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Title The Blackberry Frozen Puree Dessert

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This investigation was a trial to check the possibility of developing a frozen blackberry puree dessert. A blend of different varieties and selections of blackberries, as it may be expected in commercial production was preferred to provide the fruit-puree-mix.

Several stabilizers bearing different commercial names were added to the fruit puree mix to produce an overrun percent and texture comparable to that of ice cream. These stabilizers used in the study were as follows: Gelatin (275 Bloom), Methocel 1500 and 4000 cps., pectin (150) grade, Krim-Ko-Gel, Stavel and CMC high and medium viscosity.

The results obtained have indicated that gelatin (275 Bloom) was the easiest to bring into solution; significantly increased the viscosity of the puree-mix, produced the highest overrun percent at a comparable concentration and was the most successful stabilizer to prserve the color, flavor and texture of the puree-mix, either after freezing or at an extended storage period of fourteen months at 0 F.

THE BLACKBERRY FROZEN PUREE DESSERT

by

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Report

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CHAPTER I

INTRODUCTION

The conversion of fresh or frozen fruit into frozen fruit puree desserts is an excellent method for utilization of surplus fruit, especially for those fruits which retain their characteristic color and flavor during processing and prolonged storage. Blackberries fit readily into this group because of their abundance of excellent flavor which can withstand dilution. However the presence of large seeds (compared to strawberries) has limited their consumption in the fresh state and in products where the seeds are not removed. In the manufacture of frozen fruit desserts, the blackberries are pureed, the seeds are removed in the process, and so a big disadvantage has been eliminated.

There is very little information in the literature pertaining to the physical and chemical properties of frozen blackberry purees which may determine their stability during zero storage and their behaviour during the thawing period just before they are consumed. The consumer is used to the "thawing" behaviour of ice cream and will expect a frozen fruit puree to behave similarly. Consequently the "melt-down" characteristics of a frozen fruit puree must be superior or at least equal to that of ice cream.

The purpose of this investigation was to prepare frozen blackberry desserts from different dilutions of purees to evaluate its general acceptability as a frozen dessert and to determine its stability in frozen storage (0° F.). Physical properties of the purees were studied by means of viscosity and melting down resistance, appearance by visual examination and flavor evaluated by organoleptic tests.

CHAPTER II

LITERATURE SURVEY

A. Fruit Maturity.

Culpepper, Caldwell and Wright (4, p.7) were among the first to advocate the use of fruit pulp in the manufacture of ice cream. Using peaches at varying stages of ripeness, they showed that the differences in flavor were due to differences in the maturity of the fruit when picked. The influence of this factor was much more pronounced than that attributable to the method selected for crushing and pulping.

Sorber (13, p.16) favored the use of juicy-mature fruits which would not only produce high quality purees but would also allow the fruit growers to utilize a larger proportion of their crop which would otherwise be unmarketable.

Weigand (18, p.52) recommended the use of only dead ripe fruits in the production of purees for dessert purposes because of their better adaptability to the pureeing procedures and because they do not impart a bitter taste to the finished product.

B. The Preservation of Color and Flavor.

Mack and Fellers (9, pp.19-20) noticed that when fresh fruit was mixed with sugar the flavor was greatly accentuated, especially when it was left at 40 F for 24 hours before freezing.

Joslyn (7, p.20) found that the addition of sugar to produce a fruit pulp-sugar ratio of 3:1 prevented the loss of color and flavor from the fresh fruit.

Sorber (14, pp.18-19) noted that desserts made from most of the fruit-purees are greatly improved in color and flavor by increasing their acidity slightly. This has the effect of stabilizing vitamin C and the color of the fruit.

Gray and his associates (5, p.51) added 0.15 to 0.25% ascorbic acid based on the weight of puree to prevent the oxidative discoloration of unblanched fruit desserts.

C. The Use of Puree Equipment.

Cruess, Cole and Joslyn (3, p.8) employed a small power-driven grinder for grinding fruits on a conical screw expeller press and for pulping whole fruits for fruit ice cream. This machine grinds and sieves the fruit in one operation.

Joslyn (7, p.32) preferred to grind easily oxidized fruits such as avocados, apples, peaches and apricots in airtight grinders rather than to use a tomato cyclone which beats too much air into the product.

Culpepper, Caldwell and Wright (7, p.4) employed two different methods for the crushing and pulping of the fruit.

In one, a power driven food chopper was fitted with a plate that ground the material into a rather coarse pulp. In the other method a power driven tomato pulping machine was used with a "medium" screen (the type for finishing tomato catsup). The pulp so made was much more finely divided than that made with the food chopper and only soft-ripe fruit could be handled satisfactorily in this way.

Sorber (13, p.229) used a pulping device called a Sep-Ro-Sive to obtain seedless raspberry purees. He obtained yields averaging 81 percent by this method. The Sep-Ro-Siv is a tapered spiral equipped with a plunger which gradually presses the product against heavily reinforced screens furnished in a range of perforations down to 20/1000 of an inch, capable of removing blackberry seeds. The juice and pulp come through the perforations of the screen and the seeds, skins and roughage are discarded at the end of the screen.

Gray and his associates (5, p.51) have written an excellent review with precise directions on the preparation of frozen desserts. They preferred the use of a pulping machine plus a finisher or even a juice extractor where the "Waste" is run through several times to assure maximum yield of the puree from the fruit. In the case of quite seedy berries as raspberries and currants they recommend the immediate removal of seeds as they may introduce a woody flavor into the finished product.

Later, Sorber (through private communication) advised the use of a Model F juice extractor and pulper manufactured by the Chisholm-Ryder Company of Niagra Falls, New York. The pulper consists of a power driven rotating conical spiral screw that forces the pulp through a stationary conical screen that fits over the screw. The finest screen perforations can be satisfactorily used to make a seedless puree.

D. The Purpose of Stabilizers in the Making of Frozen Desserts.

Tressler and Evers (16, p.414) pointed out that they greatly doubt the popularity of frozen desserts without the addition of stabilizers. They found that unstabilized desserts melted faster than ice cream at room temperature unless some stabilizer was present to govern the melting behaviour.

Tracy (15, p.44) showed that the efficiency of added stabilizers is partially dependent upon the percentage of water present in the frozen product and the conditions under which the product is to be held after being stabilized and frozen i.e. the length of time and the temperature fluctuations in the storage room. Sommer (12, p.465) described the functions of added stabilizers as aids for developing a smooth texture in the frozen product and for maintaining this texture from the time the product is hardened until it reached the consumer. In addition he suggested that the stabilizer should accomplish this action without interference with normal whipping qualities and should not impart any undesirable effects on the color, flavor and the melting-down characteristics of the finished product.

