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Cellophane Wrapped Avocados

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During the past three seasons, the La Habra Heights Avocado Association has shipped 40 car lots of avocados to the Chicago and New York markets with each fruit enclosed in a special quality cellophane wrap. This method of packing is now out of the experimental stage and our cooperative plans to wrap the majority of its future car lot shipments.

In addition to the demonstrated sales appeal, our experience has confirmed three important advantages of this wrap. First, the time required for the avocado to soften, at any given temperature and maturity, is approximately doubled. This allows more time to market with less loss from spoilage. Second, the wrapped avocado retains its natural green color through the softening period and until purchased by the consumer. It is prevented from turning black on the outside, which sometimes occurs with naked packed fruit shipped from California to the eastern markets. Third, the wrapped avocado more effectively resists extremes of temperature. We have had car loads of wrapped fruit come through extremes of both heat and cold that would have spoiled avocados ordinarily packed. We believe that this wrap will increase the movement of California

avocados into the eastern markets and that it brings greater net returns to California avocado growers.

The development of this pack was the outgrowth of an idea contributed by Mr. H. M. Bergen, manager of the Times-Mirror Co. orchards at Fullerton, California. Mr. Bergen in 1939 presented to the Board of Directors of the La Habra Heights Avocado Association his idea for a more attractive display of the cooperative's avocados by placing each fruit in a cellophane bag after the manner of many other food commodities then appearing on the market. The original idea envisaged only the display appeal but experimental packages brought to light the heretofore unknown effect on the softening time of the avocado.

The Board was very much interested in the possibilities of this package and accepted the offer of Mr. Bergen for a joint investigation where Mr. Bergen would pay the salary of a technician from his ranch soil laboratory and the La Habra Heights Avocado Association would supply the quarters and materials necessary. This experimental department having been set up, work was begun in the fall of 1939. Early tests showed erratic results when the avocado was enclosed in ordinary cellophane bags. There were many types of cellophane film on the market and controlled experiments were set up, testing each product.

In December 1939, this writer became very much interested in this project and set up similar experiments at his ranch quarters. At all times there was close cooperation between these two independent groups of experiments. This was a pioneer research with little basic knowledge to guide the investigation. Results varied with different weather and temperature conditions. Each experiment suggested many more and progress was slow with many difficulties to be overcome. At one time a premature attempt at commercial sale of cellophane packaged avocados resulted in catastrophe due to the deleterious effect of a solvent in the glue used in making cellophane bags. Much time was lost running down this difficulty.

The 1939-40 season went by and also the 1940-41 without successful commercial application of the principle involved. In 1941 the Times-Mirror Co. liquidated its orchard business. Mr. Bergen went into other work and his connection with the experiments was perforce discontinued. This writer continued on alone with the experiments at his ranch headquarters in La Habra Heights.

The great quantity of data now accumulated was beginning to point the way to the solution of the problem. A special transparent film differing from ordinary cellophane, was tested by this writer and stood out as ideal for the purpose. Experimental packages using this material were shipped long distances. All these shipments were successful beyond our expectations.

All packaging to this point had been done with cellophane bags placed in paperboard cartons. We were not satisfied with this arrangement as it deviated too much from standard practice. One day the writer and Walter Beck (secretary of the Association) hit upon the idea of wrapping the avocado with squares of the film after the manner used by the citrus industry and placing the wrapped fruit in the usual wood flat with bed of excelsior (see illustration). This added little to the cost beyond the cellophane material used. The wholesale trade liked it better than the paperboard because of easier

stacking and hand trucking.

The cellophane package having been perfected, we shipped our first full car of wrapped avocados December 2, 1941. Part of this car was unloaded at Chicago and • the balance went to New York. This shipment was a big success and it has been followed by 39 more cars during the past three seasons.

The avocado, after it is picked from the tree, breathes, taking in oxygen and giving off carbon dioxide through its pores. This process continues until the avocado is soft, then it stops and the ordinary decay chemistry sets in. The speed of respiration seems to be directly proportional to the temperature and the speed of respiration in turn governs the softening time. The more mature the fruit at harvesting time the less respiration seems to be required to soften the fruit. Temperatures below 40 degrees bring respiration to a stop.

When this occurs the avocado never again resumes normal respiration even at warm temperatures and normal softening never occurs thereafter.

The above describes what happens to a fruit in a normal atmosphere. When the avocado is encased in a semi-permeable film this breathing is slowed down as the accumulation of carbon dioxide within the wrap dilutes the available oxygen. This delays the softening the same as if the temperature was lowered. When both the temperature is lowered and the avocado is wrapped the fruit may be held in good condition for quite long periods of time. The carbon dioxide content or reduced oxygen within the wrap also reduces the amount of fungus decay on the skin of the avocado.

If too tight a membrane is used the respiration comes to a stop and the avocado responds the same as if it had been chilled below 40 degrees. It never again commences the softening respiration.

The available transparent films (cellophanes) varied in their permeability to air. They ranged from pliofilm (a Goodyear rubber product), which is vapor proof, through a group of cellophanes made from wood cellulose, to the most permeable film made from cotton cellulose. While it is possible to use tighter films such as one of the wood cellulose base cellophanes under cold storage conditions, at the normal range of temperatures the only safe film is this more permeable cotton cellulose cellophane. It is tight enough in porosity to double the softening time of the avocado yet never stops respiration. This is the wrap used by the La Habra Heights Avocado Association.

There are several sources of this wrapping material. The E. I. duPont de Nemours & Co. produces it as CA (cellulose acetate) cellophane and the Celanese Celluloid Corp. as Lumarith Protectoid. There are several thicknesses available all of which are equally satisfactory.

To get the maximum holding effect the avocado should be wrapped as soon as possible after picking. As the softening process draws to completion the holding effect of the wrap is less pronounced. This is especially true on mature fruit with high oil content. Such fruit should be wrapped the same day as picked otherwise little holding effect will result. Removing the wrap will speed softening if fruit is still hard, but as softening nears completion this has little effect.

With immature fruit of low oil content the holding effect is very pronounced. We have

held such fruit for over two months at room temperature. On mature fruit nearing end of the marketing season the wrap adds additional days only.

Although external decay fungus is favorably affected by the wrap, Dothiorella, which grows deep in the skin, does not appear to be slowed up in its development, and as there is longer time for it to develop, wrapping should not be used on badly infected avocados.

The cellulose acetate film passes moisture readily so that there is greater shrinkage with wrapped avocados due to the longer softening time. This additional loss of moisture seems to improve the flavor.

The perishable character of the avocado limits its marketability in distant markets. A basic improvement in marketing methods such as provided by the cellophane wrap should be of great value to the industry. The industry has suffered from too great a percentage of the crop being marketed close to the producer. This wrap will extend the effective marketing range and add to the remuneration of the avocado grower as well as the greater satisfaction of the consumer.