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FROZEN FRUITS FOR ICE CREAM

J. C. HENING AND A. C. DAHLBERG

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FROZEN FRUITS FOR ICE CREAM

J. C. HENING AND A. C. DAHLBERG

ABSTRACT

Sliced strawberries stored at 0°F in an 80 per cent cane sugar syrup improved the flavor and appearance of strawberry ice cream when the syrup from the berries was added to the mix in the freezer and when the chilled berries were mixed into the semi-frozen ice cream after it was drawn from the freezer.

The objectionable hardness of the frozen slices of berries in the ice cream could be overcome by allowing the sliced berries, after thawing, to stand overnight in the syrup in which they were packed.

Likewise, when the syrup from whole raspberries stored at 0°F in an 80 per cent cane sugar syrup was added to the mix in the freezer and the chilled berries mixed into the ice cream after it was drawn from the freezer, an exceptionally good raspberry ice cream was produced. The seeds were least objectionable in the whole berries.

Twenty to 25 per cent of fruit and additional milk solids in the ice cream mix in proportion to the dilution of the mix with fruit syrup decidedly improved the flavor and quality of the fruit ice cream.

Raspberries and strawberries stored at 15°F for 6 months lost much of their fresh flavor as compared with the same berries stored at 0°F.

Peaches packed at the rate of 5 pounds of peaches to 1 pound of sugar and stored at 0°F produced good peach ice cream. Since the flavor of peaches is so mild, 25 to 30 per cent of the fruit in ice cream was found to be desirable. A number of trials indicated that pulped, cooked peach skin increased the flavor considerably.

Apricots packed at the rate of 4 pounds of fruit to 1 pound of sugar and stored frozen gave a very satisfactory apricot flavor in ice cream. Heating apricots to 180° to 190°F for 5 minutes
before freezing greatly intensified their flavor. When the fruit was stirred into the ice cream after it was drawn from the freezer, the apricot skins were much less noticeable than when it was added to the mix in the freezer.

INTRODUCTION

New York State grows excellent fruit that should be used in greater amounts in the manufacture of ice cream. Altho frozen fruits have been used in making fruit ice cream for many years, better methods would increase their usage. Fruits have been so reasonable in price that larger quantities could now be used in ice cream without increasing the cost of the product. Therefore, the freezing of these fruits and their use in ice cream was studied not only from the standpoint of using larger amounts of them in ice cream than have heretofore been used, but from the standpoint of utilizing them in such a way as to increase the popularity of fruit ice cream.

The original plans of this investigation included several problems. Preliminary trials in the freezing of raspberries indicated that this fruit kept particularly well in storage and that the flavor was delicious in ice cream. Strawberries are low in sugar and high in their water content, so that pieces or whole berries freeze too hard in ice cream. It was thought that the berries might be fixed in the sugar solution by agar, gum, or gelatin, thus permitting the penetration of sugar into the berries during freezing. An increased sugar content in strawberries would soften the berries in ice cream so that it would be unnecessary to whip them in the ice cream freezer to cause their complete disappearance in the ice cream.

Results of variety tests, methods of packing, ratio of fruit to dry cane sugar or sugar syrup, use of corn sugar and mixtures of corn and cane sugar, and storage temperatures of frozen fruit have been recently presented by Mack and Fellers (1932), Fabricus (1931), Cruess, Overholser, and Bjarnason (1920), Culpepper (1928), Diehl, et al. (1930), Joslyn (1930), Tracy (1931), Turnbow and Cruess (1927), Wiegand (1931), and others have presented valuable information in their studies on frozen fruits. Turnbow and Raffetto (1928) and Sommer (1932) give general information on fruit ice creams.