Potter and Williams (11, p.18) considered stabilizers as indispensable ingredients in ice cream mix because of their ability to retard the growth of large ice crystals during frozen storage. Tracy (15, p.92) observed that ice cream made with gelatin (275 Bloom) had more melt resistant characteristics at higher temperatures than that made of lower Bloom gelatin. The higher Bloom gelatin tends to keep the frozen product in a firmer state when the temperature rises. However he mentioned other factors which may affect the proper stabilization as follows:

1. Type of gelatin used. (Source and Bloom).
2. The amount and size of insoluble solids in the mix.
3. The temperature of the mix before the addition to the freezer.
4. The type of freezer used and the drawing-off[1] temperature.

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1. The drawing-off temperature is the temperature at which the ice cream is removed from the freezer after it has been frozen.

Experiments conducted by Tracy and his associates (15, p.92) revealed that acid-type gelatins were superior to alkaline-type gelatins. About 25 percent less gelatin can be used if the mix is permitted to cool slowly from 70° F. to 40° F. The viscosity of the mix increases upon slow cooling as a result of the gradual hydration of the gelatin particles. However gelatin causes an increase in the viscosity of ice cream which continues slowly after cooling for at least 24 hours.

Potter and Williams (11, p.18) proposed that a stabilizer be practically tasteless, odorless and free from foreign materials, have a low bacterial count, and be readily dispersible in the mix. However Gray and his associates (5, p.52) showed that the efficiency of a stabilizer is dependent on other processing and storage factors such as:

1. The speed of the paddles of the freezer.
2. The volume of the freezer compared to the volume of the mix.
3. The temperature and method of hardening.
4. The period and temperature of storage.

E. The Freezing Process.

Loeffler (17, p.5) observed that desserts prepared from buttery purees, such as peaches and apricots tend to become dry and grainy when too much overrun is produced. He preferred an overrun of 80 to 90 percent for these buttery fruits and a higher overrun of 100 to 110 percent for more juicy and highly flavored fruits such as berries and plum desserts.

Precooling of the fruit mix to 40° F., keeping the temperature of the refrigerant in the freezer at 0 F. and rapid paddle speed were reported to be conducive to small ice crystal formation (5, p.52). To preserve the vitamin C content of the puree, Loeffler (17, p.3) suggested that the temperature of the puree mix should be maintained at 40° F., and mixing kept to a minimum prior to transferring to the freezer.

F. Description of the Stabilizers Used.

1. Gelatin.

Gelatin is a hydrophilic colloid. It absorbs five to nine times its weight of water after being ground and allowed to swell for 48 hours at 15° C. Gelatin solutions should not be heated above 60 - 70° C., otherwise progressive destruction of the jellying power will result (6, p.824). Viscosity and osmotic pressure of gelatin sols show a minimum at the iso-electric point, rising to a maximum of different magnitudes on the acid and alkaline sides. (10, pp.167-168). Rapid stirring will lower the viscosity whereas slow stirring will increase it. In aerated products such as ice cream and frozen desserts gelatin tends to lower the interfacial tensions of the mix particles and hence it aids in stabilizing the foam (overrun) produced by the whipping action of the freezer. Its ability to adsorb water at low temperatures helps to inhibit the growth of large ice crystals.

2. Pectin (150) Grade.

Pectin is a hydrophilic colloid made from apple and citrus fruit wastes. It is graded according to its jellying power. The required amount of powdered pectin should be mixed with three or more parts sucrose and then dissolved in water at 60 to 70 C. The mixture is customarily stirred for several minutes and may then be heated to boiling to complete the dissolving of the pectin.

3. Methyl Cellulose Ethers (Dow Methocel 1500 to 4000 cps.)

Methyl cellulose ether is a synthetic hydrophilic colloid made from purified cellulose. It is made in different viscosity types to meet a wide range of requirements. It is not affected by heat, light or aging. It is soluble in cold water down to freezing temperatures (10, p.151). It is easily wetted out by first mixing the material thoroughly with approximately half of the required water at boiling temperature and allowing it to soak for 20 to 30 minutes with agitation.

4. Krim-Ko-Gel.

This stabilizer is a derivative of Irish moss. The active principle of the moss is the gell-forming carbohydrate known as gelose. It stabilizes, emulsifies and suspends solid particles in liquid solutions. It is sensitive to prolonged high temperature processing and to pH from 4.0 down to 1.0 (2, p.65). The best way to use it is to put it into complete solution by sprinkling it on the surface of cold water with vigorous agitation, heating this suspension to 160 F. and holding it at this temperature for at least 15 minutes to insure complete solution of all suspended particles.

5. Stavel.

Stavel is composed of blended, modified, specially processed gums. It is soluble in cold water and unaffected by varying acidity (1, p.3). It reduces the juice drainage in defrosted fruits. The suggested amount for use as a fruit stabilizer is four ounces of Stavel for thirty pounds of defrosted fruit.

6. CMC (High and Medium Viscosity).

Carboxymethylcellulose is a white granular powder and is sold under such trade names as Carboxy Methocel, Callocel and CMC, It forms highly viscous sols in water or in alkaline solutions.

Although the sols are quite stable to heat, there is some decrease in viscosity on long exposure to elevated temperatures such as 70° C. (10, p.153).

CHAPTER III

EXPERIMENTAL PROCEDURES AND RESULTS

A. Preparation of the Blackberry Puree.

Pound-size packages of frozen blackberries of assorted varieties and selections were used. All these berries were packed in a 50° Brix sucrose-syrup with a 2:1 fruit:syrup ratio.

The frozen packs were allowed to thaw at a temperature of 50 F. by placing them in suitable containers in a stream of cold water. Then the different varieties and selections of blackberries were blended and the thawed sample was fed into a small hand-operated cyclone pulper equipped with a finely perforated screen which separat ed the seeds and the other coarse tissues from the fruit pulp. A previously weighed container was used to receive the seeds and coarse tissues which amounted to 15.5 percent of the total weight of the sample.

A preliminary test was then run to determine the titratable acidity, soluble solids and pH of the blackberry puree. The results are tabulated in Table 1.

Table 1.

