RIPENING AND PEELING MICHIGAN FREESTONE PEACHES

Thesis for the Degree of M. S.

MICHIGAN STATE COLLEGE

Lester Robert Strong

1953

This is to certify that the

thesis entitled

Ripening and Peeling Michigan
Freestone Peaches

presented by

Lester Robert Strong

has been accepted towards fulfillment
of the requirements for

M. S. degree in Food Technology

C L Bedford
Major professor

Date June 4, 1953

O-169

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By

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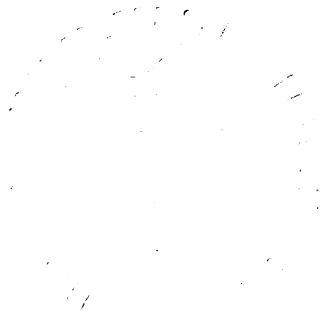
A THESIS

Submitted to the School of Graduate Studies of Michigan
State College of Agriculture and Applied Science
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE

Department of Food Technology

1953



ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Dr. C. L. Bedford, for his constant supervision and guidance throughout the entire course of this study. The writer deeply appreciates the assistance tended him by Mr. W. F. Robertson and Mr. R. W. Hirzel, without which this study would not have been possible. Grateful acknowledgement is also due the secretaries of the Horticulture Department who assisted on the taste panels.

INTRODUCTION

Michigan ranks high in the production of freestone peaches grown in the United States. During the ten year period of 1940 to 1949, Michigan produced an average of 3,607,000 bushels per year and ranked fourth in the nation (1). The total production of freestone peaches in Michigan in 1952 was 3,397,000 bushels, of which 628,000 bushels were processed (10). The Elberta variety constitutes about 45 per cent of the total freestone peach production in Michigan (22).

The most important factors governing the quality of canned freestone peaches are: color, texture, flavor and general appearance (41).

Color is probably one of the most important factors in peach quality. Processed peaches should have a bright, typical, uniform color. If a green color persists in the flesh ripening, it will carry through in the canned product giving it a dull, unattractive appearance. Difficulty of uniform ripening is experienced with early maturing varieties, however, in the variety Elberta the green color is the last to change to a full yellow. A uniform color will develop, as a rule, if the fruit is allowed to ripen until the last trace of green has left the skin.

The flesh texture of the freestone peach should be firm but not fibrous. As ripening progresses, the peach tends to

become softer and more fibrous. Part of this investigation was devoted to determining the proper ripening method for a firm textured peach.

Flavor is an elusive characteristic and difficult to classify because of considerable variations in taste occurring between individuals. Flavor is not only dependent to a large extent on the variety, but also on the maturity at which the fruit was harvested and the method of ripening used.

The general appearance of the canned freestone product is important in consumer acceptability. The ease with which the fruit is pitted and the method used to peel the fruit determines to some extent the raggedness of the canned product. The general appearance of the fruit and sirup is dependent to a very large degree upon the harvest maturity and the method of ripening.

This investigation, made during the 1952 season, was concerned with the two major systems of peeling freestone peaches - steam and hot lye solution. In addition, this study deals with the harvest maturity and ripening conditions required for canned Elberta and Hale Haven peaches of the best quality and appearance.

REVIEW OF LITERATURE

The quality of canned peaches is dependent to a large extent upon the maturity of the fruit at the time of picking (4,12,33). There have been several investigations to determine the optimum time for harvesting freestone peaches for processing and fresh market. Because the data collected in such investigations is limited to a certain area, as a result of variable effects of climatic and soil conditions, the recommendations are reliable only in that area (45). The optimum time for harvesting as outlined by Culpepper (14) is that "short clearly defined period in which the fruit is firm enough to undergo processing, without disintegrating, and yet have sufficient flavor to be palatable."

Harvest Maturity

Variations in the composition of fruit at a given stage of maturity are greatly influenced by the nutritional balance in the trees and the load and vigor of the trees (14). Moon et al (28) investigated the composition of peaches grown on thinned trees and trees not thinned. He found no consistent effects upon the date of maturity as a result of the thinning. The fruit from the thinned trees was consistently higher in total solids, soluble solids, and total sugars, at all stages of maturity. The fresh fruit from the

thinned trees was distinctly superior in sweetness, in balance between sweetness, acidity, and astringency, and in fullness and appeal of flavor. No difference was found in the texture of the flesh between the two types of trees.

Blake et al (8) in an experiment with trees of high and low vigor, found that the fruit from the low vigor trees was smaller, firmer at the same stage of maturity and ripened more uniformly than the fruit from the more vigorous trees. To combat this lack of uniformity, Coe (12) recommended different color standards and pressure tests for trees in various stages of vigor. Caldwell and Culpepper (11) found that rain during the ripening period caused the flesh to soften without the development of a full peach flavor.

Many investigations have been made to determine methods for establishing the maturity of peaches. These methods include pressure tests, ground color, tenderometer, per cent blush, per cent pit browning, and soluble and total solids.

Pressure Test. Addoms et al (2) in 1930 found that the cell walls of the peach consist of an intimate combination of cellulose and protopectin. As the fruit ripens the cell walls became thinner resulting from the changing of protopectin into pectin. The above authors found that the decrease in turgidity of the peach closely follows the decrease in protopectin and cellulose in the cell wall. To measure the firmness of the peach, Magness and Taylor (24), in 1925, developed a pressure tester. This instrument has

been modified for use on apples, pears, and plums, as well as for peaches (18). One of the first variations was made by Blake (6) who used a needle having a diameter of .032 inch which was recommended for immature fruit. Blake (8) reported that by using a pressure tester of the Magness and Taylor type, with a 0.187 inch plunger, he was able to get a decrease in resistance of the peach flesh which closely paralleled the results found by Addoms et al (2). Culpepper and Caldwell (14) felt that this resistance to pressure by the peach flesh was a good index of firmness, and therefore, canning quality. Measurements by pressure testers are of limited value alone in determining the maturity because of uneven ripening and wide differences in the various parts of a single fruit. For example, with a 0.437 inch diameter plunger on peeled surfaces, pressure test measurements on individual Elberta peaches have been observed to differ by as much as 16 pounds between suture and cheek (35). Haller (19) stated that maturing fruit ripens first at the shoulder opposite the suture, then along and opposite the suture and lastly on the cheeks. Blake (7) stated that in tests between the .187 inch and the 0.312 inch plunger, the larger plunger more accurately recorded slight differences in texture. Haller (18) also has pointed out that the higher the temperature at the time of the test the lower the reading will be. Haller and Smith (20), using a 0.312 inch diameter plunger, have reported that Elberta peaches testing 16 pounds or more on the pared cheeks or 14 pounds or more on

the pared suture should be considered immature. Many investigators (6,8,12,18,29,47) advocate the use of both the flesh firmness and undercolor in determining the maturity of the peach. Neubert and Veldhuis (33) found that the fruit should attain a ground color of 75 per cent yellow color and test four pounds with a 0.437 inch plunger to obtain processed peaches of choice quality and good flavor.

Ground Color. Ground color or undercolor has been used as an index of maturity for freestone peaches for both the fresh market and for processing (8,12,15,17,29,31,35,40). Neubert et al (31) states that "when the green undercolor has changed to a straw yellow and the fruit has just begun to soften, Pacific Northwest peaches are at the optimum stage of maturity for canning." When the fruit of any variety enters the ripening stage, the green undercolor usually changes from the shade of green immature fruit to a greenish white or yellow and finally to a clear cream or orange yellow. Veldhuis and Neubert (45) state that more important than having a typical peach color, is that the color is uniform and bright. Neubert et al (35) pointed out that although in actual practice ground color is the most useful index to maturity, it will vary from year to year in the same district.

The ground color of peaches has been measured by several color charts (11,12,25,35,47). Haller and Harding (17) found that the apple color chart developed by Magness et al (25) was more satisfactory than the color chart devised by Coe (12).

Tenderometer. The tenderometer is an instrument which measures the shearing force necessary to cut through a substance. The original use for the tenderometer was to determine the tenderness of peas (26). A modification of this instrument has been used to obtain reliable results in measuring the firmness in cooked apple slices treated with calcium choloride (16). A high degree of correlation was found by Lee and Oberle (23) between the Ballauf plunger-type pressure tester, the tenderometer readings, and organoleptic tests with fresh peaches.

Flesh Color. Van Blaricom and Musser (44) recommended harvesting peaches for processing in South Carolina when the flesh color of the yellow varieties has just begun to turn from green to yellow. Both Neubert et al (35) and Coe (12) found that the flesh color is more highly developed than the skin color in the early stages of maturity, but they are nearly equal when the fruit is fully ripe. A fairly high degree of negative correlation was obtained by Willison (47) between flesh color and flesh firmness.

Per Cent Blush. Observations made by Crawford (13) and Snyder (39) showed that the increase of blush percentage was dependent upon the exposure of the peach to the sun, and gave no indication of maturity.

Pit Browning. Neubert et al (35) state that pit color is an excellent supplement to undercolor and flesh firmness in judging actual maturity. Snyder (39) stated that the

oxidation of the pit cavity provided a fairly constant index of maturity. The above authors hesitated to set precise standards of maturity by the pit cavity color, however, the same authors stated that the appearance of brown color on at least five per cent of the pit surface was necessary to assure a sufficient maturity to develop a good flavor during ripening.

Size and Weight. The grower is especially concerned with the size and weight of the fruit. Bigelow (5) reported that between the time of the June drop and the time of market ripeness the peaches increased in weight nearly eight times, from 9.51 to 73.59 grams per peach. The same author also stated that the increase in the weight of the peach was proportioned to the increase in total solids. Neubert and Veldhuis (33) reported an increase of 10 per cent in yield for every three days the fruit was left on the trees. Coe (12) found that in the four weeks prior to harvest, the diameter of the peach increased by 39 per cent and the volume increased over 125 per cent. Mc Munn and Dorsey (27) reported an increase in weight from 47.8 to 93.7 per cent of the peaches that were above 2.5 inches in diameter during the last week before optimum maturity. Fisher and Britton (15) found an increase of nearly 25 per cent in volume of Elberta peaches in British Columbia.

The size and weight is of importance to the processor as well as the grower. Neubert and Veldhuis (33) found that 100

fruits which required four days to ripen packed five more number two and one-half cans than 100 fruits picked six days earlier. Van Blaricom and Musser (43) stated that twice as much labor was required to process peaches of 2-inch diameter than fruit which was 2.5 inches in diameter.

Texture. Many authors (2,3,7,18,35) stated that the texture of the canned fruit became softer as the fruit approached ripeness at harvest. To a certain extent, the firmer fruit required a longer ripening period than fruit which was less firm. Neubert (35) has shown that a peach which requires eleven days to ripen was undersirably firm as compared to one which required only three days to ripen and was of a soft texture. In work done in 1940, 1941, and 1942 by Neubert et al (31), a wider range of three to fourteen days to ripen was found to produce a product of good texture.

Flavor. Neubert et al (35) reported that for optimum flavor in canned or frozen peaches, the fruit required six days or less to ripen. The above authors also found that there was no advantage to leaving the fruit on the tree until it was three days or less from canning ripeness. Neubert et al (31) in another study found that there was an improvement in flavor as the maturity of the fruit advanced until only about six days were required for ripening, and when less than three days were needed the flavor became somewhat mild. Culpepper and Caldwell (14) found that as

ripening progressed there was a tendency for the total sugars to increase rather steadily throughout the ripening period up to five or six days past the shipping stage, after which they remained constant. During this time there was a decrease in the acid and total astringency. The above authors recommended that the fruit be left on the tree as long as possible and yet be firm enough to process. Van Blaricom and Musser (44) gave as the ideal situation in South Carolina the picking of peaches when tree ripe. This, however, entails a handling problem and for this reason their recommendation was to pick the peaches when the flesh color was beginning to turn but before the fruit was soft ripe.

General Appearance. Neubert et al (31) found no difference in the appearance of the canned fruit or sirup that could be attributed to the maturity at harvest.

Soluble Solids. Moon et al (28) found that fruit from thinned trees was consistently higher in soluble solids, total solids and total sugar than fruit from unthinned trees. Allen (3) found that the soluble solids tend to increase with the coloring and softening of the fruit, although the changes during the period are not always consistent and the differences are not very great. It has been found by most investigators (3,4,9,13,14,35) that there is an increase in soluble solids as the fruit ripens. The above authors also point out that the range is so narrow that soluble solid percentages are unreliable as a guide to maturity. Bigelow (5) states that

the increase in solids is proportional to the increase in water through the life of the peach and therefore, the changes in percentage of solids are small.

Total Solids. Neubert et al (35) found that there was a general tendency toward an increase in total solids until four to six days after the shipping ripe stage, then a slight decline occurred in the soft ripe fruit. Culpepper and Caldwell (14) obtained similar results.

Pitting and Peeling. Poor peeling can generally be attributed to improper ripening or storage. Neubert et al (35) reported that in the maturity range covered by their studies with Washington grown peaches no differences were found in the freeness of the pits or the ease of the removal of the skins after steam peeling.

Ripening

After harvesting the peaches at the maturity, the processor must have the correct conditions to ripen the peaches to the right stages of color, flavor, peeling quality, etc. Neubert and Veldhuis (32) found 75° F. to be ideal for ripening Washington grown Elberta peaches. They reported also that small lots did not ripen at the same rate as those ripened in large commercial lots. This, they felt, was the result of greater emanations of gases in the larger lots. Color development was retarded considerably when the fruit was ventilated.

The above authors also stated that peaches ripened at 65° F. required a longer time to attain a yellow color. Peaches ripened at 85° F. and 95° F. were difficult to steam peel. Temperatures of 31°, 37°, and 45° F. did not improve the canning quality of peaches (46). Haller and Harding (17) state that one day at 70° F. is equal to two days at 60° F., four days at 50° F., eight days at 40° F., or sixteen days at 32° F. when the respiratory rate is used as an index of maturity.

Wilt loss or reduction in weight resulting from water loss during ripening is frequently a source of economic loss to the processor of freestone peaches (35). It has been established (31) that some of this wilt loss may be recovered in the can, and that generally as the wilt loss increased the per cent of weight recovery also increased. Under conditions similar to those of commercial operations (35), gross wilt loss as high as 22 per cent was found in peaches requiring nine days or more to ripen after harvest.

Haller (21) has written and published an excellent and complete digest of recent contributions to the knowledge of physical and biological phases of handling, transportation and marketing of peaches.

Processing

The position of the pitting operation in the processing procedure depends upon the section of the country and the type of peeling operation in use. Van Blaricom and Musser (44) stated that most Eastern packers pit the peaches before peeling them. One objection to this method is that the peeling loss is greater (48). Woodroof (48) also stated that in Georgia, firm peaches for canning should be pitted before being peeled with lye.

Peaches may be peeled in several different ways. These methods include hand peeling, dipping in hot water or steam, acids, alkalis, by freezing (44) or by the so-called explosion method (9).

Woodroof (50) found that a dilute solution of hydrochloric acid could not be used in the peeling operation because a small residue left on the flesh gives the fruit an undesirable flavor. He also stated that hydrochloric acid corroded the machinery and was quite difficult to work with.

Taylor (44) in 1937 patented a process for peeling peaches by freezing the peach to a depth just below the skin and then thawing the peach just through the skin. The skin was removed by abrasion. Woodroof et al (48) found that it was difficult to adjust the thawing properly to remove the peel.

The explosion method advocated by Brown (9) uses a temperature between 212° - 250° F. with .2 pounds of pressure and an immediate reversal in temperature and pulling a vacuum of

25 to 27 inches of mercury. This is accomplished by heating the fruit in a retort with steam followed by turning off the steam and rapidly forcing cold water into the retort. Skins were removed with little waste by this method in studies by Woodroof (48). Hand peeling is slow and was claimed to increase the chances of introducing micro-organisms (49).

The peeling of freestone peaches by steam is the common commercial practice on the West Coast (30,35). Lye peeling was proven unsatisfactory in the Pullman area in Washington by Mottern and Neubert (30). They found that lye peeling resulted in an inferior product because even with a citric acid rinse, the peaches lost flavor because of lye penetration. It was also found that spraying hot lye on the peaches caused a rough surface regardless of the gentleness of the spray. Crawford (13) reported no difficulty in steam peeling Elberta peaches grown in Michigan in 1950.

The peeling of peaches with a hot lye solution is advocated to be better than the steam peeling methods for Eastern grown peaches (44,48,50). The commercial canneries in South Carolina found that peaches only occasionally peeled satisfactorily by steam (44). Woodroof (50) found the lye did not penetrate the flesh as did hydrochloric acid because of its alkalinity and the slight acidity of the peaches. Steam peeling, which partially cooked Georgia peaches, adversely affected the flavor, while lye peeling was found to be successful when a boiling hot two per cent solution was

used (48). Lye peeling is followed usually by a one to two minute dip in a five-tenths per cent hydrochloric acid solution or a two per cent citric acid solution. The acid neutralizes the film of weak alkali left on the surface of the washed peach, and thus retards browning and prevents the peach from becoming slick while peeling. In addition, citric acid is one of the natural acids of peaches and it does not impart a foreign taste to the fruit as happens with some of the other acids (48).

Recently, wetting agents as an aid in the lye peeling of peaches have been investigated (38). Van Blaricom (44) found their greatest use in speeding up the capacity of lye peeling machines, but because the amount of lye needed was not reduced, he deemed their use questionable.

METHODS AND MATERIALS

The Hale Haven and Elberta peaches used in this investigation were obtained from 11-year old trees on the Blood Farm near South Lyon, Michigan. The trees were selected for uniformity of size, vigor, and fruit load.

Harvest Maturity

To obtain peaches of suitable range in maturity, the fruit was picked on alternate days. Only two pickings were made from each tree to minimize the effect of fruit removal on the rate of growth or ripening of the peaches. Approximately 100 pounds of fruit was obtained for each maturity lot. The fruit was then transported to the laboratory at East Lansing.

The wide range of maturity on the trees made it possible to obtain more than one maturity for ripening at each harvest. A 40-fruit sample was selected at random from each maturity lot for detailed measurements and descriptions. The remainder of the lot was placed in the ripening cabinets after the number of peaches and weight of each lot was determined.

The following fruit descriptions were made on the 20 fruits taken from each maturity lot: weight, ground and flesh color, per cent blush, pit browning and pit

pigment, pressure test, ring size, circumference, diameter, split pits, soluble and total solids, and pH.

Weight. Each peach was weighed to the nearest gram.

Ground Color. The ground color was recorded as a number determined by the apple color chart developed by Magness et al (22).

Flesh Color. The same color chart as above was used to determine the flesh color.

Per Cent Blush. The per cent of distinct red blush based on the total peach was estimated.

Per Cent of Pit Browning. The percentage of pit cavity which turned brown was estimated.

Pit Pigment. The shade and intensity of the red pigment surrounding the pit cavity was noted.

