Cherry Brining and Finishing

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H. Y. Yang, Edward Ross, and J. E. Brekke*

Brined cherries are properly matured whole cherries of similar varietal characteristics packed in a solution of sulfur dioxide of sufficient strength to preserve the cherries. Hardening agents usually are added to the solution. The varieties commonly used for brining are Royal Ann (Napoleon), Bing, Lambert, and Republican.

The Cherries

While it is possible to brine cherries at almost any stage of ripeness, the best quality is obtained only at certain stages of maturity. Cherries for brining should not be overripe, since soft cherries may result and blemishes may reduce the amount of fruit suitable for U.S. No. 1 grade. If the cherries are picked too early, they will tend to have more seed in proportion to the amount of flesh and will be more difficult to pit cleanly.

Only cherries of good quality should be brined. Spoiled, damaged, belt-rejected, and other substandard fruit should not be used. Mildewed fruit, as overripe fruit, will show a blemished skin after brining, which is difficult to bleach in dark varieties.

The Brine

The following strengths of solutions have been found suitable for brining cherries:

Sulfur dioxide (SO_2) solution	Hydrated lime
1% (8.4 lbs./100 gals.)	5 lbs. per 100 gals.
1 1/4% (10.5 lbs./100 gals.)	6 1/4 lbs. per 100 gals.
1 1/2% (12.6 lbs./100 gals.)	7 1/2 lbs. per 100 gals.

Hydrated lime should be fresh so air slaking will not have taken place. Check on the purity of the lime and the available calcium content. If SO_2 strength is lower than that desired, it will be necessary to add more SO_2. The amount to add can be calculated roughly from the following formula:

(Percent SO_2 desired - percent SO_2 found) multiplied by the total gallons of brine and by 8.4, the weight of a gallon of brine, all divided by 100.

$$\frac{\text{Percent difference} \times \text{gallons} \times 8.4}{100} = \text{pounds } SO_2 \text{ to add}$$

*H. Y. Yang is Associate Professor of Food Science and Technology, Oregon State University. Edward Ross is currently head of the Department of Food Science and Technology, University of Hawaii, Honolulu, Hawaii. J. E. Brekke is currently head of the Fruit Processing Investigations, Western Utilization Research and Development Division, U. S. Department of Agriculture, Honolulu, Hawaii.

If the test shows that SO_2 is too high, it will be necessary to add more lime. Do not add water, as this will dilute the lime in the brine as well as the SO_2. To determine the approximate amount of lime to add, use the following formula:

$$\frac{\text{(Percent } SO_2 \text{ found - percent } SO_2 \text{ desired) multiplied by total gallons of brine and by 4.9, all divided by 100. Percent difference x gallons x 4.9}}{100} = \text{pounds hydrated lime to add}$$

Brine strength should show the desired SO_2 value within approximately 0.1%, higher or lower. For example, suppose a desired 1 1/4% (1.25%) SO_2 brine is found by titration to be 1.1% in a 1,500 gallon tank:

$$\frac{0.15\% \text{ difference x } 1{,}500 \text{ x } 8.4}{100} = 18.9 \text{ pounds}$$

Add approximately 19 more pounds of SO_2. In another case, suppose the brine tests 1.45% SO_2 instead of the desired 1.25%:

$$\frac{0.2\% \text{ difference x } 1{,}500 \text{ x } 4.9}{100} = 14.7 \text{ pounds}$$

Add approximately 15 pounds of hydrated lime. After necessary corrections have been made, check the SO_2 strength of the brine again.

Some briners modify this brine in anticipation of latent softening tendencies of the fruit, or just as a safety factor. This is usually done by use of additional calcium in one form or another. Great care must be exercised in altering the brine drastically. If too much calcium is used with firm brining fruit, the pits may cling so tightly that difficulty is encountered in the mechanical pitting operation. Drastic changes in pH of brine will be caused by some calcium salts, resulting in softening or cracking of fruit.

Addition of calcium chloride ($CaCl_2$) in preparation of regular brine (as described earlier) has been used by some briners as a safety factor. The approximate amount to use will vary between 0.5% and 1.0%, i.e., between 4 and 8 pounds of calcium chloride per 100 gallons. This is in addition to the hydrated lime used. The actual amount must depend on judgment concerning condition of the fruit.