Analysis of Blackberry Puree

Titratable acidity[1] (as citric acid) ...	0.95%
Soluble solids content (using the hand refractometer)	26.00%
pH value (using the Beckman model G pH meter)	3.60%

Promptly after pureeing the samples were transferred to covered enamelled cans and stored in the 34° F. room for two or three days.

B. Preparation of the Puree-Mix Prior to Addition to the Taylor Freezer.

These purees held at 32 F. had a tendency to form large ice crystals which were brought into solution by warming the samples to 75° F. with continuous stirring. Sucrose was the only sugar used in these experiments. Both sucrose and water were added to give a final soluble solids of 36.5 percent. This included 0.5 percent stabilizer. The final puree-mix had fourteen percent water added according to the formula tabulated in Table 2 a.

1. A suitable dilution of the puree was titrated with 0.1 normal NaOH solution and the titratable acidity was calculated as percent citric acid.

Table 2.

Puree Formulations for Various Packs of Blackberries.

Table 2 a.

Puree of 26% s.s. (including natural soluble solids and 14% water)[1]	84.00%
Sugar added to reach 36% s.s.	13.75%
Water added to contain 14% of the total mix	1.75%
Stabilizer added to give a final soluble solids of 36.5%	0.50%

If fresh blackberries of 10 percent n.s.s. were used, the formula would be rearranged as shown in Table 2 b. to contain essentially the same percent ingredients by weight as listed in Table 2 a.

Table 2 b.

Puree (10% n.s.s.)	55.0%
Sugar added to reach 36% s.s.	30.5%
Water added to contain 14% of the total mix	14.0%
Stabilizer added to give a final s.s. of 36.5%	0.5%

1. The percent of added water was computed from the amount of water originally added in the preparation of the packs in the form of 50° Brix sucrose syrup.

Whereas if blackberries were preserved in dry sugar with 3.8:1 fruit-sugar ratio the formula can be rearranged as is shown in Table 2 c.

Table 2 c.

Puree (31% s.s.)	72.7%
Sugar added to reach 36% s.s.	12.8%
Water added to contain 14% of the total mix	14.0%
Stabilizer added to give a final s.s. of 36.5%	0.5%

The formula listed in Table 2 a. was used throughout the first part of this investigation, in preference to the basic formula for Velva Fruit, because of its higher percent of added water. The Velva Fruit formula contains 10% added water. The greater dilution used in these experiments is suitable for the highly flavored blackberry purees.

Different stabilizers required different procedures for their addition to the mix. The prepared mix was always cooled and kept at 40° F. for 20 minutes prior to the addition to the Taylor freezer.

C. Methods of Introducing Different Test Stabilizers to the Mix.

The facility with which a stabilizer disperses in water or in a sucrose solution is an important consideration in the preparation of frozen fruit purees. Preliminary tests were carried out with various stabilizers to find out how readily these stabilizers disperse in water or sucrose solutions at different temperatures. Sixteen beakers each containing 99.5 g. distilled water and another sixteen beakers each containing 99.5 g. of 36% sucrose-water solution were kept at 75° F. and 145° F. respectively. To each beaker 0.5 grams of the stabilizers to be tested were added very carefully with continuous stirring until a very faint cloudiness in the solution developed. At this moment the addition of stabilizer was discontinued and the remaining portion of the stabilizer was reweighed and the percent dispersion was calculated according to the following equation:

$$\text{Percent dispersion} = \frac{\text{Amount of stabilizer added}}{0.5} \times 100$$

The results are summarized in Table 3.

Table 3.

The Percent Dispersion of Various Test Stabilizers in Different Media and Temperatures.

Type of stabilizer	Percent dispersion (0.5 g. stabilizer/ 99.5 g. water)		Percent dispersion (0.5 g. stabilizer/ 99.5 g. of 36% sucrose solution)	
	At 75° F.	At 145° F.	At 75° F.	At 145° F.
CMC High Viscosity	Wetted, no dispersion	Wetted, no dispersion	Wetted, no dispersion	75% dispersion
CMC Medium Viscosity	Same	Same	Same	Same
Stavel	50% dispersion	90% dispersion	90% dispersion	100% dispersion
Gelatin 275 Bloom	100% dispersion	100% dispersion	100% dispersion	100% dispersion
Methocel 1500 cps	Wetted, no dispersion	100% dispersion	100% dispersion	100% dispersion
Methocel 4000 cps	Same	Same	Same	Same
Pectin (150) grade	30% dispersion	50% dispersion	100% dispersion	100% dispersion
Krim-Ko-Gel	100% dispersion (highly turbid)	100% dispersion (highly turbid)	100% dispersion (moderately turbid)	100% dispersion (moderately turbid)

Gelatin (275 Bloom) and Krim-Ko-Gel were readily dispersible in ten times their weights of water at 145 F.; then the solution was carefully heated to 170° F. and added to the mix. However pectin (150) grade; Methocel 1500 cps and 4000 cps.; CMC of high and medium viscosity and Stavel were completely dispersed when previously mixed with ten times their weights of sucrose, dissolved in warm water (120° to 140° F.) and then were added to the mix.

D. Checking the Percent Overrun of Various Test Stabilizers.

For this test we used a six quart Taylor ice cream freezer equipped with paddles having a whipping action of 209 r.p.m. This equipment has previously been described by Lundeen (8, p.21). In this process air is whipped into the mix by the action of the revolving paddles to help produce the proper percentage of overrun. To determine the percent overrun each mix was of uniform composition except for the stabilizer which was varied from sample to sample. The mix was always cooled to 40° F. before addition to the freezer. The freezing process was continued until the mixture acquired the maximum percentage of overrun. The method used by Lundeen (8, p.22) in calculating the overrun was employed.

The results are tabulated in Table 4 and illustrated in Figure 1.