Pressure Test. The pressure tests were made using a Ballauf plunger type tester with a 0.312 inch diameter plunger on peeled surfaces of the cheeks, suture and the side opposite the suture, and the readings were recorded.

Tenderometer. All readings on the tenderometer were made in pounds per square inch and read on the number two scale except when the fruit became very soft and then it was read on the number one scale. Peaches from the representative samples were cut into halves, quarters, slices and three-eighths inch dices. The methods used for placing the samples in the chamber are as follows:

1. Halves. Six whole peaches were halved and pitted. One-half at a time was placed in the chamber cup down. The readings from the halves were averaged for each peach.

2. Quarters. Six whole peaches were quartered and pitted. Two quarters were put longitudinally in the chamber at a time with the skin side up. This was repeated for peeled fruit and the readings were recorded.

3. Slices. Whole peaches were halved, pitted and sliced into twelfths. Samples of 150 grams each were weighed out and placed in the chamber of the tenderometer. Peeled slices were used and the process repeated. This, however, was discontinued for the unpeeled slices in the last harvest because of the softness of the flesh.

4. Dices. Fruits that had been used for the fresh fruit measurements were put through a potato cutter having three-eighths inch square openings in the face plate. The use of unpeeled fruit had to be discontinued in the last harvest because of the softness of the fruit.

Ring Size. The size of each fruit was measured with the use of a standard fruit inspector's size gauge.

Circumference. The circumference was measured to the nearest centimeter, at the point of greatest transverse circumference.

Diameter. The maximum diameters from suture to back, from stem to apex and from cheek to cheek were measured to the nearest centimeter.

Split Pits. The per cent of split pits was calculated on the total number of fruit harvested.

Soluble Solids. The per cent soluble solids was determined with an Abbe refractometer. For this purpose the sheared fruit from the tenderometer was collected and the clear liquid expressed through a double layer of cheese cloth.

Total Solids. A vacuum oven was used to determine the total solids of the fruit. The determination was according to the A.O.A.C. procedure on a 25 gram sample (37).

Pit Loss. The pit loss was determined by weighing the pits after they were removed from the peaches.

Skin Loss. The skin loss for the steam peeled peaches was determined by weighing the skins which were removed. The skin loss for the lye peeled peaches was determined by the difference in weight before and after the lye peeling process.

pH. The pH was determined by a glass electrode Beckman pH meter.

Ripening. The fruit was ripened in a cabinet held at room temperature. The humidity was developed by confinement of the water vapor emanating from the fruit and controlled by means of a vent.

The temperature range during the ripening of the Hale Havens was 68° F. to 84° F. with an average of 77° F. The relative humidity ranged from 50 to 70 per cent and averaged 62 per cent. The temperature range during the ripening of

the Elbertas was 65° F. to 84° F. and the relative humidity ranged from 48 to 77 per cent with an average of 66 per cent.

Processing. The fruit was considered ready for processing when it was soft, fully colored, and easily peeled. As each lot reached processing ripeness, the loss in weight was determined. Two methods of peeling were used - steam peeling and lye peeling. For the steam peeling the individual peaches were halved, pitted, and the halves placed cup down on aluminum sheets. The halves were steamed for 60 to 90 seconds, cooled by a water spray and the skins slipped off by hand.

The procedure followed in lye peeling was to dip the whole peaches in a one and a half per cent lye solution at 200° ± 3° F. for two minutes. The lye used was a commercial product containing 94 per cent sodium hydroxide, two per cent sodium carbonate and four per cent inert materials. The peaches were allowed to drain for ten seconds and then sprayed with cold water. When the peels were completely off, the peaches were dipped in a two per cent citric acid solution for one minute and then reweighed. The peaches were then halved. Other than being halved before lye peeling, the procedure for the halves was identical to that of the lye peeled whole peeling method.

The prepared halves were accurately weighed into number two tin cans, specially lacquered for peaches, to 14½ ounces, siruped with hot (180°-190° F.) 40 per cent sucrose solution,

exhausted in boiling water for seven minutes, sealed and processed in boiling water for 20 minutes and water cooled. The canned samples were stored at 55° F. for approximately six months before being opened and evaluated.

Ripening Studies

Fruit Selection. The peaches used in the ripening study were obtained from the same orchard as those for the harvest maturity study. The fruit was sorted to obtain as uniform a maturity as possible within each lot. The peaches were placed under the several ripening conditions within four hours after picking.

Ripening Methods. The peaches were ripened in cabinets equipped with fans to control the humidity which is supplied by the fruits themselves. The heat was furnished by automatic heat units built into the cabinets and connected to an automatic cut off. The temperatures used were 75°, 85°, and 95° F. with a high and moderate humidity for each temperature.

Processing. One tray of peaches of each maturity was removed from each cabinet over a period of three to six days, respectively. An attempt was made to remove the fruit about one day before comparable fruit held at 75° F. under conditions of high humidity had reached processing ripeness. The second and third trays were removed on two and four days later, respectively.

After the fruits were removed from the cabinets, and weighed, to determine the wilt loss, all the lots were compared for color and processed as in the harvest maturity study. Observations were made on the pitting, peeling, and general character of the fruit.

The following determinations or calculations were made after ripening or after the cans were opened and the peaches were evaluated: Calculated and actual yields, total loss, net loss, pit loss, and product evaluation.

Taste Panel. A taste panel composed of five to seven judges was held to evaluate all the samples processed. The score was based on a maximum of five points for an excellent rating and one point for a poor rating.

Product Evaluation. The drained weight was determined using the procedure outlined in the United States Standards for Grades of Freestone Peaches (39).

PRESENTATION AND ANALYSIS OF DATA

Fresh Fruit Measurements

The results obtained from the fresh fruit measurements have been averaged from the 20 fruits used in the sample and recorded in tables 4, 8, and 9 for the Elbertas.

Because it was impossible to use the same fruit for measurements throughout the harvest period the usual error of sampling was introduced. Within the limits of this error it was possible to calculate the average changes made in the fruit during the harvest period.

Weight. The overall increase in weight for Hale Haven amounted to 25 per cent covering the eight-day period. There was little gain in the riper peaches after the sixth day of the study or three days before processing. The greener peaches could have been harvested for commercial production on the eighth day of the study and ripened for six days.

Elberta showed an increase in weight of 86 per cent over the 12 day harvest period. There was no increase in growth after the sixth harvest was made. From the data given there was a decrease in weight after this date.

The difference in the increase in weight between the two varieties during the harvesting periods was mostly a result of the different lengths of the harvesting periods.

The Elbertas had a longer harvesting period and therefore showed a greater range of weight increase.

The grower and the processor are interested in obtaining the highest yield possible. Because of the variability in the maturity of the peaches in 1952 it is difficult to give the optimum time for harvest on a weight basis.

Ground Color. The ground color for the Hale Havens progressed steadily throughout the maturity period ranging from 2.4 to 4.1 on the apple color chart.

For the Elbertas the range was somewhat lower, 2.3 to 3.8. Although ground color is important as a measure of maturity, the variability between seasons, orchards, or even between trees is so great that it is impossible to set a reliable standard for harvesting based on such a factor alone.

Flesh Color. The flesh color score in both Hale Havens and Elbertas was higher than the score given for skin color, being 2.7 to 4.2 and 2.5 to 4.0, respectively, becoming more yellow as the period advanced. From tables 2 and 5 it can be noted that the coefficient of variation becomes less as the harvest period advances, that is, the standard deviation and the mean grow farther apart.

Per Cent of Blush. The estimated per cent of blush for Hale Haven ranged from 24 to 93 per cent with a steady increase throughout the maturity phase.

The per cent of blush on Elberta was not quite so intense as the Hale Havens. The shade and intensity increased with

the length of the harvest period ranging from 12 to 64 per cent.

On the basis of this increase in blush of both varieties, it might be assumed that the amount of blush is directly related to the maturity. It is, however, not an index of the maturity of the fruit but the amount of sunlight the peach has received as some immature green peaches had a high degree of blush.

Ring Size and Circumference. The ring size of the Hale Haven peaches increased from 2.1 to 2.7 inches or about 28 per cent during the harvesting time. The circumference of the Hale Havens increased by about 13.5 per cent.

The Elbertas increased in ring size from 2.3 to 2.9 for an increase of 26 per cent with a steady upward increase.

These two measurements alone gave very little indication of the maturity of the fruit.

Pressure Test. As the Hale Havens and Elberta peaches advanced in maturity, the flesh became progressively softer. It was found that the flesh at the suture and the opposite side of the suture were less firm than the cheeks in both varieties.

Many authors (6,8,12,18) advocate the use of both ground color and pressure tests as a measure of maturity. It is shown in tables 2 and 5 that although the coefficient of variations are quite moderate for the ground color, it is quite high for the pressure test, especially towards the

latter part of the harvesting season. This would indicate that even though the ground color and pressure test are used as indices of maturity, they may not be closely related.

Diameter. The suture and cheek diameters for the Hale Haven peaches increased by 16 per cent and the longitudinal diameter increased by 13 per cent.

The Elberta peach had a suture diameter increase of 24 per cent, the longitudinal diameter 18 per cent, and the cheek diameter 25 per cent.

It was observed from the data that the increase in the size of the peach in the final stages of ripening came in the suture and cheek diameter rather than the longitudinal diameter.

Pit Browning. The pit browning increased progressively from no pit browning at the beginning of the harvesting study to a maximum of 66 per cent for the Hale Havens and 63 per cent for the Elbertas. Although there was a general increase in pit browning, the increase was too variable to use as an index of maturity.

Pit Pigment. Pigmentation of the pit cavity was not as intense in the Hale Havens as in the Elbertas. The red coloration of the pit cavity progressed from very light to light medium in the Hale Havens, whereas it progressed to a full medium in the Elbertas. There was no indication that this could be used as the measure of the maturity of the fruit.

Split Pits. The percentage of split pits was inconsistent and in no way correlated with either variety of fruit or time of harvest.

Tenderometer. The tenderometer readings for the Hale Haven peaches on the unpeeled halves, quarters, slices, and cubes decreased 41, 59, 56, and 70 per cent respectively and 80, 89, 57, and 59 per cent, respectively, for the unpeeled peaches. The tenderometer readings on the ripe peaches harvested on the last harvest day decreased 46 per cent for the unpeeled halves and 72 per cent for the peeled halves during the harvesting period (table 1). It was impossible to get readings with the unpeeled slices and cubes because of the softness of the flesh and the packing of the skins on the grid.

The same general trend was followed with the Elbertas. The tenderometer readings on the unpeeled halves, quarters, slices, and cubes decreased 59, 77, 75 and 80 per cent, respectively (table 4). On the peeled peaches it was 87, 90, and 90 per cent, respectively.

The correlation coefficients for Hale Havens between the pressure test, using a .312 inch plunger, and the tenderometer are very high except for the unpeeled quarters (table 3). The correlation between the .437 inch plunger pressure tester and the tenderometer is high in all cases except the peeled halves and peeled quarters.

The correlation coefficients for the Elbertas between the pressure tests using a 0.312 inch plunger and the tenderometer are high in all cases except with the peeled quarters. These results show that by using peeled and pitted halved,

quartered and sliced peaches the tenderometer may be used as a means for determining maturity.

Soluble Solids and Total Solids. Both the soluble and total solids with the Hale Havens showed a slight increase in the first three harvests and then a decrease to the original value. The increase in soluble solids was from 11.6 to 12.9 per cent and the increase in total solids was from 12.6 to a maximum of 13.8 per cent.

The soluble solids in the Elberta studies showed a decrease during the first five harvests and then began to increase and the soluble solids of the last harvest did not attain the value of those of the first three harvests.

The narrow range reported in both varieties is similar to the results found by Neubert et al (33) and the soluble solid content cannot be assumed reliable as an index of maturity.

pH. While the pH increased with the increase in maturity of the Hale Havens from 3.58 to 3.80 the pH varied from 3.55 to 3.60 for the Elbertas.

Wilt Loss During Ripening. The wilt loss for the Hale Havens varied from 1.2 to 13.3 per cent of the initial weight for the peaches ripened at room temperature. The wilt loss for those lots ripened at higher temperatures ranged from 15.7 to 38.6 per cent (table 7).

The range for the wilt loss of the Elbertas was from 0.6 to 19.1 per cent during the ripening at room temperature

(table 8). It was obvious in both varieties studied that the wilt loss varied directly with the length of the ripening period.

Pit Loss. The pit loss decreased as the fruit became more mature before harvest in each of the freestone varieties. The range was from 11.2 to 6.2 per cent and 14.1 to 6.6 per cent respectively, for the steam and lye peeled Hale Havens. The pit loss for the Elberta peaches was from 13.4 to 6.1 per cent and 13.4 to 6.2 per cent respectively, for the steam and lye peeled fruit. No significant difference was found between the two methods of peeling with either variety. A positive correlation was found between the wilt loss and pit loss in both varieties (figures I and II).

Skin Loss. The fully matured peaches peeled easily, The skin loss for the steam peeled halves of Hale Havens ranged from 4.2 to 11.0 per cent of the ripened fruit, while the calculated skin loss for the lye peeled whole peaches ranged from 0.0 to 11.0 per cent.

The skin loss of the Elberta variety ranged from 3.4 to 6.7 per cent of the ripened fruit for the steam peeled halves and from 0.0 to 6.8 per cent for the lye peeled whole peaches.

The calculated loss of skin for the lye peeled peach halves varied from 3.2 to 15.3 per cent. The higher average loss for the lye peeled halved peaches was a result of the loss of flesh from the pit cavity and the cut surfaces. The lower skin loss values for the lye peeled peaches were obtained on

the peaches having the higher wilt loss. This decrease was probably a result of a reabsorption of water by the flesh of the wilted peaches during the successive immersions in a hot lye solution, water and dilute citric acid (table 7). The correlation between wilt loss and skin loss for the steam peeled peaches was +.099 and the same losses showed a negative correlation of -.560 for the lye peeled fruit.

Yield. The calculated yields were determined by subtracting the pit and skin loss from the weight of the peaches used. The actual yields were determined from the difference between the original weight and the ingoing weight of the peaches.

The calculated yields for the steam peeled Hale Havens ranged from 79.9 to 88.7 per cent with an average of 85.27 per cent and 81.2 to 92.0 per cent with an average of 87.92 per cent for the lye peeled fruit (table 7). A highly significant difference was found in yields between the two methods of peeling with Hale Haven peaches (table 10).

The actual yields for the steam peeled Elberta peaches varied from 80.6 to 90.2 per cent of the original weight with an average of 86.25 per cent; for the lye peeled whole fruits from 84.1 to 90.9 per cent, with an average of 86.89 per cent; and for the lye peeled halved peaches 71.5 to 85.5 per cent, with an average of 80.8 per cent. No significant differences were found between the steam peeled and lye peeled

whole peaches, however, the yields of the lye peeled halved Elbertas were significantly lower (table 11). The yield of the steam peeled fruit showed a negative correlation with the wilt loss (figure IV).

The calculated and actual yield for the steam peeled Elbertas were similar but the actual yields obtained for the lye peeled fruit was significantly lower than the calculated yields.

Total Loss. The total loss includes the wilt loss, pit and skin loss and the difference between ingoing and drained weights of the canned peaches.

The total loss for the Hale Havens ranged from 20.2 to 40.3 per cent of the original weight with an average of 26.33 per cent and 17.8 to 34.0 per cent with an average of 23.68 per cent respectively for the steam and lye peeled fruit (table 7). No significant difference was found between the two methods of peeling but each showed a high positive correlation between total loss and wilt loss (figures V and VI).

The total loss for the Elbertas, based on the actual yield, ranged from 18.6 to 37.8 per cent with an average of 25.5 per cent for the steam peeled halves; 13.0 to 30.7 per cent with a mean of 21.7 per cent for the lye peeled whole peaches and; 23.7 to 34.4 per cent with an average of 28.4 per cent for the lye peeled halved peaches (table 8). The calculated total loss was significantly lower than the actual total loss for the lye peeled halved peaches. The actual

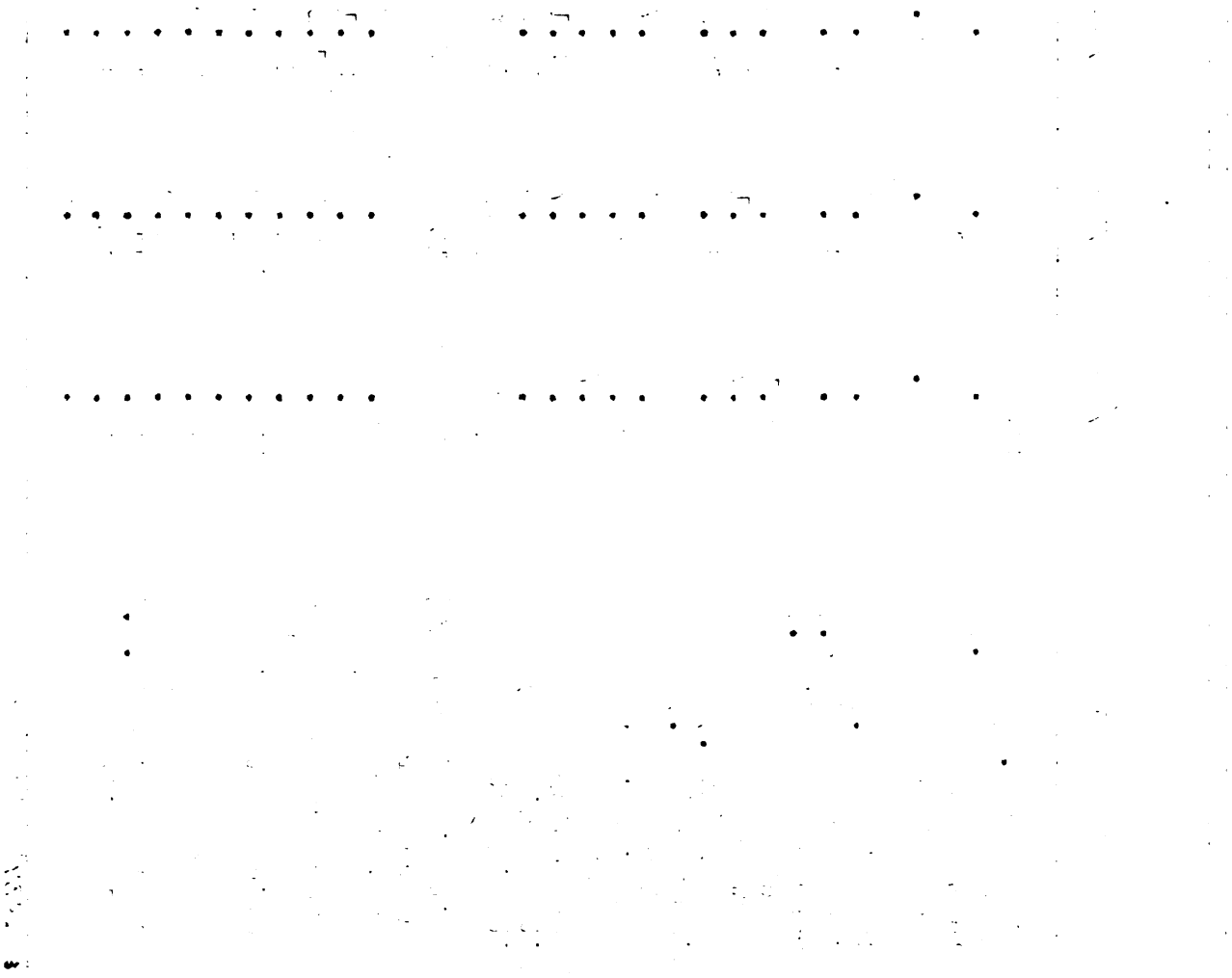
total loss for the lye peeled halved peaches was significantly higher than the actual total losses for the steam peeled halved and lye peeled whole peaches (table 11).

