Pear Transit Simulated in Test

four varieties of pears included in experiments to evaluate ability of containers to withstand damage and protect fruit

Noel F. Sommer

Nonwrapped jumble packed pears in cartons did not suffer more damage—when pads were compressed over the fruit by a tightly fastened lid—than wrapped fruit, in standard wooden boxes, in a series of laboratory tests.

No carton failed to complete the test but 12 of 28 wooden boxes did fail because of breakage.

Fiberboard cartons are not only less expensive than wooden boxes but the labor requirements for packing are less because cartons are adapted to machine filling as the fruit is neither wrapped nor hand placed according to pattern. However, compression pads must be placed in the cartons to prevent fruit movement and damage during rail transit.

Damage to fruit considered in these tests included surface discoloration, pressure bruises and stem punctures.

Surface discoloration is readily visible soon after damage is inflicted. A brown coloration develops when the epidermis —the outer skin—is injured by abrasion or impacts during transit and handling.

Pressure bruises of mature green pears usually are not apparent at the surface and damaged tissue can not ordinarily be seen until after the fruit is peeled. Even then, the extent of damage is difficult to determine if it has just been inflicted. At most, the tissue will exhibit only a water-soaked appearance. In time, however, the damage becomes sharply delineated by the reddish-brown color of the damaged area contrasting with the white uninjured tissue. If pears are placed in storage following injury, the discolored necrotic tissue may become somewhat dry and pithy. Since the damaged area ordinarily does not extend to the surface of the fruit, the necrotic tissue remains sterile. Consequently, this type of bruise is not necessarily associated with the onset of pathogenic rots. When pears are nearly ripe, however, damaged tissue is more extensive and may be visible from the surface.

Representative containers of pears following transit and handling tests. Nonwrapped jumble packed fruit in fiberboard cartons are on the left and wrapped pears in standard wooden boxes are on the right. Wraps were removed from the top layer of the fruit in wooden boxes to reveal damage. Top, Bartlett; center, Comice; bottom, D'Anjou.

The tests provided an initial period of vibration to produce surface discoloration followed by a series of drops. The drop tests are apparently most effective in evaluating fruit pressure bruise damage. While such tests provide a general indication of container strength, they do not necessarily determine the ability of cartons to withstand the weight of a load during a sustained period of time while subjected to vibrations and impacts. This is particularly true of cartons near the floor under the extremely moist conditions frequently encountered in refrigerator cars. Bulging of the carton sides would allow excessive fruit settling and result in a loose pack.

The transit tester was used to produce vibrations in vertical and horizontal directions with an amplitude of 0.25″ at a frequency of 510 cycles per minute. During a 1.5 hour period, each container was—presumably—subjected to 183,600 impacts with a force equal to gravity. More severe shocks would be imparted to the fruit if it were free to move within the container.

For accuracy and convenience, nearly all container drops were made on a swing type tester and were equivalent to a 12″ free fall to a concrete surface. The first drop, in each case, was made on an upper corner. With cartons, this was the corner located at the manufacturers joint. The first drops were followed by a series of edge drops on the shortest edge radiating from the tested corner, then the next shortest edge and finally, the longest edge. The remaining portion of the test consisted of a flatwise drop

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on each end, on each side, the top, and the bottom.

Five lots of fruit representing four varieties—Bartlett, Winter Nelis, D'Anjou and Comice—and four different brands were used in the tests. Pears were obtained from commercial packing houses, wrapped and packed in standard wooden boxes. One third of the containers were tested as received while another one third served as nontested checks to indicate the level of fruit damage present before testing. Fruit from the remaining containers was removed from the boxes, unwrapped and jumble packed into cartons.

If pear lots contained fruit of several sizes, these different sizes were equitably distributed among the three test categories. The Bartletts varied in size from 90–150 while *B* brand Winter Nelis were size 135–150. The D'Anjou pears were all size 80 and the Comice all size 100 but the *C* brand Winter Nelis were sizes 100 and 110.

Certain lots of fruit were considerably softer than the normal condition at shipping. Bartletts scored an average Magness-Taylor pressure reading of 16.7 pounds; Comice, 10; D'Anjou, 13; *B* brand Winter Nelis, 14.3 and *C* brand Winter Nelis, 13.6. However, pears this ripe—or riper—very likely receive considerable handling in market areas. Consequently, information is of value which tends to evaluate the ability of the carton to prevent damage to fruit approaching the ripe condition.

