2.02	100	—	87.5	3.28	87.5	3.71
3%)	45°F-RT[3]					100	4.30	7.14	—	14.2	10.02	14.2	12.73
Vinylite N2	R.T.[2]	100	3.75	73.3	7.17	53.3	11.68	0	13.95	0	—	0	—
20 ga (chem.	45°F.	100	0.74	100	1.43	100	2.21	100	—	100	3.63	87.5	4.26
treated)	45°F-RT[3]					100	4.58	100	—	14.2	10.97	0	13.96
Vinylite 20 ga	R.T.[2]	100	3.63	80.0	6.07	46.6	9.27	20.0	10.69	0	12.32	0	14.31
P9V (Lead	45°F.	100	0.83	100	1.74	100	2.59	100	—	87.5	4.24	75.0	4.86
Stearate)	45°F-RT[3]					100	5.37	85.7	—	57.1	10.88	42.8	13.84

[1] M.F.—% Marketable Fruit. [2] R.T.—Room Temperature (80-90°F). [3] 45°F-RT—Fruit held 2 weeks at 45°F then removed to R.T. (80-90°F).

TABLE II—Continued

EFFECT OF VARIOUS WRAPPING MATERIALS AND TEMPERATURES ON THE KEEPING QUALITY OF PERSIAN LIMES HARVESTED DURING SUMMER MONTHS

WRAPPING MATERIAL	STORAGE TEMP.	AFTER 1 week M.F.[1] %	AFTER 1 week % WT. loss	AFTER 2 weeks M.F.[1] %	AFTER 2 weeks % WT. loss	AFTER 3 weeks M.F.[1] %	AFTER 3 weeks % WT. loss	AFTER 4 weeks M.F.[1] %	AFTER 4 weeks % WT. loss	AFTER 5 weeks M.F.[1] %	AFTER 5 weeks % WT. loss	AFTER 6 weeks M.F.[1] %	AFTER 6 weeks % WT. loss
Pliofilm	R.T.[2]	60.0	0.71	46.6	1.61	40.0	2.65	40.0	3.25	40.0	4.27	33.3	5.30
100 ga N 1.	45°F.	100	0.16	86.6	0.34	75.0	0.50	62.5	–	50.0	0.75	50.0	0.95
	45°F-RT[3]					100	1.25	57.1	–	42.8	2.66	42.8	3.41
Aluminum Foil	R.T.[2]	100	0.67	73.3	2.39	60.0	7.42	40.0	9.28	06.6	2.33	0	–
(Thin gauge)	45°F.	100	0.22	100	0.53	100	1.28	100	–	100	9.70	100	2.99
	45°F-RT[3]					100	4.40	85.7	–	42.8	–	28.5	10.89
Cellophane	R.T.[2]	93.3	6.78	66.6	12.07	06.6	18.19	0	21.40	0	–	0	
Exp. Film No. 146	45°F.	100	1.75	100	2.87	100	4.12	100	–	100	6.69	75.0	7.98
	45°F-RT[3]					85.7	8.75	71.4	–	0	16.81	0	–
Sylphwrap	R.T.[2]	86.6	2.33	86.6	4.46	66.6	6.92	66.6	9.10	06.6	12.42	06.6	12.60
PMB 6 CSX	45°F.	100	0.67	100	1.30	100	2.50	100	–	75.0	4.02	62.5	4.69
300 ga.	45°F-RT[3]					100	3.86	85.7	–	57.1	8.29	57.1	10.61
Cellophane	R.T.[2]	93.11	1.11	86.6	2.71	73.3	4.63	60.0	6.10	26.6	8.83	0	11.59
300 ga	45°F.	100	0.48	86.6	0.77	75.0	1.57	75.0	–	75.0	2.40	62.5	2.83
MSAT 86	45°F-RT[3]					100	2.71	57.1	–	28.5	7.36	14.2	9.70
Sylphwrap	R.T.[2]	93.3	3.81	80.0	7.09	60.0	10.78	46.6	14.78	0		0	
300 ga	45°F.	100	0.81	100	1.37	100	2.58	100	–	100	4.41	100	5.31
DO627PDS	45°F-RT[3]					100	5.78	71.4	–	0	14.18	0	–
Pliofilm	R.T.[2]	93.3	1.85	93.3	3.91	73.3	6.16	73.3	7.79	33.3	9.45	26.6	10.88
75 ga F. F.	45°F.	100	0.52	100	0.89	100	1.48	100	–	100	2.24	100	2.56
	45°F-RT[3]					100	3.08	85.7	–	28.5	6.70	28.5	8.36
Pliofilm 20 ga	R.T.[2]	100	3.53	100	6.56	46.6	10.38	46.6	12.68	06.6	13.81	06.6	16.07
P 9	45°F.	100	1.07	86.6	1.72	75.0	2.77	75.0	–	75.0	4.24	75.0	5.09
	45°F-RT[3]					100	5.59	71.4	–	0	11.56	0	–
Vitafilm 20 ga	R.T.[2]	73.3	3.94	66.6	7.29	33.3	11.47	33.3	13.05	0	–	0	
P. 5.	45°F.	100	1.08	100	1.76	100	2.85	100	–	100	4.48	100	5.29
	45°F-RT[3]					100	5.69	42.8	–	14.2	11.71	14.2	15.36
Vinylite 20 ga	R.T.[2]	100	3.15	73.3	6.30	53.3	9.73	46.6	10.05	0	–	0	–
P9V. (Lead	45°F.	100	1.28	100	1.93	100	3.11	100	–	100	4.69	100	5.50
Stearate)	45°F-RT[3]					100	5.39	85.7	–	71.4	10.26	57.1	–
Aluminum Foil	R.T.[2]	100	0.80	86.6	1.70	60.0	5.19	60.0	6.54	33.3	10.06	0	–
(Heavy Gauge)	45°F.	100	0.19	93.3	0.51	93.3	1.23	93.3	–	93.3	2.43	93.3	3.56
	45°F-RT[3]					100	4.28	100	–	42.8	8.91	14.2	10.45