1 Refers to Literature Cited, page 18.
Caldwell, Lutz, and Moon (1933), in recent variety studies of strawberries, placed Big Joe, Klondike, Brandywine, Blakemore, and Redheart in the first rank for the frozen pack method. These five varieties stood out as distinctly superior to the others when retention of color, texture or firmness, fragrance, and flavor was considered collectively. Those ranked second included Abington, Bliss, Chesapeake, Dr. Burrill, Howard, Portia, Missionary, Fairfax, Southland, and Belt. The varieties of peaches ranked first by them were J. H. Hale, Reeves, Chairs, St. John, and Up-to-Date. Those ranked second were Early Crawford, Late Crawford, Slappey, and the New Zealand variety A1. Crawford, however, was the best variety available for the tests reported here and was considered by them to be the best of the varieties placed second in rank.

The experimental methods are such that they can be presented to best advantage with the data. The ice cream mixes were prepared from sweet milk and cream produced by the Station herd using skim milk powder as the source of additional serum solids. The mixes contained 0.5 per cent of gelatin testing 150 grams by the Bloom gelometer. They were pasteurized at 150°F for 20 minutes and homogenized at 2,000 pounds pressure using a single stage valve.

RESULTS

The psychological effect of quartered strawberries or whole raspberries in ice cream made with these fruits prompted the writers to study the possibilities of making ice cream with pieces of the fruit scattered thru it. Some manufacturers have added strawberries in the freezer as the ice cream is being drawn from the freezer to preserve the identity of the berries. However, it is difficult to secure a satisfactory distribution of the fruit in the ice cream in this way. Some manufacturers stir the fruit into the ice cream after it is drawn from the freezer. However, whole or sliced strawberries when intact in ice cream are generally so much harder than the ice cream that they are objectionable.

Strawberry Ice Cream

Strawberries held in 75, 80, and 85 per cent sugar syrups for periods of 1, 2, 4, 6, 7, and 8 days at 40°F and then frozen were compared for hardness with berries put in the 0° room at once. The syrup was put on the berries at temperatures of 80°,
100°F, 140°F, and 160°F. The more concentrated syrups required the higher temperatures to prevent excessive sugar crystallization. It was expected that temperature would be of major importance in affecting sugar penetration. There was no softening or shrinking of the berries with syrup temperatures of 80°F to 100°F. A slight softening and heated flavor occurred at 120°F and 140°F, and greater softening and heated flavor took place at 160°F. The 100°F to 120°F temperatures were satisfactory for the 80 per cent sugar syrups, altho there was some sugar crystallization.

Cane sugar and a 5 to 2 combination of cane and corn sugar were used in an attempt to lower the freezing point of the berries by increased sugar concentration and by a sugar which has a greater depressing effect upon the freezing point.

In these preliminary trials, the 24- or 48-hour holding periods at 40°F before freezing gave slightly softer berries than when the berries were stored at 0°F as soon as the syrup was added. The berries at the bottom in the heavy syrup were not as icy as those at the top. The longer holding periods at 40°F had no effect on the hardness of the berries after freezing but did increase the shrinkage of the berries. The concentrated sugar syrups, of course, drew juice out of the fruit.

In 1931, four varieties of strawberries were packed, namely, Parsons Beauty, Howard, Redheart, and Culver. Culver is a new canning variety of considerable promise developed at this Station. Howard is a commercial variety grown extensively in this neighborhood. Redheart is a variety grown on the West Coast and was the outstanding berry of the lot, being deep red in color, firm, and of good flavor. These qualities made it an excellent berry to use in ice cream, altho the other varieties were also very satisfactory. In the first trials of the other three varieties Parsons Beauty was placed first, Howard second, and Culver third. Parsons Beauty was ranked a little better in flavor, altho not quite as firm as the other two varieties. There was considerable variation in the berries in each variety which made it difficult to secure uniform results.

Two-quart fruit jars were used as containers. In these first trials dry cane sugar was used, the ratio of fruit to sugar being 2 to 1; also 80 per cent sugar syrups containing cane and corn sugar in the ratio of 5 to 2 and straight invert syrup. Gelatin, gum, and agar were used in some of the 80 per cent sugar syrups. It was thought that the stabilizer might not only help in holding the berries
uniformly in the syrup to facilitate sugar penetration but also in preventing any coarseness that might occur in the ice cream due to dilution with fruit and syrup.

