THE EFFECT OF THE METHOD OF DEFROSTING ON THE DRAINED WEIGHTS OF SELECTED MICHIGAN FROZEN FRUITS

Thesis for the Degree of M. S.

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This is to certify that the

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The Effect of the Method of Defrosting on the Drained Weights of Selected Michigan Frozen Fruits

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Rudolph William Hirzel

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C L Bedford
Major professor

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THE EFFECT OF THE METHOD OF DEFROSTING ON THE DRAINED WEIGHTS OF SELECTED MICHIGAN FROZEN FRUITS

By

Rudolph Wm. Hirzel

AN ABSTRACT

Submitted to the School of Graduate Studies of Michigan
State College of Agriculture and Applied Science
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Approved C. F. Bedford

This study was carried out during the 1952-53 season to determine the effect of the rate of defrosting on the drained weights of Michigan frozen fruit. The fruits considered were blueberries, Jersey and Rubel varieties; cherries, red and sweet; raspberries; peaches; and strawberries. The study was limited to retail size packages.

All of the fruit was grown and harvested in Michigan. Normal processing plant operation was observed throughout the packaging and storage. Drained weights were determined in grams, and juice volume in milliliters.

The blueberries were packaged in sirup at a 5 + 1 ratio. Four pretreatments were used: untreated, a 10-second steam scald, nicking, and a 10-second steam scald + nicking. The cherries, raspberries, and strawberries were packaged in dry sugar, sucrose sirup, and a 70-30 sucrose-sweetose sirup mixture. The peaches were packaged only in sirup.

Three methods of defrosting were used. They were water at 70°F, and 100°F, and air at 70°F. The effect of the internal temperature at time of determining drained weights was determined. 45°F, 70°F, and 70°F hald for two hours were the temperatures used. Soluble solids of both fruit and juice were determined by use of an Abbe' refractometer.

In all cases the treatment had a significant effect upon the drained weight of the fruit. With blueberries, the drained weight decreased in the following way: untreated, 10-second steam scald, nicked, and 10-second steam scald +

nicked. In all cases, dry sugar produced the lowest drained weight with cherries, raspberries, and strawberries. The sirup drained weights were very similar.

The method of thawing had a marked effect upon the drained weights. The 70°F was the most consistent and the air at 70°F produced the lowest drained weights.

The internal temperature to which the fruits were thawed resulted in large fluctuations in the drained weights, but the 70°F was most consistent. The 70°F held for two hours tended, in general, to have lower drained weights.

A significant negative correlation was found between the drained weights and juice volume for all fruits.

There was no relationship of the soluble solids of the fruit and the juice.

In conclusion, any standard drained weight for fruits must consider the type of pretreatment, the method of defrsoting, and the temperature at package center at time of drained weight determination. Future study may indicate a curve factor that would adjust all of these variables to a constant evaluation.

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INTRODUCTION

Frozen blueberries, cherries, peaches, raspberries, and strawberries are all important processed horticultural crops in Michigan. A considerable quantity of this fruit is packed in 30-pound containers for the manufacturing trade. However, in the last five years, there has been an expanding market for the consumer size package, until today 30 percent of the total frozen pack is sold in this manner. With this trend there has resulted a greater interest in the improvement in the definition and objective measurements of quality.

At the present time the U.S. standards of the Production and Marketing Administration are still dependent upon the observation and judgement of trained inspectors. The criteria of the grading is dependent upon general descriptions of shape, color, and character. It is realized that in order to establish objective standards it will be necessary to determine the effect of variety, maturity, and handling.

This study, made in the summer and winter of 1953, was to determine the effect of the method of defrosting on the drained weights. In addition, the effects of the types of sweetening agents and pre-treatment of the fruit is considered in relation to the drained weight. The fruits used

were blueberries, red cherries, sweet cherries, peaches, raspberries, and strawberries.

REVIEW OF LITERATURE

In the canning industry, recommended drained weights have been established for fruit packaged in various mediums (8, 9, 10, 11) although the drained weight recommendations are not incorporated in the numerical grade of the finished product, they do give an indication as to quality of fresh fruit, its pre-treatment and its fill-in weight. At the present time no similar standards have been established for frozen foods (12, 13, 14, 15, 16). However, standards now in use state that the package shall be filled with fruit as full as practicable without impairment of quality (12, 13, 14, 15, 16).

Joslyn (2) and Joslyn and Marsh (3) reported that the loss in weight during thawing varied with the kind and character of fruit, and was greatest in water, and least in sirups of certain concentrations. They found that the loss did not vary in a regular manner with the concentration of sirup, and there was no definite relationship between the two.

Woodruff (17) reported that the loss of juice from a frozen fruit on thawing is not due to the rupturing of the cell wall, but due to the denaturization of the protein within the cell.

Marshall (5) and Tressler (7) have reported that the use of dry sugar results in a maximum drained weight.

However, work done by Loutfi, Bedford and Robertson (4) on red cherries show the sirup packs to have a consistently higher drained weight. Bedford (1) reported higher drained weights on blueberries, raspberries, and strawberries with the use of sirups.

Cruess and Perry (6) reported that the pre-treatment can have a definite effect on the drained weight. While their work was limited to the action and penetration of sugars, the dry sugar pack produced a lower drained weight than the sirup packs.

METHOD

All of the work was done in the Food Technology Laboratory at Michigan State College. The blueberries were obtained from the Grand Junction area of Michigan. The red cherries were obtained from the Mayes Orchard located at Parma, Michigan. The sweet cherries, raspberries, peaches, and strawberries were from the Michigan State College Horticultural farms located at East Lansing.

The fruit was harvested and immediately brought to the laboratory. The blueberries, raspberries and strawberries were placed in a 35-38° F cold storage room for one to three hours. The peaches were ripened at 70° F for five days prior to processing. The cherries, both red sour and sweet, were soaked in running water (at 42° F) for six to eight hours prior to pitting.

All fruit was washed, and sorted to remove defective and immature fruit prior to processing. All fruit was packaged in pint Marpack bags (Marathon Corp., Menosha, Wisconsin), heat sealed, and placed in pint Freeztex cartons.

Individual Treatments

Blueberries

Jersey and Rubel varieties were used. They were given identical treatments. The treated blueberries were packaged

at a 5 + 1 ratio* on the basis of dry sugar (10 oz of fruit to 4 oz of 50° Brix sirup).

Untreated - no pretreatment, berries packaged in sirup and frozen.

10-second Steam Scald - the fruit was given a 10-second live steam scald, then immediately cooled by air blast from an electric fan to 60-65° F and packaged in sirup.

Nicked - the berries were run through a nicker of laboratory design. The purpose of the nicker is to place a series of small cuts in the skin of the fruit 1/16 to 1/4 inch in length, and 1/16 inch apart about the circumference of the berry. The fruit was immediately packaged in sirup.

10-second Steam Scald and Nicked - the blueberries were given a 10-second live steam scald, then cooled by air from an electric fan to 60-65° F. The fruit was then run through the afore mentioned nicker, and immediately packaged in sirup.

Cherries and Raspberries

The cherries were pitted on a Dunkly pitter of pilot plant capacity.

Dry Sugar - the cherries and raspberries were packaged with dry sugar as a 5 + 1 pack (12½ oz of fruit to 2½ oz of sugar).

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*5 + 1 ratio is the designation used in the industry to indicate 5 parts fruit to 1 part sugar. A 50° Brix sirup is 50% sugar, therefore 10 oz of fruit plus 4 oz of 50° Brix sirup is a 5 + 1 ratio.

Sucrose Sirup - Sucrose sirup was added to the cherries and raspberries as a 4 + 1 pack based on dry sugar (12 oz of fruit to 5 oz of 60° Brix sirup).

70-30 Sucrose-Sweetose Sirup - the sweetose sirup used was an enzyme high conversion corn sirup. The mixed sirup was 70 percent sucrose and 30 percent sweetose. The combination sirup was added to the cherries and raspberries at a 4 + 1 ratio based on dry sugar (12 oz of fruit to 5 oz of 60° Brix sirup).

Peaches

Only one treatment of peaches was used as only one method of packing is in commercial use today. The peaches were steam peeled, and cut into twelfths. Sirup was added to the peaches as a 6 + 1 pack based on dry sugar (12 oz of fruit to 5 oz of 40° Brix sirup).

Methods of Defrosting

All packages were weighed prior to defrosting to determine total weight.

For the water thawing procedure a rectangular 2' x 2' x 4' tank with a steam coil was used. The packages were placed on a one-inch screen placed six inches below the top of the tank so that packages were totally submerged in water during thawing. The individual packages were separated by a series of crosswires so there was at least one inch of free

water circulating about each package. The water was agitated by a propellor type stirrer, and the temperature was controlled at $\pm$ 2° F.

In the air thawing procedure the packages were placed three to four inches apart on a table in a room having a temperature of 70° F, $\pm$ 2° F.

Representative packages were allowed to thaw until temperature at center of the package reached 45° F, 70° F, and 70° F and held for two hours at 70° F, respectively. The center package temperature of 45° F represents the usual temperature of a housewife's refrigerator. The package center temperature of 70° F is the temperature that is recommended by the U.S.D.A. for grading frozen fruit (12, 13, 14, 15, 16). The temperature of 70° F held for two hours represents a condition where the soluble solids content of fruit and juice have become more nearly equalized.

The time for the package centers to come to the desired temperatures varied according to the method of defrosting.

Water at 70° F - The length of time for the package center to reach 45° F was 55 minutes, and the time for the center to reach 70° F was two hours.

Water at 100° F - The length of time for the package center to reach 45° F was 25 minutes, and the time for the center to reach 70° F was one hour.

Air at 70° F - The length of time for the center package temperature to reach 45° F was five hours, and for the temperature to get to 70° F was seven hours.

METHOD OF DATA COLLECTION

Temperature

A standard laboratory mercury thermometer was used to indicate the temperature. The package center temperature was taken by "rolling" the package in the hand until a standard temperature was noted.

Drained Weights

The procedure used for obtaining the drained weights was identical to the method outlined by the U.S.D.A. for canned foods (8, 9, 10, 11). A standard No. 8 drained weight sieve containing 8 meshes to the inch was used. Draining time was for two minutes, and the drained weights determined in grams.

Soluble Solids

The refractive index was determined on both fruit and juice with an Abbe' refractometer. The soluble solids of the juice was obtained directly, and the soluble solids of the fruit was obtained on the expressed juice from the drained fruit.

DISCUSSION

Blueberries

Jersey variety - The effects of the treatments on the drained weights of the Jersey blueberry variety were very significant (see Tables I and XII). While there was no difference between the drained weights of the untreated and the 10-second steam scalded berries, there was a significant difference between the drained weights of the 10-second steam scalded, nicked, and 10-second steam scalded-nicked berries. The difference in drained weight was greater between the 10-second steam scalded and the nicked berries than between the nicked and steam scalded-nicked berries. The highest drained weight was obtained with the untreated berries.

The skin of the blueberry is rather impermeable to the exchange of sugars. The action of the 10-second steam scald increased the permeability of the skin, and as a result the drained weight decreased. Nicking, which is a cutting of the skin, further reduced the drained weight by allowing the sirup to come in contact with the internal pulpy flesh. The combination of the 10-second steam scalded and nicking caused an even greater lowering of drained weight.

The temperature of the package center had a marked effect upon the drained weights. In general, the drained

weights decreased with an increase in temperature, and length of thawing time. The higher temperature caused a greater exchange of liquid from the fruit to the surrounding medium.

An interaction was noted between the treatments and the method of defrosting (see Table IX). An analysis of the two-way tables indicated that there was no one trend. Two methods of thawing -- water at 70° F, and water at 100° F -- produced the highest drained weight with the 10-second steam scald treatment. The 70° F air defrosting gave the highest drained weight in the untreated fruit.

A high negative correlation was obtained between the drained weight and juice volume (see Table VIII). No significant difference was found between the regression curves of the various treatments.

Rubel variety - The results of the drained weights are summarized in Table II. As was the case with the Jersey variety, there was no difference between the drained weights of the 10-second steam scalded, and the untreated berries. The drained weights of the 10-second steam scalded fruit were significantly higher than the nicked or 10-second steam scalded-nicked fruit. Although the difference in drained weights between the treatments was large, they were not nearly as large as in the Jersey variety. The skin of the Rubel may be more permeable to sirups than the Jersey.

In the Rubel variety, the method of defrosting had

little effect upon the drained weight of the two water defrosting methods; water at 100° F, and water at 70° F. The air thawing at 70° F had a much lower drained weight. This difference may be explained by the length of time for defrosting. In air at 70° F the thawing time was longer therefore a greater exchange of juices was possible.

The effect of the temperature at package center on drained weight was much the same as for Jersey variety. The drained weights decreased as temperature and length of thawing time increased.