Calcium chloride may also be added to brined cherries after storage when firming appears to be sluggish or incomplete. If a regular nonchloride brine was used originally, 1 to 2 pounds of calcium chloride added per barrel appears to be beneficial in increasing firmness. Barrels should be rolled, or the dry chloride stirred in thoroughly in some manner.

Care should be taken to see that no iron comes in contact with the brine, as it will cause discoloration of the cherries during processing. Use stainless steel, wood, or concrete for the construction of tanks and equipment.

When making the sulfur dioxide solution by bubbling, use floating wood lids to keep the bubbles from breaking on the surface.

It has also been found desirable to place a sheet of polyethylene film on the surface of the brine during the entire brining process. The film can be used on storage tanks of brined cherries or on brine preparation tanks. It will prevent loss of sulfur dioxide by vaporization and dilution by rain water. Place some SO_2 solution on the polyethylene film to weight it down in order to maintain a good contact between the film and the brine surface. In windy areas, the film may have to be cinched down by wooden frames or other devices. To use or not to use the film covers depends on the individual briner's operations and physical set-up. It is advisable to try the film first on one or two tanks to determine whether it is advantageous to use. Only high quality food-grade polyethylene film should be used.

In recent years, some briners have used bulk boxes for holding and transporting brined cherries. These boxes are made of wooden staves, lined with heavy paper and 6-mil polyethylene film. A bung hole may be provided through the wooden lid to facilitate withdrawing or replenishing brine. Each box is about 4 feet x 4 feet x 2 feet high and holds approximately the equivalent of four barrels of brined cherries. The boxes are constructed for stacking and palleting.

Testing the SO_2 Solution

Introduce 125 milliliters (ml) of distilled water into a 500-ml Erlenmeyer flask. Pipet 25 ml of the standard iodine solution (0.2 normal) into the flask. Add a few drops of starch solution (1% soluble starch) and titrate with the SO2 solution from a burette or a graduated pipet. Shake the flask constantly. As the reaction nears completion, the color of the iodine solution becomes purple. At this point, add the SO_2 solution very slowly and at the point where one drop dispels the color from the iodine solution, stop the titration and read the volume used. Always read to the bottom of the curved surface of the SO_2 solution in the burette or pipet.

Now refer to Figure 1 to obtain the strength of the SO_2 solution. Move your pencil point to the right from the zero on the bottom line of the chart until the number of milliliters of the SO_2 solution used in the test is reached. Then move upward from the bottom of the chart until the curve is met. From this point of intersection, move the pencil point horizontally to the left edge of the chart. Then read the strength of the SO_2 solution from the vertical reference line at the left edge of the chart.

Titration can also be done with 0.1 normal standard iodine solution, using a fixed amount of brine. Put 10 ml of brine in a flask. Add 100 ml of distilled water, a few drops of 1:3 sulfuric acid (acid:water), and a few drops of starch indicator. Titrate with the iodine solution until a light blue color persists for about 30 seconds. One ml of 0.1 normal iodine used is equivalent to 0.032% of SO_2 in the solution. By multiplying 0.032 by the number of ml of iodine used, the percent of SO_2 in the brine is obtained.

Control and Observation

After cherries are brined, they should be observed frequently. Containers should be kept full. Firmness of the cherries should be checked with the texture testing method recommended below. The SO_2 content of the brine should be checked and the degree of bleach noted. Always keep in mind that there must be a quantity of free sulfur dioxide; otherwise, the product will spoil. Tying up all the sulfur dioxide with lime should, by all means, be avoided. Slow bleaching is an indication of low sulfur dioxide content. The SO_2 concentration should be maintained at about 3/4% during storage and shipping.