The berries packed as described were used for ice cream the following spring. The mixes were prepared to contain 12 per cent fat, 10 per cent serum solids, and 14 per cent sugar. The mixes were frozen in a Miller 40-quart freezer and the berries with syrup were stirred by hand into the frozen ice cream in the cold room. Commercially, these berries could be very readily mixed into the ice cream after it was drawn from the freezer into a hopper. Fifteen and 20 per cent of berries and syrup were added to the frozen ice cream. Whole berries were added in the first trials. When the hardened ice cream was served the berries were evident and attractive. The whole berries, however, were too large and somewhat hard. The ice cream lacked somewhat in creaminess and smoothness. The flavor of the berries packed in invert syrup was objectionable. Likewise, nothing was gained by the use of a 5 to 2 ratio of cane and corn sugar or by the stabilizers in the preparation of the syrups.

Some of the whole berries were sliced by hand after freezing to compare the sliced and whole fruit added to the ice cream after it was drawn from the freezer, as previously discussed. The sliced berries were more easily consumed and gave the appearance of additional fruit.

The next season, 1932, Howard was the only variety of berries packed. These were packed in an 80 per cent cane sugar syrup in a ratio of 2.5 pounds of berries to 1.5 pounds of syrup. A 70 to 75 per cent sugar syrup would undoubtedly be more easily handled and a little larger quantity of the 75 per cent sugar syrup could be used to keep the sugar-berry-ratio constant. Both whole and sliced berries were packed and placed immediately into cold storage. The berries were sliced with a fruit slicer and each slice represented about a quarter of a berry. Half of the whole and sliced berries were held in commercial storage at 12° to 15°F and the other half in the laboratory hardening room at 0° to —10°F. A few lots were held at 40°F for 24 hours before freezing at 0° to —10°F.

In these tests a mix containing 14 per cent fat, 11 per cent solids not fat, and 14 per cent sugar was used to make allowance for the dilution of the ice cream with syrup. The amount of fruit was increased to 25 per cent. The mix and the syrup from the thawed
strawberries were frozen together in the ice cream freezer and the berries were stirred into the ice cream in the hardening room. The portions of ice cream and berries were weighed.

Comparisons were made of both whole and sliced berries stored at 15° and at 0°F and berries held 24 hours at 40°F before freezing.

The sliced berries were softer and the pieces were more numerous than the whole berries. The berries sliced at the time of packing were much more satisfactory than those which were packed whole and sliced before using. The berries held at 40°F for 24 hours before freezing did not seem to be different from those frozen immediately.

The increased percentages of milk solids greatly improved the strawberry ice cream. No attempt has generally been made in the commercial standardization of ice cream mixes to make any allowance for the dilution of the dairy products with fruit juice. Consequently, fruit ice cream has generally not been as rich as vanilla ice cream. The increase in fat and serum solids to care for the dilution with fruit materially improved the flavor, body, and texture of the fruit ice cream. When 20 and 25 per cent of the ice cream was fruit and syrup the flavor was decidedly superior as compared with 15 per cent.

Strawberries separated from the syrup in which they were frozen and subsequently soaked at 35°F for 72 hours in an 80 per cent sugar syrup increased in sugar content. They were soft when removed from the syrup and remained soft in ice cream but they were too sweet and had a preserved flavor.

Berries separated from their syrup and soaked overnight in a 50 per cent sugar solution were compared with berries soaked overnight in the syrup in which they were frozen. The berries were then removed from the sugar syrup and were mixed in ice cream containing the syrup in which they had been frozen. After thawing, the berries were capable of taking up considerable additional sugar. The sliced berries soaked in their own juice were judged to be not quite as soft as the berries soaked in the 50 per cent sugar solution. Berries soaked in their own syrup overnight will take up sugar which will prevent them from being too hard in the ice cream. The hardness of the berries can be varied by the amount of sugar they contain. If the thawed berries are put into concentrated sugar syrups, the hardness of the slices of berries in the frozen state in the ice cream will be decreased. However, if the fruit takes up too much
sugar, it becomes too soft, and when frozen, tastes like preserved fruit. The fresh fruit flavor is much more desirable.