Net Loss. The net loss includes the wilt loss and the difference between the ingoing and drained weights of the canned peaches.

The net loss for the Hale Havens ranged from 8.3 to 28.0 per cent of the original flesh weight with a mean of 13.78 per cent for the steam peeled whole peaches and 7.0 and 26.6 per cent with an average of 13.81 per cent for the lye peeled halves. No significant difference was found between the steam peeled halved and lye peeled whole peaches. A high positive correlation was found between the wilt loss and the net loss in each case.

The net loss for the Elbertas ranged from 8.5 to 30.2 per cent of the original flesh weight, with a mean of 12.95 per cent for the steam peeled halves; 7.1 to 18.6 per cent with an average of 11.57 per cent for the lye peeled whole and 5.8 to 15.9 per cent with an average of 10.46 per cent for the lye peeled halved peaches (table 9). No significant difference was found between the three types of peeling operations, and there was a high correlation between the wilt loss and the net loss for the three methods (figures VII and VIII).

Drained Weight. The drained weight average for the steam peeled halves was 13.49 and 14.45 ounces for the lye



Table

HARVEST MATURITY MEASUREMENTS
Hale

Measurement	Date of 8/18	8/20	8/22
Weight (gms.)	114	93	99
Ground Color (Avg.)	2.5	2.7	2.7
Blush (per cent)	55	41	58
Shade of blush	Med.	Med.	Med.
Ring size (in.)	2.5	2.4	2.4
Circumference (cms.)	19.5	17.9	18.5
Pressure test (lbs.)			
Back	12.1	13.5	9.3
Suture	11.7	14.1	10.9
Cheek (Avg.)	13.7	15.8	12.2
Diameter (cms.)			
Suture	5.9	5.4	5.7
Longitudinal	4.9	4.6	4.8
Cheek	5.7	5.4	5.6
Flesh color	3.4	2.7	3.1
Pit browning (%)	0.5	1.0	19.5
Pit pigment	Very Light	Very Light	Light
Split pits (per cent)	30	10	5
Tenderometer			
Halves Not Peeled	60.5	56.0	55.3
Peeled	36.6	40.0	34.1
Quarters Not Peeled	86.9	77.9	61.2
Peeled	53.3	51.2	48.8
Slices Not Peeled	117.6	122.0	96.0
Peeled	86.6	91.0	80.0
Cubes Not Peeled	114.3	99.0	96.0
Peeled	84.3	77.0	68.3
Soluble Solids (R.I.)	11.6	11.9	12.9
Total Solids	13.4	13.8	13.8
pH	3.58	3.6	3.6

a .437" plunger
b Flesh too soft
c Small green peaches
d Green peaches
e Riper peaches

1

BASED ON AVERAGE OF TWENTY FRUITS
Haven

Harvest					
8/24	8/26	8/26[e]	8/20[c]	8/26[d]	8/22[e]
140	130	148	67	95	133
3.6	3.7	4.1	2.6	3.0	3.6
79	78	93	24	46	76
Med.to dark	Med.to dark	Dark	Light to Med.	Med.	Med.to dark
2.7	2.7	2.7	2.1	2.4	2.7
20.6	20.7	20.9	16.3	18.0	20.5
5.3	6.1[a]	2.0[a]	14.9	10.1	9.8
5.8	5.6[a]	1.5[a]	14.1	9.3	7.6
7.8	7.8[a]	2.0[a]	16.7	12.4	11.9
6.2	6.3	6.4	5.0	5.5	6.1
5.1	5.0	5.2	4.2	4.6	5.1
6.3	6.2	6.4	4.8	5.5	6.2
4.1	3.9	4.2	2.7	3.3	3.7
15.0	39	66	0	37	22
Light to Med.	Light to Med.	Light to Med.	Very Light	Light	Light
10	5	35	0	5	30
42.8	35.2	32.8	---	39.0	39.7
32.8	7.5	9.7	---	9.7	16.2
62.9	35.6	24.3	---	57.7	48.3
37.7	6.0	11.9[b]	---	8.2	16.5
79.0	51.8	----[b]	---	63.5	62.0
62.8	37.3	15.0[b]	---	53.0	47.0
65.0	34.8	-----[b]	---	57.5	54.5
57.3	34.3	12.8	---	41.3	37.8
12.2	11.4	11.7	---	12.1	12.5
12.6	13.2	12.9	---	----	13.2
3.6	3.7	3.8	---	3.65	3.62

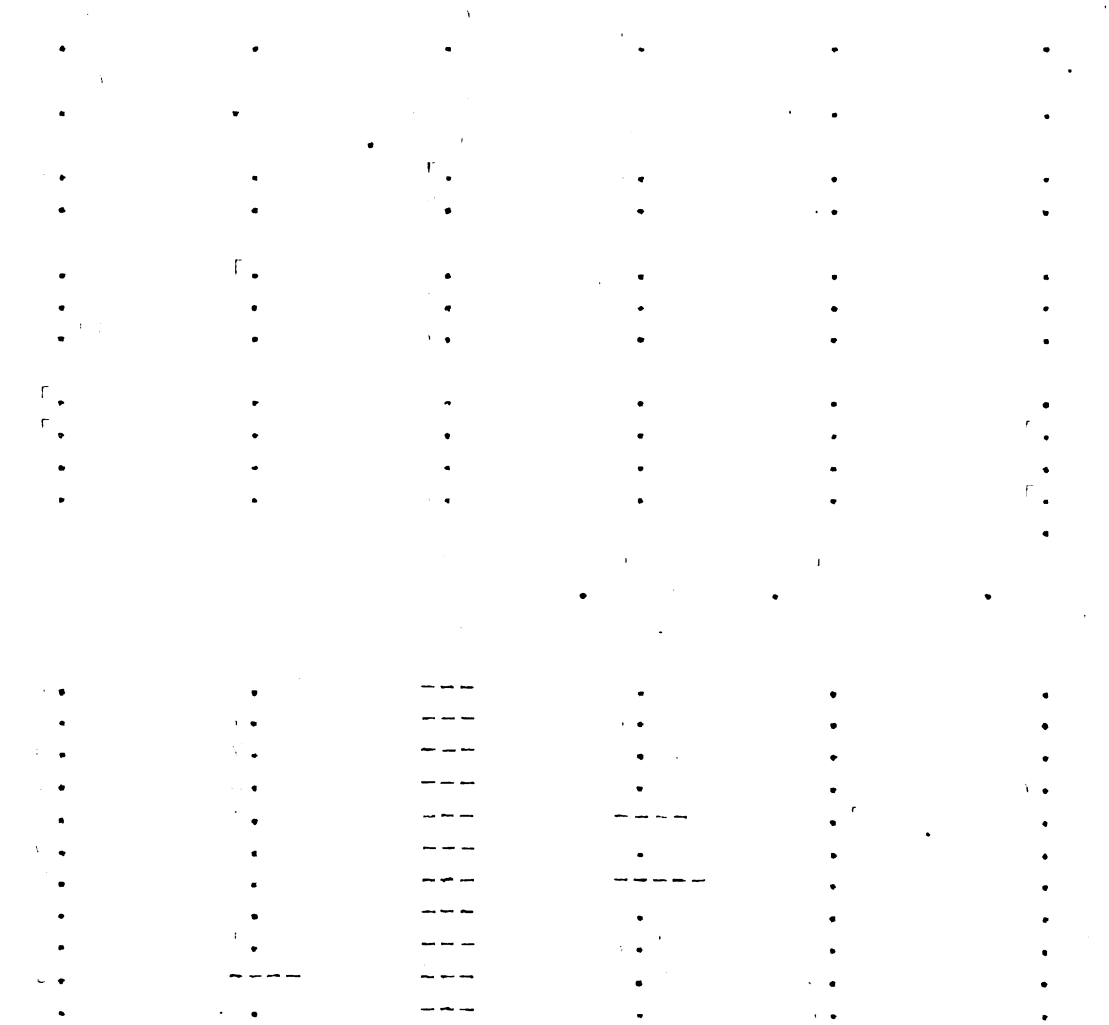


Table 2

Coefficient of Variation of Measurements
of Peach Maturity - Per Cent

Hale Havens

Harvest Date	8/18	8/20	8/22	8/22	8/24	8/26	8/26	8/26
Days to ripen	12	10	6	3	8	6	3	2
Weight (gms.)	14.74	22.63	16.69	11.78	14.13	7.48	14.40	13.90
Ground Color	22.68	18.49	20.99	11.35	10.87	15.11	11.63	5.18
Ring size	5.35	8.00	6.77	6.27	5.49	4.83	5.49	5.05
Circumference(cms.)	6.30	7.78	5.18	4.37	4.54	2.57	9.73	5.16
Pressure test (lbs.)								
Back	21.65	19.08	40.54	59.10	80.11	65.74	75.50	59.00
Suture	30.41	12.87	41.47	45.68	86.27	77.83	96.30	74.08
Cheek 1	13.75	13.00	34.18	54.52	69.39	68.27	77.33	88.14
Cheek 2	15.50	14.92	28.97	51.22	48.58	70.22	84.97	71.35
Flesh color	23.13	24.56	15.09	11.15	6.94	18.04	10.00	4.83
Diameter (cms.)								
Suture	5.85	8.93	5.26	4.20	7.21	3.69	8.36	5.24
Longitudinal	6.13	9.34	4.11	6.51	6.70	5.79	9.34	7.24
Cheek	7.20	9.14	5.81	6.13	6.77	3.42	6.19	5.96
Tenderometer								
Halves, Not Peeled	13.06	15.56	12.04	16.38	15.47	19.50	18.37	19.97
Peeled	10.44	9.27	15.63	66.89	42.80	62.25	38.26	26.68
Quarters, Not Peeled	15.42	18.69	16.94	26.52	28.58	23.76	15.14	19.87
Peeled	12.49	18.61	13.03	72.9	42.30	57.80	33.33	37.01
Slices, Not Peeled	1.34	2.22	2.70	1.53	5.88	2.80	2.08	---
Peeled	1.60	5.46	4.89	2.12	14.11	14.28	17.59	3.84
Cubes, Not Peeled	2.05	5.23	7.26	4.84	4.06	2.22	5.98	---
Peeled	0.96	2.11	7.69	25.43	5.40	1.00	15.26	3.72

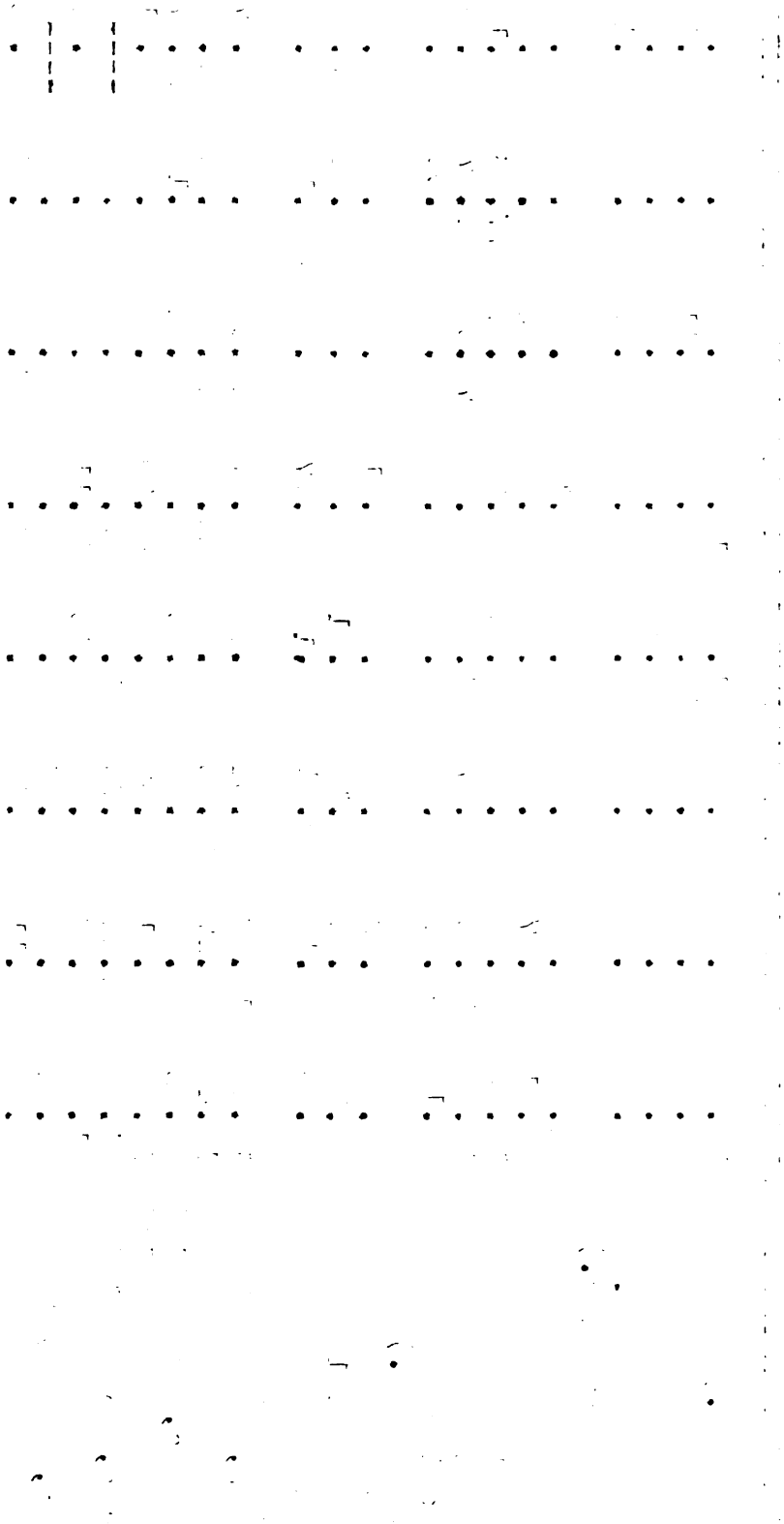


Table 3

Correlation Coefficients Between Pressure Tests and Tenderometer Values

Hale Haven

Pressure Test 0.312 inches	Tenderometer							
	Halves		Quarters		Slices		Cubes	
	Not Peeled	Peeled	Not Peeled	Peeled	Not Peeled	Peeled	Not Peeled	Peeled
Back	.878	.921	.760	.929	.989	.992	.872	.916
Cheek (avg.)	.852	.908	.663	.914	.961	.991	.839	.862
Suture	.848	.872	.602	.915	.932	.986	.833	.831
Pressure Test 0.437 inches								
Back	.958	.471	.964	.126	----	.986	----	.956
Cheek (avg.)	.951	.434	.959	.081	----	.993	----	.971
Suture	.906	.297	.982	.057	----	.997	----	.972

Table

HARVEST MATURITY MEASUREMENTS
Elberta

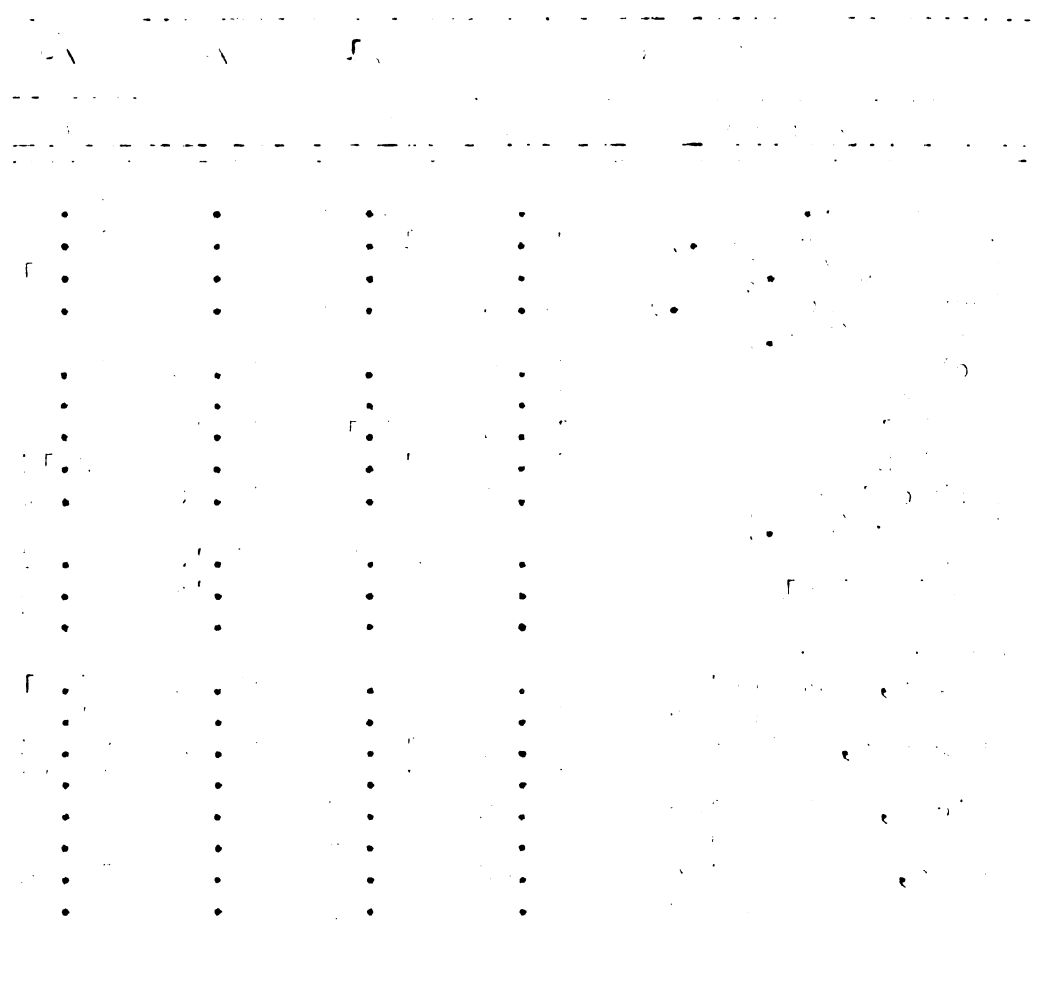
Measurement	Date of 8/30	9/1	9/3	9/5
Weight (gms.)	90	110	139	120
Ground Color (Avg.)	2.3	2.7	2.7	3.3
Blush (per cent)	12	21	26	35
Shade of blush	Light	Light	Light Med.	Light Med.
Ring size (in.)	2.3	2.5	2.7	2.6
Circumference (cms.)	17.3	18.6	20.2	19.4
Pressure test (lbs.)				
Back	23.1	14.7	14.4	12.1
Suture	21.6	15.0	14.4	12.8
Cheek (Avg.)	22.7	16.6	16.0	14.9
Diameter (cms.)				
Suture	5.4	5.9	6.3	6.0
Longitudinal	4.8	5.2	5.4	5.2
Cheek	5.1	5.5	6.2	5.8
Flesh color	2.5	2.8	3.0	3.6
Pit browning (per cent)	0	4.0	7.5	7.5
Pit pigment	Very Light	Light	Light	Light Med.
Split pits (per cent)	0	5	5	15
Tenderometer				
Halves Not Peeled	74	63	71	59
Peeled	54	44	47	42
Quarters Not Peeled	100	90	97	84
Peeled	61	55	74	52
Slices Not Peeled	165	110	117	90
Peeled	133	111	89	77
Cubes Not Peeled	136	108	94	87
Peeled	109	85	87	84
Soluble Solids (R.I.)	13.5	13.1	13.6	12.4
Total Solids	15.5	13.9	13.9	13.7
pH	3.6	3.6	3.5	3.5