An interaction of the drained weights was noted between the treatments and the method of defrosting (see Table IX). The untreated and the 10-second steam scalded had a higher drained weight when defrosted in water at 100° F. The nicked and the 10-second steam scalded-nicked had higher drained weights when thawed in water at 70° F. The reversal of trend occurred between nicked and unnicked berries. The nicked, having more internal pulp surface exposed, were influenced more by the time of thawing.

A significant interaction of drained weights appeared between the method of defrosting and the temperature at package center (see Table XI). The internal package temperature of 45° F had the highest drained weights for all defrosting methods.

As with Jersey variety, the Rubel variety had a high negative correlation between the drained weights and the

juice volume.(see Table VIII). A difference was found in the regression slopes of untreated and 10-second steam scalded-nicked fruit. The variation in this case may be explained by the size of the Rubel berry. The cutter bed of the nicker is of a set length. As a result, the smaller berry tends to acquire more cuts, as it is forced to make more turns traveling the length of the bed. The greater number of cuts in the surface of the Rubel fruit results in softer berries in the package, and the liquid is not released in the same manner as the Jersey variety.

Cherries

Red Sour - The drained weights of the Red Sour cherries were highly influenced by the method of treatment, and by the thawing temperatures. The drained weights of the dry sugar pack were significantly lower than those of the sirup packs. This lower drained weight is expected, as in the dry sugar all of the liquid must come from the fruit. No difference was found in the drained weights of the sucrose sirup and the 70-30 sucrose-sweetose pack.

The method of defrosting had no effect upon the drained weights. However, the temperature to which the fruit was thawed had a significant effect upon the drained weights. The highest drained weight was obtained for fruit brought to 45° F internal temperature, and the lowest drained weight was when the fruit was allowed to stand for two hours at 70° F. A higher drained weight was obtained for the dry

sugar pack at 45° F. One reason for this is that the dry sugar did not go completely into solution at 45° F and was partially retained as crystals on the surface of the fruit.

An interaction was found between treatment and temperature to which the fruit was thawed (see Table X). The lowest drained weight for the 70-30 sucrose-sweetose sirup was at 70° F while the lowest drained weight for dry sugar and sucrose sirup was at 70° F held for two hours.

A high negative correlation was obtained between the drained weight and juice volumes for all packs (see Table VIII). No significant difference was found between the slopes of the regression curves.

Sweet - The drained weights of sweet cherries are significantly affected by treatments, the method of defrosting and the internal package temperature. The sucrose sirup treatment had the highest drained weight, while the 70-30 sucrose-sweetose sirup had the lowest drained weight. The fruit of the sweet cherry was torn considerably while being pitted since no sweet cherry pitter was available, and a sour cherry pitter was used. This tearing resulted in more flesh being exposed to the sirup. This accounts for the fact that while there were differences in the drained weights, they were not nearly as great as in the red cherries.

The drained weights were influenced by the method of thawing. The highest drained weight was obtained by thawing

in water at 70° F. The pulpy flesh condition of the fruit was responsible for the lowest drained weight found at 100° F water thaw.

The marked effect of temperature at package center on drained weight seemed to be dependent upon time. The highest drained weight was obtained when the internal temperature was 45° F, and the lowest drained weight was at 70° F held for two hours. The longer time with lower drained weights would indicate that with greater amounts of flesh exposed, the greater juice loss occurs.

An interaction of drained weights was found to exist between the treatments and the method of defrosting (see Table IX). The sucrose sirup treatment had the highest drained weight in all cases. Dry sugar pack had the lowest drained weight at 100° F, and the 70-30 sucrose-sweetose pack had the lowest drained weight in air at 70° F.

A high negative correlation was found between the drained weight and juice volume (see Table VIII). An analysis of the regression lines showed no significant difference in slopes.

Peaches

The drained weights of sliced peaches did not react in the manner of the other fruits. The effect of the method of defrosting on the drained weight was very marked (see Table V). The air at 70° F produced the highest drained weight, while water at 100° F produced the lowest. The

sliced peaches have no skin barrier to the transfer of liquid. All of the surrounding medium is able to be in direct contact with the flesh of the fruit, therefore equalization could more easily occur. The peach, as time increases, tends to pick up liquid from the medium.

A significant interaction was indicated between the method of defrosting and the package center temperature (see Table XI). The highest drained weights were obtained in water at 70° F and 100° F with an internal temperature of 70° F held for two hours.

A marked negative correlation was found between the drained weight and juice volume (see Table VIII). The regression curve had the same general slope as the other curves.

Raspberries

The drained weight of the raspberries were significantly influenced by the method of treatment (see Table VI). The highest drained weights were obtained in the sucrose sirup packs and the lowest weights in the dry sugar packs. The raspberry is composed of a series of small droplets separated by a thin membrane. This membrane is very permeable to the transfer of liquid. As a result the drained weight of the berry was highest with sucrose sirup. Dry sugar pack tends to remove or draw the liquid from the fruit. The sucrose and 70-30 sucrose-sweetose sirup packs had similar drained weights.

The method of defrosting had a marked effect on drained weight. Water at 70° F produced the highest drained weight, and water at 100° F produced the lowest drained weight. As the temperature of the water increased there was a tendency for some of the droplets to burst. As a result the drained weight decreased. The temperature of the package center highly influenced the drained weight of raspberries. The higher drained weights were produced by 45° F internal temperature, while the 70° F and the 70° F held for two hours were similar. There must be a certain temperature that must be reached before a rapid exchange of liquid occurs. 45° F seems to be below this critical temperature.

A slight interaction was noted between the treatments and the method of defrosting (see Table IX). Water at 70° F produced the highest drained weights for all treatments. Sucrose sirup had the lowest drained weights at 100° F water, while dry sugar and 70-30 sucrose-sweetose sirup had the lowest drained weights in air at 70° F.

A highly significant interaction was indicated between the treatments and package center temperature (see Table X). The highest drained weight for all treatments was at 45° F internal temperature, while sucrose sirup and 70-30 sucrose-sweetose sirup have the lowest drained weight at 70° F held for two hours, and dry sugar having the lowest drained weight at 70° F.

An interaction between the method of defrosting and the

temperature at package center occurred (see Table XI). The 45° F internal temperature caused the highest drained weights. Water at 70° F, and air at 70° F had the lowest drained weight at the internal temperature of 70° F held for two hours. Water at 100° F produced the lowest drained weight at 70° F internal temperature.

A highly significant negative correlation was found between the drained weight and juice volume (see Table VIII). There was no significant difference in the slopes of the regression curves.

Strawberries

The drained weights of strawberries were influenced significantly by the treatments. The dry sugar treatments had much lower drained weights than the sirup treatments. The lower drained weight resulted from the fact that all of the juice must come from the fruit. The strawberry has a very thin skin, and when sliced, almost all of the flesh of the fruit is brought in direct contact with the surrounding medium. As a result the juice is released very easily.

The defrosting method causes a marked variation in the drained weights. Strawberries thawed at 70° F water and 70° F air were highest in drained weight, and very similar, while berries thawed at 100° F had the lowest drained weight. This result is in agreement with raspberries. Sliced strawberries form a pulpy mass and as a result do not react as

skin fruits. The internal temperature of the package has a marked effect upon the drained weights. A temperature of 45° F caused the highest drained weight, while the 70° F and 70° F held for two hours were lower, and much more similar. Since the strawberries form a mass of pulpy material, and heat conduction is difficult, it is conceivable that a slight amount of ice crystals may have remained in the package center.

A significant negative correlation was found to exist between the drained weight and juice volume (see Table VIII). No significant difference was found in the slopes of the regression curves.

Soluble Solids

The refractive index of all of the fruit and juice was recorded throughout all of the samples. The results are shown in the appendix tables. There was no one correlation or trend shown by any of the fruits under any of the conditions of thawing.

SUMMARY

From the foregoing it is apparent that if drained weights are to be used as a criterion for the standards of frozen fruit, the treatment that the fruit is given must be considered. The drained weights of blueberries were varied with the pretreatments with the untreated berry having highest drained weights. The type of sweetening agent, dry sugar or sirup, caused a very significant difference. In all cases, the dry sugar pack was lower in drained weight than the sirup pack. Another consideration is the amount of flesh that is exposed by the fruit. If the fruit has a high percent of its flesh exposed, such as peaches, then it must have a classification of its own.

The necessity of further work in this field is shown by variations within the treatments. Jersey and Rubel blueberries did not vary in equal amounts. While the same trend was shown, the difference in the drained weight of the Rubel variety was not nearly as great as in the Jersey variety.

In general, if the dry sugar is in solution, the dry sugar pack always produced the lowest drained weights. Variations occurred within the sirup packs, however, in that the 70-30 sucrose-sweetose sirup produced a higher drained weight in sweet cherries than the sucrose sirup. In all other cases the sucrose sirup had the higher drained

weight. Further experimentation should be channeled in this direction. Is this variation caused by the fruit, or by the sirup?

While the defrosting methods produced erratic results, it was felt that the 70° F water thaw with an internal temperature of 70° F produced the most consistent results. Utilizing the 100° F thawing water caused an overheating in parts of the package which influenced the liquid exchange.

It is felt that the 45° F internal temperature will not allow all sugar crystals to get into solution, therefore this low internal temperature will tend to give erratic results.

There is no one trend or relation shown between the soluble solids of the fruit and juice.

CONCLUSIONS

1. Drained weight standards for frozen fruit must consider the pretreatments of the fruit. A highly permeable skinned fruit, such as blueberries, is radically altered by physical processes. Nicking, or cutting, has the greatest effect.

2. Drained weight standards for frozen fruit must consider the type of pack. The dry sugar produces a significantly different drained weight than the sirup packs.

3. The amount of flesh exposed must be considered when establishing drained weight standards. A blueberry with no flesh exposed will not react the same as a sliced peach, where the flesh is exposed.

4. It is felt that if drained weights are to be used for standards, a standard thawing method should be adopted. The author recommends the thawing method of 70° F water to an internal temperature of 70° F. The higher thawing temperature and lower internal temperature all produce erratic results.

5. It is felt that further experimentation will produce a common drained weight curve, where a set factor would adjust all pretreatments and treatments to an equal valuation.

TABLE I

EFFECT OF DEFROSTING METHOD ON DRAINED WEIGHTS OF BLUEBERRIES - JERSEY VARIETY

Method of defrosting		Temperature of package center			Mean	Treatment mean
		45°F	70°F	70°F held 2 hrs		
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Untreated			
Water	70	289.6***	291.6	286.6	289.3	
	100	290.8	290.0	286.2	289.0	
Air	70	294.4	289.8	288.4	290.9	
Mean		291.6	290.5	287.1		289.7
			10-sec. Steam Scald			
Water	70	297.0	291.2	288.6	292.2	
	100	294.8	291.8	286.6	291.0	
Air	70	293.4	288.2	281.0	297.5	
Mean		295.0	290.4	285.4		290.3
			Nicked			
Water	70	281.6	275.6	266.8	274.7	
	100	283.4	279.2	273.8	278.8	
Air	70	278.0	272.4	270.8	273.7	
Mean		281.0	275.7	270.5		275.7
			10-sec. Steam Scald + Nicked			
Water	70	274.8	276.2	267.6	272.9	
	100	276.2	272.2	265.4	271.3	
Air	70	276.0	270.2	269.8	272.0	
Mean		275.7	272.9	267.6		272.1

	F values	LSD 5%	LSD 1%
Treatments	269.0**	1.58	2.09
Method of defrosting	2.33	--	--
Temperature of package center	64.7**	1.42	1.89

**Highly significant

***Average of five samples

TABLE II

EFFECT OF DEFROSTING METHOD ON DRAINED WEIGHTS OF BLUEBERRIES - RUBEL VARIETY

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Untreated			
Water	70	290.4	288.4	282.0	286.9	
	100	291.2	287.2	284.0	287.5	
Air	70	286.0	272.0	281.2	279.7	
Mean		289.2	282.5	282.4		284.7
			10-sec. Steam Scald			
Water	70	288.2	283.6	281.0	284.3	
	100	290.8	286.4	280.2	285.8	
Air	70	285.2	278.0	277.2	280.1	
Mean		288.1	282.7	279.5		283.4
			Nicked			
Water	70	290.0	284.0	277.4	283.8	
	100	285.6	279.0	274.2	279.6	
Air	70	288.6	277.2	275.8	280.5	
Mean		288.1	280.1	275.8		281.3
			10-sec. Steam Scald + Nicked			
Water	70	279.0	278.8	272.2	276.7	
	100	275.4	281.6	276.8	277.9	
Air	70	270.0	276.2	273.4	273.2	
Mean		274.8	278.9	274.1		275.9

	F values	LSD 5%	LSD 1%
Treatments	70.9**	1.58	2.07
Method of defrosting	16.3**	1.36	1.79
Temperature of package center	70.7**	1.36	1.79