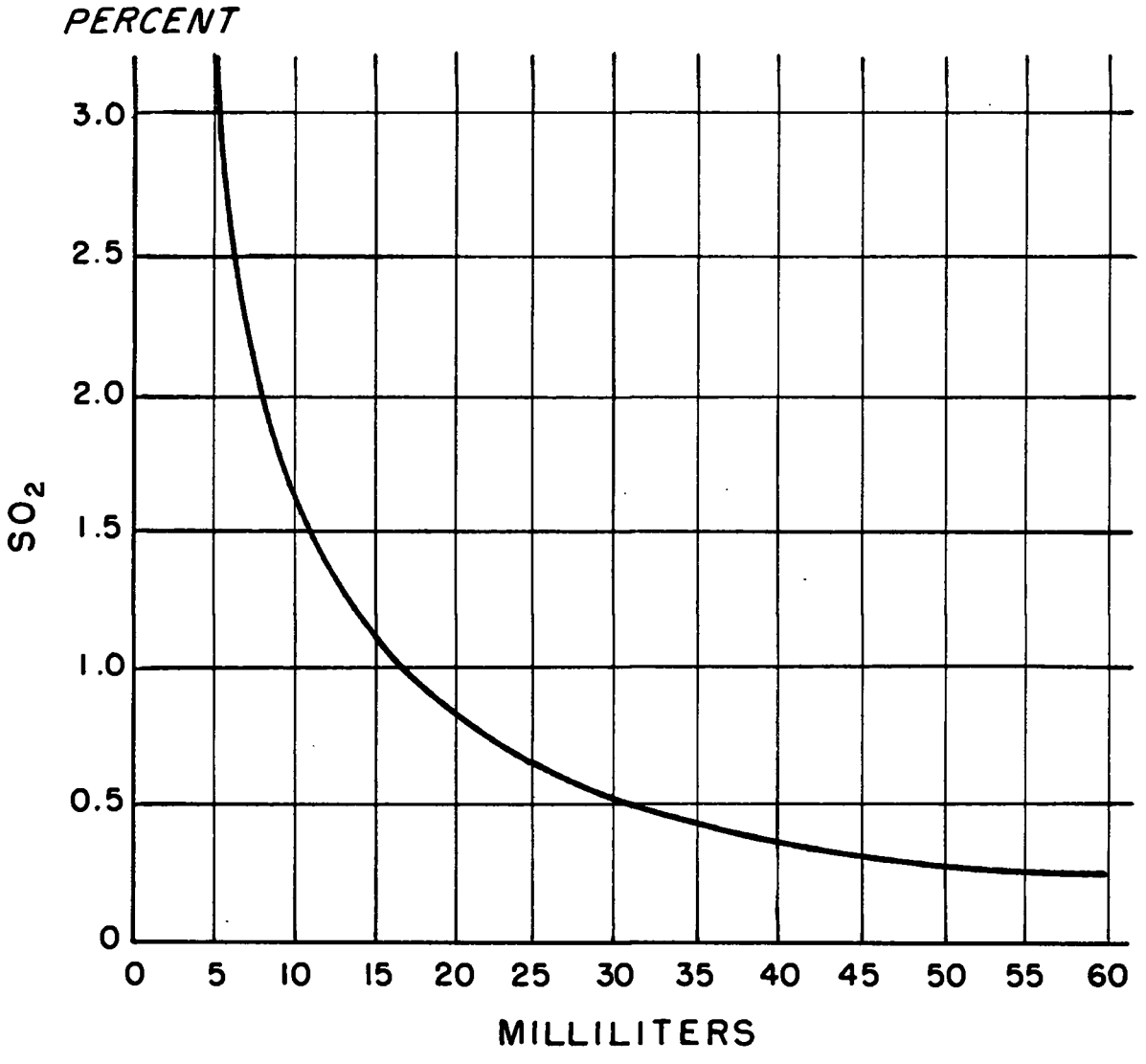

Figure 1. Milliliters of SO_2 required for 25 milliliters of 0.2 normal iodine solution.

Texture Testing

To test the texture of cherries, a puncture meter similar to the one shown in Figure 2 has been found suitable. This is a spring push gauge, 0-500 g. or 0-1,000 g., complete with steel points of various sizes. Choose a size which will provide readings of firm cherries in the upper 3/4 of the scale. A point of 0.08 inches diameter has been found to be suitable for general testing.