a .437" plunger
b Riper peaches
c Green peaches

4

BASED ON AVERAGE OF TWENTY FRUITS

Harvest					
9/7	9/9	9/11	9/7[b]	9/11[c]	9/11[b]
133	172	165	159	152	163
3.6	3.4	3.6	3.8	2.8	3.8
32	25	40	42	30	64
Med.	Med.	Med. Dark	Med. Dark	Light Med.	Med. Dark
2.7	2.8	2.9	2.8	2.8	2.9
20.0	21.4	21.7	21.0	20.8	21.5
11.3	8.8	4.1[a]	6.7[a]	15.1[a]	2.5[a]
11.2	8.4	2.6[a]	4.4[a]	12.2[a]	1.7[a]
14.4	12.8	6.4[a]	7.5[a]	20.3[a]	4.0[a]
6.3	6.7	5.7	6.5	6.5	6.7
5.5	5.8	5.7	5.6	5.6	5.7
5.9	6.4	6.6	6.3	6.3	6.4
3.6	3.6	4.0	4.0	3.3	3.9
18	33	63	34	37	31
Med.	Med.	Med.	Med.	Light	Med.
5	5	15	20	5	10
48	46	31	35	38	30
21	26	9	10	24	7
63	56	28	34	46	23
43	42	10	10	22	7
85	74	41	---	50	---
64	66	23	19	48	12
79	60	31	---	52	27
63	53	16	14	43	11
12.4	12.2	12.9	12.7	12.6	12.8
13.0	13.8	14.2	14.8	13.1	14.4
3.6	3.55	3.6	3.6	3.6	3.6



Table

COEFFICIENT OF VARIATION OF MEASUREMENTS
Elbertas

Harvest Date	8/30	9/1	9/3	9/5
Days to Ripen	17	13	9	7
Weight (gms.)	37.00	10.68	13.28	10.58
Ground Color (avg.)	17.00	16.00	16.47	14.00
Ring size (in.)	5.70	3.95	5.32	4.71
Circumference (cms.)	3.07	3.60	4.60	3.79
Pressure (lbs.)				
Back	12.90	8.53	11.22	15.50
Suture	13.62	8.34	8.95	9.50
Cheek 1	11.97	7.17	14.12	12.48
Cheek 2	10.00	10.00	10.00	9.14
Flesh color	16.83	15.45	11.26	15.26
Diameter (cms.)				
Suture	5.87	3.34	5.15	3.34
Longitudinal	6.20	4.63	4.14	2.93
Cheek	5.68	4.24	5.67	4.06
Tenderometer				
Halves, Not Peeled	8.20	26.00	13.72	24.41
Peeled	13.89	20.09	12.19	31.28
Quarters, Not Peeled	20.54	15.48	13.53	24.63
Peeled	15.38	12.58	15.39	18.19
Slices, Not Peeled	5.02	9.54	13.69	5.55
Peeled	8.40	7.64	5.84	7.90
Cubes, Not Peeled	2.43	3.02	11.56	10.34
Peeled	4.30	2.70	8.00	4.45

5

OF PEACH MATURITY - PER CENT

9/7	9/7	9/9	9/11	9/11	9/11
8	2	6	6	5	3
12.96	11.72	19.54	12.80	13.07	13.92
13.70	11.60	15.02	16.20	12.70	13.53
4.90	3.99	4.87	3.55	5.23	10.27
4.51	3.54	4.61	4.04	4.72	5.30
26.42	59.91	27.63	37.88	47.70	49.20
26.65	47.94	41.69	61.87	83.26	68.42
25.87	71.52	23.80	40.01	58.11	59.88
21.06	61.53	29.85	32.81	63.06	77.68
13.21	7.84	10.14	12.90	9.34	10.37
5.10	4.92	7.56	5.08	5.87	5.09
4.62	4.96	5.46	4.98	5.44	5.44
4.05	5.46	5.34	5.24	7.61	8.05
23.27	23.60	39.16	22.50	20.90	15.26
66.55	62.40	59.50	41.58	94.41	19.61
23.11	16.84	27.99	25.22	20.51	26.63
60.86	41.04	70.16	60.36	87.30	14.92
20.1	---	6.05	5.33	4.22	---
6.25	22.65	14.43	3.60	3.57	6.85
5.18	---	6.93	3.24	2.65	11.27
7.66	7.00	6.52	13.36	6.25	5.22

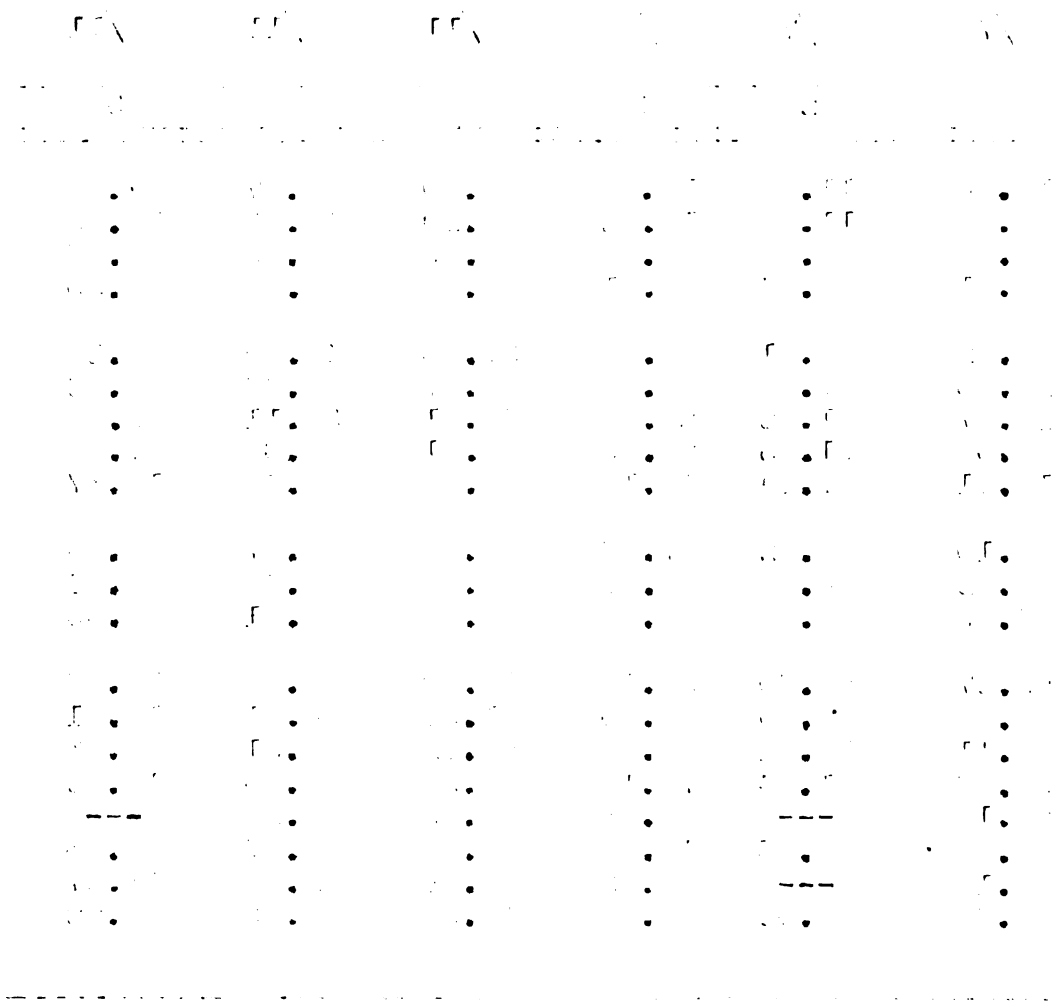


Table 6

Correlation Coefficients Between Pressure Tests and Tenderometer Values

Elberta

Pressure Test 0.312 inches	Tenderometer							
	Halves		Quarters		Slices		Cubes	
	Not Peeled	Peeled	Not Peeled	Peeled	Not Peeled	Peeled	Not Peeled	Peeled
Back	.847	.806	.799	.569	.991	.932	.971	.923
Cheek (avg.)	.809	.778	.760	.510	.981	.926	.963	.904
Suture	.882	.848	.855	.609	.981	.938	.968	.959

Table

Effect of Harvest Maturity on Wilt Loss, Net Loss, Drained

Hale

Days to Ripen	Wilt Loss %	Pit Loss		Skin Loss		Yield	
		Steam Peeled %	Lye[e] Peeled %	Steam Peeled %	Lye[e] Peeled %	Steam Peeled %	Lye[e] Peeled %
12	13.3	8.0	9.6	6.2	2.1	85.8	88.3
10[a]	10.8	7.9	8.9	4.4	3.1	87.7	88.0
8	10.6	7.7	7.2	5.1	1.6	87.2	91.2
6	6.4	8.3	7.0	5.7	6.2	86.0	86.8
5	7.4	6.6	6.6	6.6	3.6	86.8	89.8
4	5.6	6.5	9.6	5.6	5.1	87.9	85.3
3	4.2	6.2	7.1	6.6	3.8	87.2	89.1
2	1.3	6.3	9.3	11.0	3.0	82.7	87.7
1	1.2	6.3	7.3	8.0	9.0	85.7	83.7
11[b]	33.5	11.2	11.2	7.3	0.0	81.5	88.8
9[c]	22.8[d] 15.7	9.3	10.2	6.6	0.7	84.1	89.1
10[a]	16.3	9.3	11.1	4.7	0.0	86.0	88.9
9[b]	30.0	10.5	11.0	7.6	0.0	81.9	89.0
9[b]	29.1	11.2	14.1	8.9	4.7	79.9	81.2
6[a]	8.4	7.1	6.9	4.2	1.1	88.7	92.0

a Green Fruit.
b Ripened at 85° F., moderate humidity.
c Ripened at 85° F., high humidity.
d Wilt loss on lye peeled peaches is 15.7.
e Lye peeled whole peaches.

7

Pit Loss, Skin Loss, Yield, Total Loss, Weight and Flavor Score

Haven

Total Loss		Net Loss		Drained Weight		Flavor Score	
Steam Peeled %	Lye Peeled %	Steam Peeled %	Lye Peeled %	Steam Peeled oz.	Lye Peeled oz.	Steam Peeled avg.	Lye Peeled avg.
27.4	24.1	15.4	14.0	14.3	14.4	1.77	2.33
22.5	22.9	11.5	12.0	14.4	14.3	2.88	3.00
22.7	19.9	11.3	12.0	14.4	14.3	3.22	3.33
22.3	22.9	9.2	10.5	14.1	13.9	4.22	3.88
21.7	20.9	9.5	11.5	14.2	13.9	4.44	4.33
19.8	20.9	8.4	7.0	14.1	14.3	4.22	4.44
20.6	18.1	8.3	8.2	13.9	14.0	4.11	4.00
26.0	20.3	8.9	10.8	13.4	13.5	3.55	3.67
24.3	26.9	10.2	10.9	13.2	13.1	3.33	3.22
40.3	34.0	28.0	26.6	15.3	15.5	2.00	1.78
31.1	21.4	18.7	12.2	15.0	15.0	2.00	1.67
27.3	22.8	15.6	19.1	14.6	14.9	2.67	2.67
34.4	31.5	21.7	23.8	15.7	15.4	1.55	2.00
34.4	31.5	20.2	18.1	15.8	16.1	1.67	1.67
20.2	17.8	9.8	10.5	14.3	14.1	3.89	4.00

Table

Effect of Harvest Maturity on Wilt

Elberta

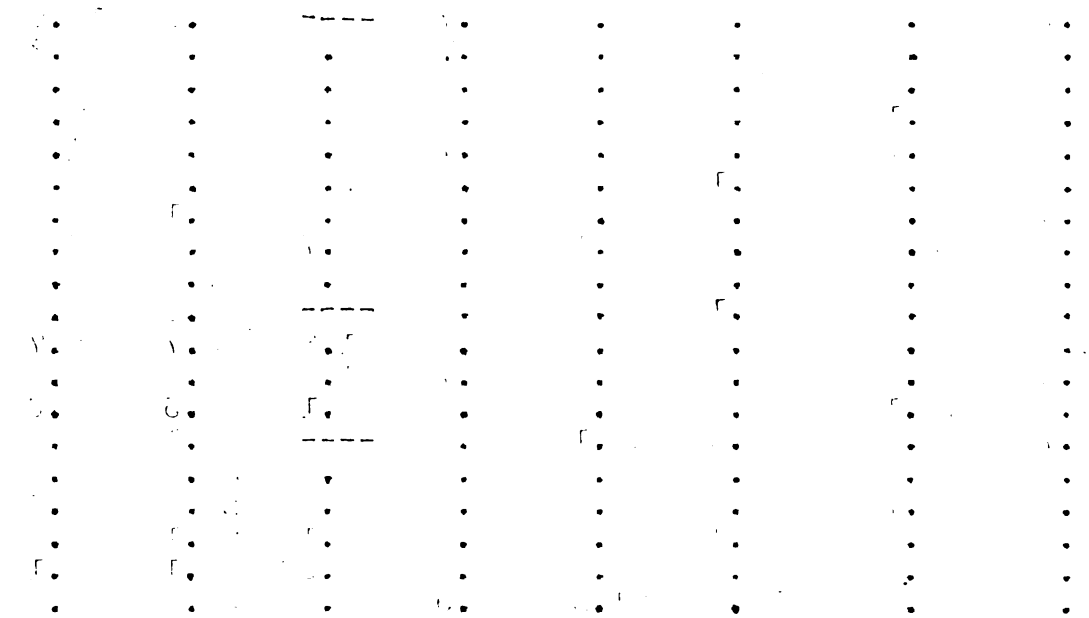
Days to Ripen	Wilt Loss %	Skin Loss: Steam Peeled Halves %	Skin Loss: Lye Peeled Whole %	Skin Loss: Lye Peeled Halves %	Yield: Steam Peeled Halves Act.[a] %	Yield: Steam Peeled Halves Calc.[b] %	Yield: Lye Peeled Whole Act.[a] %	Yield: Lye Peeled Whole Calc.[b] %
17	11.7	6.7	0.0	3.2	80.7	81.2	84.1	86.9
19	19.1	7.6	0.0	3.6	80.6	79.0	85.1	86.6
13	13.8	5.6	6.4	10.2	78.4	83.3	85.2	87.5
15	16.0	6.4	0.0	3.5	85.2	84.6	87.4	90.0
9	6.2	3.4	2.4	7.1	89.1	88.7	87.2	88.7
11	9.6	5.0	2.1	12.2	84.9	87.2	89.7	89.5
7	5.3	4.8	3.4	11.5	89.4	87.4	85.4	87.5
9	7.0	4.6	2.4	8.2	85.8	87.2	88.4	89.4
12	11.7	6.1	.9	3.2	85.0	83.8	88.3	88.9
8	6.3	5.1	3.1	7.8	89.0	87.8	87.3	89.6
9	8.5	5.0	2.4	7.0	87.9	87.7	88.0	89.8
10	9.9	5.7	1.9	7.6	86.1	86.8	80.8	90.9
2	2.3	6.7	4.0	10.5	87.6	86.9	85.0	88.6
6	5.0	5.4	4.0	8.9	83.2	88.5	87.5	89.7
8	7.5	6.1	2.7	9.1	87.3	87.6	89.7	90.8
6	6.2	4.2	3.5	9.5	88.9	89.4	89.0	88.8
8	7.6	5.3	1.9	7.0	88.1	88.0	89.3	90.6
3	4.6	5.6	5.4	14.2	86.4	88.3	84.0	87.1
5	0.6	6.1	6.8	15.3	90.2	87.6	84.9	86.4

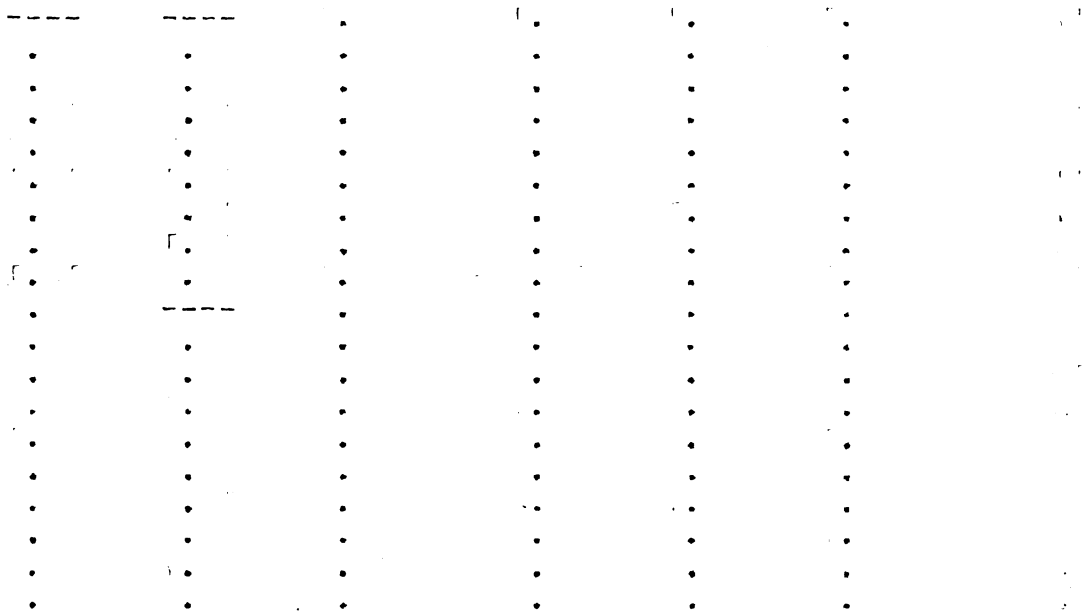
a Actual Yield
b Calculated Yield
c Actual Total Loss
d Calculated Total Loss