**Highly significant

TABLE III

EFFECT OF METHOD OF DEFROSTING ON DRAINED WEIGHTS OF RED SOUR CHERRIES

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Dry Sugar			
Water	70	293.6	278.6	269.2	280.5	
	100	290.6	269.6	273.4	277.9	
Air	70	283.2	276.4	270.6	276.7	
Mean		289.1	274.9	271.1		278.4
			Sucrose Sirup			
Water	70	303.6	299.4	287.8	296.9	
	100	296.8	287.0	289.6	291.1	
Air	70	292.2	290.2	287.4	289.9	
Mean		297.5	292.2	288.3		292.7
			70-30 Sucrose-Sweetose Sirup			
Water	70	299.6	292.8	290.6	294.3	
	100	303.0	280.2	288.6	290.6	
Air	70	299.0	294.0	291.0	294.7	
Mean		300.5	289.0	290.1		293.2

	F values	LSD 5%	LSD 1%
Treatments	84.1**	2.58	3.41
Method of defrosting	4.4*	2.58	3.41
Temperature of package center	57.7**	2.58	3.41

*Slightly significant
**Highly significant

TABLE IV

EFFECT OF METHOD OF DEFROSTING ON DRAINED WEIGHT OF SWEET CHERRIES

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Dry Sugar			
Water	70	302.2	294.4	288.4	295.0	
	100	298.4	289.6	278.8	288.9	
Air	70	301.6	285.2	282.4	289.7	
Mean		300.7	289.7	283.2		291.2
			Sucrose Sirup			
Water	70	308.0	294.6	287.2	296.6	
	100	302.4	292.2	280.0	291.5	
Air	70	309.2	293.4	289.6	297.4	
Mean		306.5	293.4	285.6		295.2
			70-30 Sucrose-Sweetose Sirup			
Water	70	311.0	293.4	280.8	295.1	
	100	298.8	283.4	279.6	287.3	
Air	70	297.6	285.8	277.8	287.1	
Mean		302.5	287.5	279.4		289.8

	F values	LSD 5%	LSD 1%
Treatments	14.5**	2.04	2.70
Method of defrosting	19.2**	2.04	2.70
Temperature of package center	203.6**	2.04	2.70

**Highly significant

TABLE V

EFFECT OF METHOD OF DEFROSTING ON DRAINED WEIGHTS OF PEACHES

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Sucrose Sirup			
Water	70	293.4	292.0	295.6	293.7	
	100	276.8	286.4	293.0	285.4	
Air	70	298.2	298.0	287.0	294.4	
Mean		289.5	292.1	291.9		291.2

	F values	LSD 5%	LSD 1%
Method of defrosting	11.03**	4.33	5.78
Temperature of package center	0.92	--	--

**Highly significant

TABLE VI

EFFECT OF METHOD OF DEFROSTING ON DRAINED WEIGHT OF RASPBERRIES

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Dry Sugar			
Water	70	266.2	269.2	267.2	267.5	
	100	265.6	262.2	265.6	264.5	
Air	70	270.6	259.4	263.2	264.4	
Mean		267.5	263.6	265.3		265.5
			Sucrose Sirup			
Water	70	303.6	281.8	294.6	293.3	
	100	284.6	281.6	296.8	287.7	
Air	70	289.6	281.0	282.4	284.3	
Mean		292.6	281.5	291.3		288.5
			70-30 Sucrose-Sweetose Sirup			
Water	70	295.4	285.6	282.2	287.7	
	100	289.6	271.8	277.2	279.5	
Air	70	293.0	276.8	268.4	279.4	
Mean		292.7	278.1	275.9		282.2

	F values	LSD 5%	LSD 1%
Treatments	258.0**	2.301	4.616
Method of defrosting	11.9**	2.301	4.616
Temperature of package center	74.0**	2.301	4.616

**Highly significant

TABLE VII

EFFECT OF METHOD OF DEFROSTING ON DRAINED WEIGHTS OF STRAWBERRIES

Method of defrosting		Temperature of package center 45°F	70°F	70°F held 2 hrs	Mean	Treatment mean
	(°F)	(gms)	(gms)	(gms)	(gms)	(gms)
			Dry Sugar			
Water	70	275.6	256.6	250.2	260.8	
	100	255.4	254.4	244.4	251.4	
Air	70	275.6	256.0	253.3	261.6	
Mean		268.9	255.7	249.3		258.0
			Sucrose Sirup			
Water	70	278.0	263.8	266.6	269.5	
	100	261.8	252.4	256.4	256.9	
Air	70	275.8	260.2	264.6	266.9	
Mean		271.9	258.8	262.5		264.4

	F values	LSD 5%	LSD 1%
Treatments	12.54**	4.58	6.09
Method of defrosting	6.33**	5.30	7.47
Temperature of package center	18.80**	5.30	7.47

**Highly significant

TABLE VIII

CORRELATION COEFFICIENTS OF DRAINED WEIGHTS AND JUICE VOLUMES

Fruit	Treatment	Correlation
Bleuberries - Jersey	Untreated	- .694**
	10-sec. Steam Scald	- .633**
	Nicked	- .719**
	10-sec. Steam Scald + Nicked	- .551**
Blueberries - Rubel	Untreated	- .401**
	10-sec. Steam Scald	- .888**
	Nicked	- .509**
	10-sec. Steam Scald + Nicked	- .256
Cherries - Red Sour	Dry Sugar	- .698**
	Sucrose Sirup	- .789**
	70-30 Sucrose-Sweetose Sirup	- .886**
Cherries - Sweet	Dry Sugar	- .762**
	Sucrose Sirup	- .804**
	70-30 Sucrose-Sweetose Sirup	- .811**
Peaches	Sucrose Sirup	- .780**
Raspberries - Red	Dry Sugar	- .730**
	Sucrose Sirup	- .363*
	70-30 Sucrose-Sweetose Sirup	- .869**
Strawberries	Dry Sugar	- .447**
	Sucrose Sirup	- .645**

*Significant at 5% level
**Significant at 1% level

TABLE IX

INTERACTION BETWEEN TREATMENT AND METHOD OF DEFROSTING

Treatment		Method of defrosting		
		Water 70°F	Water 100°F	Air 70°F
		(gms)	(gms)	(gms)
Blueberries - Jersey Variety				
Untreated		289.2	288.8	290.8
10-sec. Steam Scald		292.2	291.0	287.5
Nicked		274.6	278.8	273.7
10-sec. Steam Scald + Nicked		270.8	271.6	272.1
			5%	1%
F value	4.0**	LSD	2.83	3.71
Blueberries - Rubel Variety				
Untreated		286.9	287.5	283.2
10-sec. Steam Scald		284.1	285.8	280.1
Nicked		283.8	279.6	278.9
10-sec. Steam Scald + Nicked		276.7	276.3	274.7
			5%	1%
F value	2.3*	LSD	2.66	3.51
Cherries - Sweet				
Dry Sugar		295.0	288.9	289.7
Sucrose Sirup		296.6	291.5	297.4
70-30 Sucrose-Sweetose Sirup		295.1	287.4	287.1
			5%	1%
F value	3.45*	LSD	3.53	4.67
Raspberries - Red				
Dry Sugar		267.5	264.5	264.4
Sucrose Sirup		289.9	286.9	289.1
70-30 Scurose-Sweetose Sirup		287.7	279.5	279.4
			5%	1%
F value	2.6*	LSD	3.63	4.81

*Slightly significant
**Highly significant

TABLE X

INTERACTION BETWEEN TREATMENT AND TEMPERATURE AT CENTER OF PACKAGE

Treatment	Temperature of package center		
	45°F	70°F	70°F held 2 hrs
	(gms)	(gms)	(gms)
Cherries - Red Sour			
Dry Sugar	289.1	275.1	271.1
Sucrose Sirup	297.5	290.5	278.3
70-30 Sucrose-Sweetose Sirup	300.5	289.0	290.1
		5%	1%
F value 2.93*	LSD	4.36	5.79
Raspberries - Red			
Dry Sugar	267.5	263.6	265.3
Sucrose Sirup	298.3	286.0	281.7
70-30 Sucrose-Sweetose Sirup	292.7	278.1	275.9
		5%	1%
F value 11.5**	LSD	3.63	4.81

*Slightly significant
**Highly significant

TABLE XI

INTERACTION BETWEEN METHOD OF DEFROSTING AND TEMPERATURE AT CENTER OF PACKAGE

Method of defrosting		Temperature of package center		
		45°F	70°F	70°F held 2 hrs
	(°F)	(gms)	(gms)	(gms)
		Blueberries - Rubel Variety		
Water	70	286.8	283.7	278.2
	100	287.5	282.4	277.1
Air	70	282.4	278.4	276.9
			5%	1%
F value	2.9*	LSD	2.37	3.13
		Cherries - Red Sour		
Water	70	298.9	298.9	282.5
	100	296.8	278.9	283.9
Air	70	291.5	286.9	283.0
			5%	1%
F value	6.55**	LSD	4.36	5.79
		Peaches		
Water	70	293.4	292.0	295.6
	100	274.8	286.4	292.8
Air	70	298.2	298.0	287.0
			5%	1%
F value	7.46**	LSD	16.8	22.6
		Raspberries - Red		
Water	70	288.4	279.5	277.3
	100	283.3	272.9	274.8
Air	70	286.8	275.3	270.9
			5%	1%
F value	2.9*	LSD	3.63	4.81

*Slightly significant
**Highly significant

TABLE XII

SAMPLE ANALYSIS OF VARIANCE*, BLUEBERRIES - JERSEY VARIETY

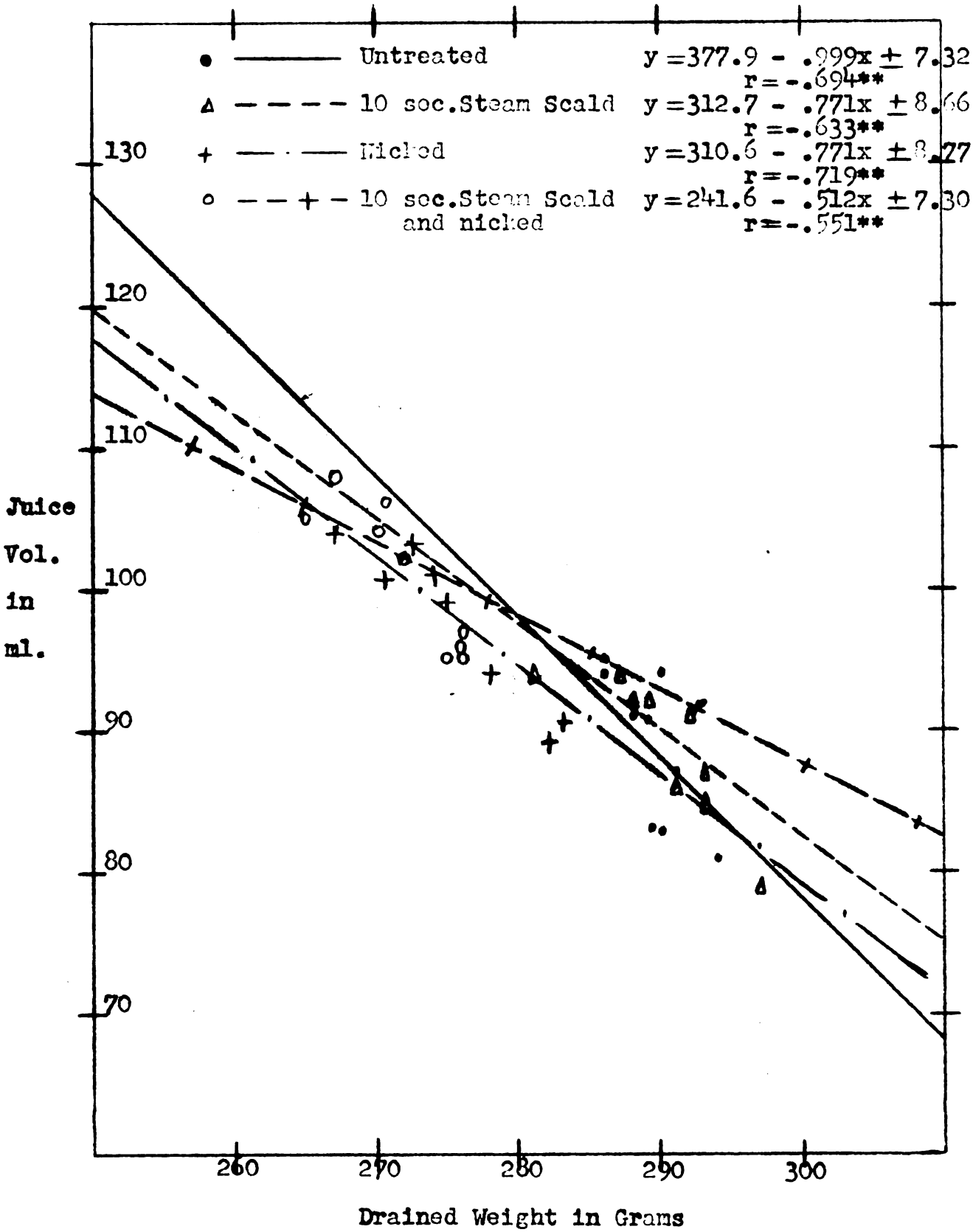
Source	df	F
Total	144	
Treatments	3	269.00**
Thawing Temperature	2	2.33
Temperature at Package Center	2	64.70**
Treatments x Thawing Temperature	6	4.00**
Treatments x Temperature at Package Center	6	1.98
Thawing Temperature x Temperature at Package Center	4	0.84
Treatments x Thawing Temperature x Temperature at Package Center	12	1.14
Error	144	

