



SMOOTH SPREAD is made without pectin, has fine texture and fruit flavor.

New Crystallized Fruit Spread Shows Commercial Promise

Rated high in flavor, ERRL product combines fruit and honey. Mix is vacuum-cooked to 83 percent solids. Fine-grain crystallization follows

JONATHAN W. WHITE, JR.

Eastern Regional Research Laboratory, Bureau of Agricultural & Industrial Chemistry, Agricultural Research Administration, USDA, Philadelphia

A new fruit product—a smooth spread whose excellent texture is contributed by fine-grained crystallization of dextrose—has recently been developed at this laboratory. Used in the same way as jams and preserves, it serves as a delightful spread for bread, toast, or crackers.

The new product has an excellent fruit flavor. Its solids content and energy value are higher than jams and jellies, and it does not depend on the conventional pectin gelation for its properties. Moreover, its acid content may be controlled for optimum flavor, since the texture is not influenced by the acidity.

Fruit juice (or puree) and honey are first mixed then finished in vacuum to about 83 percent solids. Next, the mix is subjected to a controlled fine-grained crystallization to produce a smooth, nonsticky consistency. Such crystallization is the basis for the natural-honey product known as honey-spread, creamed honey, or Dyce-processed honey¹.

Fine texture of the new product is

brought about by dextrose hydrate crystallization in the presence of a relatively large amount of levulose, which prevents a hard, solid crystallization.

During studies on the utilization of dark, strong-flavored honeys, a de-flavoring and decoloring process was developed² that produced a bland, high-levulose syrup in which the natural honey sugars were retained substantially in their original proportion. Invert sugar—equal parts of dextrose and levulose—also crystallizes under

Shortcut to Solids

TABLE—CONVERSION of Degrees Brix (Determined by Refractometer) to Percent Solids in Spread*

Degrees Brix	Equivalent Solids Percent
78.0	79.2
79.0	80.3
80.0	81.4
81.0	82.5
82.0	83.6
83.0	84.7
84.0	85.8

* Calculated from published data on honey¹ and sucrose².

the specified conditions. But crystallization is too extensive, producing a hard mass that cannot be spread. Hence, the sugar component for the product must be either natural or de-flavored honey.

The latter is recommended, since it affords a uniform, flavorless raw material that does not mask the fruit flavor. However, a pleasing fruit-and-honey flavored product is made with natural good flavored honey and a reduced amount of the fruit component.

Various surplus fruits, purees, or by-product juices may be converted into the crystallized spreads.

What Fruits Were Used

We have prepared fruit spreads with excellent consistency and flavor by using a de-flavored buckwheat honey and the following fruit materials: (1) purees of frozen strawberry and red raspberry; (2) "juice" from frozen strawberries and red raspberries; (3) fresh peach puree; (4) commercial bottled grape juice; (5) commercial canned pineapple juice, loganberry juice, peach "nectar," apricot "nectar," Montmorency cherries (puree); (6) an experimental pack of grape juice concentrate with essence³; and (7) commercial frozen orange juice concentrate.

An excellent spread resulted when one part of the de-flavored honey was used with one part of juice or puree. Crystallized spreads made from red raspberry, grape, loganberry and orange are especially pleasing in flavor.

The products are stable and self-sterile at ordinary temperatures. But they deteriorate when stored for some time at temperatures above 90 deg. F. Reason: High temperature storage brings about a reversion of the crystallization, resulting in a product with an undesirable texture.

Fruits generally contain dextrose, levulose, and sucrose sugars. And in several cases, the amount of levulose equals or exceeds the dextrose content.⁴ Some sucrose (up to at least 8 percent of the weight of the honey) has little if any effect on the texture of the spread. On the other hand, excessive dextrose from a fruit could lower the levulose-dextrose ratio to unity or below, resulting in a too-firm texture. Such a product may possess a good texture after crystallization. But on storage, further crystallization takes place, resulting in a firmer product.

Since vacuum concentration is a step in the process, it would be highly desirable to return the volatile flavoring constituents ("essence") to the

³ Prepared by R. P. Homiller and N. H. Eisenhardt of the Chemical Engineering & Development Div. of our laboratory.

product later in the process. Flavor losses are no greater in preparation of spreads than in jams and jellies made by ordinary processes. However, the return of volatile flavors to the spread produces a superior product. And because of the relatively low temperatures involved in the process, there is little loss of added essence.

The fruit component may be juice, puree or concentrate. Juice and puree should be de-pectinized to form a concentrated product that is easier to handle. If a concentrate is used, it should not be of the "full flavor" type, because vacuum treatment removes the volatile flavor component. And the fruit component should be suitably processed to destroy enzymes.

The sugar component must be either natural good-flavored honey or, preferably, de-flavored honey (refined honey syrup).

Starter material for sugar crystallization may be taken from a previous batch. Alternately, it may consist of the sugar component alone, which has previously been seeded with dextrose hydrate and crystallized. It may

also be finely ground crystalline dextrose hydrate.

The process itself is relatively simple. Equal weights of the sugar and fruit (if a fruit concentrate, use an amount equivalent to an equal weight of single-strength juice) are mixed and vacuum-cooked below 150 deg. F., to an 82 to 85-percent solids content, then the vacuum is released and the concentrated product is cooled to 90-100 deg. F. The concentrate is next blended with 5 to 10 percent finely crystallized starter in a tank equipped with a slow-speed mixer. At this point, fruit essence, ^{4,5,6} if available, should be added.

The well-mixed product is then filled into consumer packages. And after labeling and casing, it is held at 55 to 60 deg. F. for about seven days to complete crystallization.

If essence is added, the product should be quickly placed in the cool room after casing, to minimize loss of volatile aroma constituents.

Determination of solids content of the concentrated material should be by refractometer. Since sugars present are

largely levulose and invert sugar, conversion tables for sucrose give erroneous results. Suitably accurate values result from the refractive index-honey solids of Chataway, as adopted by the AOAC. Degrees Brix, as determined by the refractometer, may be converted to percent solids in the spread by using the figures given in the table accompanying this article.

References

1. E. J. Dyce, U. S. Patent 1,987,893, Jan. 15, 1935.
2. J. W. White, Jr., and G. P. Walton, AIC-272, BAIC, 1950.
3. E. M. Widdowson and R. A. McCance, *Biochem. J.*, 29, 151, 1935.
4. R. P. Homiller, et al., "Preparation of Full-Flavor Concentrated Concord Grape Juice," In press.
5. H. P. Milleville and R. K. Eskew, AIC-63, Sup. 1, BAIC, 1945.
6. H. P. Milleville and R. K. Eskew, *Western Canner & Packer*, 38, p. 51, Oct. 1946.
7. Anon., *J. AOAC*, 25, 99, 1942.
8. *Methods of Analyses*, AOAC, 5th Ed., 1940, Appendix, Table 6.

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