Cartons of the type used commercially, having inside dimensions of about 8¾" × 11½" × 17" and holding 37 pounds of fruit, were selected for the test. Of telescope type construction, the body is made of double walled, 325-pound-test fiberboard. After jumble filling with pears, padding was placed over the fruit and the single walled lid was pressed down tightly—to compress the pad—and fastened in place. When packed in this manner, pears are held firmly to prevent jiggling or rolling during transit. Furthermore, the fruit is surrounded by several thicknesses of corrugated fiberboard—or fiberboard and padding—with considerable shock absorbing ability that undoubtedly dampens many vibrations and impacts that would otherwise be transmitted to the fruit.

Carton lids were securely fastened by four staples on the sides near the ends using a stapler with retractable anvils. This closure method is adequate and is adapted to automatic or semi-automatic methods.

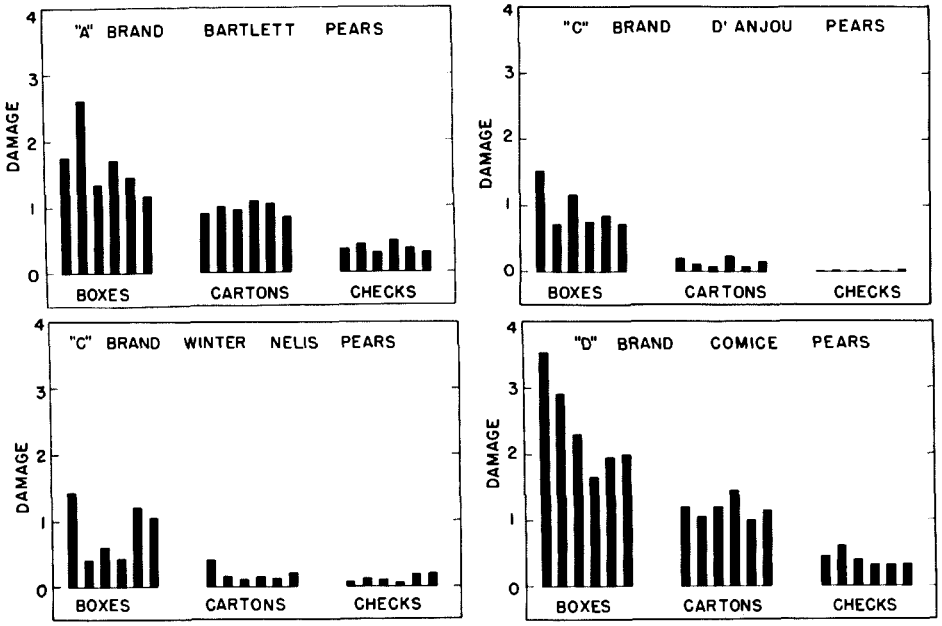
Following the test, all containers—cartons and boxes—were examined for structural damage. Containers were considered to have failed the test if damage was so extensive that fruit would spill during normal handling operations. If failure occurred before completion of the drops, the test was discontinued with regard to that container.

Of the 28 wooden boxes tested, 12 were eliminated—because of breakage—and many boxes completing the tests suffered minor damage which usually consisted of loosened nails and broken slats.

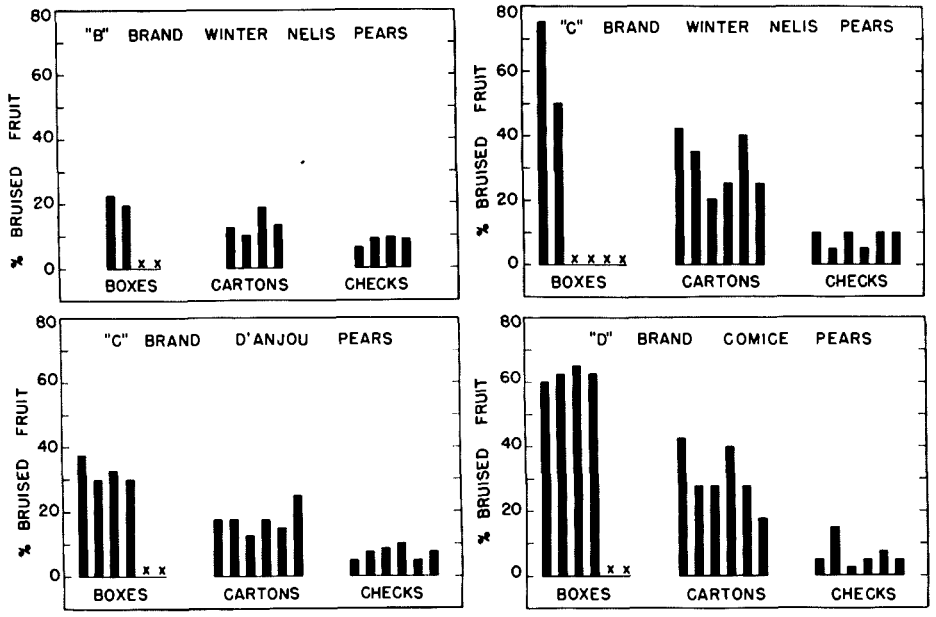
The most consistent damage to cartons was the tendency for the corners and edges absorbing the drops to become slightly rounded. In addition, some staples holding the lid to the body pulled loose. In one carton two of the four staples were loosened while one came loose in each of five cartons. In every case, however, the lid stayed securely fastened by the remaining staples and no carton failed to complete the test.