8

Loss, Skin Loss, Yield, and Total Loss

Yield		Total Loss					
Lye Peeled Halves		Steam Peeled Halves		Lye Peeled Whole		Lye Peeled Halves	
Act.[a] %	Calc.[b] %	Act.[c] %	Calc.[d] %	Act.[c] %	Calc.[d] %	Act.[c] %	Calc.[d] %
83.7	83.7	30.1	29.7	25.7	----	26.0	17.2
83.5	83.5	34.1	35.4	25.7	24.5	27.6	27.6
80.6	79.8	31.4	33.0	27.3	29.4	32.6	33.3
83.4	92.1	37.8	37.2	28.0	25.8	30.0	22.6
78.8	84.7	20.9	20.9	21.7	20.3	26.8	21.3
78.7	79.6	28.1	26.0	24.7	24.6	32.4	31.6
76.2	88.5	21.5	23.4	23.9	21.9	27.1	15.5
85.5	83.8	26.4	25.1	22.6	21.7	25.3	26.9
83.9	84.8	26.3	26.5	22.0	21.5	27.3	26.5
71.5	84.7	22.1	23.2	14.7	----	34.4	22.0
85.0	86.1	23.1	23.3	13.0	21.3	23.7	22.7
84.0	85.4	25.2	24.6	30.7	21.6	25.0	23.8
78.8	74.1	20.6	21.3	21.8	18.1	26.5	23.6
74.7	84.8	27.2	22.1	20.5	----	33.1	23.5
82.0	84.6	24.0	23.8	23.2	22.2	30.9	27.9
83.6	84.7	21.4	20.9	20.6	20.8	26.4	25.4
85.2	86.1	22.1	22.2	20.3	19.1	24.1	26.6
78.3	79.4	23.8	22.0	24.0	21.0	30.1	29.1
77.9	78.5	18.6	21.2	22.5	21.0	30.2	29.6





Table

Effect of Harvest Maturity on Pit Loss

Elberta

Days to Ripen	Pit Loss			Net Loss		
	Steam Peeled Halves %	Lye Peeled Whole %	Lye Peeled Halves %	Steam Peeled Halves %	Lye Peeled Whole %	Lye Peeled Halves %
17	12.1	13.1	13.1	13.1	----	----
19	13.4	13.4	12.9	18.4	13.6	14.3
13	11.5	10.3	10.0	30.2	18.6	15.9
15	10.3	10.0	7.9	24.3	17.4	16.0
9	7.4	8.9	8.2	10.3	9.7	6.9
11	7.8	8.4	8.2	14.4	15.1	13.1
7	7.8	9.1	7.9	11.5	11.8	4.6
9	8.2	8.2	8.0	13.2	10.1	11.8
12	10.1	10.2	12.0	13.1	11.7	13.1
8	7.1	7.3	7.5	11.8	----	6.7
9	7.3	7.8	6.9	12.0	12.0	9.9
10	7.5	7.2	7.0	12.7	13.4	10.6
2	6.4	7.4	7.7	8.5	7.1	5.8
6	6.1	6.3	6.3	10.5	8.6	9.1
8	6.3	6.5	6.3	11.6	13.7	13.7
6	6.4	7.7	5.8	11.0	10.3	11.0
8	6.7	7.5	6.9	11.1	10.4	10.4
3	6.1	7.5	6.4	10.8	8.7	9.4
5	6.3	6.8	6.2	8.9	7.5	8.1

a Input of 11 oz.

9

Net Loss, Drained Weight, and Flavor Score

Drained Weight			Flavor Score		
Steam Peeled Halves oz.	Lye Peeled Whole oz.	Lye Peeled Halves oz.	Steam Peeled Halves avg.	Lye Peeled Whole avg.	Lye Peeled Halves avg.
14.3	12.1[a]	12.1[a]	2.33	2.33	2.33
14.6	15.3	15.2	2.66	2.33	2.33
13.8	13.8	14.2	2.16	2.50	2.67
13.3	14.3	14.5	2.66	2.66	2.67
13.9	14.0	14.4	3.16	3.33	3.50
13.8	13.7	14.0	3.16	3.16	3.17
13.6	13.8	14.6	3.66	4.00	4.00
13.6	13.8	13.8	3.50	3.83	3.67
14.3	14.5	14.3	2.33	----	----
13.7	11.4[a]	14.3	3.50	3.33	3.33
14.0	14.0	14.3	3.66	3.83	3.67
14.1	14.0	14.4	3.33	3.33	3.50
13.6	13.8	14.0	3.67	3.50	3.50
13.6	10.6[a]	13.9	4.33	4.50	4.33
13.8	13.6	14.1	4.13	4.33	4.33
13.8	14.0	14.3	3.83	3.83	3.67
14.0	14.1	14.3	4.00	----	----
13.6	14.0	13.8	4.00	4.00	4.33
13.3	13.5	13.4	3.50	3.33	3.17

Table 10

Effect of Harvest Maturity on Hale Haven

Analysis of Variance and Correlation with Wilt Loss

	Steam Peeled Avg.	Lye Peeled Avg.	Sample F. Value	Predicted F. Value %	Predicted F. Value 1%	r Steam Peeled	r Lye Peeled
Pit Loss %	8.16	9.14	1.85	---	---	.960[b]	.771[b]
Skin Loss %	6.56	2.93	206.14**	4.20	7.64	.099	-.566[a]
Yield %	85.27	87.92	7.17**	4.20	7.64	-.710[b]	-.084
Total Loss %	26.33	23.68	1.65-	---	---	.900[b]	.806[b]
Net Loss %	13.78	13.81	0.00	---	---	.961[b]	.911[b]
Drained Weight oz.	13.49	14.45	0.91-	---	---	.523[a]	.930[b]

** Highly Significant Difference
a Significant
b Highly Significant

Table 11

Effect of Harvest Maturity on Elberta

	Steam Peeled		Lye Whole		Lye Halved		F.	L.S.D.	
	Calc.[a]	Act.[b]	Calc.[a]	Act.[b]	Calc.[a]	Act.[b]	Value	5%	1%
Total Loss %	25.35	25.50	21.77	23.85	25.35	28.47	4.83**	2.74	3.62
Net Loss %	---	12.95	---	11.57	---	10.46	2.16	---	---
Drained Weight oz.	---	13.82	---	14.02	---	14.22	3.19*	1.19	---
Pit Loss %	---	8.08	---	8.57	---	8.15	0.32	---	---
Skin Loss %	---	5.54	---	2.54	---	8.21	23.88**	1.63	2.17
Yield %	86.37	86.25	88.80	86.89	84.03	80.80	17.55**	1.85	2.45

a Calculated
b Actual
* Significant Difference
** Highly Significant Difference

Table 12

Correlation With Wilt Loss

Elberta

	Steam Peeled		Lye Peeled Whole		Lye Peeled Halves	
	Calc.[a]	Act.[b]	Calc.[a]	Act.[b]	Calc.[a]	Act.[b]
Total Loss %	.910**	.879**	.671**	.556*	.219	.044
Net Loss %	---	.864**	---	.783**	---	.743**
Drained Weight oz.	---	.569**	---	.673**	---	.642**
Pit Loss %	---	.868**	---	.767**	---	.698**
Skin Loss %	---	.236	---	-.865**	---	-.735**
Yield %	-.802*	-.732*	.030	.092	.306	.477*

a Calculated
b Actual
* Significant Correlation
** Highly Significant Correlation