To use the meter, follow directions supplied by the manufacturer. Test about 20 cherries from each barrel and average the results. An arbitrary scale can be set up to show the relation between meter readings and cherry firmness.

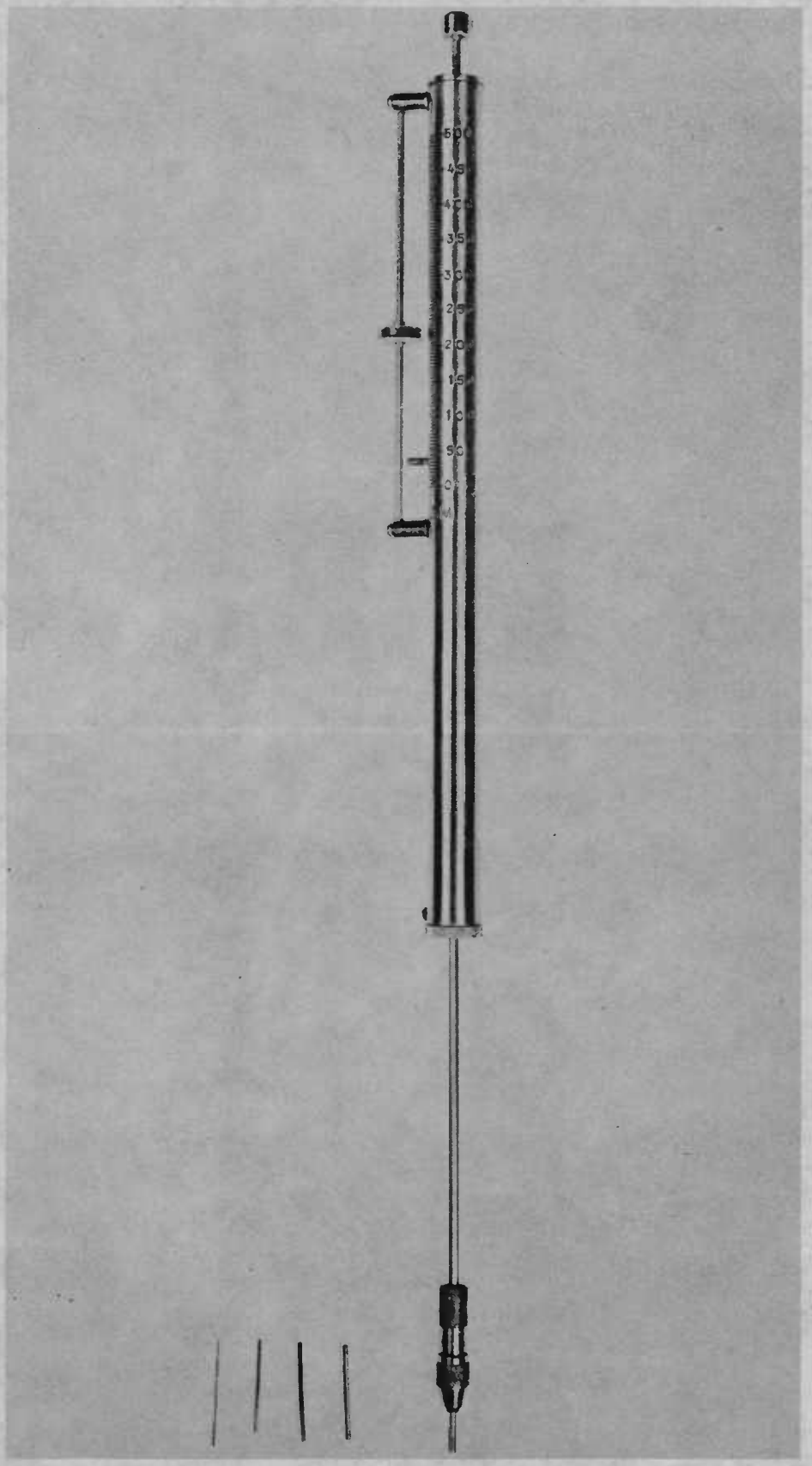

Figure 2. Texture tester equipped with various sizes of steel points.