Adding fruit in the freezer just after shutting off the brine, in which case the fruit was thoroughly incorporated into the ice cream mix, or adding fruit to the freezer a minute or two before drawing the ice cream to leave pieces of fruit intact in the ice cream, were not as satisfactory procedures as adding sliced fruit to the ice cream after freezing. Adding the fruit a minute or two before drawing the ice cream did not give time enough to distribute it evenly. The ice cream drawn last scarcely contained any berries.

When frozen berries were soaked in their syrup after thawing, they must take up some sugar, as they were softer when frozen again. However, it was desired to obtain evidence to support this assumption.

It was not necessary to differentiate between the cane sugar and fruit sugar, but it was desirable to show whether or not the frozen berries soaking in the syrup after thawing contained more sugar than when they were first thawed.

One 2-quart jar of whole berries and one 2-quart jar of sliced berries, each containing 2½ pounds of berries and 1½ pounds of an 80 per cent cane sugar solution, were used for the experiment. The berries had been stored for 6 months at 12° to 15°F. The jars of berries were placed in cold water and thawed for 1 hour when the berries were taken out of the jars and drained for one-half hour. The weight of the whole berries after draining was 1.9 pounds and of the sliced berries 1.5 pounds. The weight of the syrup drained from the whole berries was 2.1 pounds and from the sliced berries 1.5 pounds. Weighed portions of these berries were soaked in weighed amounts of their syrup for 20 hours. The syrup was then drained from the berries and the berries and syrup were again weighed. There was no change in the weights of berries and syrup before and after soaking. Freezing point determinations were made on the syrup from the whole and sliced berries before and after the berries were allowed to soak in it and also on 50-gram lots of pulped berries before and after soaking. The berries were pulped in a mortar with a pestle and mixed with 50 grams of distilled water for the determination.

The syrup from the whole berries depressed the freezing point more than this same syrup after the berries had been allowed to soak in it. Also, the soaked whole berries depressed the freezing
point more than the berries previous to soaking. The syrup from
the sliced berries and the sliced berries themselves showed this
change to a very small degree. This indicates that, in the case of
sliced berries, the distribution of sugar between berries and syrup
takes place to a considerable extent before the berries are frozen and
that a certain amount may take place at this storage temperature after
they are frozen. The whole berries stored at this temperature had
some crystallized sugar at the bottom of the jar, while the sliced
berries did not. The freezing point determinations and the percent-
age of sugar, as indicated by these determinations, are given in
Table 1.

**Table 1.—Freezing Point Determinations of Strawberries and Syrup.**

<table>
<thead>
<tr>
<th></th>
<th><strong>BEFORE SOAKING</strong></th>
<th><strong>AFTER SOAKING</strong></th>
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<tbody>
<tr>
<td></td>
<td>Freezing point,</td>
<td>Sugar, per</td>
</tr>
<tr>
<td></td>
<td>°F</td>
<td>cent *</td>
</tr>
<tr>
<td>Syrup from whole berries</td>
<td>18.77 (−7.35°C)</td>
<td>50.65</td>
</tr>
<tr>
<td>Syrup from sliced berries</td>
<td>21.74 (−5.70°C)</td>
<td>45.36</td>
</tr>
<tr>
<td>Whole berries</td>
<td>26.65 (−2.97°C)</td>
<td>32.34</td>
</tr>
<tr>
<td>Sliced berries</td>
<td>22.23 (−5.43°C)</td>
<td>44.38</td>
</tr>
</tbody>
</table>

* Percentage of sugar calculated from freezing point determinations according to a table presented by Leighton (1927); originally worked out by Pickering (1891).