Figure I

Hale Haven Peaches

Harvest Maturity

Regression Lines of Pit Loss on Wilt Loss

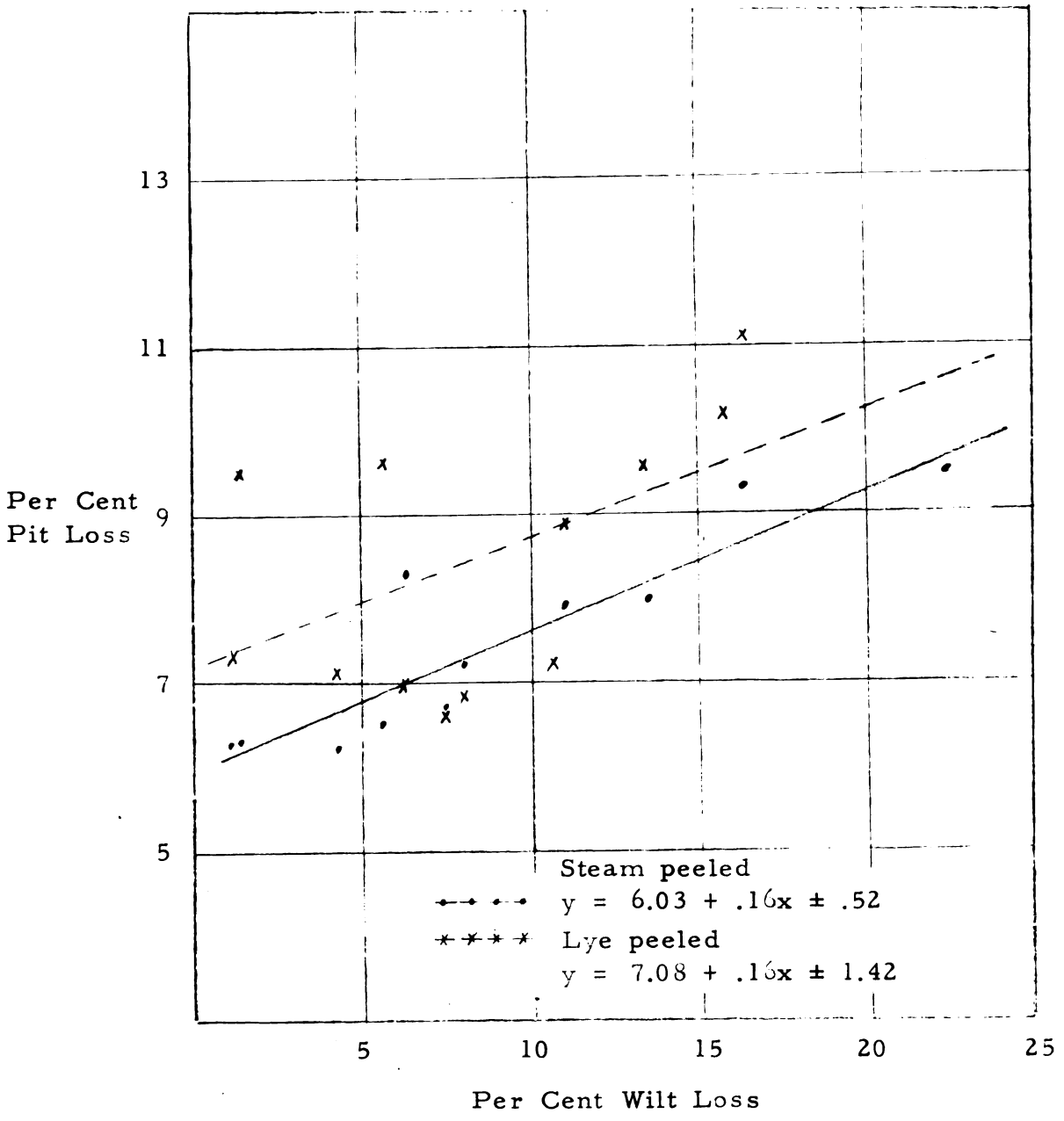


Figure II

Elberta Peaches

Regression Lines of Pit Loss on Wilt Loss

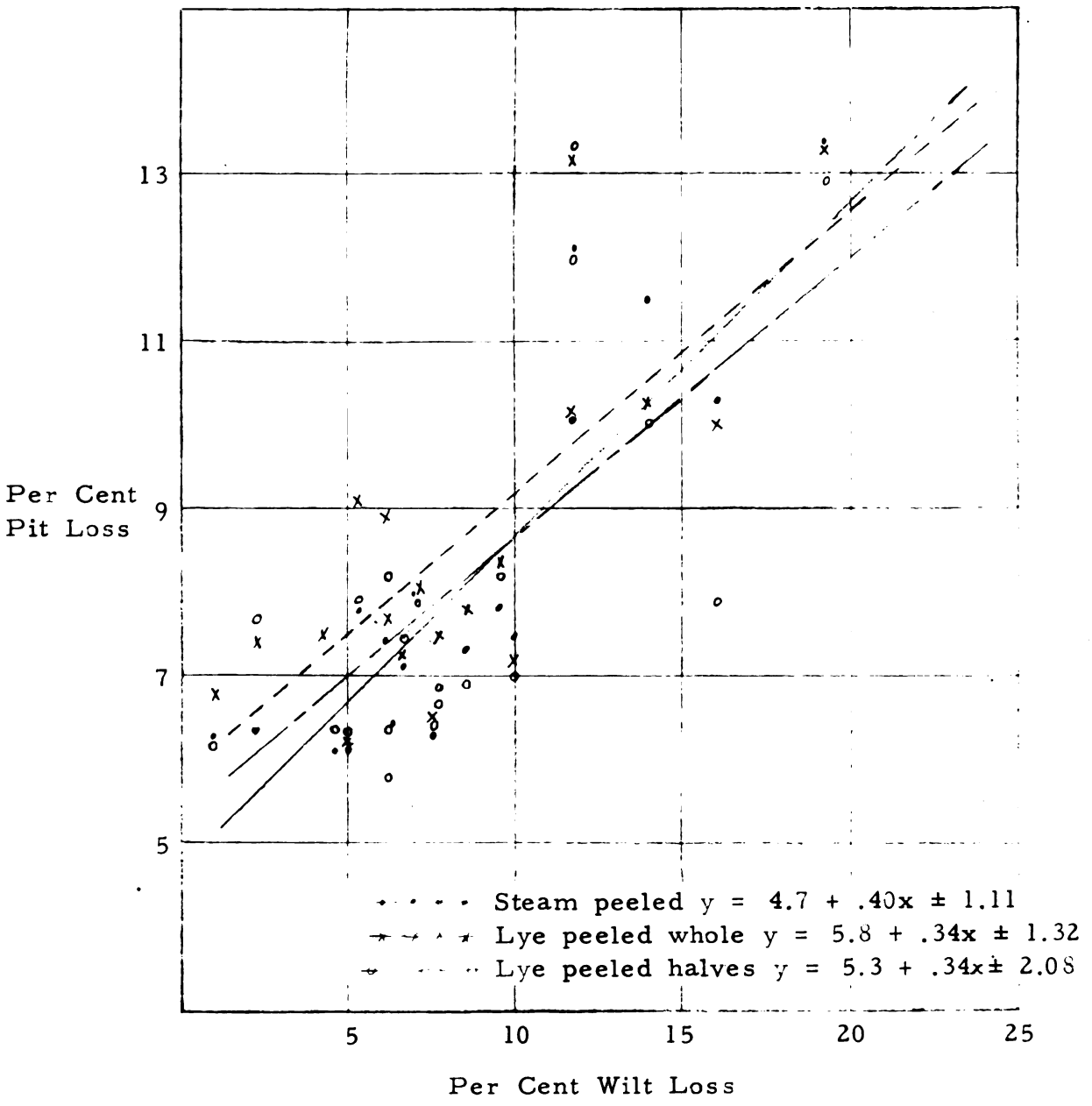


Figure III

Hale Haven - Elberta

Harvest Maturity

Regression Lines of Skin Loss on Wilt Loss
with Lye Peeled Method

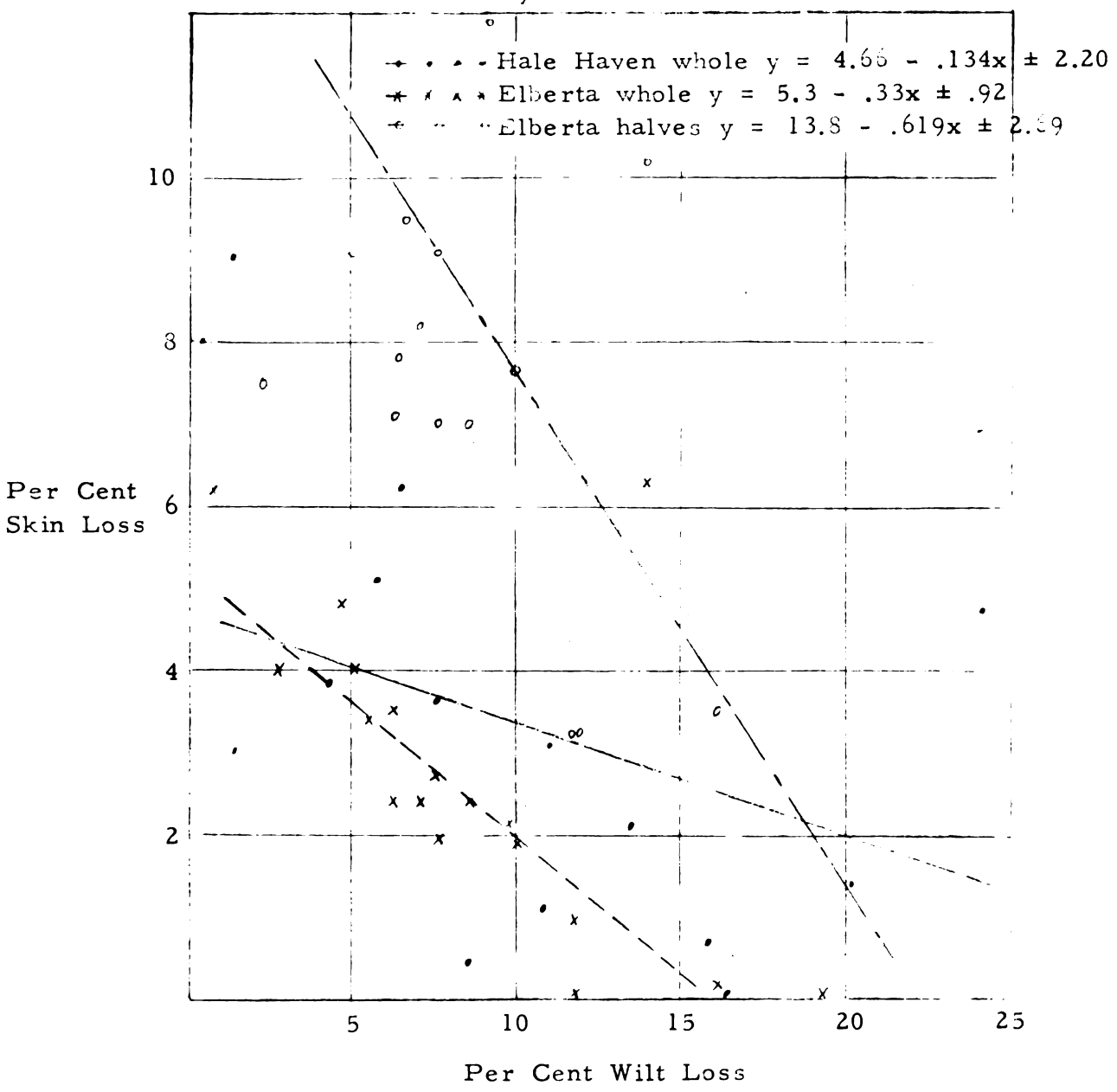


Figure IV

Hale Haven - Elberta

Harvest Maturity

Regression Lines of Yield on Wilt Loss

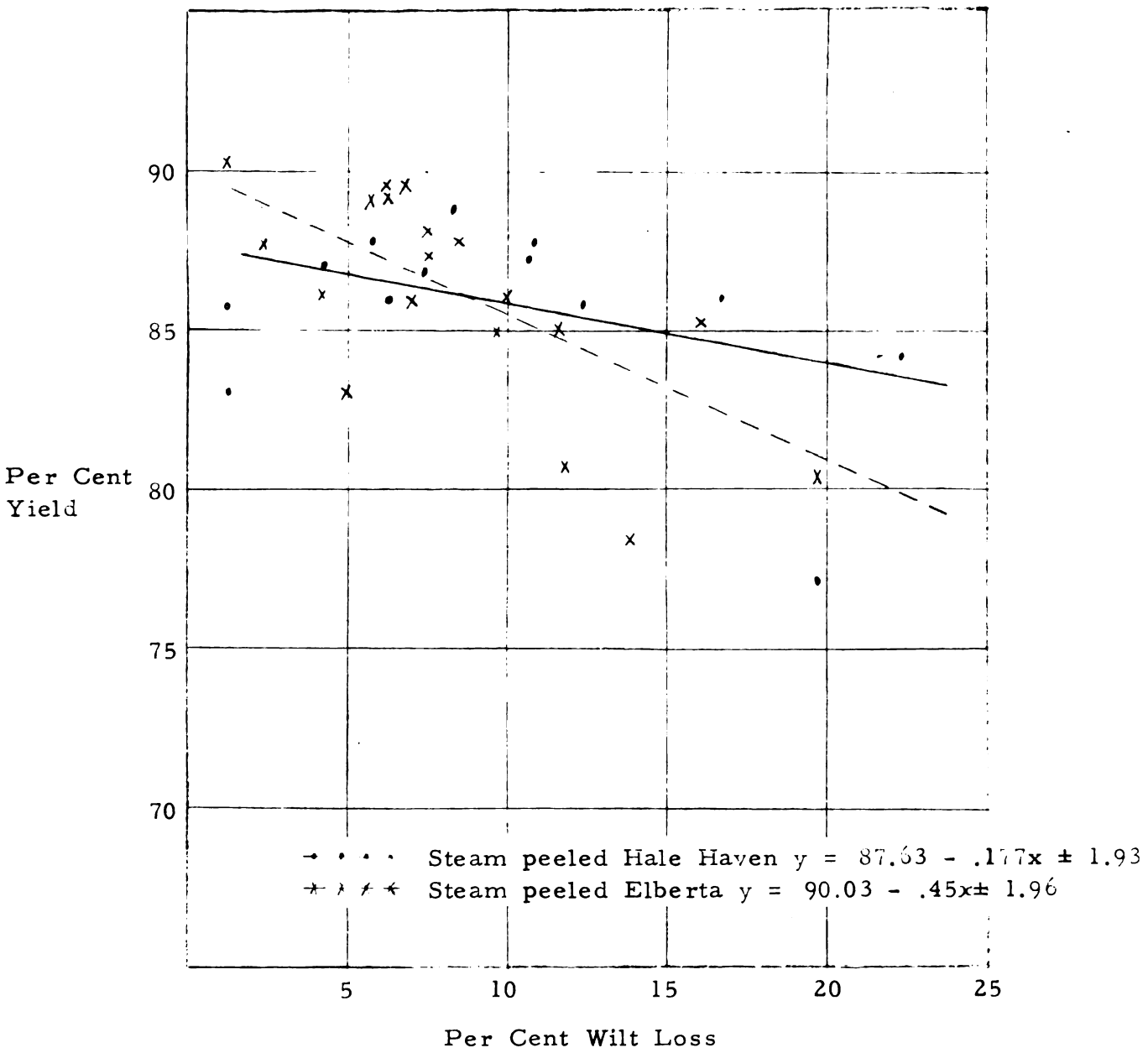


Figure V

Hale Haven

Harvest Maturity

Regression Lines of Total Loss on Wilt Loss

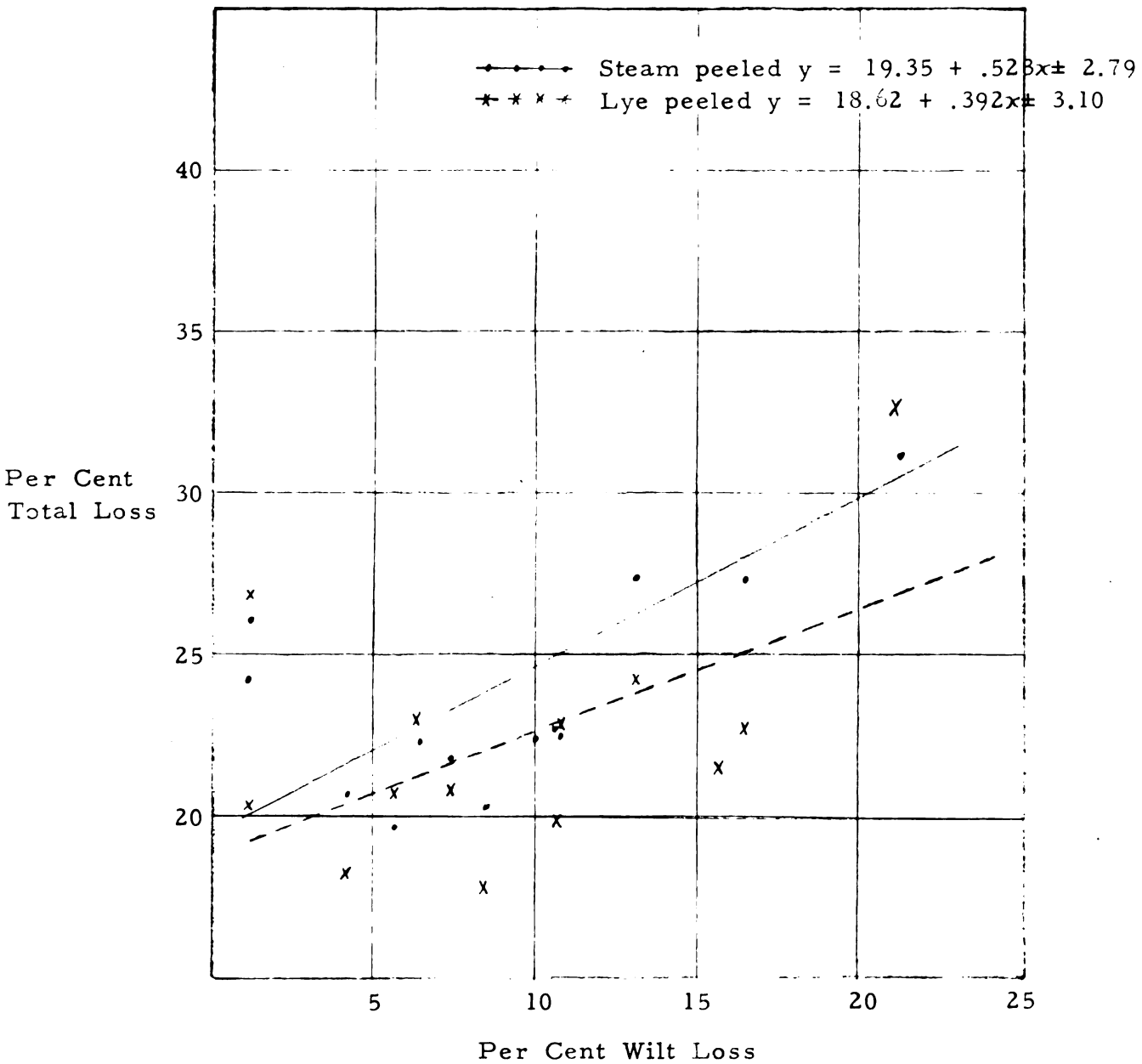


Figure VI

Elberta

Harvest Maturity

Regression Lines of Total Loss on Wilt Loss

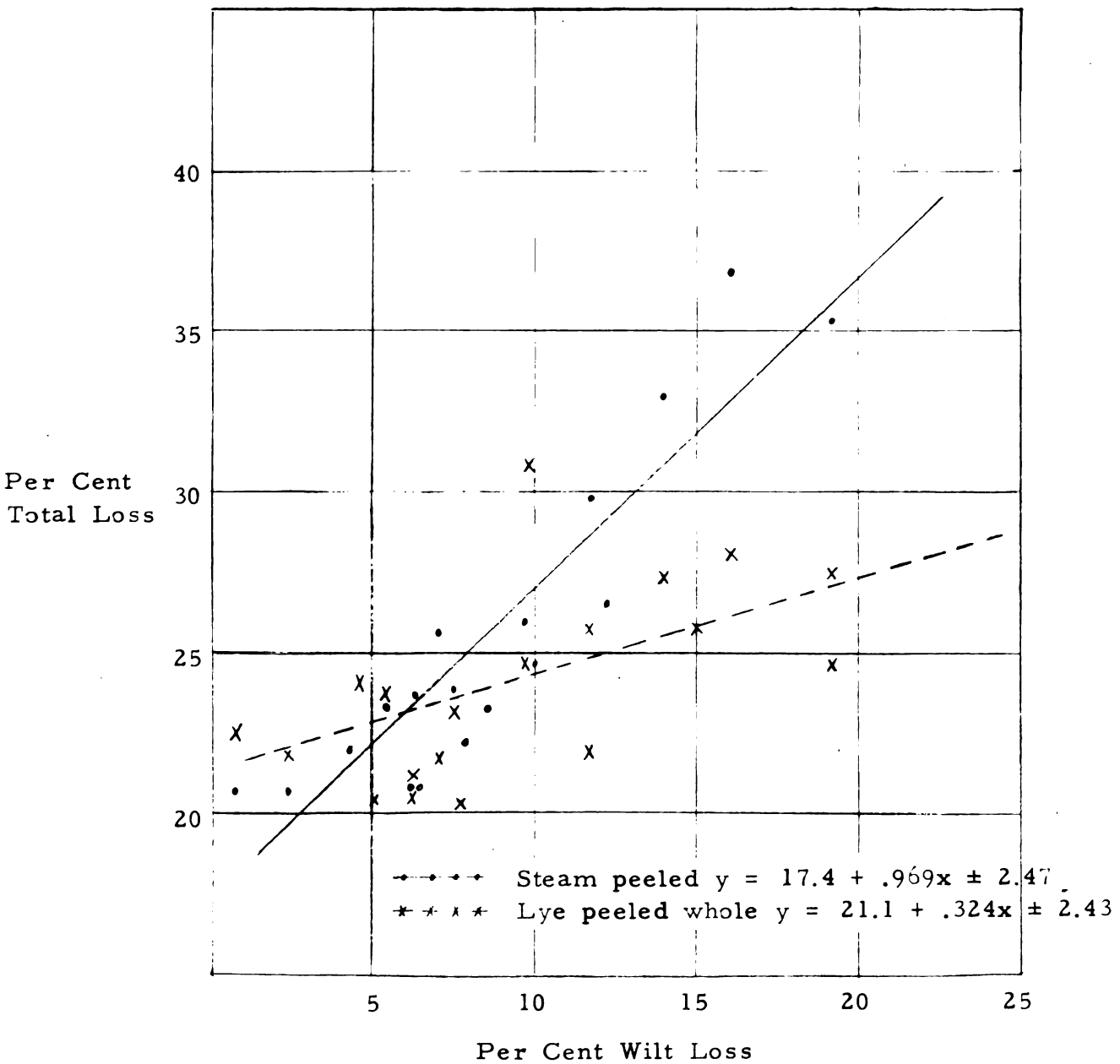


Figure VII

Hale Haven

Harvest Maturity

Regression Lines of Net Loss on Wilt Loss

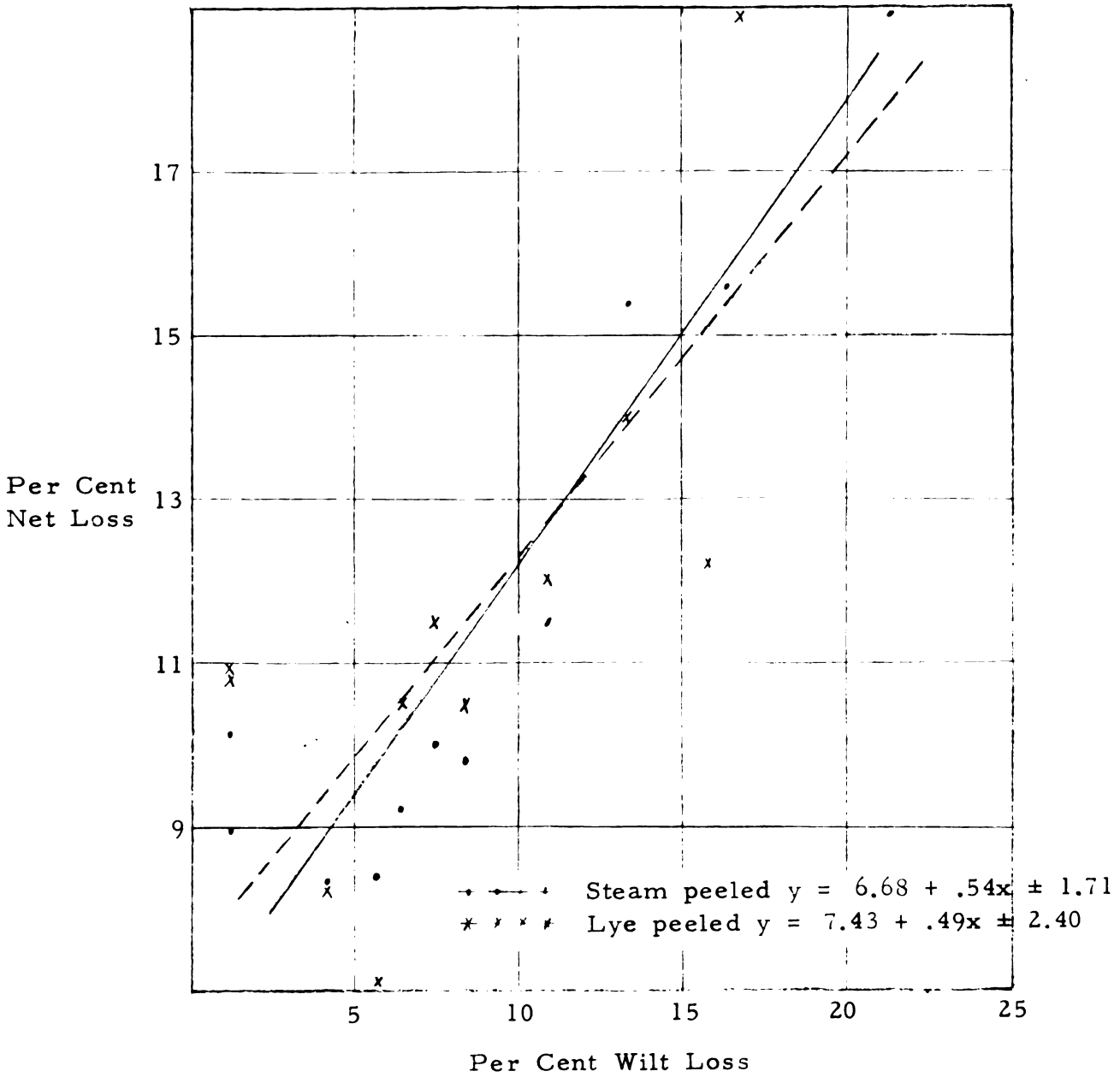


Figure VIII

Elberta

Harvest Maturity

Regression Lines of Net Loss on Wilt Loss

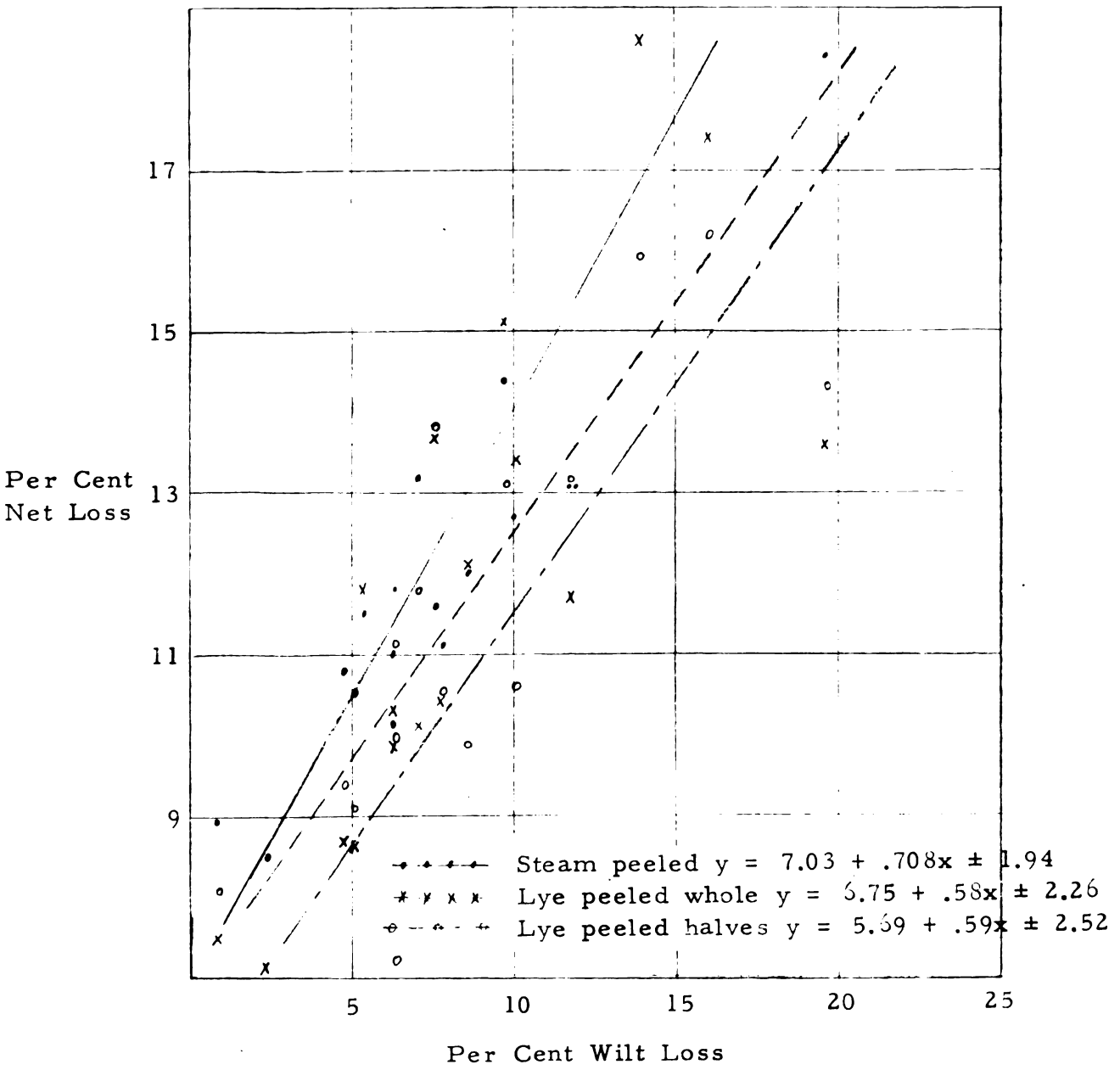


Figure IX

Hale Haven

Harvest Maturity

Regression Lines of Drained Weight on Wilt Loss

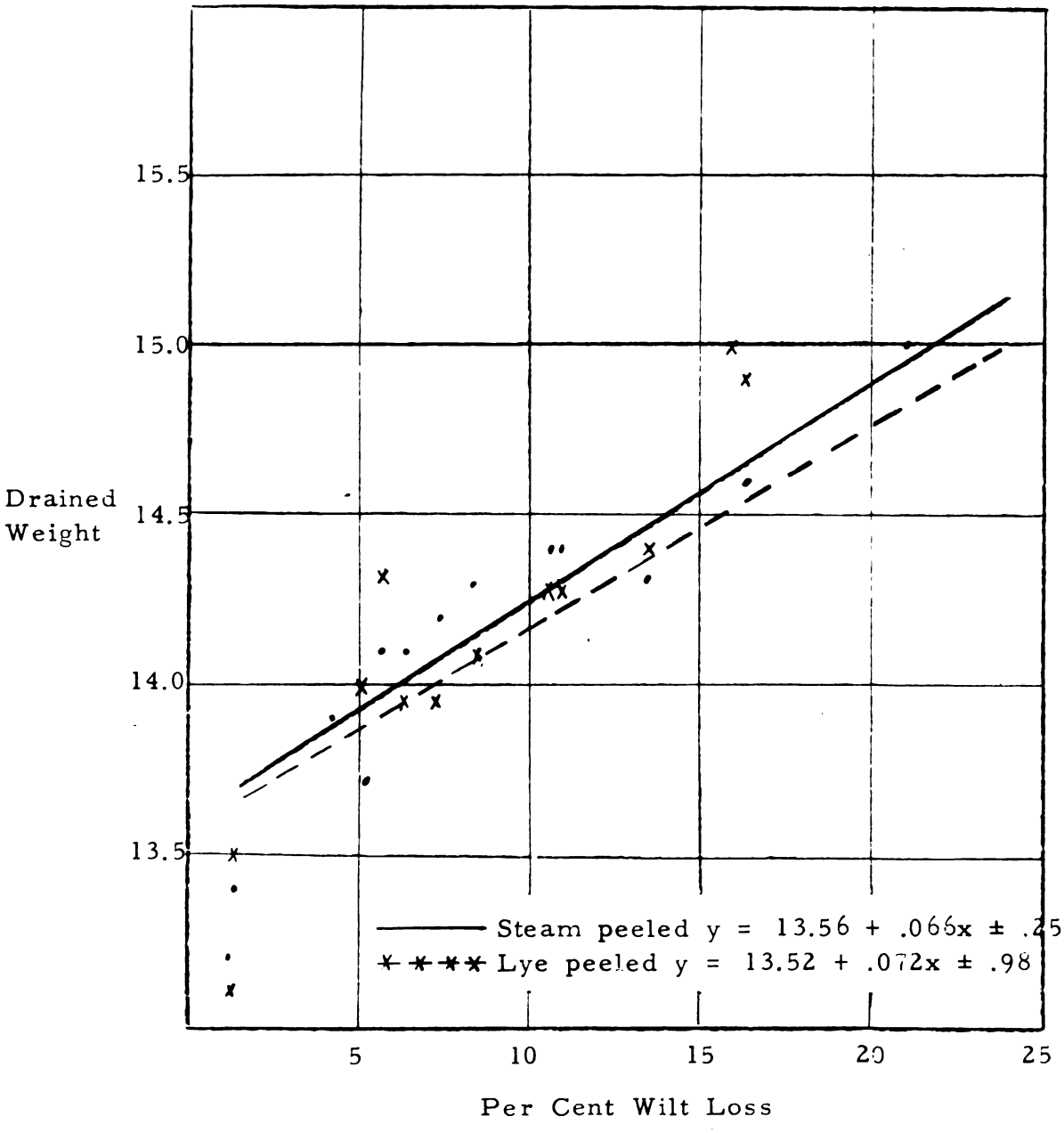
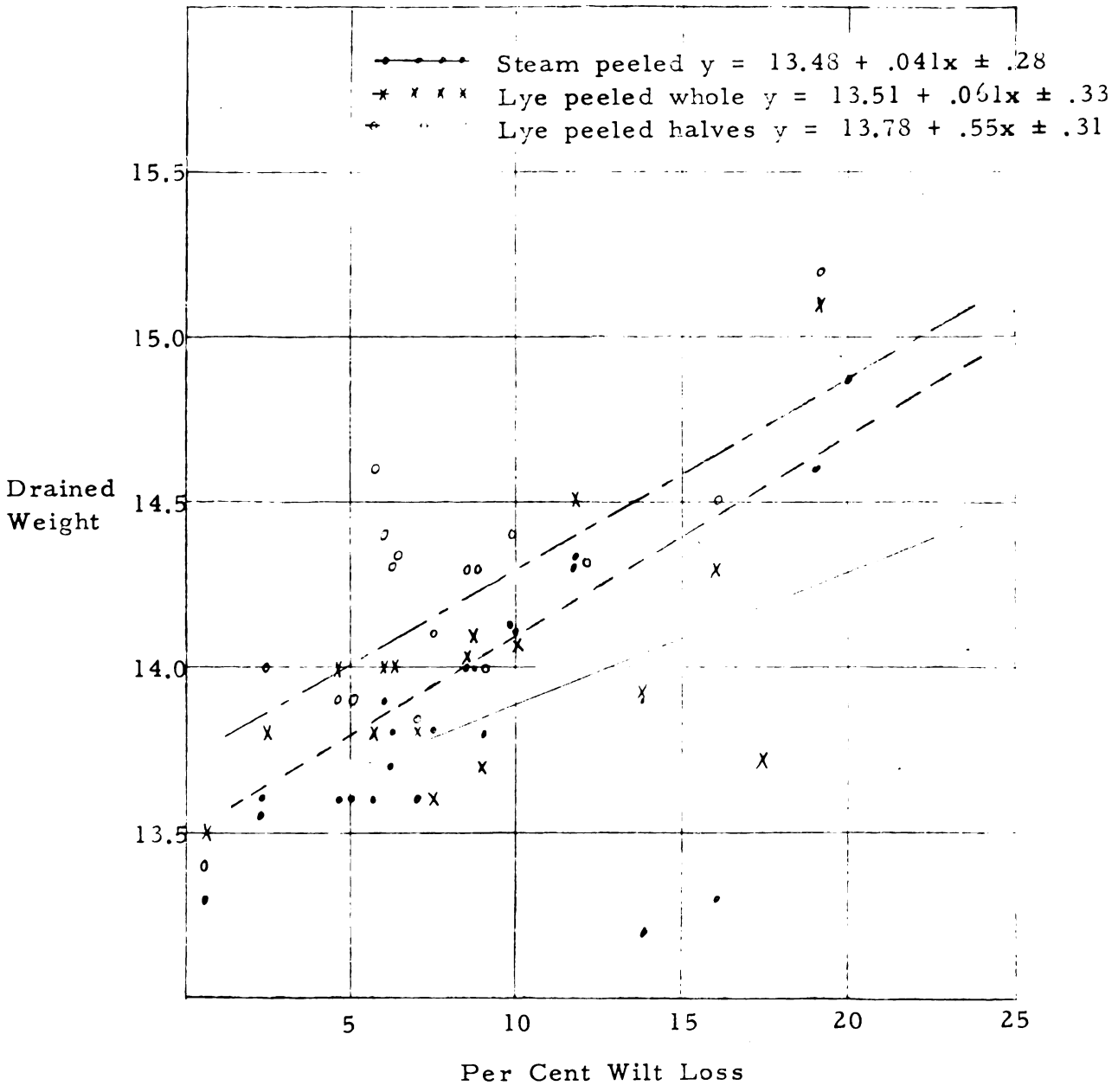


Figure X

Elberta

Harvest Maturity

Regression Lines of Drained Weight on Wilt Loss



peeled whole Hale Havens. No significant difference was noted in drained weights between the lye peeled and steam peeled Hale Havens. There was a highly significant correlation between the drained weight and the wilt loss of the steam peeled and lye peeled peaches.

The mean drained weight for the Elberta peaches was 13.82, 14.02, and 14.22 per cent respectively for the steam peeled halved, lye peeled whole, and the lye peeled halved peaches. There was no significant difference between the three methods of peeling. A medium correlation was found between the three methods of preparation and wilt loss (figure IX and X).

Product Evaluation. The flavor scores based on a possible five points for an excellent product ranged from 1.55 to 4.44 for both the steam and lye peeled Hale Havens. The flavor scores for the Elbertas ranged from 2.16 to 4.33, 2.33 to 4.50, and 2.33 to 4.33 for the steam peeled halved, lye peeled whole, and lye peeled halved peaches respectively. From tables 7 and 9 it is noted that the score for flavor in all cases increased as the time needed for ripening decreased and that the best flavored peaches were those requiring three to six days to ripen. Peaches requiring less than three days to ripen were lacking in peach flavor and were given scores similar to those requiring seven to nine days to ripen.

The fruit which was slightly green and difficult to steam peel, peeled easily with the hot lye solution. These latter peaches when evaluated, however, were less acceptable than the riper fruit due to a greenish cast on the surface of the fruit.

Ripening Study

The fruit descriptions for the representative samples of peaches from each harvest lot are summarized in table 12. The temperature and humidity ranges in the ripening cabinets are given in table 13.

Hale Havens only were used for the steam and lye peeling studies with the various ripening conditions.

