

RD
5655
A761
M1156
No. 540-1
C.2



Food Science and Technology Notes

Extension Division Department of Food Science and Technology Virginia Polytechnic Institute Blacksburg, Virginia

MFST-540-1

IMPROVE THE IMAGE OF YOUR ICE CREAM

by

Dr. Joseph Tobias
Department of Food Science
University of Illinois, Urbana

Nearly every step in the manufacture of ice cream is related to the quality of the finished product. The following are some of the major considerations which should be understood by the ice cream maker.

(1) Selection of ingredients

The dairy products used should be of good flavor and bacteriological quality. The flavor quality of the finished ice cream cannot be much better than the flavor quality of the ingredients which go to make it up. Generally speaking, the fresher the dairy products are, the better are the chances that their flavor is desirable. However, there may be many exceptions and it is imperative that a flavor check on all dairy ingredients be made before they are used in the mix.

(2) The total solids content of the mix

The total solids content will determine what type of body the ice cream is going to have. A low solids content may give rise to a weak body and to a texture which may become icy as a result of prolonged storage and heat shock resulting from fluctuating temperatures. The body of this ice cream may be characterized as "lacking resistance." It is not possible to give a firm figure for the desirable total solids content because one must know the storage requirements of the ice cream. Practical experience indicates, however, that the lowest total solids content of the ice cream should not be below 37%. The upper limit is determined by such additional factors as fat content, white or flavored mix and consumer preference. An ice cream which has too high a solids (above 42%) may be criticized as having a heavy or soggy body.

(3) The fat content

This is usually an economic consideration to keep the price of the product competitive. However, it is generally known that the fat content of ice cream is

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. W. E. Skelton, Dean, Extension Division, Cooperative Extension Service, Virginia Polytechnic Institute, Blacksburg, Virginia 24061.

extremely important in its effect on ice cream quality and ice cream makers will surely agree that a 10% fat ice cream will not be as fancy a product as a 15% fat ice cream. The additional fat not only makes the product richer, but it enhances its flavor and improves its body.

(4) The serum solids content

The protein constituents of the serum solids are important components of the ice cream "superstructure" which gives the product its characteristic body. Thus, some minimum quantity is necessary in making ice cream. While improvements in the body of ice cream would be obtained with increasing serum solids contents, a serious limitation on the maximum quantity used is imposed by the lactose content which may give rise to a sandy texture defect.

(5) The sweetness level

Sweetness is a matter of consumer preference and may vary regionally as well as from person to person. Using sucrose as a standard of sweetness, the correct sweetness of ice cream probably lies within the limits of 14 to 16% sucrose of most consumers.

(6) The sugar solids content

Depending on the source of the sugar solids, there are some limitations on the amount of total sugar solids that should be used. A syrupy flavor may be imparted by excessive quantities of certain syrups. The body of such an ice cream may also be criticized as gummy or heavy and might be described as overly resistant. On the other hand, the syrups may be used advantageously to overcome such defects in ice cream as lack of resistance, weak, coarse and poor resistance to damage caused by heat shock.

(7) The stabilizer

An excessive amount of stabilizer may produce a gummy body in the ice cream. An insufficient amount of stabilizer may produce a coarse textured ice cream which will have little resistance to heat shock. Some stabilizers may cause the mix or the melting ice cream to whey off. An excessive amount of emulsifier may result in churning of the mix in the freezer.

(8) Mix pasteurization

Excessive heating, particularly when a burn-on of the mix takes place on the heating surface causes a cooked flavor to develop in the ice cream. This is particularly true when ingredients of the mix have already received an excessive amount of heat treatment. On the other hand, sufficient heat treatment of the mix has a beneficial effect on the body and texture of the ice cream.

(9) Mix homogenization

Incomplete homogenization of the mix will cause churning in the freezer and a greasy feel in the mouth when the ice cream is consumed. Generally, the higher the homogenization pressure, the better will the body and texture be of the ice cream. However, a point is reached beyond which there is very little improvement and higher pressures simply adds to the cost of the process. The efficiency of homogenization may be best checked by a microscopic examination which reveals both the size of the fat globules and the presence of clumping. Homogenization should reduce diameter of globules to 2 microns or less.