In a previous test with whole berries only, freezing point deter-
minations and refractometer readings gave practically the same
results. In this trial 300 grams of berries were pulped in a large
mortar with a pestle. They were put in a flask with 800 cc. of
distilled water and boiled an hour, keeping the water up to volume.
They were then made up to 2 liters in a volumetric flask, and
refractometer readings were made on aliquot portions. The syrup
from the whole berries before they were allowed to soak in the
syrup contained 51.91 per cent sugar by the freezing point deter-
mination and 54.4 per cent sugar by the refractometer reading and
the syrup after the berries soaked in it contained 47.58 and 49.00
per cent sugar by the two methods, respectively. The juice extracted
from the berries previous to soaking contained 22.11 and 22.45
per cent sugar and after soaking 31.35 and 29.40 per cent sugar, as
indicated by the two methods, respectively.

2 The authors are indebted to D. C. Carpenter of the Chemistry Division
for making the refractometer readings.
Preferences of research workers at the Station were obtained for strawberry ice cream with pieces of fruit intact in comparison with ice cream in which the strawberries and juice were added at the start of the freezing of the mix. In the ice cream with the fruit intact the syrup from the berries was frozen with the mix. The ice cream mix, fruits, and amounts of fruit were identical for these tests. Only whole strawberries were available and these had to be sliced by hand in order to make the test. Thru accident the berries were not soaked in their syrup overnight, and thus were too hard in the ice cream. The summarized results showed that 12 preferred the flavor of the ice cream with sliced berries, whereas only 1 preferred the flavor of the ice cream without visible berries. Thirteen objected to the hardness of the berries and 4 liked them.

These same ice creams were tried by a group outside the Station who were asked to express their preferences for flavor, smoothness and richness, and to indicate which was the better ice cream. Nineteen liked the flavor of the ice cream with sliced berries better, while 5 preferred that with the crushed berries; 8 chose ice cream with sliced berries for smoothness, 21 the other; 10 thought the ice cream with sliced berries was the richer and 15 the other; while the vote was even on which was the better ice cream.

This same test was repeated on the investigators at the Station, except that the whole berries were cut when partially frozen with the coarsest knife of a food chopper and these pieces allowed to soak overnight in their syrup. The pieces of berries were much softer and smaller in this case after they hardened in the ice cream. The smaller, softer pieces were much preferred. In this test the vote on flavor was 24 to 7 in favor of sliced berries; on smoothness, 5 to 22 in favor of berries whipped up in the freezer; on richness, 12 to 11 in favor of sliced berries; and 25 to 10 for the sliced berry ice cream as the better of the two. There was a decided preference for the ice cream with the small pieces of strawberry. The pieces, however, should be sliced thin and should not be hard when frozen.

It is believed that pieces of strawberries in ice cream have several distinct advantages over berries beaten to such fine pieces that they do not show. In the first place, the product gives a pleasing appearance, for the consumer sees the fruit, and as a result, anticipates the flavor and is in no doubt as to its identity. The pieces of berries are tasted last as they are broken up after the ice cream has melted in the mouth and the characteristic flavor of the fruit is the predominat-
ing flavor remaining after the ice cream has been swallowed. This accounts, in part, for the opinion that the flavor is better when pieces of fruit are available.

**Raspberry Ice Cream**

Cuthbert raspberries were packed for freezing in 2-quart fruit jars. The first season the berries were packed in sugar and a sugar syrup. Two pounds of berries to 1 pound of cane sugar, packed in layers, was used in comparison with 2 pounds of berries and 1 ¼ pounds of an 80 per cent cane sugar syrup. The berries were frozen at 0° to -10°F. The cane sugar syrup was most satisfactory and was used for packing the fruit the second season. A storage temperature of 12° to 15°F was also used the second season. Prior to use, the frozen raspberries were allowed to thaw slowly at 40°F and the juice drained from them. The juice and coloring were added to the mix in the freezer, and the chilled fruit was stirred into the ice cream after it was drawn.