The greener fruit ripened for six days at 75° F. and 85° F. steam peeled readily. The peaches ripened at 95° F., although having a deep yellow color, did not peel readily. The riper fruit steam peeled readily after three days at 75° F. and 85° F., moderate humidity, while the fruit ripened at 85° F. high humidity and 95° F. moderate humidity, required five days and that at 95° F. high humidity required seven days. The skin on the highly blushed portion of the peaches was tender and fragmented in peeling. No trouble was encountered in the lye peeling operation.

The skin loss of the lye peeled fruit was significantly lower than that of the steam peeled peaches and the losses from the fruit ripened six to ten days were less than that of the fruit ripened three to seven days. The pit loss of the steam peeled peaches ripened for three to seven days was

significantly lower than that of the lye peeled fruit. No significant differences were found between the pit losses of the steam peeled fruit ripened six to ten days and the lye peeled peaches ripened three to seven or six to ten days. No significant correlation was found between wilt loss and pit loss for the steam and lye peeled peaches ripened from three to seven days or the lye peeled peaches ripened for six to ten days.

The calculated yields of the peaches ripened three to seven days and six to ten days were 86.08 and 87.06 per cent respectively for steam peeling and 89.28 and 89.54 per cent respectively for lye peeling. The yields of the lye peeled peaches were higher than those steam peeled. There were no differences between the respective ripening times.

No significant differences were found between the total losses of the various treatments. However, the peaches ripened three to seven days tended to have less total loss than those ripened six to ten days. This was particularly true for the lye peeled fruit. The net loss showed similar results to that obtained for total loss. The net loss of the lye peeled fruit ripened for three to seven days was significantly lower than that of the fruit ripened for six to ten days.

A high positive correlation was found between the wilt losses and drained weights of the steam peeled peaches and for the lye peeled peaches ripened for six to ten days when

Table 13

HARVEST MATURITY MEASUREMENTS

Hale Haven

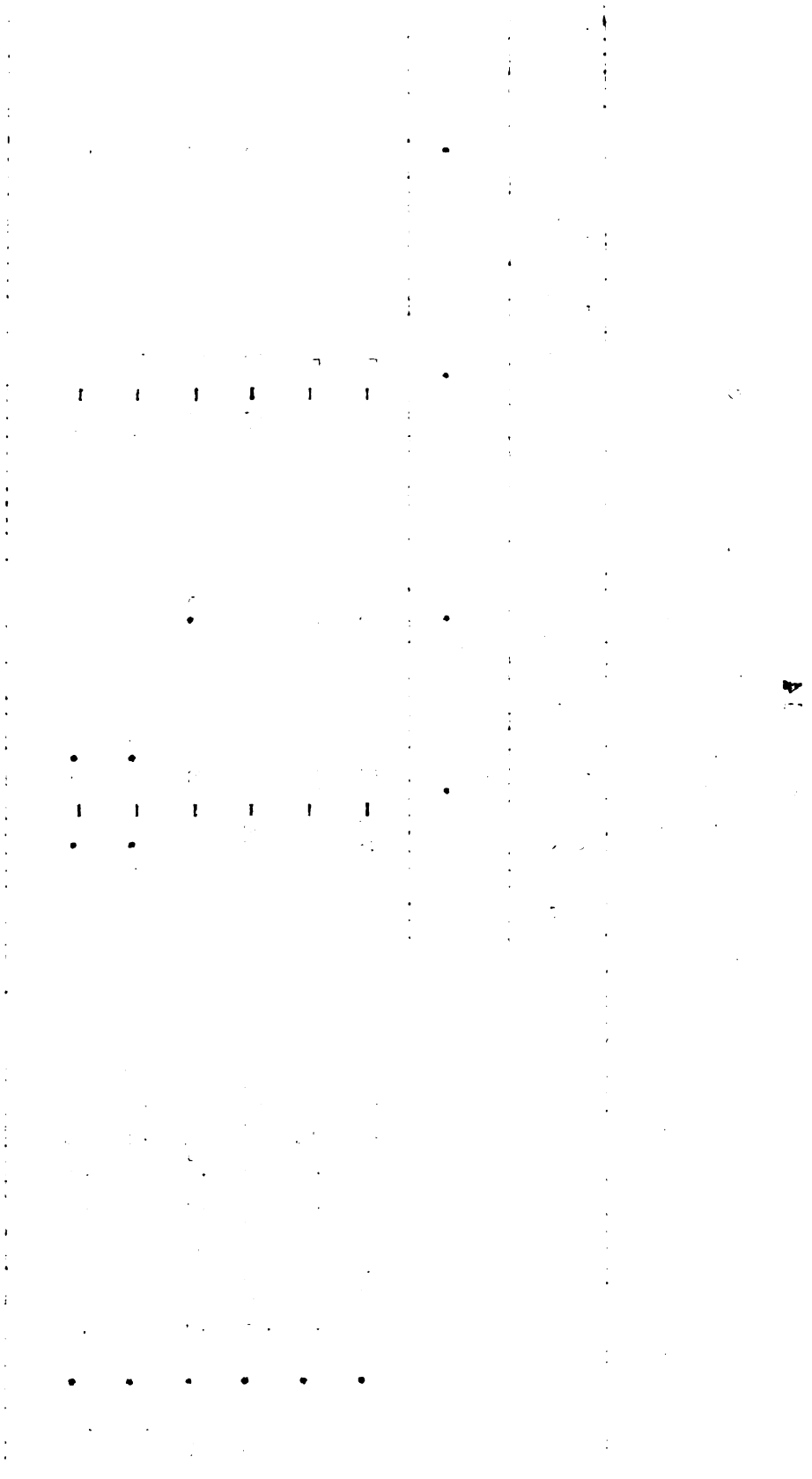
Measurement	6-10 Days	3-7 Days
Weight (gms.)	99.0	130.0
Ground Color (avg.)	2.7	3.7
Blush (per cent)	58.0	78.0
Shade of blush	Med.	Med.-Dark
Ring size (ins.)	2.4	2.7
Circumference (cms.)	18.5	20.7
Pressure test (lbs.)		
Back	9.3	6.1[a]
Suture	10.9	5.6[a]
Cheek	12.2	7.8[a]
Diameter (cms.)		
Suture	5.7	6.3
Longitudinal	4.8	5.0
Cheek	5.6	6.2
Flesh color	3.1	3.9
Pit browning (per cent)	19.5	39.0
Pit pigment	Light	Light-Med.
Split pits (per cent)	5.0	5.0
Tenderometer		
Halves, Not Peeled	55.3	35.2
Peeled	34.1	7.5
Quarters, Not Peeled	61.2	35.6
Peeled	48.8	6.0
Slices, Not Peeled	96.0	51.8
Peeled	80.0	37.3
Cubes, Not Peeled	96.0	34.8
Peeled	68.3	34.3
Soluble solids (R.I.)	12.9	11.4
Total solids (per cent)	13.8	13.2
pH	3.62	3.7

a .437inch. plunger

Table 14

Temperature and Humidity Ranges for Each Ripening Method

	Actual Temperature For Each Ripening Condition		Actual Relative Humidity For Each Ripening Method	
	Range °F.	Average °F.	Range °F.	Average °F.
75° F. Moderate Humidity	74-76	75	69-81	76
75° F. High Humidity	74-76	75	79-91	85
85° F. Moderate Humidity	84-88	85	47-76	60
85° F. High Humidity	85-92	85.5	67-89	84
95° F. Moderate Humidity	94.5-95.5	95	50-70	62
95° F. High Humidity	94.5-95.5	95	77-98	85