Enzyme and Calcium Tests

Methods of testing for enzymes and calcium are available on request from each of the authors. They are not included in this paper because special precautions are required for their successful use. Individuals who wish to test for enzymes and/or calcium may receive help from the authors.

Maraschino Cherries

After four to six weeks of storage, brined cherries are ready for finishing into maraschino cherries. They are removed from the brine and rinsed in water and graded. The cherries are then pitted and stemmed, although in some instances stems are left on the cherries intentionally, to make the cocktail style. The pitted fruit is leached in running water to remove most of the sulfur dioxide. A rubber or plastic tubing is run to the bottom of the container and a stream of water is allowed to flow for 24 to 48 hours.

The cherries are then dyed, preferably with an insoluble food dye such as erythrosine (known as FD&C Red No. 3). Other dyes approved by the Food and Drug Administration (FDA) can also be used. Erythrosine is soluble at a pH of 4.5 or higher and precipitates in the tissue of fruit at lower pH so that the color will not leach out or "bleed" to color other fruits with which the cherries may be used, as in the case of canned fruit salad. The pH adjustment can be made with sodium bicarbonate to increase and with citric acid to decrease the pH. The cherries are boiled for about 20 minutes in a 0.025% to 0.050% erythrosine solution of pH 4.5 or higher. Use enough solution to cover all the cherries.

After cherries and dye solution have cooled and have stood together for 24 hours, 0.25% to 0.50% citric acid by weight is added to bring the pH of the solution to 4.2, and the boiling and standing procedures are repeated in order to set the dye. The cherries are then rinsed in water to remove all dye particles from the surface and pit cavities. The dyed cherries are now boiled in a 30° Brix sirup for 5 to 10 minutes and then are left to stand for 24 hours, during which time the sirup is absorbed. The sirup is removed by draining and sugar is added to it to increase the Brix reading to 40°. Repeat the boiling and standing procedures to build up the sugar content in the cherries. The sirup is drained again, sufficient sugar is added to restore the sirup concentration back to 40° Brix, and imitation maraschino cherry flavor is added. The sirup is returned to the cherries and the entire contents is brought to boiling; then it is packed hot and sealed in the glass jars. Sodium benzoate, 0.1% or less, may be used as a preservative, if necessary.

If the cherries are to be used with other fruits, such as in canned fruit salad or cocktail, they are not siruped but are sliced or quartered after dyeing.

FD&C Red No. 4 (Ponceau SX) has been used for coloring maraschino cherries for some time. It has brilliant red color with unusual resistance to the destructive influences of food ingredients and heat. At this writing, the FDA legal status for Red No. 4 is as follows: "It may be used in food only for the coloring of maraschino cherries at a level not to exceed 150 parts per million by weight of the maraschino cherries. Such weight shall not include packing media, or in the case of candied maraschino cherries, added sugar." Users of food colors should consult with the FDA regarding the current status of such colors.

Ponceau is a soluble dye. It can be dissolved in the sirup directly. Prepare a 30° Brix sirup; add 0.5% citric acid and the desirable amount of Ponceau (note FDA rule above). Boil the leached cherries with the sirup for 5 to 10 minutes. Let stand for 24 hours and continue with the same procedure described above for erythrosine.

The presence of artificial flavor, approved color, citric acid, and sodium benzoate (if used) must be declared on the label.

Glacé

The manufacture of glacé cherries may be considered as a continuation of the maraschino process. Before the flavoring material is added, the sirup build-up procedure is repeated on succeeding days, with an increase of 10° Brix each day until the sirup has reached approximately 72° Brix. Sucrose and dextrose (or corn sirup) are used in equal weights to increase the sirup concentration. The cherries are held in the 72° Brix sirup at least three weeks for the sirup to penetrate into the cherries. Dextrose is used, because it prevents the cherries from becoming hard and granular.

The cherries are then dried with a thin coat of the sirup on them. Drying is done on screens at 120° to 140° F. until the cherries are no longer sticky.

Various modifications have been introduced in the preparation of glacé cherries, mainly to shorten the sirup penetration process from one day to a few hours. It is done by maintaining the sirup at 140° to 150° F., instead of room temperature.