Table 4

The Percent Overrun of Different Test Stabilizers

Type of stabilizer	Concentration of stabilizer used	Percent overrun	Rating
Gelatin (275 Bloom)	0.50	104.30	1
Methocel 4000 cps.	0.50	95.80	2
Methocel 1500 cps.	0.50	95.80	Same
Pectin (150) grade	0.50	91.80	3
Krim-Ko-Gel	0.50	75.50	4
Stavel	0.50	62.00	5
CMC H igh Viscosity	0.50	46.80	6
CMC Med. Viscosity	0.50	34.20	7
Control (No stabilizer)	None	33.80	8

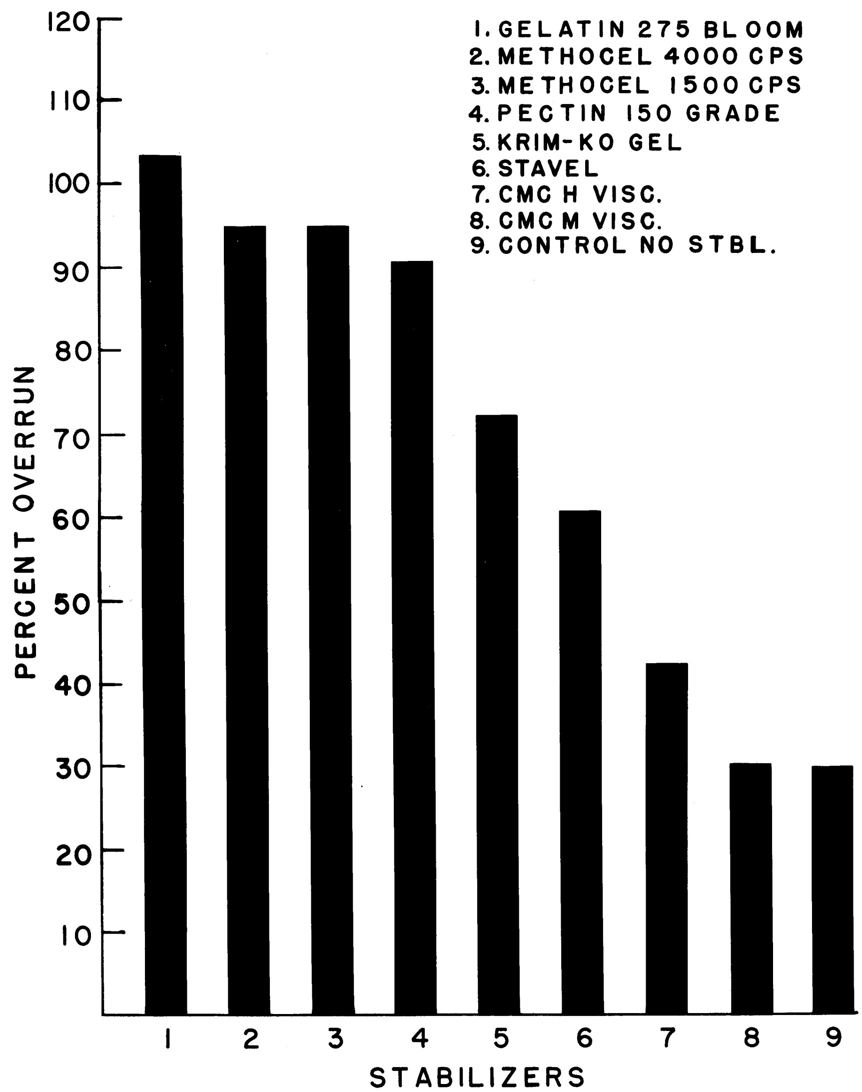

Figure 1

THE PERCENT OVERRUN OF TESTED STABILIZERS

AT .5 PERCENT CONCENTRATION IN BLACKBERRY PUREE

E. Viscosity Measurements of the Puree-Mix at Specific Times.

This test was confined to those stabilizers which produced the maximum overrun percentage in the preceding test, namely gelatin (275 Bloom), pectin (150) grade and Dow Methocel 4000 cps. In order to determine their influence upon the mix viscosity, 450 grams of puree mixes having the same initial viscosity, 36.5% soluble solids and 0.5% added stabilizer were poured into 600 ml. beakers. By means of a Brookfield Syncho-Lectric Viscosimeter, the viscosity in centipoises was determined immediately after the addition of stabilizer and at ten minute intervals thereafter.

The results are shown in Figure 2.

F. Factors Affecting the Percent Overrun in the Fruit Puree.

1. The concentration of the stabilizer.

In this experiment the three stabilizers which produced the highest percentage of overrun were tested at three concentrations. The mixes used contained the same percentage of the ingredients but the type and amount of stabilizer varied.

Each of the concentrations of gelatin used produced a higher percentage of overrun than the

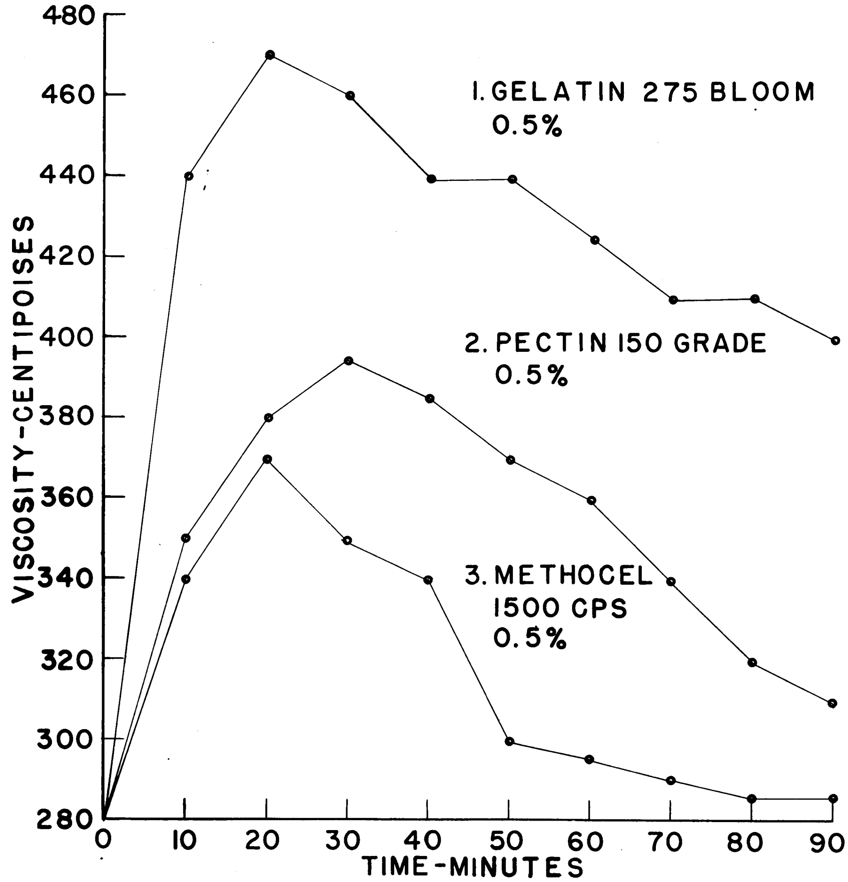

Figure 2

VISCOSITY MEASUREMENTS OF STABILIZERS

AT REGULAR TIME INTERVALS

same concentration of the other stabilizers.

