Almond Meats and Hulls

new and improved uses for larger-sized meats and for hulls subjects of investigations

W. V. Cruess

Ten times more almonds are being produced annually in California than in 1915, and imports of shelled almonds from southern Europe have increased greatly since World War II.

New and improved uses for almonds—particularly those of larger size—were the objectives of a series of experiments conducted by the Division of Food Technology as small almonds are preferred for use in chocolate bars, which is the chief market for shelled almonds.

Certain experiments were aimed at providing sugared sliced almonds with long shelf life—resistance to rancidification—and which would afford an attractive candy without further processing.

Shelled almonds were blanched—peeled—by first immersing in hot water, then the skins were removed mechanically by blanching rollers. These almonds were then sliced to about the thickness of writing paper by means of a mechanical slicer. Almonds must be moist and flexible, as they are after blanching, otherwise they would break badly when sliced.

The sliced almonds were moistened slightly by a fine spray of water and rolled in powdered or fine-grained crystalline sugar. Excess sugar was removed by screening and the sugared slices were dried at 140° F in a brisk air current or were air-dried on screen trays at room temperature till crisp.

Sugared almonds can be packed in cellophane or pliofilm bags for retail sale, or in cartons or large friction-top tins for use by bakers and confectioners.

Sugared sliced almonds stored in the laboratory for more than two years were still sound and not rancid.

Sliced almonds are good in fondant, fudge, nougat, and as a confection with raisins, also in various baked products.

Sugared chopped almonds for use in cakes, cake fillings, and confections were processed similarly except that the blanched almonds were coarsely chopped or ground.

For true macaroons—made with almonds—a free-running granular or powdery mixture of almonds and sugar is most suitable.

Shelled almonds blanched as described above were ground medium fine. Then to 354 parts—by weight—of almonds, 218 parts of powdered sugar were added. These were mixed and finely reground. Then 428 parts of powdered sugar were added and thoroughly mixed.

When this mixture was reground to obtain a free-running, dry powder, it was approximately 64% sugar and 36% nut meat. Less sugar would have made the product richer, but would have made it oily.

The samples of dry macaroon mix now over two years old are still sound and free of rancidity.

Two types of mixes for a popular cake bar were prepared: *1*, a moist mixture of ground dates and chopped nuts; and *2*, a mixture of dry date granules and chopped nuts.

For the first mix, pitted Deglet-Noor dates of about 20% moisture were ground coarsely and mixed with chopped unblanched almonds in the ratio of three parts dates—by weight—to one of nuts. This mixture was ground, canned, and sealed. Had the moisture content been much above 20%, it would have been necessary to sterilize the canned mixture.

For the second mix, one pound of ground dates was added to three parts—by weight—of commercial dextrose. This mixture was reground and rubbed through a one-eighth inch mesh to give short strips, which were air-dried on screen trays at 120° until bone-dry, then coarsely crushed. To each three parts of the granules was added one part of chopped almonds.This mixture could be packaged in cellophane or pliofilm bags. No sterilization by heat would be necessary.

Roasted or Oil Cooked

Oven roasted almonds were preferred by a majority of laboratory testers to the oil cooked almonds most used commercially, since the nuts kept longer without rancidification and were not oily on the surface.

Blanched almonds were mixed while moist with salt—2%—and roasted at 400° F until the meat was light amber. Unblanched almonds were immersed in boiling 25% salt solution for 20 to 30 seconds, drained, and oven-roasted.

If the nuts burst, they should be dehydrated after brine treatment but before roasting. If the nuts are first roasted, they may be cooled, then moistened with an adhesive such as dilute pectin solution, then mixed with 2% salt and left in a dehydrator till bone-dry. Commercially, nuts are roasted in a rotary drum at about 245°.

Though direct shredding was not successful, a shredlike product was obtained. To 450 parts—by weight—of ground blanched almonds, 350 parts of powdered cane sugar and 50 parts of water were added. These ingredients were mixed and reground through the nut butter blade of a food grinder. The resulting paste was heated a little to soften it, then forced through small openings in a steel plate to obtain spaghettilike strings. These were cut into short pieces and dehydrated to crispness. The sugar retards rancidification.

Almond shreds may be used in candies, frostings, and cake fillings.

It was found that the broken nuts that accumulate in almond-shelling plants may be made into almond butter. The broken pieces, together with the unblanched almonds, were lightly roasted, cooled, ground in the nut butter attachment, mixed with 2½% salt, and twice reground. The addition of a small amount of edible oil improved the dry texture.

Almonds may be coated commercially with a white coating made of an edible vegetable fat, powdered sugar, and powdered milk, melted over water and allowed to thicken somewhat by cooling. This coating is tender, not hard, and its flavor blends well with the nuts.