*All analyses followed the same pattern
**Highly significant

Figure I

Blueberries - Jersey Variety

Regression Lines of Drained Weights on Juice Volume

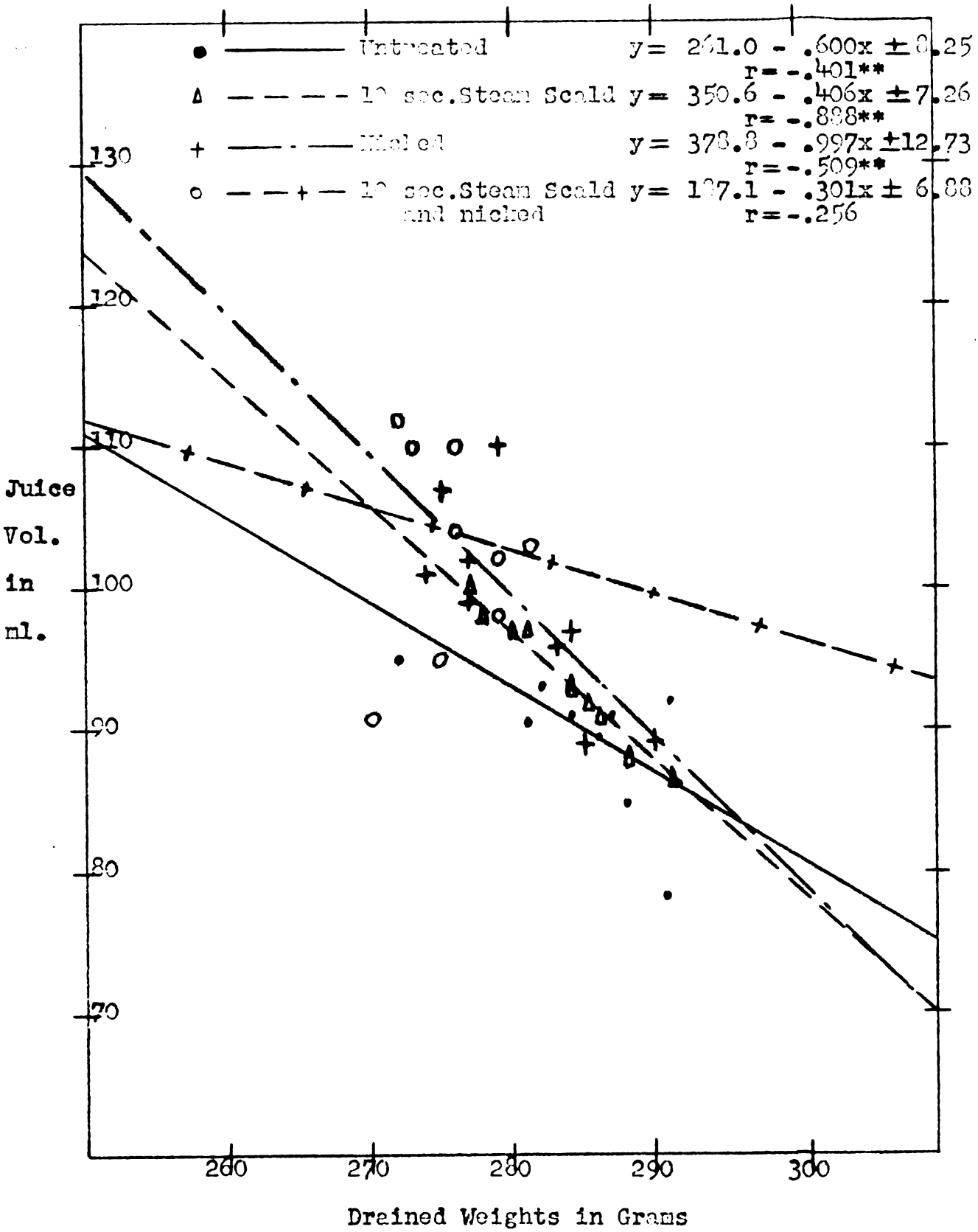


** Highly Significant

Figure II

Blueberries - Rubel Variety

Regression Lines of Drained Weights on Juice Volume

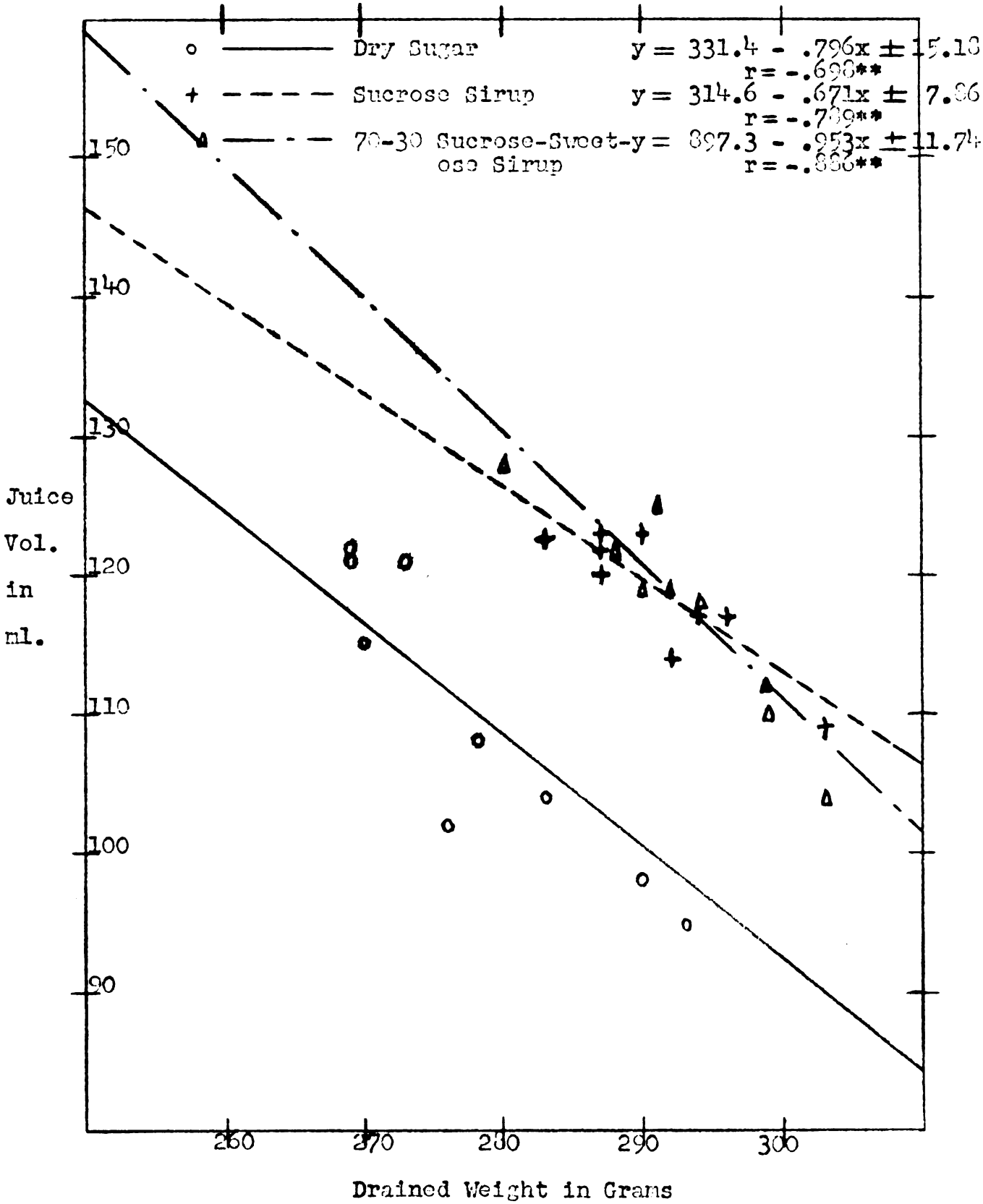


** Highly Significant

Figure III

Cherries - Red Sour

Regression Lines of Drained Weights on Juice Volume

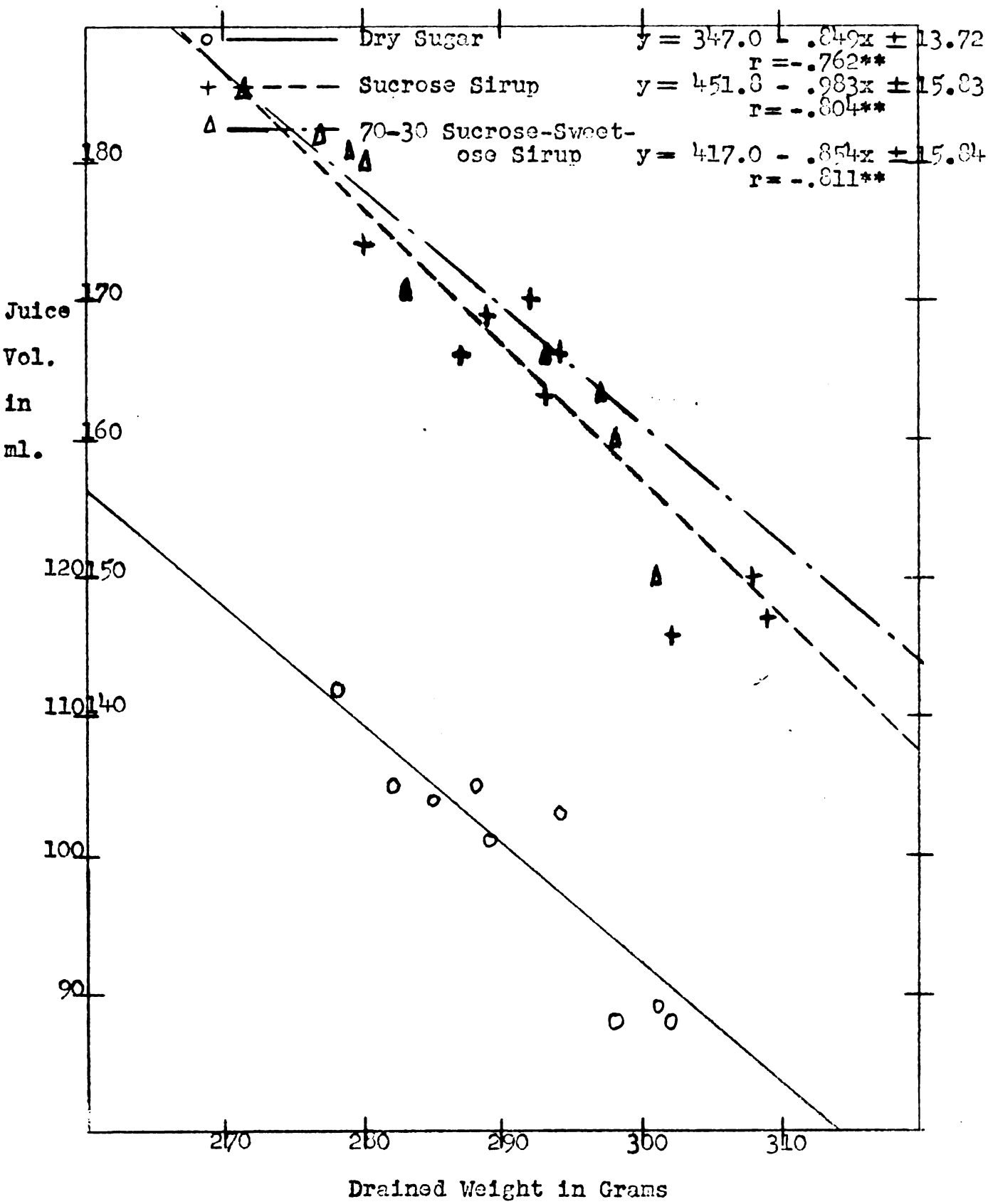