The results are tabulated in Table 5.

Table 5.

Stabilizer	Concentration Used	Percent Overrun
Gelatin (275 Bloom)	0.36%	95.50%
" " "	0.50	104.30
" " "	0.60	110.70
Methocel (1500 cps.)	0.36	79.50
" " "	0.50	95.80
" " "	0.60	108.20
Pectin (150) grade	0.36	63.40
" " "	0.50	91.80
" " "	0.60	95.10

2. Variation in the percent of puree and sucrose added.

In this test, test samples of constant weight with variable soluble solids content were used. The volume of added water and the weight of stabilizer were kept constant.

The results are shown in Table 6.

Table 6

Ingredients in the formulas	Formula A	Formula B	Formula C
Puree	68.33%	63.88%	59.44%
Added sucrose	21.17	25.62	30.06
Total puree and added sucrose	89.50	89.50	89.50
Added water	10.00	10.00	10.00
Added stabilizer	0.50	0.50	0.50
Final soluble solids	28.50 Brix	32.50	36.50
Overrun percent	75.50	80.70	90.10

3. Reduction in the percent of puree plus additional water.

In this test, mixes of different percentages of added water were prepared. Both soluble solids content and stabilizer were fixed at 36% and 0.5% respectively of the total mix.

The results are shown in Table 7.

Table 7

Ingredients in the formulas	Formula C	Formula D	Formula E
Puree	59.44%	55.00%	48.33%
Added sucrose	30.06	30.50	31.17
Total puree and added sucrose	89.50	85.50	79.50
Added water	10.00	14.00	20.00
Added stabilizer	0.50	0.50	0.50
Percent overrun	90.10	104.80	115.60

G. Rates of Warming of the Blackberry Desserts.

In this test duplicate samples of each of the three best stabilizers were brought from 0° F. storage and left to warm-up at room temperature (75° F.). The temperature readings were recorded at 10 minute intervals.

The results are shown graphically in Figure 3.

H . The Melting-Down Tests.

After storage for 14 months at 0° F., the purees stabilized by gelatin, Methocel and pectin are evaluated by the melting test. Duplicate samples were placed on 8-mesh screens in a 75° F. room. After a 45 minute thawing

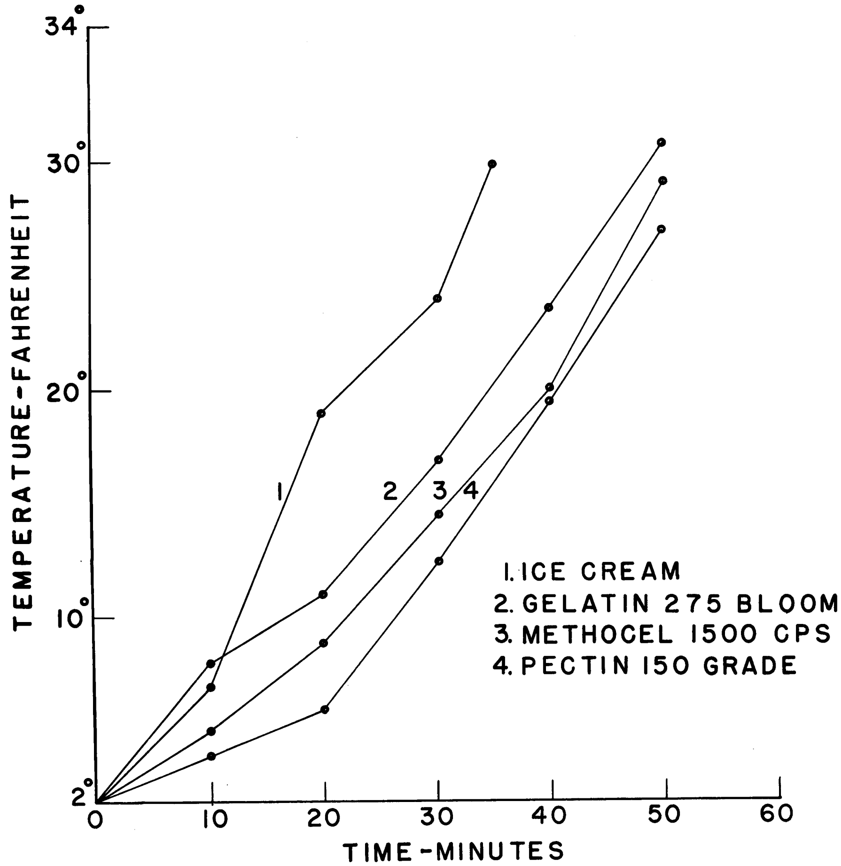

Figure 3

THE RATE OF WARMING UP OF FROZEN BLACKBERRY DESSERTS MADE WITH DIFFERENT STABILIZERS COMPARED TO ICE CREAM.

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1. The values for ice cream were obtained from Velva Fruit report (17, p.8).

period, the weight of the drip from each sample was recorded at ten minute intervals. The percent drained weights plotted against elapsed time are shown in Figure 4. In addition pictures of this action were taken at different intervals at room temperature.

I. Storage Tests.

These tests were primarily conducted to determine in general how blackberry frozen desserts keep in storage and to establish how different stabilizers affect the characteristics of the frozen desserts such as flavor, color, body and texture, after a long period of storage. The stabilizers tested were gelatin (275 Bloom), pectin (150) grade and Methocel 1500 cps. Fifteen samples of each stabilizer dessert were frozen at the same time under similar conditions and were promptly hardened at -20 F. and stored at 0° F. for fourteen months.

The samples were then taken out for examination and the results are shown in Table 8.