Damage to the fruit in the containers was determined after a suitable ripening period. Only fruit in containers complet-

Surface discoloration damage to pears following transit and handling tests. Wrapped fruit in standard wooden boxes are compared with nonwrapped, jumble packed pears in fiberboard cartons and nontested check boxes. These data indicate the average level of damage in each container. Zero represents no discoloration while 5 indicates almost total discoloration.



Pressure bruise damage to pears following transit and handling tests. Wrapped pears in standard wooden boxes are compared with nonwrapped, jumble packed fruit in fiberboard cartons and nontested check boxes. These data indicate the percentage of fruit in each container with 0.25" diameter or larger bruises. X denotes containers broken during the test.



Consumer Acceptance Surveys

samples of experimental food products submitted to public taste-testing in attempt to estimate consumer acceptance

Rose Marie Pangborn and Marion Simone

Unless the public accepts the taste of a food product—regardless of how carefully prepared, nutritious, packaged, priced and available—the food is a complete failure.

The flavor—and consequent public acceptance of a food—can not be defined or measured except in terms of human reactions, because flavors are what people perceive them to be.

Experimental samples of canned cling peaches—packed at various sweetness and acidity levels in the pilot canning plant at Davis—have been submitted to consumers visiting the California State Fair at Sacramento, each year since 1954.

The opinions of approximately 13,000 people—expressed over the three-year period—revealed that consumer acceptance of the peaches was based primarily upon the sweetness-acid-flavor relationship.

In 1956, more than 7,000 additional consumers evaluated vanilla ice cream made at Davis—from five sweetness formulas—by stating a choice between paired samples.

Each taste survey participant completes a questionnaire concerning age group, sex, height, weight, and frequency of use of the product. The information obtained is later correlated with sweetness preference and degree of acceptability of the product. Children between six and 12 years are admitted if accompanied by an adult. After the participant completes the questionnaire he is given a colored score card which he takes to one of the six sampling windows where he is served peaches or ice cream, in a specific combination determined by the color of his score card. He records the degree of his like or dislike on the card or—in some instances—simply a preference between two samples.

In addition to obtaining information on sweetness preferences and frequency of use, the surveys provide a medium for basic studies on the most efficient and accurate methods of collecting consumer opinions.

California food processors have submitted from 20 to 30 foods and beverages each year to the Consumer Reaction Council—operated by the State Fair Administration—for an unbiased estimate of the acceptability of their products that have ranged from salami and chocolate creams to beer and cottage cheese. The processor pays an entry fee and attests that the food entered is a standard product and samples submitted are of regular quality.

An average of 1,200 evaluations have been made on each processed food during the consumer acceptance surveys. At the end of each test period, the score cards are correlated and gold medals awarded to products receiving above 93% approval and blue ribbons to products placing between 75% and 93%.

The program of public taste-testing at the California State Fair has provided an economical and satisfactory method for pre-testing a food product and seemingly conclusive results have been obtained from consumers on food preference. The prediction of consumer behavior remains a problem because liking may change on repeated tasting.

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ing all drops were examined for pressure bruises. Fruit from all containers were rated for surface discoloration, however, as most of this damage occurred during the vibration phase of the test.

Surface discoloration injury was rated on a scale of 0-5. Zero indicated that no discoloration could be detected even upon careful examination and five represented almost total discoloration. Pressure bruise data were obtained by peeling a representative sample, usually 40 pears per container, and noting the number having bruises of 0.25″ diameter, or larger. The latter data were not obtained for the Bartlett pears, however, because of the highly variable number of pressure bruises in the nontested check boxes.