The seeds or the hardness of the whole berries were not particularly objectionable in the ice cream. The fresh fruit flavor of the raspberry ice cream was excellent. Twenty to 25 per cent of fruit and syrup should be used for raspberry ice cream. An ice cream mix containing 14 per cent fat, 11 per cent solids not fat, and 14 per cent sugar gave much better results than one containing a lower fat and solids-not-fat content.

**Storage Temperature**

A comparative test was made of strawberries and raspberries stored at 15° and at 0°F for 7 months. Tests after 2 month's storage showed no difference in the quality of the fruit held at these temperatures. However, over the longer storage period, the warmer storage temperature was found to be less satisfactory.

Both raspberries and strawberries lost considerable of their fresh fruit flavor. This was even more noticeable in the raspberries than in the strawberries. In studies of frozen pack berries and vegetables, Berry (1933) reports that berries in airtight containers at a storage of 25°F did not suffer microbiological spoilage, but that strawberries particularly deteriorated in quality in a short time.

This loss in strength of the fresh fruit flavor was very marked in ice cream prepared with these fruits. Further tests on the effect of these two storage temperatures are being conducted. In all pre-
vious tests, long storage periods at 0°F did not cause any loss of flavor.

**PREPARATION OF PEACHES AND APRICOTS FOR FREEZING**

Ripe fresh peaches of the Early Crawford variety were dipped into boiling water and skinned. They were put thru a food chopper, using the coarsest blade and mixed with cane sugar at the rate of 1 pound of sugar to 5 pounds of peaches. They were then put into 2-quart fruit jars and immediately placed in the hardening room.

Ripe, fresh apricots were washed, pitted, ground in the same manner as the peaches, and divided into two portions. One portion was mixed with sugar at the rate of 1 pound to 4 pounds of apricots, as recommended by Turnbow and Raffeto (1928), placed in fruit jars, and held at 40°F for 1 day and then frozen. The other portion was handled in the same way, except that it was heated to 180° to 190°F for 5 minutes before it was placed in the jars. These peaches and apricots were used for ice cream the following spring. The ice cream used in these trials contained 12 per cent fat, 10 per cent solids not fat, and 14 per cent sugar.

In the first trial, the mix was frozen to 24.4°F with the brine on 4 minutes, 20 per cent cold peaches added after 6 minutes, and the mix drawn in 10 minutes at 25.0°F at approximately 90 per cent overrun. The apricots were handled in the same way.

The peaches were very good in flavor and good peach ice cream resulted from the above procedure, but the flavor was very mild.

The unheated apricots gave a good apricot flavor, while the cooked apricots gave a very pronounced apricot flavor. Of 17 people who tried the apricot ice cream, 13 preferred the pronounced flavor and 4 the milder flavor.

The skins were fairly noticeable and somewhat objectionable in the apricot ice cream. When the apricots were stirred into the ice cream after it was frozen, the skins were not noticeable, thus improving the quality of the apricot ice cream considerably from that standpoint. Small pieces of apricot were scattered thru this ice cream.

Nothing was to be gained in stirring peaches into the ice cream after it was frozen. Various amounts of citric acid and lemon juice were added to increase the flavor of the peaches in the ice cream but without success. One-fourth and one-half of the peaches were replaced with apricots. The apricot flavor predominated even with
one-fourth apricots and three-fourths peaches. The flavor of the ice cream was increased to good advantage, but most people would consider it apricot instead of peach. The quantity of peaches was then increased to 29 per cent with only 1 per cent of the cooked apricots. This made a satisfactory peach ice cream. The flavor was pronounced and, altho apricot could be detected, few persons suspected the presence of apricots.

Since there is supposed to be considerable flavor in peach skins, it seemed that a small amount of finely ground skin added to peach ice cream might improve the flavor. The skins were prepared by washing the peaches and peeling them like an apple, leaving some of the pulp on the skin.