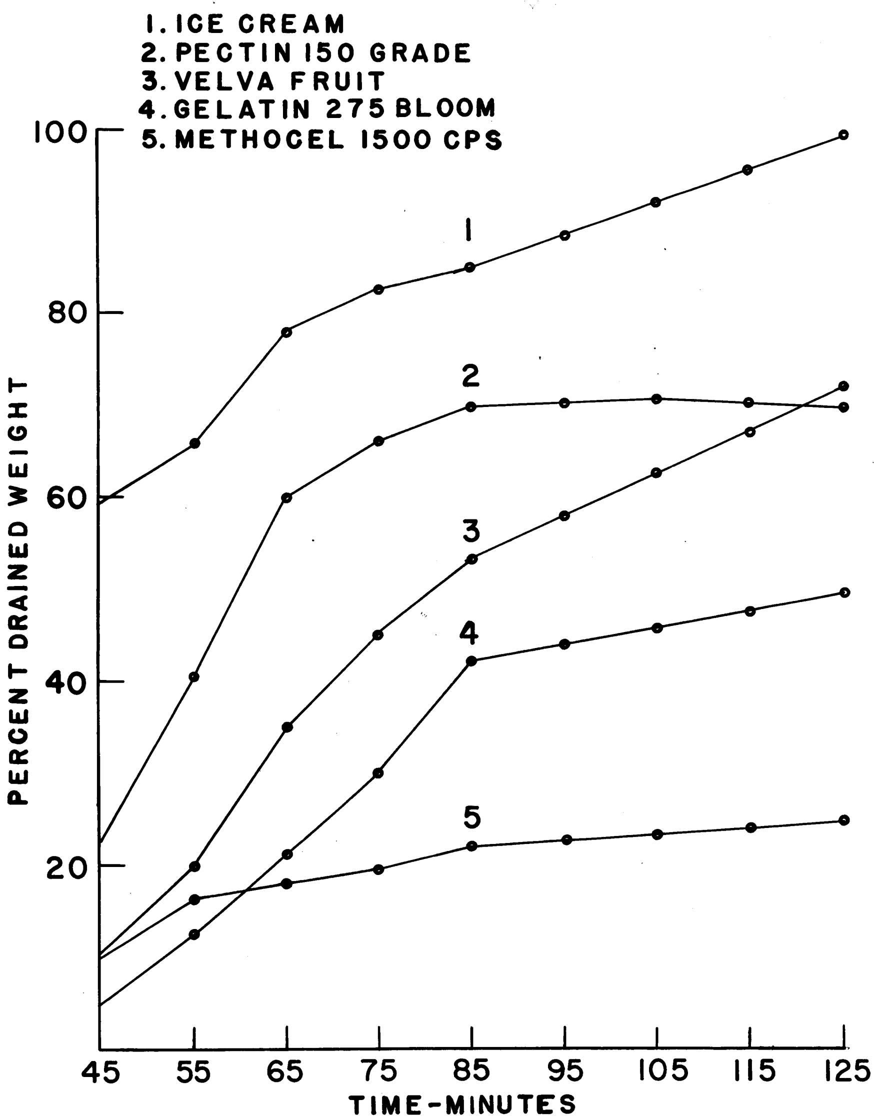
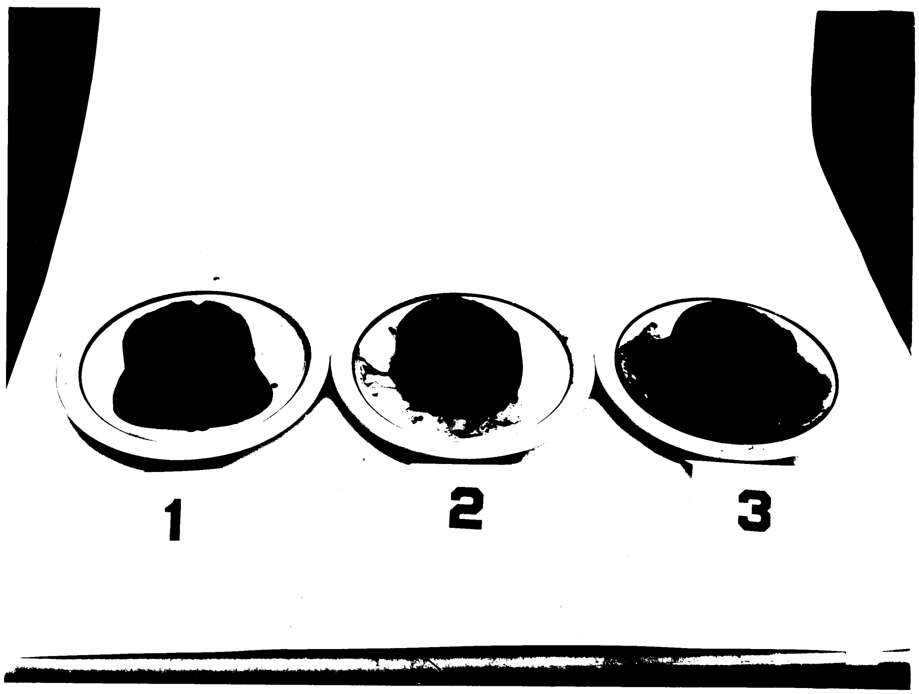


Figure 4

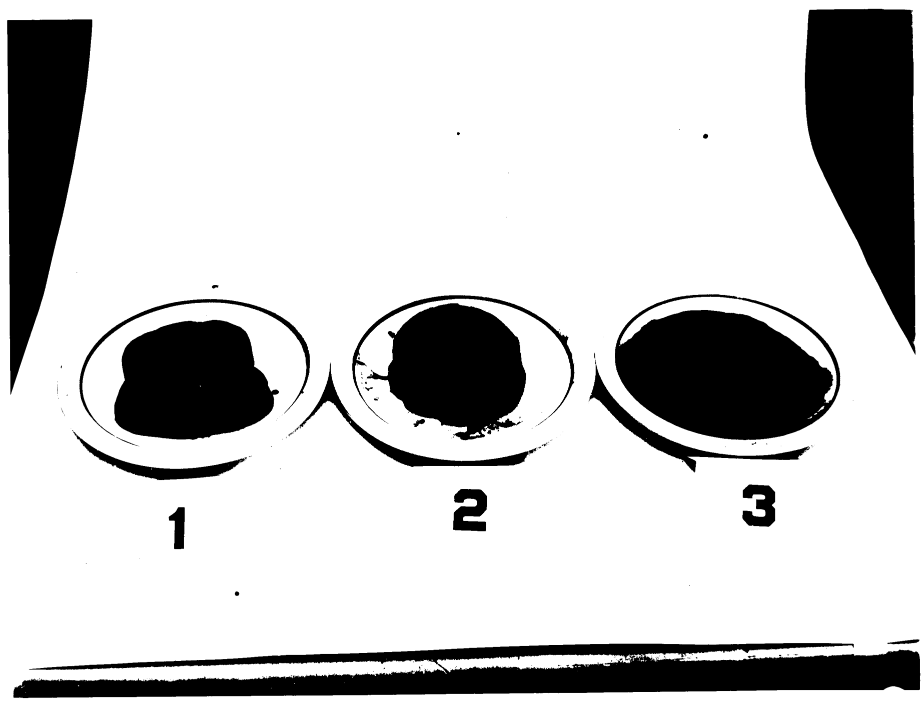
THE PERCENT DRAINED WEIGHTS OF

TESTED STABILIZERS AT SPECIFIC TIMES.