(10) Cooling of the mix

The mix should be cooled rapidly to 40°F or slightly lower. A warmer mix entering into the ice cream freezer will lower the capacity of the freezer or will cause the ice cream to emerge at a higher temperature than it should, which may result in a coarser textured ice cream. It is also undesirable to store a mix at a temperature above 40°F because psychrophilic bacteria may cause spoilage of the mix.

(11) Storage of the mix

If gelatin is used as a stabilizer, the mix should be aged for a period of at least 4 hours to produce the best body and texture in the ice cream.

The keeping quality of ice cream mixes depends primarily on the amount of post pasteurization contamination of bacteria. An old mix may develop undesirable off-flavors, may become yeasty or spoil due to the growth of microroganisms. It is difficult to designate a time that a mix should keep--some will keep for only a few days. A mix should be frozen fresh when it is at its best.

(12) Freezing

The smoothest ice cream is obtained when the freezing is rapid and the ice cream leaves the freezer stiff and dry. When these conditions do not exist, the problem may be in the composition of the mix or in the defective operation of the freezer. Check the temperature of the product leaving the freezer and the rate at which the ice cream is discharged from the freezer to help you determine whether the refrigeration system is working properly. The problem may be in the freezer or in some other part of the refrigeration system. Oil in the ammonia may insulate the freezing jacket. In fact, a deposit .002" thick will reduce freezing by 40% of rate capacity. The blades may be dull causing a layer of ice to adhere to the surface of the freezing jacket and reduce freezing rate by 20%. The ice cream should leave the freezer in top condition because once it comes out there is no way of improving on it. The time and effort spent in getting the freezer in top operating condition is most worthwhile.

(13) Flavoring

The addition of the flavor of good quality and in the correct quantity is a most important step in ice cream making. Chronologically, freezing does not necessarily precede flavoring as some flavors such as vanilla and chocolate are always added before freezing, but other flavors are added or injected into the frozen ice cream. In either case, the same quality criteria are true.

Flavoring materials range from pure to imitations with any number of possibilities in between. The price of the ice cream generally dictates the type and quantity of flavoring to be used. The flavoring cost will vary widely between, for instance, an inc cream containing frozen strawberries and one containing only imitation strawberry flavor. A difference obviously also exists between ice creams containing 20% berries as opposed to 10% berries. To make the best possible ice cream it is necessary to use the natural flavors in correct concentration. The addition of a generous quantity of fruit, such as cherries or strawberries can make the difference between an ordinary and a premium ice cream.

Ice cream should be able to pass the blindfold test, i.e. there should be no doubt as to what flavor it represents without reading the label. Correct flavoring

of ice cream is an art which the ice cream maker should learn and constantly practice. It must also be remembered that there are legal limitations pertaining to ice cream flavoring which must be adhered to.

(14) Packaging

Ice cream should be packaged promptly after freezing and placed in the hardening room without delay. Failure to do so will warm the product causing recrystallization of ice crystals and a coarser ice cream when hardened. The package used should be attractive, neat, correctly filled and properly sealed. Packaging provides protection against the harmful influence of air which could lead to the formation of stale, "surface taint" flavors. Free movement of air through ice cream while in storage provides favorable conditions for shrinkage. The package must be a good vapor barrier and it should be free of any materials which might impart flavors to ice cream.

(15) Hardening

The aim of most efficient hardening is to cool the core of the ice cream in the container to a temperature near 0°F in as short a time as possible. Continuous hardening may be able to accomplish this in one to two hours. Forced air hardening may require somewhat longer depending on the temperature of the forced air. The manner in which packages are stacked in the hardening room may greatly influence the rate of hardening--channels must be provided for plenty of air circulation.

(16) Storage

To prevent damage to the body of ice cream, the product should be stored at an uniformly low temperature, -15°F, for prolonged storage. Fluctuations in temperature may lead to sandiness, shrinkage and coarseness.

Start today to evaluate your ice cream manufacture carefully according to each of the above factors. Initiate the improvements and then enjoy the benefits of a better image as it develops.