** Highly Significant

Figure IV

Cherries - Sweet

Regression Lines of Drained Weights on Juice Volume

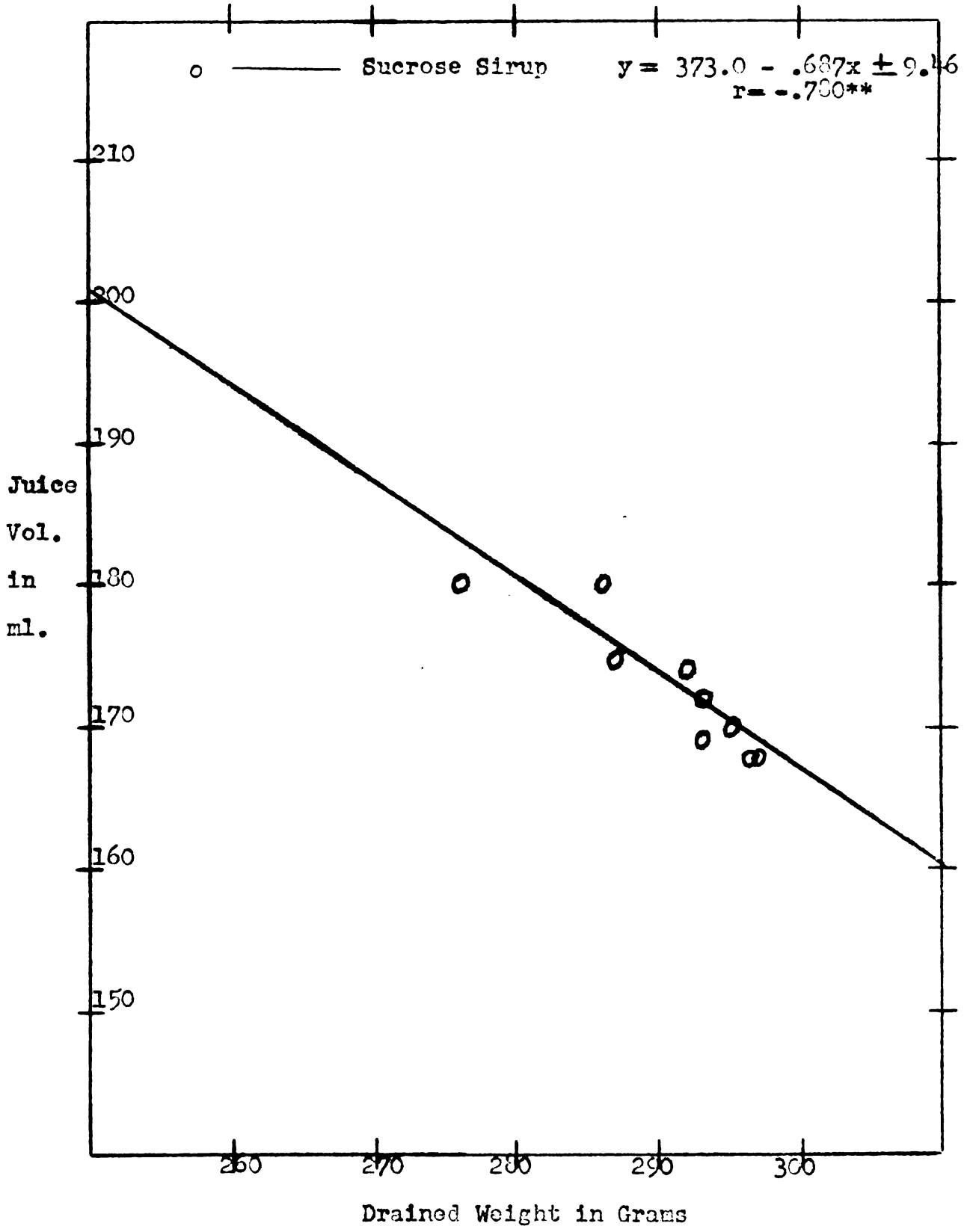


** Highly Significant

Figure V

Peaches

Regression Lines of Drained Weights on Juice Volume

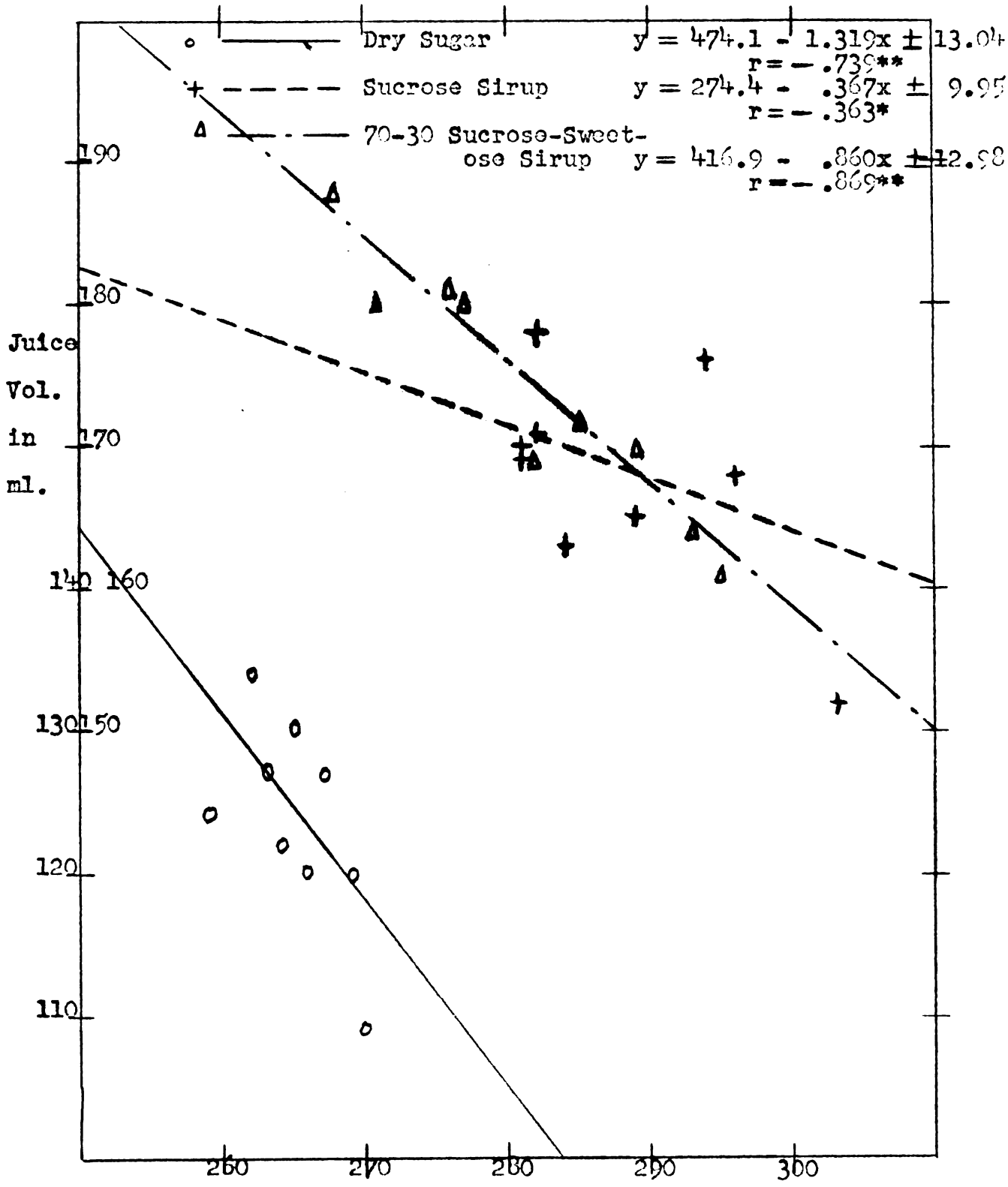


** Highly Significant

Figure VI

Raspberries - Red

Regression Lines of Drained Weights on Juice Volume



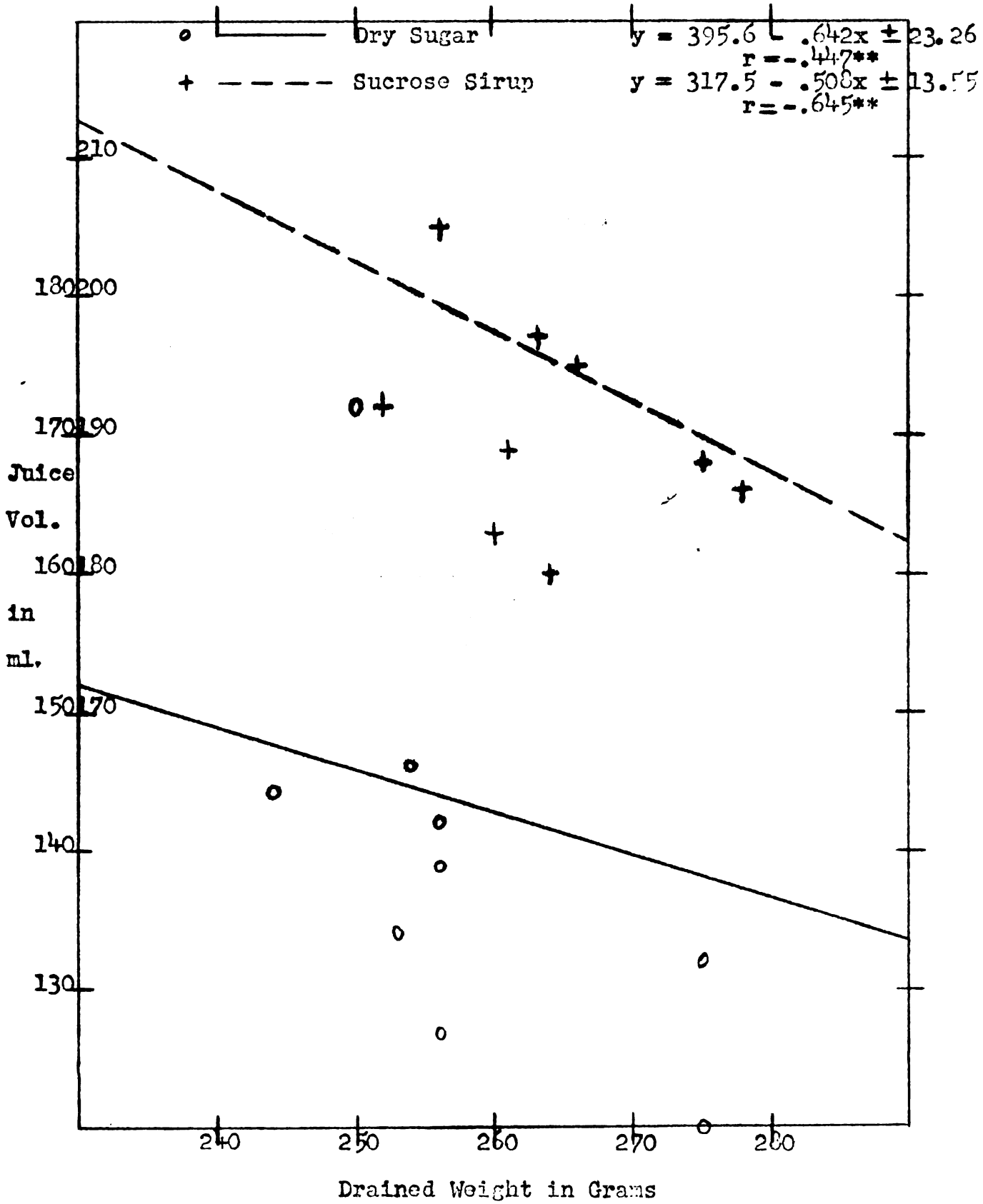
Drained Weight in Grams

* Significant
** Highly Significant

Figure VII

Strawberries.