Forty-six clingstone peaches weighing 12 pounds, 9 ounces were found to yield 3 pounds, 4 ounces of skins and attached pulp. These skins were ground and cooked with ½ pound of sugar at 180° to 190°F for 5 minutes. The final weight was 3.5 pounds. The peach pulp weighed 7½ pounds and the pits with adhering pulp 1 pound, 13 ounces. When 28.5 per cent of peaches and 1.5 per cent of peach skins were used there were about 0.7 pound of skins for a 10-gallon batch of ice cream. The amounts per 10-gallon batch would be 31.5 pounds of ice cream mix, 12 pounds of peaches, and 0.7 pound of pulverized peach skins. The 46 peaches supplied enough pulverized skins for 50 gallons of ice cream. The cooked peach skins were stored at 0° to —10°F until needed.

One-gallon, motor-driven experimental freezers were used for a number of comparative trials. The mix used for these trials contained 14 per cent fat, 11 per cent solids not fat, and 14 per cent sugar. Freezings were made with ice cream containing a total of 30 per cent peaches in which a certain part of the peaches was replaced with apricots or peach skins, as follows:

Test No. 1, 29 per cent of peaches plus 1 per cent of heated apricots
Test No. 2, 28 per cent of peaches plus 2 per cent of heated apricots
Test No. 3, 27 per cent of peaches plus 3 per cent of unheated apricots
Test No. 4, 25 per cent of peaches plus 5 per cent of peach skins unheated
Test No. 5, 25 per cent of peaches plus 5 per cent of cooked peach skins
Test No. 6, 30 per cent of peaches alone.
Test No. 5 was placed first as having the best peach flavor; No. 4 second with a milder peach flavor; No. 6 third, as having a satisfactory mild peach flavor; No. 3, satisfactory; and Nos. 1 and 2, satisfactory with a trace of apricot flavor. In several other tests the pulped peach skin intensified the peach flavor in the ice cream.

Another series of tests were made to determine the limits of the amount of peach skin to use. Thirty and 20 per cent quantities of peaches were used as controls. In these trials 10, 20, and 30 per cent portions of the 30 and 20 per cent quantities of peaches were replaced with cooked and ground peach skin.

The 5 or 10 per cent quantities of peach skins were found to be preferable, while the 20 and 30 per cent quantities were stronger in flavor but undesirable. The 20 and 30 per cent quantities of peach skin were not so objectionable in the ice cream containing the smaller quantities of peaches. The 30 per cent peaches, the mixtures in which 5 and 10 per cent of the peaches were replaced with 5 and 10 per cent of pulped peach skin, and the mixture in which 10 per cent of the peaches were replaced with 10 per cent of skin were preferred. The pulped skin gave a more pronounced peach flavor to the ice cream. The majority of the tests indicated that the pulped peach skin was helpful in increasing the peach flavor in peach ice cream. However, more extensive tests would be desirable.

DIRECTIONS FOR MAKING FRUIT ICE CREAMS

In presenting these directions for making fruit ice creams, no endeavor has been made to give complete directions but rather to stress the points of variation from standard practice so that the ice cream manufacturer can improve present methods.

STRAWBERRY ICE CREAM

A strawberry variety that has been found to give good results in freezing tests should be used. (See page 5.) The berries should be sliced. A ratio of berries to sugar of 2 to 1 or the use of a 75 per cent sugar solution (2.5 pounds of berries to 1.6 pounds of syrup) will give good results. It is desirable to freeze the fruit quickly to 0°F and to hold it at 0° or below to retain the maximum flavor. Small containers, such as the 30-pound tin single-service container, can be more readily frozen and handled than barrels and proper proportions of berries to syrup can be secured more easily.
Before using the berries they should be thawed at a temperature not exceeding 40°F and soaked in their syrup for 12 to 24 hours to soften them.