Considerable variation in fruit damage occurred between varieties and between different fruit lots. With regard to pressure bruises, these differences can largely be explained by differences in firmness at the time of the test. With surface discoloration, however, the russeted variety, Winter Nelis, was found much less susceptible than other varieties tested. The nonliving cork cells covering the surface evidently provide considerable protection against discoloration bruising. Furthermore, the dark surface color tends to mask the symptoms of damage that does occur. The extent of the protection provided appeared to be directly related to the amount of russeting. In this study, one lot of Winter Nelis was heavily russeted and discoloration was minor while another was lightly russeted and damage was sometimes extensive.

Container Failure During Simulated Transit and Handling Tests

Fruit	Cartons tested	Carton failures	Boxes tested	Box failures	Reason
A Bartlett	6	0	6	2	Broken lids
B Winter Nelis	4	0	4	2	Broken lids
C D'Anjou	6	0	6	2	Broken lid (1) side (1)
C Winter Nelis	6	0	6	4	Broken sides (3) lid (1)
D Comice	6	0	6	2	Ends split
Totals	28	0	28	12	

The nonwrapped fruit in the cartons generally exhibited less surface discoloration and fewer pressure bruises than the wrapped fruit in the wooden box. Stem punctures were less consistent but the incidence was low and there was no indication of any major differences between containers. Evidently compression pads in cartons are—providing pressure is maintained—at least as effective as the bulge of the wooden box in preventing fruit movement.

The successful utilization of the jumble pack method will undoubtedly require careful attention to a number of factors. The inadequacy of any one of these will likely result in excessive transit damage to the fruit: The carton must be accurately filled to the proper level and settled by vibration to reduce further settling during transit; sufficient pressure must be applied—when fastening the lids—to ensure a tight pack; cartons must be used which will not materially bulge

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DELAYED HARVEST

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14.17 tons on October 22 is evident when compared to a 12 ton yield on September 20, the release date. Conservatively, it can be concluded that delaying harvest from release date until late October—a matter of between five and six weeks—resulted in a gain in yield of from 1.5 to 2.5 tons per acre, equivalent to a yield 14% to 23% greater than if the fruit had been harvested on release date.

Dillon S. Brown is Associate Professor of Pomology, University of California, Davis.

Edward C. Koch is Farm Advisor, Santa Cruz County, University of California.

Carl Bronson, Watsonville apple grower, cooperated in the study reported.

The above progress report is based on Research Project No. 1697.

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or change shape during transit. Furthermore, the use of cartons will likely require important modifications of car loading practices, the nature of which are not yet fully understood.

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DONATIONS FOR AGRICULTURAL RESEARCH

Contributions to the University of California for research by the Division of Agricultural Sciences, accepted in July, 1957.

BERKELEY

Cactus & Succulent Society of California, Inc. $200.00
For importation and study of succulent plants

DAVIS

American Cyanamid Co.
For turfgrass research program $600.00
For aureomycin feed-lot lamb studies $1,000.00

Bakelite Co. $2,500.00
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Grower-Shipper Vegetable Assoc. $5,762.00
For research on insect projects dealing with vegetable problems, particularly lettuce

Henningsen, Inc. $750.00
For research on utilization of by-products from the egg industry

Kelco Co. ..... 10 gr. manuronic acid lactone
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Milk Industry Foundation $6,500.00
For Q fever pasteurization studies to determine thermal death time of the Coxiella burnetii in cream

Monsanto Chemical Co. ..... 400# Krilium loammaker
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National Science Foundation $5,700.00
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Jackson Manufacturing Co. ..... 1 lawn type sprayer
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Charles S. Jones ..... camellia plants
For research and culture

Merck & Co., Inc. $2,500.00
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Monsanto Chemical Co. ..... 30# Krillium
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RIVERSIDE

American Chemical Paint Company $2,500.00
For aid in research with 3-amino-1, 2, 4-triazole as an herbicide

American Petroleum Institute $20,000.00
For aid in research on the effect of polluted atmosphere on vegetation

Monsanto Chemical Co.
To aid in soil fertility research in Imperial and San Joaquin valleys $1,500.00
For irrigation and soils research ..... 200 lbs. of Krillium

National Science Foundation $9,900.00
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To assist in installation of necessary equipment to accomplish the specific objectives of the proposed lysimeter investigation

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Kaiser Aluminum and Chemical Sales
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