Regression Lines of Drained Weights on Juice Volume



** Highly Significant

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APPENDIX

Code for Appendix Table Columns

MD	Method of defrosting (^{o}F)
TP	Temperature of package center (^{o}F)
Tm	Time in hours and minutes
Tp	Actual temperature of package center (^{o}F)
DW	Drained weight in grams
VJ	Juice volume in milliliters
%ssJ	Percent soluble solids of juice by refractometer
%ssF	Percent soluble solids of fruit by refractometer

TABLE XIII

BLUEBERRIES - JERSEY VARIETY - UNTREATED

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	1:00	50	287	84	47.8	14.2
				52	289	80	47.2	13.8
				52	288	82	46.0	14.0
				45	293	85	46.2	13.4
				48	291	84	45.6	14.6
		70°F	2:00	70	289	85	44.6	16.4
				69	291	88	44.2	15.8
				68	292	88	44.2	15.2
				70	291	90	44.2	14.7
				68	295	88	42.2	15.9
		70°F held 2 hrs	4:00	70	289	94	42.2	17.7
				70	291	95	44.8	18.3
				70	292	97	43.7	18.4
				70	281	97	43.7	18.4
				70	290	92	42.2	18.2
Water	100°F	45°F	0:30	47	297	72	47.7	20.7
				46	288	81	47.7	16.1
				48	293	87	48.3	15.9
				44	292	85	46.1	17.1
				52	282	94	44.3	15.9
		70°F	1:00	70	292	88	45.9	18.5
				72	292	88	45.5	16.1
				73	286	93	45.5	15.5
				76	293	88	45.9	16.1
				74	287	95	44.7	16.6
		70°F held 2 hrs	3:00	72	285	95	44.6	17.0
				72	283	94	44.9	20.8
				73	286	93	44.3	21.6
				72	288	93	43.5	17.1
				72	289	95	43.5	17.8
Air	70°F	45°F	5:30	48	291	78	42.4	17.8
				47	295	78	44.7	18.3
				47	298	83	43.3	24.2
				44	295	81	45.7	17.8
				45	292	84	43.9	17.0
		70°F	8:30	68	294	87	43.9	20.1
				70	279	99	42.7	17.5
				68	293	87	45.4	14.0
				68	290	92	44.0	15.6
				68	293	89	44.7	17.1
		70°F held 2 hrs	10:30	72	288	90	43.9	20.6
				72	286	92	44.3	23.0
				72	286	97	44.3	18.8
				72	291	88	43.3	18.2
				72	291	91	43.1	16.9

TABLE XIV

BLUEBERRIES - JERSEY VARIETY
10-SECOND STEAM SCALD TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:55	46	300	70	45.7	18.7
				46	302	72	47.4	20.6
				47	298	82	45.3	17.0
				43	294	82	46.1	17.1
				52	291	93	43.4	16.8
		70°F	1:55	68	287	82	45.7	18.5
				68	291	78	44.8	19.4
				68	293	88	46.6	22.8
				71	296	87	42.7	17.0
				68	289	98	44.5	17.1
		70°F held 2 hrs	3:55	70	287	98	45.0	17.7
				70	292	210	24.6	14.5
				70	290	90	43.4	18.9
				70	284	90	41.7	17.1
				70	290	93	41.7	20.1
Water	100°F	45°F	0:25	50	292	84	44.1	16.5
				44	296	80	44.2	15.9
				46	296	86	45.9	19.2
				46	291	90	45.2	17.6
				47	299	84	45.3	15.8
		70°F	0:45	74	290	94	45.2	16.1
				76	289	94	44.9	16.5
				75	295	86	46.6	20.8
				72	294	88	44.9	18.3
				70	291	92	43.7	16.8
		70°F held 2 hrs	2:45	70	286	88	45.3	23.0
				72	289	88	44.9	23.1
				72	285	101	42.9	20.5
				72	282	100	43.3	19.7
				71	291	93	43.8	20.1
Air	70°F	45°F	5:15	47	293	87	44.6	17.4
				44	294	85	47.2	17.2
				44	295	88	46.0	19.1
				44	289	88	46.5	17.7
				46	296	86	46.4	19.7
		70°F	8:24	70	284	95	44.6	20.6
				68	284	93	44.2	18.1
				70	292	92	44.7	20.2
				69	288	92	44.4	18.1
				69	293	90	44.0	21.6
		70°F held 2 hrs	10:24	72	277	88	41.9	21.2
				72	281	89	41.8	20.0
				73	284	95	42.1	21.3
				73	283	94	41.7	20.8
				73	280	104	42.4	17.9

TABLE XV

BLUEBERRIES - JERSEY VARIETY - NICKED TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	44	281	78	43.9	19.4
			44	279	84	42.6	17.6
			44	289	85	40.7	20.5
			43	278	98	42.2	16.5
			45	281	96	42.8	15.6
	70°F	1:50	69	279	90	42.7	20.1
			68	275	95	40.6	20.2
			69	273	108	41.5	18.6
			68	278	98	41.6	16.0
			71	273	104	41.7	19.2
	70°F held 2 hrs	3:50	70	266	103	40.2	18.4
			70	267	106	39.5	18.0
			70	279	105	40.4	20.6
			70	268	106	39.4	20.6
			70	264	105	38.6	21.4
Water 100°F	45°F	0:25	44	286	85	43.8	16.1
			45	276	96	43.2	17.8
			44	288	90	43.3	18.0
			44	286	86	43.5	16.9
			44	281	95	43.2	19.1
	70°F	0:45	65	293	96	42.0	18.3
			68	279	98	42.2	18.1
			67	278	96	42.8	17.5
			70	272	102	42.7	19.5
			68	274	101	40.8	18.2
	70°F held 2 hrs	2:45	70	268	98	41.6	18.6
			70	275	103	42.6	17.1
			70	274	100	43.1	18.5
			70	280	100	41.4	18.4
			70	272	108	40.5	15.0
Air 70°F	45°F	5:30	50	273	98	40.6	18.9
			46	273	100	40.8	18.2
			46	283	94	42.6	18.9
			46	283	87	42.5	18.9
			47	278	96	42.8	18.2
	70°F	8:30	67	267	108	40.3	20.1
			67	276	100	41.2	18.9
			67	276	101	41.2	19.7
			67	272	104	39.4	20.1
			67	271	105	39.8	19.0
	70°F held 2 hrs	10:30	70	269	98	39.4	19.6
			70	268	98	39.8	19.4
			70	271	101	40.3	21.9
			70	271	103	38.2	19.6
			70	275	101	38.0	19.4

TABLE XVI

BLUEBERRIES - JERSEY VARIETY
10-SECCND STEAM SCALD + NICKED TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:50	44	278	82	43.7	22.8
			45	273	92	43.2	22.2
			44	281	95	42.8	19.7
			43	275	98	42.6	20.7
			48	267	109	40.0	18.9
	70°F	1:54	69	269	103	41.3	18.3
			68	269	105	40.3	18.4
			68	275	101	41.2	18.9
			68	273	102	41.6	18.4
			70	265	110	40.2	20.3
	70°F held 2 hrs	3:54	70	267	106	37.4	21.0
			70	268	108	40.2	23.4
			70	268	110	38.6	20.7
			70	270	109	38.6	23.1
			70	265	110	39.1	22.5
Water 100°F	45°F	0:25	47	273	98	41.2	18.2
			45	274	97	41.5	19.5
			41	281	94	43.2	20.2
			46	276	100	42.2	18.2
			47	277	98	41.8	18.4
	70°F	0:50	70	271	94	41.8	18.2
			68	280	98	41.9	17.6
			68	271	104	43.1	19.4
			68	277	105	41.8	20.0
			72	267	110	40.8	18.4
	70°F held 2 hrs	2:50	70	265	101	37.2	19.8
			70	266	98	40.3	20.2
			70	264	108	40.5	18.5
			70	264	110	39.4	18.2
			70	268	109	39.9	19.0
Air 70°F	45°F	5:45	50	270	98	41.4	16.2
			47	274	100	40.5	19.4
			46	283	92	41.2	19.4
			48	280	94	42.2	23.4
			48	273	98	42.3	18.4
	70°F	8:15	68	275	103	40.0	18.9
			68	267	109	39.8	19.6
			67	271	106	39.8	18.3
			67	268	110	40.1	21.9
			67	271	105	40.2	17.7
	70°F held 2 hrs	10:15	72	271	102	39.6	19.4
			72	270	106	38.8	17.1
			72	267	108	38.1	18.5
			72	272	103	38.5	19.5
			72	269	105	37.5	19.6

TABLE XVII

ELUEBERRIES - RUBEL VARIETY - UNTREATED

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	46	290	68	47.6	19.7
			45	290	75	47.5	20.1
			45	293	81	47.5	15.9
			47	289	86	45.9	18.9
			47	290	83	47.4	17.7
	70°F	2:00	68	285	82	47.4	19.7
			68	293	78	46.3	18.3
			68	294	86	45.8	20.7
			68	287	87	46.0	21.1
			70	283	91	45.2	21.8
	70°F held 2 hrs	4:00	70	277	95	43.3	20.6
			70	290	87	43.8	23.3
			70	278	94	42.9	18.9
			70	280	94	42.8	22.5
			70	285	95	43.1	21.2
Water 100°F	45°F	0:25	46	292	85	41.7	22.1
			48	288	91	40.7	18.3
			47	294	84	41.5	17.9
			47	290	84	41.5	22.6
			48	292	116	37.7	19.6
	70°F	0:55	76	287	89	45.7	20.1
			72	291	85	44.9	20.1
			73	286	94	45.2	20.0
			74	285	94	45.7	21.8
			73	287	92	45.2	20.0
	70°F held 2 hrs	2:55	72	284	82	45.2	17.9
			72	277	90	43.8	17.6
			72	293	88	43.0	17.6
			72	282	97	44.4	19.1
			72	284	98	43.2	19.0
Air 70°F	45°F	5:30	48	281	93	40.0	17.2
			46	290	89	44.2	20.3
			47	287	88	45.3	19.8
			47	292	88	45.4	20.1
			46	281	91	44.7	20.0
	70°F	8:25	68	278	100	43.0	22.6
			68	283	91	43.6	22.6
			68	280	99	42.7	23.1
			68	283	93	43.6	20.0
			69	287	91	44.1	20.1
	70°F held 2 hrs	10:25	74	277	86	42.3	21.3
			74	282	84	44.1	21.2
			74	284	94	42.7	19.5
			74	281	97	43.4	18.8
			74	282	93	43.3	19.4

TABLE XVIII

BLUEBERRIES - RUBEL VARIETY
10-SECOND STEAM SCALD TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:55	45	291	80	45.6	22.0
				44	285	88	46.1	20.4
				45	287	92	46.7	22.7
				44	291	88	44.6	20.6
				44	285	92	45.2	23.6
		70°F	2:00	68	285	94	44.6	19.6
				68	280	94	44.7	18.8
				68	283	94	43.9	18.4
				68	284	91	44.2	23.3
				69	286	90	49.5	20.7
		70°F held 2 hrs	4:00	70	279	97	42.4	19.0
				70	279	97	43.4	19.5
				70	282	98	43.1	18.2
				72	281	95	41.5	19.4
				72	284	97	43.0	18.9
Water	100°F	45°F	0:30	46	289	88	44.2	17.5
				47	288	87	44.4	18.2
				46	295	85	45.9	20.8
				48	290	88	46.2	19.1
				48	292	88	44.4	19.4
		70°F	0:50	68	284	92	44.7	18.9
				68	289	92	43.8	18.8
				68	284	94	43.9	18.3
				68	287	91	44.2	20.2
				68	288	80	44.2	17.8
		70°F held 2 hrs	2:50	72	281	90	42.7	21.2
				72	279	97	43.3	20.0
				72	281	98	42.2	19.9
				72	280	100	41.8	19.6
				72	280	102	41.4	20.0
Air	70°F	45°F	5:40	48	295	84	45.1	20.7
				48	281	93	43.3	18.6
				45	288	90	44.2	19.7
				45	280	99	43.8	20.3
				48	282	92	43.7	19.6
		70°F	8:30	70	283	98	43.2	18.9
				68	278	100	43.1	19.6
				69	278	98	43.0	20.6
				70	275	100	42.9	17.6
				70	276	97	42.8	19.4
		70°F held 2 hrs	10:30	74	278	100	39.7	19.5
				74	277	101	41.8	19.2
				74	279	100	41.7	20.5
				74	276	102	40.7	19.2
				74	276	101	40.1	17.1

TABLE XIX

BLUEBERRIES - RUBEL VARIETY - NICKED

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:55	45	295	80	44.9	18.9
				45	289	88	44.7	18.8
				45	293	87	44.2	19.0
				45	286	95	43.3	22.1
				45	287	96	42.8	18.6
		70°F	2:00	68	278	100	41.9	18.2
				68	277	98	41.8	19.5
				68	287	98	40.6	19.0
				70	289	94	42.2	18.9
				70	289	94	41.4	18.5
		70°F held 2 hrs	4:00	70	276	95	40.1	20.1
				70	275	95	40.5	22.4
				70	281	101	39.6	23.0
				70	278	108	39.9	19.5
				70	277	109	40.9	22.5
Water	100°F	45°F	0:25	45	283	80	43.9	23.2
				46	284	90	45.4	20.8
				46	288	90	43.8	22.0
				45	289	88	42.8	22.4
				45	284	97	43.1	20.6
		70°F	0:50	70	278	100	43.3	24.0
				68	282	97	43.8	20.1
				72	277	103	42.8	22.5
				70	279	101	42.8	24.8
				72	279	102	42.2	23.8
		70°F held 2 hrs	2:50	74	275	97	40.9	18.9
				72	276	94	40.2	19.5
				72	276	103	39.7	19.0
				72	275	106	39.8	19.7
				74	269	105	40.6	20.0
Air	70°F	45°F	4:45	50	280	90	43.5	18.7
				46	285	90	44.7	20.4
				48	284	104	42.3	17.8
				48	282	96	42.8	18.4
				50	287	100	42.7	19.6
		70°F	7:00	68	277	107	40.1	19.1
				67	277	105	41.6	18.9
				68	276	102	40.1	19.1
				70	278	80	38.8	18.9
				70	278	103	40.0	19.5
		70°F held 2 hrs	9:00	70	276	108	39.6	23.0
				70	275	108	39.9	23.2
				70	276	109	40.2	21.4
				70	277	105	39.8	24.2
				70	275	109	39.2	21.4