[1] M.F.—% Marketable Fruit. [2] R.T.—Room Temperature (80-90°F). [3] 45°F-RT—Fruit held 2 weeks at 45°F then removed to R.T. (80-90°F).

which resulted in higher percentage loss from decay, shriveling, and case hardening.

The experiments showed that it is possible to extend the storage life and shelf life of Persian limes with several kinds of wrapping materials and with refrigeration temperature of 45°F. Many of the films showed advantages when used in refrigerated temperatures but were not of value when removed to room temperatures from refrigeration, whereas others were found beneficial under both conditions of storage.

Refrigeration itself proved to be very valuable for extending the period of marketability of limes, the results indicating that the whole lime industry could be improved by use of more refrigeration, both in transportation and in holding fruit in storage to stabilize the market at times of overshipment. The results also show that a much more valuable consumer type package could be made of any one of several different wrapping materials proven of value in these experiments for preserving better quality of Florida Persian limes than the window-type package which is generally used at the present time and has no moistureproofness.

Not only will further investigations be made as new wrapping materials become available but will also include different types of consumer packages as well as the over-all carton or container.

THE MANGO RELATIVES OF COCHIN CHINA; —THOSE WITH FIVE-STAMEN FLOWERS

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Plant introduction is a long drawn-out game in which there are critical moments, as I suppose there are in all life. I am reminded of this as I attempt to put down here the incidents which have led up to the writing of this paper.

The Messagerie Maritime boat that I boarded in Bombay in the spring of 1902 made a call of 24 hours in the port of Saigon, capital of the French colony of Cochin China. Twenty-four hours is a pretty short time to explore a country like Cochin China, but I was hurrying through to Japan to meet my patron, Barbour Lathrop.

It was the 16th of April when I got off the boat in the early morning and made my way to the Botanic Garden in Saigon where, as though he had been awaiting me, I found Dr. Haffner, one of those delightful French botanists who in those days were stationed in the French Colonies, and were in charge of pretty much all the agricultural work that was going on in them. We "hit it off" at once, for he was interested in bringing new crops into the colonies, and when he discovered I could speak French, he told me how he was intriguing the Annamites into growing Javanese peanuts, that were better than their own, merely by *forbidding* any from being taken from his experimental plantings.

When I asked about mangos, Dr. Haffner said I could find in the market a mango which he called the "Cambodiana" which came practically true to seed;