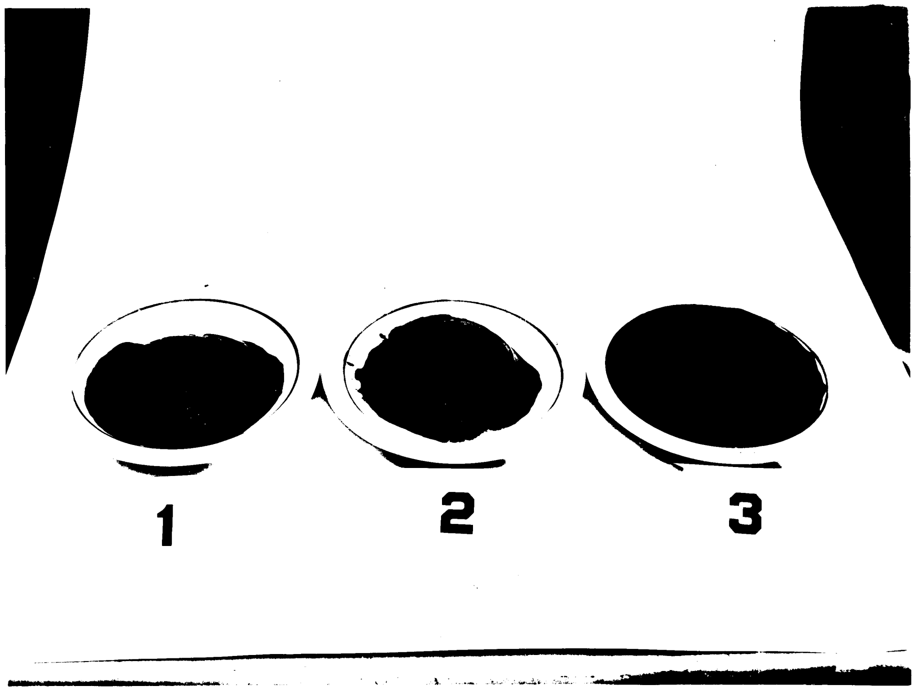
Picture 1

Picture 1 shows the shape of the three blackberry desserts at the start of the melting. No. 1 is the dessert made with gelatin (275 Bloom) as stabilizer; No. 2 was made with Methocel 1500 cps. and No. 3 was made with pectin (150) grade.



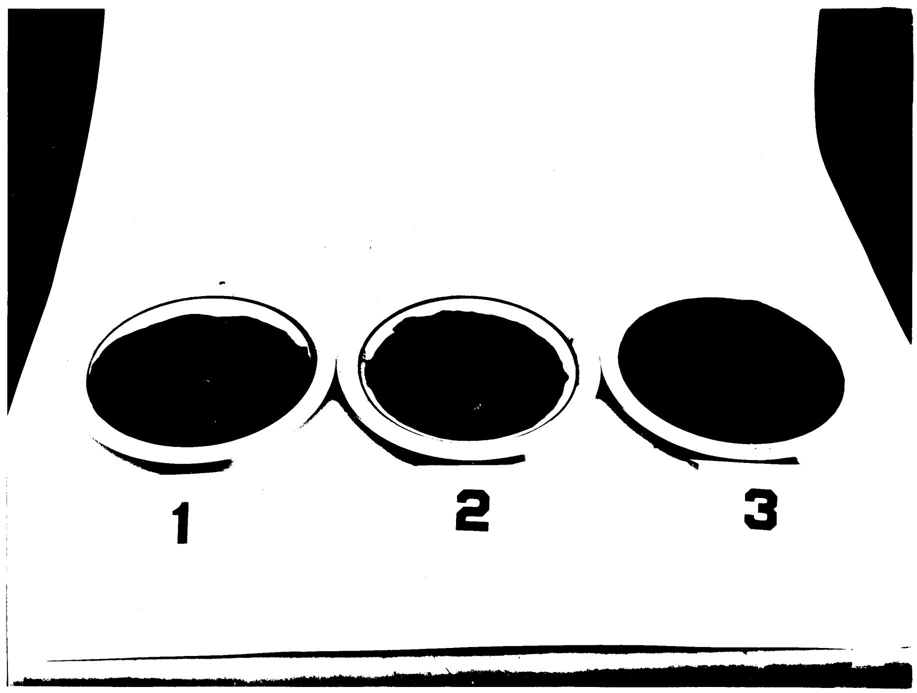
Picture 2.

Same after half an hour.



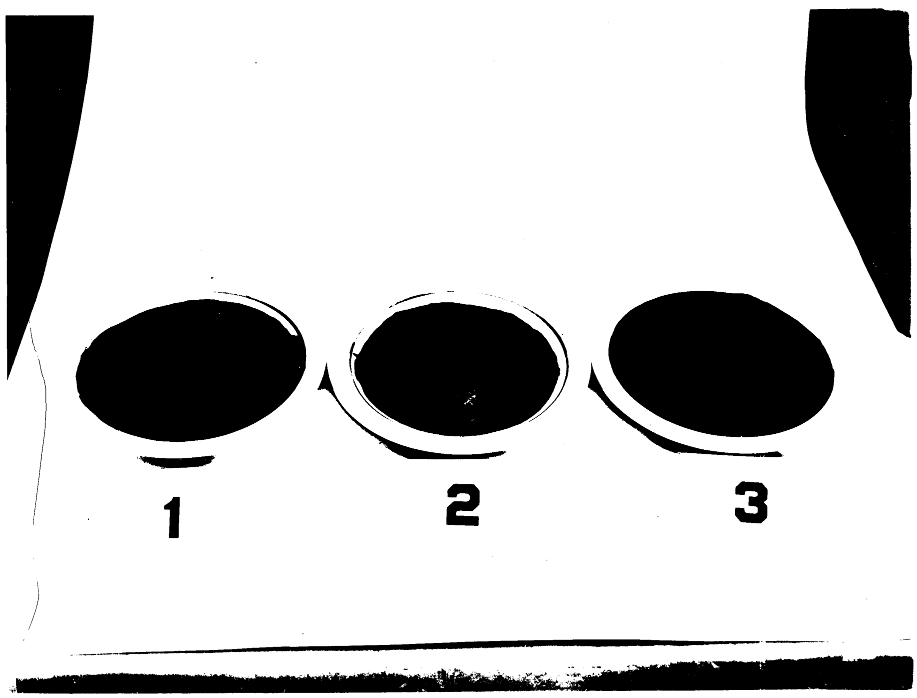
Picture 3.