TABLE XX

BLUEBERRIES - RUBEL VARIETY
10-SECOND STEAM SCALD + NICKED

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	45	280	98	41.7	22.0
			45	279	93	41.4	19.6
			45	284	98	40.9	19.7
			45	275	101	41.0	19.5
			46	277	100	40.2	18.8
	70°F	2:00	70	277	102	40.8	19.5
			68	277	100	41.2	20.9
			70	281	106	40.2	21.2
			68	275	106	39.0	20.1
			70	284	98	41.9	19.7
	70°F held 2 hrs	4:00	70	275	116	38.0	19.4
			72	272	107	39.2	18.5
			70	271	116	38.5	20.6
			72	270	111	40.1	17.9
			70	273	110	38.8	17.8
Water 100°F	45°F	0:25	45	284	90	42.6	19.0
			46	281	91	42.8	18.8
			44	282	98	42.1	17.8
			45	285	94	42.1	18.3
			45	280	100	40.9	19.5
	70°F	0:55	72	275	102	41.0	20.2
			84	279	200	20.0	16.0
			69	275	103	38.3	19.6
			70	276	102	39.2	21.2
			70	279	106	41.3	20.1
	70°F held 2 hrs	2:55	72	269	109	39.9	20.6
			72	275	103	39.6	23.3
			72	271	111	38.3	20.5
			72	271	111	38.3	17.7
			72	265	116	38.1	19.4
Air 70°F	45°F	5:30	50	280	103	41.0	18.4
			52	281	100	41.3	20.2
			50	254	94	41.1	18.9
			50	276	107	29.0	22.0
			49	282	101	39.8	17.8
	70°F	7:40	68	279	104	40.7	19.0
			68	276	101	40.3	19.6
			68	279	101	39.8	20.3
			69	275	107	40.6	20.6
			70	272	111	37.4	20.1
	70°F held 2 hrs	9:40	70	273	111	38.7	21.5
			70	275	108	38.4	21.2
			70	275	112	37.6	24.4
			70	273	110	39.3	18.4
			70	271	114	38.4	18.9

TABLE XXI

CHERRIES, RED SOUR - DRY SUGAR TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:45	42	306	78	43.9	24.8
			42	299	98	44.2	27.8
			43	302	93	43.8	33.4
			45	289	96	40.6	33.4
			46	272	110	43.8	23.7
	70°F	2:00	68	292	104	44.7	27.9
			66	277	112	41.6	29.9
			69	276	120	43.0	29.1
			70	276	108	40.4	27.9
			68	276	96	39.7	28.9
	70°F held 2 hrs	4:00	72	267	118	38.2	27.9
			72	267	118	38.1	27.5
			72	271	124	39.0	27.2
			72	274	124	40.7	26.5
			72	267	126	38.0	35.0
Water 100°F	45°F	0:25	50	275	105	42.5	24.7
			45	295	86	43.7	25.0
			44	292	102	43.7	19.2
			44	294	98	44.7	28.4
			44	297	100	44.2	26.0
	70°F	0:55	70	268	120	39.2	26.5
			72	271	122	42.5	28.0
			74	266	115	39.0	27.4
			72	279	118	38.1	26.0
			80	264	131	38.2	28.9
	70°F held 2 hrs	2:55	71	266	130	38.8	24.8
			72	275	118	39.1	27.1
			73	280	115	40.3	27.6
			72	271	125	38.5	26.5
			72	275	118	40.2	26.5
Air 70°F	45°F	5:30	50	276	106	37.9	25.5
			47	277	106	38.0	27.6
			46	288	104	39.0	26.5
			45	285	110	38.2	27.2
			50	290	108	41.4	28.9
	70°F	7:45	68	277	108	37.1	34.0
			68	276	78	39.2	21.4
			68	284	105	39.1	32.2
			68	272	110	40.4	25.3
			68	273	112	39.1	26.0
	70°F held 2 hrs	9:45	74	276	112	40.1	26.1
			74	267	116	39.6	28.1
			74	271	115	35.3	24.3
			74	275	115	37.3	28.9
			74	264	121	39.4	26.3

TABLE XXII

CHERRIES, RED SOUR - SUCROSE SIRUP TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:55	48	305	110	32.5	28.3
				47	310	104	32.7	20.1
				45	306	108	32.5	24.3
				46	303	110	32.5	19.6
				48	294	114	31.1	22.5
		70°F	1:55	68	294	120	31.2	23.1
				67	299	116	31.2	23.9
				68	291	118	29.4	23.0
				68	298	112	29.3	22.0
				69	290	120	29.8	24.3
		70°F held 2 hrs	3:55	72	286	124	31.0	24.2
				72	284	124	30.9	24.2
				72	293	130	27.9	24.9
				72	285	130	29.1	26.6
				72	291	120	28.6	20.1
Water	100°F	45°F	0:25	48	287	125	31.4	24.9
				45	299	112	30.0	23.6
				46	299	115	34.3	27.8
				47	303	109	33.9	25.5
				44	296	118	30.6	22.6
		70°F	0:52	72	289	122	29.3	25.7
				70	290	120	30.4	29.1
				69	281	126	30.2	28.6
				72	283	126	30.6	23.1
				69	292	118	29.4	26.3
		70°F held 2 hrs	2:52	72	291	116	29.4	24.8
				72	292	118	29.8	26.2
				73	291	118	29.5	27.7
				74	280	120	29.5	26.1
				74	294	116	28.9	25.6
Air	70°F	45°F	6:55	50	291	112	32.1	25.4
				46	287	120	29.7	21.3
				45	286	116	29.1	25.0
				48	300	110	27.0	17.8
				46	297	112	28.2	19.0
		70°F	8:30	68	280	130	27.7	27.0
				70	288	130	26.8	22.0
				68	291	122	27.9	20.6
				70	293	122	27.8	23.0
				72	299	112	27.7	21.8
		70°F held 2 hrs	10:30	74	280	125	27.9	24.3
				74	287	118	27.8	27.9
				74	287	120	25.4	23.6
				74	289	120	26.4	30.7
				74	294	118	27.0	27.2

TABLE XXIII

CHERRIES, RED SOUR
70-30 SUCROSE-SWEETOSE SIRUP TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	45	306	102	32.7	23.8
			45	297	110	31.1	25.8
			45	292	120	30.7	24.3
			45	300	110	29.9	28.3
			45	303	110	31.2	25.8
	70°F	2:00	70	298	112	31.7	24.7
			68	292	118	29.8	27.8
			68	294	118	30.0	24.7
			68	291	122	30.0	25.0
			68	289	126	28.4	23.1
	70°F held 2 hrs	4:00	68	296	116	31.0	26.6
			68	284	122	30.4	22.7
			68	294	120	29.4	24.8
			68	293	122	28.2	24.9
			68	296	118	28.8	25.2
Water 100°F	45°F	0:25	45	304	96	27.8	19.1
			44	302	100	27.8	23.8
			45	303	108	27.9	22.5
			44	302	108	32.3	22.6
			42	304	109	32.4	23.7
	70°F	0:50	80	280	128	30.6	22.3
			76	276	130	31.1	22.5
			74	289	124	31.8	24.6
			72	280	130	31.2	24.7
			74	276	130	30.6	24.2
	70°F held 2 hrs	2:50	72	282	130	30.6	20.1
			72	284	128	30.1	23.7
			72	297	112	30.1	23.6
			72	286	126	31.2	24.4
			72	294	118	29.4	24.6
Air 70°F	45°F	5:30	48	287	120	30.4	24.4
			48	299	140	29.5	25.6
			48	300	114	27.7	23.9
			48	301	110	28.8	25.4
			48	308	108	28.1	24.0
	70°F	8:25	68	285	128	28.1	23.2
			68	294	118	27.8	24.4
			68	299	115	28.1	23.8
			68	302	112	27.3	24.9
			68	290	120	28.8	19.6
	70°F held 2 hrs	10:25	72	290	128	29.0	24.4
			72	291	120	28.3	23.7
			72	287	130	28.1	24.7
			72	294	124	29.0	24.7
			72	293	124	27.1	24.9

TABLE XXIV

CHERRIES, SWEET - DRY SUGAR TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:52	46	301	90	45.3	36.3
			45	298	92	44.7	27.8
			46	296	84	46.0	39.1
			45	310	90	41.9	32.4
			45	306	86	43.8	33.3
	70°F	2:06	68	299	94	43.0	30.6
			68	302	92	43.0	28.1
			68	292	120	39.6	28.9
			68	286	108	42.3	31.2
			68	293	104	44.1	32.6
	70°F held 2 hrs	4:06	72	291	100	37.6	31.4
			72	285	104	38.7	34.7
			72	293	110	35.3	30.4
			72	276	110	37.7	29.4
			72	297	104	37.2	29.7
Water 100°F	45°F	0:25	48	298	83	44.9	31.1
			46	300	78	46.0	32.6
			45	300	88	44.3	29.8
			45	296	105	40.3	33.4
			48	298	90	45.3	32.9
	70°F	0:50	72	294	97	45.2	34.1
			70	297	88	47.4	34.1
			72	291	98	46.3	33.9
			70	285	110	43.8	35.3
			74	281	112	44.3	30.5
	70°F held 2 hrs	2:50	72	280	104	42.8	35.7
			72	278	111	41.8	32.5
			72	280	111	41.8	31.1
			72	280	114	38.0	33.4
			72	276	120	37.8	32.9
Air 70°F	45°F	5:00	48	289	90	47.1	31.2
			45	304	88	42.6	29.8
			45	313	84	41.1	26.2
			46	302	88	40.8	28.3
			48	300	98	43.7	29.0
	70°F	7:40	68	278	105	39.6	34.2
			68	292	92	40.0	29.4
			68	288	104	42.8	31.1
			68	288	110	41.2	31.5
			68	280	110	41.2	31.1
	70°F held 2 hrs	9:40	70	277	98	41.3	34.3
			70	288	96	37.6	28.9
			70	278	112	40.2	24.3
			70	283	109	38.3	31.2
			70	286	110	40.6	32.2

TABLE XXV

CHERRIES, SWEET - SUCROSE SIRUP TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:50	45	310	150	37.8	26.5
				46	309	150	36.0	29.1
				44	312	146	35.4	27.9
				45	302	154	34.5	28.1
				45	307	150	35.6	28.2
		70°F	1:50	68	305	158	34.3	29.8
				68	295	165	36.0	29.4
				68	287	170	34.9	26.5
				68	295	170	34.6	26.1
				68	291	170	35.3	32.5
		70°F held 2 hrs	3:50	70	288	156	34.4	30.7
				70	286	164	35.2	31.3
				70	283	173	35.8	30.8
				70	292	170	33.4	32.6
				70	287	170	34.3	27.7
Water	100°F	45°F	0:25	48	303	138	31.7	28.1
				48	303	140	37.4	28.9
				45	304	150	36.8	27.1
				46	303	152	37.2	32.8
				47	299	154	35.5	32.2
		70°F	0:42	71	287	162	36.2	30.0
				72	295	162	36.5	29.5
				72	291	188	33.9	26.4
				72	288	168	36.0	27.3
				69	300	160	34.8	27.9
		70°F held 2 hrs	2:42	72	283	162	36.4	28.2
				72	282	184	33.1	27.6
				72	278	174	33.3	29.2
				72	283	174	32.9	32.2
				72	274	178	33.9	26.1
Air	70°F	45°F	6:05	45	304	148	32.9	30.7
				45	314	140	35.5	29.1
				45	312	150	35.3	33.2
				46	304	152	35.0	29.5
				46	312	145	36.0	32.2
		70°F	7:45	67	298	162	35.4	31.5
				67	291	164	34.0	27.6
				67	295	158	34.6	27.6
				67	293	170	33.9	30.5
				67	290	162	34.2	31.6
		70°F held 2 hrs	9:45	69	289	168	34.4	30.5
				69	293	168	31.7	26.8
				69	287	172	34.3	28.2
				69	291	170	34.3	26.2
				69	288	170	33.7	31.6

TABLE XXVI

CHERRIES, SWEET
70-30 SUCROSE-SWEETOSE SIRUP TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:55	45	320	140	35.5	28.4
				48	310	150	36.2	28.4
				45	314	152	35.1	27.1
				48	301	160	34.4	26.6
				45	310	152	35.0	26.6
		70°F	2:00	68	294	168	35.2	28.9
				68	295	166	34.9	30.4
				68	289	168	35.5	29.5
				68	296	164	33.9	27.6
				68	293	168	35.9	26.5
		70°F held 2 hrs	4:00	70	282	210	31.6	29.4
				70	281	170	34.1	30.6
				70	281	174	34.4	30.1
				70	275	178	35.0	28.8
				70	285	170	34.3	31.1
Water	100°F	45°F	0:25	47	299	158	35.2	24.5
				45	293	162	37.3	29.5
				46	305	152	37.7	29.4
				46	299	158	36.2	28.2
				45	298	160	38.2	29.1
		70°F	1:05	70	286	164	35.6	28.2
				72	282	170	35.6	27.9
				72	281	174	34.9	32.2
				73	283	176	35.1	29.2
				74	287	174	34.1	30.5
		70°F held 2 hrs	3:05	72	282	174	35.1	33.1
				72	272	184	32.6	28.9
				72	279	180	33.8	31.2
				72	286	174	33.3	31.4
				72	279	194	32.3	27.6
Air	70°F	45°F	5:25	50	297	160	31.8	29.4
				48	300	162	34.1	29.4
				50	295	164	34.4	31.8
				50	298	164	33.9	29.0
				48	298	168	34.6	33.6
		70°F	8:25	70	282	170	32.8	29.9
				70	296	168	32.8	28.2
				70	282	176	34.3	29.9
				70	282	172	33.9	30.6
				70	287	170	34.0	31.0
		70°F held 2 hrs	10:25	72	277	182	32.1	30.1
				72	277	181	32.8	33.2
				72	281	178	33.9	30.6
				72	277	180	32.3	30.5
				72	277	189	32.3	34.1