It is desirable to make a special mix for fruit ice creams in which the fat content is about 2 per cent higher and the serum solids 1.5 per cent higher than in regular vanilla ice cream to make allowance for the diluting effect of the syrup. The sugar content of the mix should be about 2 per cent below that of vanilla ice cream, as 5 to 6 per cent sugar is added in the fruit juice. The use of 20 per cent of fruit gives a very desirable, evident flavor and plenty of visible fruit. The syrup should be drained off the berries and the berries alone placed in the hardening room for about a half hour to chill well. The syrup and color should be added to the mix in the freezer. The berries can be readily mixed by hand with the frozen ice cream. A hopper is desirable, but a large can, such as a 10-gallon tin container, may be used for this purpose. It is essential to pre-chill the utensils and the berries to avoid increasing the temperature of the ice cream, thereby lessening the degree of smoothness and creaminess of the finished product.

RASPBERRY ICE CREAM

The general directions for packing and freezing raspberries should be the same as for strawberries, except that the berries ought not to be sliced. Cuthbert was the only variety used in these tests and it gave a very desirable characteristic flavor.

PEACH ICE CREAM

Fresh, ripe peaches of a standard variety (page 5) with a fairly pronounced flavor should be dipped in boiling water, skinned, and ground or very finely sliced. The pulp should be mixed with sugar at the rate of 5 to 1 and immediately frozen to and held at 0°F or below.

A day before using, the frozen peaches should be held at 40°F to thaw. The color and the peaches may be added to the ice cream mix in the freezer as there is little advantage in endeavoring to retain pieces of peach in the ice cream due to the blending of color with the ice cream and to lack of a pronounced flavor. About 25 per cent of peaches gave a recognizable, mild peach flavor. Peaches do not increase the moisture and sugar content of the ice cream as
much as strawberries or raspberries, so they may be advantageously added to the regular vanilla mix, but the flavor will be best if the mix is rather rich.

As previously mentioned, approximately 20 to 30 per cent of the fresh, ripe peaches may be skinned like an apple and, after grinding the skins finely and adding 20 per cent of sugar, cooked for 5 minutes just below the boiling point. The cooked skins with pulp may then be frozen and used to increase the intensity of the peach flavor by replacing 5 to 10 per cent of the peaches in the ice cream. The skins must be fine enough to avoid detection in the ice cream.

One per cent of apricot added to peach ice cream increased the intensity of the flavor noticeably. Altho the flavor was characteristic of apricots, few persons recognized their presence.

CONCLUSIONS

Strawberry ice cream was improved in flavor, appearance and texture when the syrup from sliced strawberries stored at 0°F in an 80 per cent cane sugar syrup was added to the mix in the freezer and the chilled berries mixed into the ice cream after it was drawn.

The objectionable hardness of the frozen slices of berries in ice cream could be overcome by allowing the sliced berries, after thawing, to stand overnight in the syrup in which they were packed.

Mixing whole raspberries which had been stored at 0°F in an 80 per cent cane sugar syrup in the ice cream after it was drawn from the freezer produced delicious raspberry ice cream. The syrup in which the berries were packed and the color were added to the mix in the freezer.

Twenty to 25 per cent quantities of raspberries or strawberries produced excellent flavors in the ice cream.

The fresh fruit flavor of raspberries and strawberries stored at 15°F for 6 months was impaired in comparison with another lot of the same berries stored at 0°F.

Peaches packed at the rate of 5 pounds of peaches to 1 pound of cane sugar and stored at 0°F produced good peach ice cream when 25 to 30 per cent of the peaches were used. It was found that pulped peach skin would considerably increase the flavor of peach ice cream.

Apricots packed at the rate of 4 pounds of fruit to 1 pound of sugar and frozen gave a very satisfactory apricot flavor and an espe-
cially pronounced apricot flavor when they were heated to 180° to 190°F for 5 minutes before freezing. It was noted that when the fruit was stirred into the ice cream after it was drawn from the freezer the apricot skins were much less noticeable than when they were added to the mix in the freezer.

The body, texture, and flavor of fruit ice cream are improved by preparing a richer mix to make allowance for the dilution with syrup. An additional 2 per cent of fat and 1.5 per cent of serum solids and a decrease of 2 per cent in the sugar content makes proper allowance for the fruit syrup.

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