Table

Effect of Ripening Conditions on Wilt
Total Loss, Net Loss, Drained

Hale

(Three and Five

Ripening Conditions	Ripened	Wilt Loss %	Pit Loss Steam %	Pit Loss Lye %	Skin Loss Steam %	Skin Loss Lye %	Yield Steam %	Yield Lye %
75 M.H.*	3	5.5	6.3	7.0	4.7	3.5	89.0	89.5
	5	10.0	6.6	7.4	3.9	3.6	89.5	89.0
75 H.H.**	3	4.2	6.3	7.6	4.3	3.8	89.4	88.6
	5	5.9	6.4	7.1	4.1	3.5	89.5	89.4
85 M.H.	3	10.6	6.6	8.6	6.8	1.4	86.6	90.0
	5	13.7	6.8	6.5	3.7	3.2	89.5	90.3
85 H.H.	3	6.1	6.3	6.4	10.8	2.7	82.9	90.9
95 M.H.	3	12.5	6.5	7.8	11.9	6.3	81.6	85.9
	5	19.1	6.9	8.4	6.0	1.5	87.1	90.1
95 H.H.	3	8.6	5.9	7.1	12.0	3.1	82.1	89.8
	5	11.6	5.7	8.4	14.6	3.0	79.7	88.6

* Moderate Humidity
** High Humidity

15

Loss, Pit Loss, Skin Loss, Yield,
Weight, and Flavor Score

Haven

Days to Ripen)

Total Loss		Net Loss		Drained Weight		Flavor Score	
Steam %	Lye %	Steam %	Lye %	Steam oz.	Lye oz.	Steam avg.	Lye avg.
23.5	20.2	13.1	10.3	13.4	13.8	4.16	4.00
22.8	20.6	13.5	10.7	14.0	14.4	4.66	4.00
19.3	19.9	9.0	9.0	13.8	13.8	4.00	4.16
20.6	15.9	10.7	5.9	13.8	14.5	4.16	4.33
26.7	20.9	14.7	12.0	13.9	14.3	3.66	3.67
24.3	20.0	15.1	11.6	14.4	14.8	3.83	3.83
27.0	20.8	10.9	12.3	13.8	13.6	3.83	4.00
32.7	28.3	16.6	16.0	13.9	14.0	3.00	3.16
30.2	27.8	19.8	19.8	14.4	14.4	3.50	3.67
36.7	26.2	20.3	16.9	12.8	13.3	2.83	2.33
39.1	28.6	21.2	18.5	13.1	13.5	3.66	3.00

Table

Effect of Ripening Conditions on Wilt
Total Loss, Net Loss, Drained

Hale

(Six to Ten

Ripening Conditions	Ripened	Wilt Loss %	Pit Loss Steam %	Pit Loss Lye %	Skin Loss Steam %	Skin Loss Lye %	Yield Steam %	Yield Lye %
75 M.H.*	6	11.7	7.9	7.4	4.0	1.1	88.1	91.5
	8	16.4	7.0	8.3	3.6	0.9	89.4	90.8
	10	19.0	7.8	7.8	3.5	0	88.7	92.2
75 H.H.**	6	8.5	7.7	8.1	4.2	1.9	88.1	90.0
	8	10.7	7.4	8.7	4.5	2.5	88.1	88.8
	10	12.4	7.0	7.2	4.4	3.1	88.6	89.7
85 M.H.	8	26.7	8.3	9.2	4.5	0.8	87.2	90.0
	10	28.7	9.2	10.6	4.3	0	86.5	89.4
85 H.H.	6	10.6	6.7	7.9	6.0	2.1	87.3	90.0
	8	14.1	7.4	7.8	4.7	10.4	87.9	81.8
	10	19.7	7.8	7.1	4.0	2.1	88.2	90.8
95 M.H.	8	28.5	8.6	7.3	6.4	1.6	85.0	91.1
95 H.H.	6	11.9	7.5	7.9	10.3	2.4	82.2	89.7
	8	24.6	7.5	8.5	6.4	1.6	86.1	89.9
	10	22.4	8.0	9.8	7.8	2.7	84.2	87.5

* Moderate Humidity
** High Humidity

16

Loss, Pit Loss, Skin Loss, Yield,
Weight, and Flavor Score

Haven

Days to Ripen)

Total Loss		Net Loss		Drained Weight		Flavor Score	
Steam %	Lye %	Steam %	Lye %	Steam oz.	Lye oz.	Steam avg.	Lye avg.
23.6	20.6	12.1	13.1	14.3	14.3	3.83	3.67
23.2	24.1	14.3	16.4	14.8	14.5	3.50	3.50
26.1	27.7	16.9	20.4	14.8	14.3	2.16	2.33
22.8	20.4	11.9	11.3	14.0	14.1	3.50	3.50
22.0	21.4	11.4	11.4	14.4	14.4	3.33	3.00
22.4	24.2	12.4	15.2	14.5	14.1	2.50	2.33
30.6	28.5	21.2	21.2	15.3	15.3	1.83	2.00
32.1	30.1	22.5	22.5	15.4	15.4	1.83	1.33
24.8	23.6	13.3	14.7	19.1	13.9	3.50	3.33
23.8	31.8	13.4	16.2	14.6	14.1	2.33	3.16
27.1	29.7	17.6	21.8	14.8	14.1	1.67	1.67
34.4	30.1	23.7	23.7	15.2	15.2	1.67	1.83
35.9	28.6	20.2	19.5	13.3	13.4	1.67	1.83
41.3	36.4	30.8	28.7	13.6	13.9	1.83	2.00
38.2	39.7	25.8	30.0	14.0	13.4	1.33	1.33

Table

Effect of Ripening

Analysis of Variance and

	Steam Peeled		Lye Peeled	
	3-7 Days	6-10 Days	3-7 Days	6-10 Days
Pit Loss %	6.39	7.72	7.48	8.24
Skin Loss %	7.52	5.24	3.23	2.21
Yield (Calculated) %	86.08	87.06	89.28	89.54
Total Loss %	27.53	28.55	22.65	27.79
Net Loss %	14.99	17.83	13.00	19.07
Drained Weight oz.	13.75	14.47	14.03	14.29
Drained Weight oz. (Omitting 95 High Humidity)	13.93	14.68	14.17	14.47

* Significant Difference
** Highly Significant Difference
a Significant
b Highly Significant

17

Conditions on Hale Haven

Correlation with Wilt Loss

F	L.S.D.		r Steam Peeled		r Lye Peeled	
Value	5%	1%	3-7 Days	6-10 Days	3-7 Days	6-10 Days
13.56*	.58	.78	.471	.739 [b]	.465	.463
10.51**	2.00	2.67	.037	.114	-.306	-.228
5.81**	1.96	2.61	-.166	-.285	-.042	.120
2.54	---	---	.435	.663 [b]	.619 [a]	.665 [b]
3.44*	4.12	---	.703 [a]	.805 [b]	.713 [b]	.805 [b]
---	---	---	.462	.546	.411	.572 [b]
5.84**	.38	.51	.834 [b]	.891 [b]	.570	.807 [b]

the 95° F. high humidity samples were omitted. The drained weights of the peaches ripened at 95° F. high humidity were significantly lower than the peaches of the other ripening conditions.

Apparently the tissue of the fruit ripened at this temperature and humidity was altered, and its ability to recover from shrinkage in the canning process was impaired.

The peaches ripened for the shortest period of time, especially those at high temperatures, were light yellow with an occasional greenish cast. The peaches ripened for longer periods showed full yellow and those ripened at 85° F. and 95° F. as the ripening time increased, developed a deeper yellow color tending towards orange-yellow. The greatest increase in depth of color was at 95° F. with moderate humidity. The pit cavities of the fruit ripened at 85° F. and 95° F. for the longer time developed an orange-red color and this color tended to penetrate into the flesh. This was most pronounced in those fruits ripened under moderate humidities.

Flavor. The peaches ripened at 75° F. attained a better flavor than those ripened at higher temperatures. The best flavor was attained in the fruit ripened for five days with moderate humidity. The quality of the peaches ripened at 85° F. for the shorter periods were almost as good as those ripened at 75° F., while those fruits ripened at 95° F. with low humidity were lowest in flavor.

The greener fruit ripened at 95° F. required eight days of ripening before the development of their best flavor, whereas identical fruit required six days at 75° F. and 85° F. temperatures to develop an optimum flavor.

A rapid deterioration was noted after the fruit reached its maximum flavor within the ripening conditions. This was most pronounced in the greener fruit and in the fruit ripened at the high temperatures, and was characterized by a decrease in the intensity of the peach flavor and tendency for the development of a musty or stale flavor.

These results indicate that the lower ripening temperatures are more desirable when peaches are held after the stage of proper processing ripeness is reached.

The flavor of the steam peeled peaches was similar to that of the lye peeled peaches in all of the ripening conditions.

Color. The characteristic flesh color of the canned products obtained under the different ripening conditions showed that the higher ripening temperatures yielded products of a deeper yellow color than did the lower termperatures and the yellow color deepened with the longer ripening periods. A deep yellow to orange color was characteristic of the peaches ripened at 95° F. and medium to deep yellow for the fruits ripened at 85° F. and 75° F.

The ripening conditions also had a pronounced effect on the color of the pit cavity. The higher ripening temperatures and longer ripening periods increased the intensity of the red color, and in the fruit ripened at 95° F. the red pigment diffused into the surrounding tissue. There was also some internal breakdown, characterized by a brown discoloration of the pit cavity, in the greener fruit ripened at 95° F. with low humidity.

SUMMARY AND CONCLUSION

This study was carried out during the 1952 season to determine the effect of harvest maturity and ripening conditions on steam and lye peeled canned freestone peaches. The peaches were picked from trees of similar vigor and only two pickings were made from each tree.

Measurements were made on a representative sample from each lot. The major portion of the lots were placed in specially constructed cabinets to ripen at a room temperature of 70° F. with a relative humidity of 60 - 70 per cent. A few lots were ripened at 85° F. and 95° F. with a moderate humidity. The fruit was processed when it was fully ripe using steam and a hot lye solution as the two methods of peeling.

The other phase of the experiment was to determine the effect of lye and steam peeling of peaches ripened at 75° F., 85° F. with a moderate and high humidity for each temperature. For this purpose, peaches of two maturities were placed in special cabinets and ripened for three and five days and six to ten days, respectively. Both methods of peeling were again used in the processing of these peaches.

The following conclusions can be drawn from the data obtained during the 1952 season:

1. The per cent blush increased as the fruit matured, but it did not prove to be a satisfactory index of maturity.

2. The use of pressure tests in conjunction with the ground or undercolor was found to be the best index of maturity.

3. A high positive correlation was found between the pressure tests, using a 0.312 inch diameter plunger, and the tenderometer using peeled halves, quarters, slices, and cubes of peaches.

4. The wilt loss during ripening for the harvest study was directly proportional to the length of the ripening period.

5. The flavor evaluation of the fruit increased as the time needed for ripening decreased with a minimum of three days as a limiting factor.

6. The ripening study showed that the best light and bright peach color was obtained with the peaches ripened for three to seven days. The color deepened with an increase in the length of the ripening period and a higher temperature and lower humidity.

7. The peaches ripened at 75° F. with moderate and high humidity conditions gave fruit with the best flavor.

8. The peaches which were processed while the flesh was green to any extent could not be successfully steam peeled. The same peaches could be lye peeled without difficulty but a green cast was apparent in the flesh.

9. There was no significant difference between the flavor of the lye and the steam peeled peaches harvested and ripened under identical conditions.

10. It was determined that either steam or lye peeling was satisfactory for the processing of Michigan freestone peaches.

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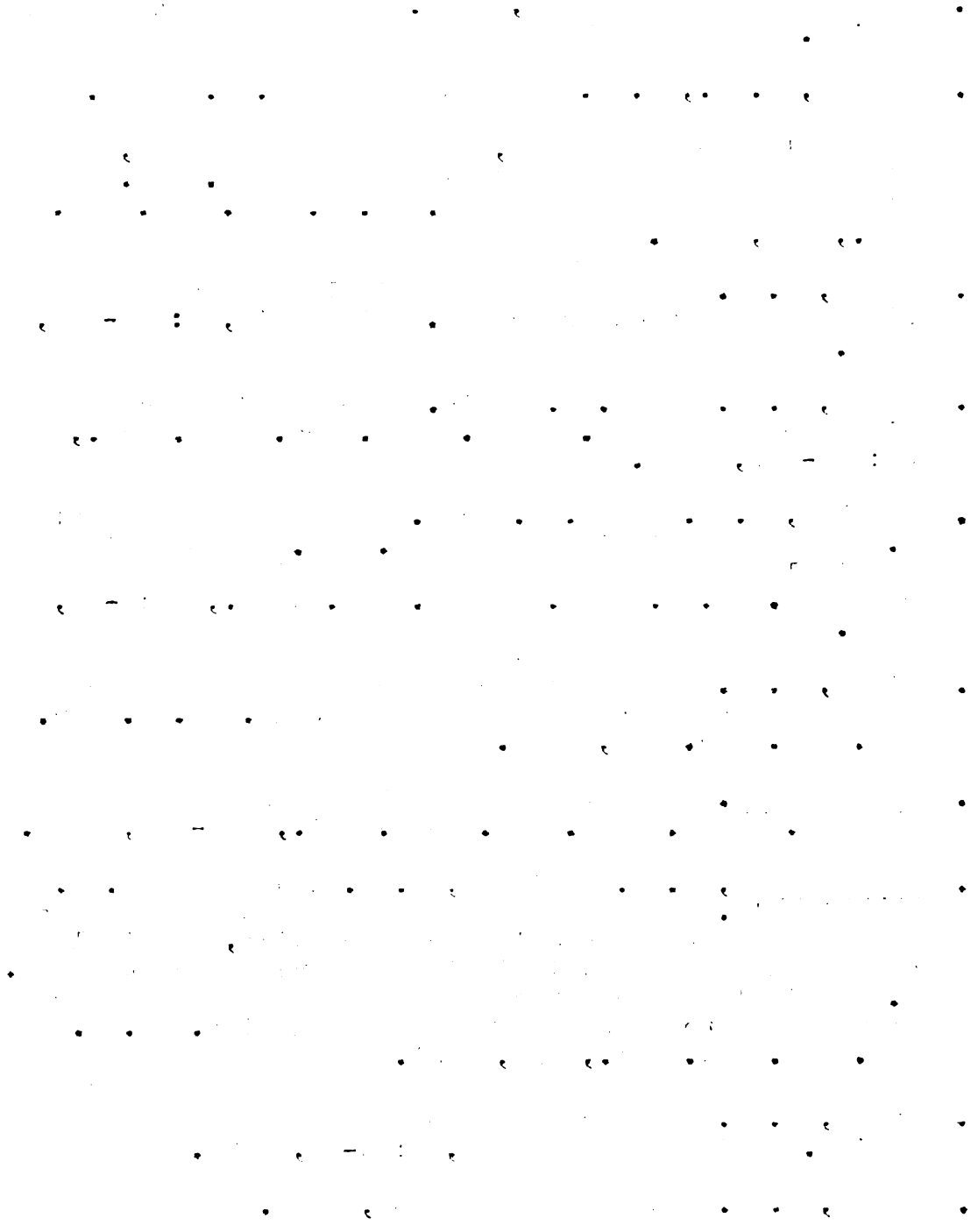

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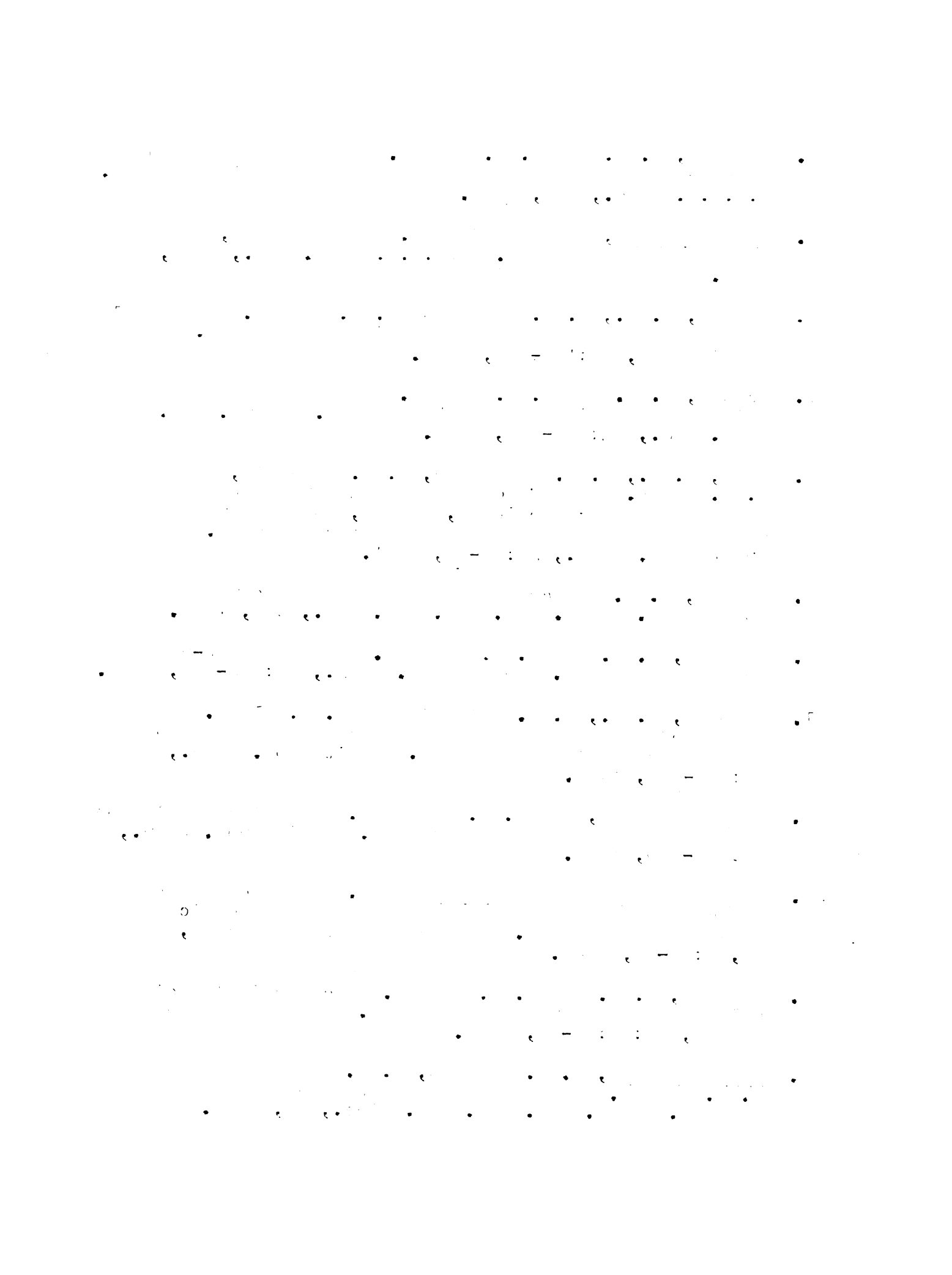

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