A table syrup was made from the hulls by water extraction of the sugars, refining, concentrating, and flavoring with mapeline. A ton of hulls should yield about 100 gallons of syrup. But such a syrup is not as good as that made with sugar, water, and maple flavor, and would have to compete with such syrups.

Uses of Hulls

California processes about 40,000 pounds of almond hulls annually, and little use is made of them save for plowing under as a soil texture improver which forms humus in the soil but has little fertilizer value. Most of the hulls are burned.

Samples of almond hulls from Paso Robles and Sacramento Valley hullers were analyzed for possible use as a sup-

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GARDENIA

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traced either to excessive use of chemical fertilizers or to salts in the water supply. In much of central and southern California the use of water containing considerable amounts of soluble salts may be unavoidable. The increased use of underground water during the recent years of below normal rainfall has caused a rise in the salt content of the water of many wells. For example, conductance readings of between 60 and 150 are common for well waters in San Mateo County.

Even though one must use saline water, growing practices can be employed which in most cases will alleviate the danger of salt injury. Benches must be provided with adequate drainage. A layer of porous material should be placed on the bottom of raised benches. Straw is hardly adequate. Ground benches may need additional tile drainage. Plants should be grown in not more than five to six inches of light, porous soil. Clay loams should be avoided. Watering should always be in excess of the plants' needs. An excess of water provides the necessary leaching to remove salts which otherwise would accumulate. Chemical fertilizers should be applied sparingly and frequently.

Growers will find it worth while to determine periodically the salt content of their soil solutions and leachings. On the basis of work done already it appears that a conductance of around 150 to 200 is the upper limit of safety for the gardenia. Growers who have lowered the conductance of their bench soils to less than 100 have completely eliminated the trouble of salt injury to gardenias. It should be remembered that after the plant shows symptoms much of the damage is already done.

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plementary feed for cattle and sheep. It was found that the moisture content of the hulls ranged from 5.88% to 10.80%, averaging 7.54%. Total sugar content ranged from 18.3% to 30.56%, with an average of 25.61%.

From 41% to 45% of the weight of the finely ground hulls was soluble in cold water. Thus half the weight of the dry hulls—a high rate—was water soluble. About half was sugars and half carbohydrates, tannin and ash constituents. Crude fiber—roughage—averaged 12.6%. The hemicellulose content—about 10%, is probably digestible for sheep and cattle.

The hulls contained some tannin, but apparently not enough for production of tannin for leather making. The vitamin C content of a mixed sample was 43 milligrams per 100 grams—nearly as much as in fresh orange juice, and vitamin B_2 content was about 2 milligrams per 100 grams. The ash content was 70% water soluble.

Though the dry hulls keep well and are eaten by sheep and cattle, almond hulls have been converted experimentally into ensilage by filling a 50-gallon barrel with the hulls, heading up the barrel, filling it with hot water, and allowing it to stand for several weeks.

As a fertilizer, almond hull ash is a good source of potassium—which California soils usually do not lack—but is a poor source of phosphorus, a useful fertilizing element for most soils.

Alcohol was made from a mixed lot of the ground hulls by adding water and yeast, fermenting, distilling and redistilling the alcohol. The yield was 39 gallons of pure alcohol—200 proof—per ton of hulls. This, at 30¢ a gallon, would be worth $11.70 at wholesale, but manufacturing costs would be worth at least 15¢ per gallon. The yield would be about $5.85 worth of alcohol in a ton of dry hulls, leaving only $5.85 a ton for hauling and other expenses. The hulls are worth much more than $5.85 for stock feed.

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For a report on the use of almond hulls as a feed for dairy cattle and lambs, see "Almond Hulls," by Robert F. Miller, June, 1949, CALIFORNIA AGRICULTURE.

NEW PUBLICATIONS

—now ready for distribution—

Each month, new publications of the College of Agriculture are listed in this column as they are received from the press.

Single copies of these publications or a catalogue of Agricultural Publications may be obtained without charge from the local office of the Farm Advisor or by addressing a request to: Publications Office, 22 Giannini Hall, University of California, College of Agriculture, Berkeley 4, California.

SELECTIVE WEED KILLERS, by Alden S. Crafts and W. A. Harvey. Ext. Cir. 157, Sept., 1949.

This circular discusses the most important of the compounds, including dinitro selectives; selective oils; 2,4-D; 2,4,5-T; pentachlorophenol and its salts; I.P.C.; T.C.A.; phenyl mercuric acetate; potassium cyanate; and others. A table giving average dosage rates is also included.

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LOS ANGELES

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