TABLE XXVII

PEACHES - SUCROSE SIRUP TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	0:53	45	291	172	23.8	22.0
				44	285	182	23.2	20.3
				44	299	168	22.0	21.6
				45	293	174	23.3	21.6
				46	299	166	23.8	20.8
		70°F	2:00	68	289	174	25.0	20.8
				68	286	176	24.3	21.8
				68	299	170	22.5	21.8
				68	287	180	22.6	17.9
				68	299	172	22.5	21.4
		70°F held 2 hrs	4:00	70	289	172	23.9	22.6
				70	294	170	23.2	19.8
				70	295	170	23.1	21.4
				70	297	170	22.5	22.5
				70	203	168	21.9	23.0
Water	100°F	45°F	0:29	45	282	168	24.2	18.9
				48	272	180	23.1	19.6
				45	287	176	22.5	20.0
				48	275	190	22.5	19.0
				50	268	190	22.8	18.8
		70°F	0:55	72	281	182	23.7	18.3
				72	289	178	23.2	19.4
				70	287	180	22.8	22.2
				70	285	180	24.2	19.9
				70	290	180	22.5	21.4
		70°F held 2 hrs	2:55	70	287	166	24.6	20.6
				70	292	168	24.4	24.2
				70	295	174	23.1	23.8
				70	296	170	22.6	22.5
				70	294	170	22.6	21.9
Air	70°F	45°F	5:15	43	294	168	23.4	22.1
				43	287	172	23.9	19.0
				42	302	168	23.1	20.8
				43	303	164	23.1	17.8
				43	305	164	23.7	22.0
		70°F	9:45	68	290	170	23.0	20.9
				68	302	166	22.7	20.1
				68	295	170	22.4	23.0
				68	297	168	22.4	23.0
				68	306	162	22.0	21.8
		70°F held 2 hrs	11:45	70	294	162	23.7	19.0
				70	290	170	23.7	20.2
				70	284	188	22.4	21.8
				70	280	188	21.2	21.0
				70	287	178	23.1	21.4

TABLE XVIII

RASPBERRIES - DRY SUGAR TREATMENT

MD		TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water	70°F	45°F	1:00	45	265	112	37.3	26.0
				46	268	105	36.6	27.0
				46	263	128	37.3	27.5
				46	269	132	38.1	27.6
				46	266	125	37.1	24.6
		70°F	1:55	67	268	110	38.9	25.8
				68	264	114	39.0	26.6
				67	268	124	37.0	23.9
				68	266	134	38.5	24.6
				68	280	118	38.6	29.8
		70°F held 2 hrs	3:55	68	271	121	37.0	25.6
				68	268	128	38.7	27.2
				68	269	126	35.1	29.8
				68	265	132	36.2	24.8
				68	263	130	37.5	27.0
Water	100°F	45°F	0:30	48	276	122	36.5	28.4
				45	265	130	39.2	26.2
				42	257	130	36.2	28.5
				46	260	140	35.2	26.0
				49	270	130	35.0	25.3
		70°F	1:30	70	260	138	37.1	31.4
				67	271	120	35.4	23.0
				68	261	138	37.6	23.8
				68	261	136	37.5	23.6
				68	258	140	39.0	27.0
		70°F held	4:30	70	267	114	38.1	26.2
				70	260	114	37.1	23.8
				70	276	112	35.3	22.5
				70	262	130	37.5	23.9
				70	263	140	37.8	23.8
Air	70°F	45°F	5:00	47	270	94	37.2	28.2
				46	271	100	36.0	26.4
				45	280	110	37.4	26.0
				45	266	120	35.0	27.8
				46	266	122	35.1	26.5
		70°F	8:15	65	256	120	37.2	28.8
				67	257	132	37.6	29.7
				67	263	120	38.7	22.4
				68	261	120	38.1	17.9
				68	260	128	37.1	20.2
		70°F held 2 hrs	10:15	70	270	125	31.6	17.9
				70	263	132	31.6	21.8
				70	256	123	31.6	22.4
				70	267	125	34.3	25.7
				70	260	130	35.4	29.8

TABLE XXIX

RASPBERRIES - SUCROSE SIRUP TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	46	300	150	37.2	25.9
			47	298	152	37.8	25.0
			48	300	154	37.1	24.5
			46	300	160	35.0	25.9
			46	320	146	34.4	29.1
	70°F	2:00	70	284	166	34.3	26.8
			70	281	170	33.9	27.4
			68	287	166	35.1	26.8
			68	284	172	32.9	27.1
			70	283	176	33.6	22.6
	70°F held 2 hrs	4:00	70	287	178	33.0	31.5
			70	283	174	32.5	26.8
			70	281	180	32.5	23.2
			70	286	172	33.4	27.8
			70	275	178	34.1	26.2
Water 100°F	45°F	0:25	45	287	174	33.8	23.8
			45	296	164	35.2	24.8
			46	304	155	35.2	26.4
			46	294	160	34.6	21.2
			46	292	165	33.9	21.4
	70°F	0:55	70	293	165	36.5	23.9
			70	278	176	33.7	26.8
			68	290	170	34.4	24.9
			68	274	180	33.9	21.8
			69	288	170	31.4	25.8
	70°F held 2 hrs	2:55	70	284	150	33.2	29.3
			70	279	164	33.9	25.6
			70	283	174	33.8	23.9
			70	276	182	34.1	30.1
			70	286	170	34.1	30.5
Air 70°F	45°F	6:00	50	295	170	34.4	22.7
			45	299	165	34.4	27.0
			45	298	162	34.4	22.3
			46	301	160	33.9	29.4
			46	291	171	32.9	27.1
	70°F	8:30	68	290	168	35.0	20.4
			67	287	170	34.2	28.4
			66	288	172	35.0	20.5
			66	289	170	33.8	28.2
			66	294	168	32.6	29.0
	70°F held 2 hrs	10:30	70	279	184	32.6	31.6
			70	274	188	34.0	34.3
			70	287	170	33.6	28.2
			70	282	175	31.5	27.8
			70	283	174	31.1	33.4

TABLE XXX

RASPBERRIES - 70-30 SUCROSE-SWEETOSE SIRUP TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	44	297	160	32.8	25.7
			45	295	162	34.2	28.9
			44	299	158	33.7	26.1
			46	293	168	34.5	24.9
			45	293	160	34.3	27.8
	70°F	2:00	68	281	178	33.2	23.0
			68	286	172	33.4	26.0
			68	292	162	34.4	25.6
			68	290	168	34.2	26.2
			68	279	182	34.5	27.6
	70°F held	4:00	70	282	164	32.6	27.6
			70	277	164	33.9	19.0
			70	285	172	32.6	23.5
			70	285	172	32.7	26.2
			70	282	176	33.5	28.0
Water 100°F	45°F	0:25	45	287	172	33.2	24.2
			45	294	164	33.2	25.4
			45	283	176	34.2	23.1
			45	294	166	34.9	25.9
			45	290	174	31.8	25.4
	70°F	1:05	76	273	172	33.4	23.1
			76	270	180	31.2	23.1
			76	271	184	31.6	20.9
			74	268	188	33.7	21.8
			78	277	180	31.7	20.7
	70°F held 2 hrs	3:05	74	276	174	31.8	30.7
			74	276	181	30.5	23.6
			74	277	184	31.4	24.2
			74	272	188	30.6	24.9
			74	285	174	31.6	30.1
Air 70°F	45°F	5:15	45	294	160	32.1	27.7
			45	293	166	30.0	26.1
			44	289	166	32.8	25.5
			44	295	164	30.5	28.1
			44	294	166	32.5	25.6
	70°F	8:45	68	273	181	33.6	27.1
			68	276	178	31.7	22.1
			68	280	182	31.1	22.5
			68	279	180	31.0	22.4
			68	276	184	29.8	22.8
	70°F held 2 hrs	10:45	70	271	190	30.6	25.0
			70	265	186	30.0	23.7
			70	265	192	29.8	26.5
			70	276	180	30.8	23.2
			70	265	192	29.8	24.9

TABLE XXXI

STRAWBERRIES - DRY SUGAR TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:54	45	280	122	33.4	24.6
			46	250	141	34.1	16.2
			46	285	120	34.2	26.5
			45	275	144	31.1	25.3
			46	268	136	33.3	31.2
	70°F	2:00	67	260	128	33.8	28.1
			67	268	130	29.9	19.7
			67	254	144	33.4	28.8
			68	246	146	31.5	24.4
			68	255	148	31.3	23.0
	70°F held 2 hrs	4:00	68	261	210	28.1	17.2
			68	252	130	29.9	21.4
			68	232	170	23.8	20.9
			68	235	210	24.0	18.8
			68	251	140	29.5	24.9
Water 100°F	45°F	0:25	45	262	108	35.0	26.2
			45	252	126	37.8	25.4
			45	269	122	32.2	20.8
			45	247	144	33.9	27.9
			45	267	134	35.1	27.0
	70°F	0:55	70	248	152	32.3	26.0
			72	228	164	33.4	18.8
			72	243	158	33.6	20.2
			70	256	148	33.8	23.7
			72	244	150	35.0	23.2
	70°F held 2 hrs	2:55	70	246	130	31.2	28.0
			70	250	120	32.1	39.0
			70	240	154	31.1	24.3
			70	248	154	34.7	29.9
			70	255	164	33.4	27.9
Air 70°F	45°F	5:35	45	276	112	31.1	23.7
			44	275	120	34.8	25.6
			44	276	114	31.8	27.2
			44	275	126	32.1	24.7
			44	276	128	32.7	23.9
	70°F	9:00	68	261	139	30.4	27.2
			68	255	140	33.4	22.0
			68	258	150	30.0	20.0
			68	248	140	30.5	30.1
			68	258	142	31.2	29.5
	70°F held 2 hrs	11:00	72	260	118	32.2	21.0
			72	247	130	33.9	23.2
			72	252	140	30.6	23.6
			72	262	130	30.4	19.1
			72	249	155	28.1	22.5

TABLE XXXII

STRAWBERRIES - SUCROSE SIRUP TREATMENT

MD	TP	Tm	Tp	DW	VJ	%ssJ	%ssF
Water 70°F	45°F	0:55	45	262	194	31.2	21.3
			45	286	180	30.0	17.8
			45	285	184	30.5	20.8
			45	280	188	30.6	18.8
			45	277	187	30.6	20.8
	70°F	1:05	68	268	198	29.8	20.7
			68	265	200	30.7	17.7
			68	260	196	31.1	17.5
			68	264	192	31.5	20.7
			68	262	200	31.1	22.4
	70°F held	3:05	70	266	189	31.7	21.8
			70	266	190	30.6	20.0
			70	276	196	30.4	17.8
			70	257	210	28.8	20.2
			70	268	194	30.5	16.5
Water 100°F	45°F	0:25	45	252	200	32.5	17.6
			45	265	190	31.2	19.8
			46	288	178	31.7	18.6
			47	269	188	31.5	17.7
			46	275	190	30.3	20.8
	70°F	0:50	69	266	176	33.2	18.8
			70	242	186	31.5	22.4
			69	227	218	28.2	15.5
			70	260	192	32.1	17.7
			70	267	188	31.6	15.8
	70°F held	2:50	70	239	218	30.5	19.0
			70	263	214	32.7	19.7
			70	254	208	29.9	20.7
			70	260	196	31.5	20.1
			70	262	190	32.2	20.7
Air 70°F	45°F	5:40	44	267	192	29.7	24.2
			44	285	188	31.1	24.7
			44	258	210	31.6	22.7
			44	293	172	30.0	15.9
			44	276	180	29.0	21.3
	70°F	8:55	67	266	198	31.6	29.0
			67	258	210	30.0	26.2
			67	265	198	28.6	24.0
			67	251	210	29.4	25.0
			67	262	202	28.2	24.8
	70°F held 2 hrs	10:55	70	288	188	29.9	28.2
			70	258	208	29.1	24.3
			70	271	190	30.0	27.6
			70	246	214	28.3	23.0
			70	260	204	29.8	16.5

The effect of the method of defrosting on the drained weights of selected Michigan frozen fruits.

1/15/35