Same after one hour.



Picture 4.

Same after one and one-half hours.



Picture 5.

Same after two hours.

Table 8

Type of stabilizer	Storage period in months	Color	Flavor	Texture and body
Gelatin (275 Bloom)	14	good	good	smooth, small ice crystals
Methocel 1500 cps	14	very good	fair	rubbery
Pectin (150) grade	14	poor (bluish cast)	fair	coarse and sticky, large ice crystals

J. Organoleptic Tests.

Many food products can be analyzed in the laboratory and their quality can be judged thereby. However such a judgment is incomplete, since it does not indicate or take into consideration the function of gustation. Flavor is the final factor which must be evaluated before a product is developed for the commercial market.

Accordingly a series of taste-tests were carried out to examine the quality characteristics of desserts made with .5 percent gelatin (275 Bloom), Dow Methocel 1500 cps. and pectin (150) grade to find out how these desserts made with different stabilizers compared to each other and how close they are in matching the remarkable qualities of ice cream. Each taster was supplied with three samples at a time, one of these was a duplicate sample. The samples were brought from the storage room at the same time and served under similar conditions. The taste-test results obtained, have indicated that blackberry desserts stabilized with gelatin (275 Bloom) were preferred by the majority of the taste-testers. These were judged to have a better fruit flavor and smoother texture with very small ice crystals. Pectin (150) grade stabilized had a coarse texture with large ice crystals, sticky feeling, very dark color and poor flavor. Desserts containing Methocel 1500 cps. were described to be too rubbery, too pasty, quite spongy in texture and lacking in flavor.

CHAPTER IV

DISCUSSION OF RESULTS

From Table 3, we observe that gelatin (275 Bloom) and Krim-Ko-Gel at 0.5% concentration, were readily dispersible both in water and in a 36% sucrose solution at 75° F. and 145° F. temperature. As shown, other stabilizers did not disperse with the same ease and required a certain procedure for their dispersion which may restrict their use in commercial production.

From Figure 2 we see that gelatin (275 Bloom) at a concentration of 0.5% had introduced the highest viscosity measurement to the mix when measured with the Brookfield Syncho-Lectric viscosimeter.

From Table 4 and Figure 2, gelatin (275 Bloom) at 0.5% concentration rated first in producing the highest overrun percent, followed by Methocel 1500 cps. and 4000 cps. and pectin (150) grade.

It has been reaffirmed from Table 5 that lower concentrations of stabilizers did not produce the proper overrun. On the other hand, when higher concentrations were used, there was no significant increase in the overrun. Also it has been observed from Tables 6 and 7 that an increase in both water and soluble solids percent in the mix was inducive to higher overrun percent within the range of these tests.

Data in Figure 3 show that desserts made with gelatin (275 Bloom) warmed up at a slower rate than ice cream at room temperature (75° F.).

We notice in Figure 4 that practically all the blackberry desserts made with different test stabilizers melted at a slower rate than ice cream. A comparison between graph 1 and graph 4 shows that gelatin (275 Bloom) stabilized blackberry dessert melted in the same fashion as ice cream did but at a much slower rate. Methocel (1500 cps.) left an unmeltable residue which was gummy in character.

From Table 7 gelatin (275 Bloom) stabilized desserts were found to bear a good color and flavor with a smooth texture containing very small ice crystals after being stored for 14 months at (0° F.). Methocel (1500 cps.) produced a rubbery texture more or less gummy in character with masked flavor. Pectin (150) grade failed to inhibit the growth of ice crystals as a result of its inability to absorb water at a lower temperature. The dessert acquired a sticky feeling and the color turned a dark bluish.

The taste-test results have shown that gelatin (275 Bloom) was the most successful stabilizer to bring out the proper qualities of the blackberry puree dessert and to

CHAPTER V

SUMMARY AND CONCLUSIONS

1. On the basis of solubility; the gelatin stabilizer was preferred. The difficulty which is encountered and the time consumed in getting the substitutes into a homogeneous suspension is much greater than with gelatin. The ease of securing a homogeneous mix is a point in favor of the gelatin.

2. Gelatin (275 Bloom) of a similar concentration gave a higher viscosity measurement after being introduced to the mix than any other stabilizer tested.

3. Blackberry frozen desserts made with 0.5% gelatin (275 Bloom) produced the highest overrun percent; had the most practical melting behaviour, comparable to ice cream; retained all the natural color and flavor unchanged and gave the smoothest texture with small ice crystals after being frozen; when hardened at -20 F. after being frozen and stored for fourteen months at 0 F.

4. A rather significant increase in overrun percent was observed in desserts made with 0.5% gelatin (275 Bloom) when the amounts of added water and soluble solids were raised from 10% to 20% and 28.5% to 36.5% respectively.

5. Desserts made with 0.5% gelatin (275 Bloom) and 14% and 20% added water, provided the soluble solids of the

mix was 36.5 in each case, showed no indication of large ice crystal formation when promptly hardened at -20° F. after being frozen and stored for 14 months at 0° F.

6. Desserts made with 0.5% Dow Methocel (1500 cps.) and (4000 cps.) gave practically the same overrun under similar conditions of freezing.

7. Desserts made with 0.5% Dow Methocel (1500 cps.) gave the second highest overrun percent after gelatin (275 Bloom); the color was superior; had a starchy flavor; showed no melting-down characteristics and were more or less gummy in character after being hardened at -20 F. and stored for 14 months at 0° F.

8. Desserts made with CMC high and medium viscosity with 0.5% Krim-Ko-Gel and with 0.5% Stavel failed to produce the proper overrun percent and were discontinued early in the experimentation.

9. Desserts made with 0.5% pectin (150) grade gave the third highest overrun percent after gelatin (275 Bloom) and Methocel (1500 cps.). They melted faster than gelatin desserts, the color turned dark bluish; the flavor was undesirable; the body had a sticky feeling and was very coarse in texture with large ice crystals.

10. The majority of the taste-testers preferred the blackberry desserts made with gelatin (275 Bloom) over the other substitutes.

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