

## Research Notes

### MANGO PULP EXTRACTING METHOD

Mangos (*Mangifera indica*, L.) are widely used in Puerto Rico in the preparation of nectars, drinks, paste, and jams.

Information is available on the extraction of mango pulp by dilution with water, but efficient methods are lacking for the extraction of the undiluted pulp for processing pastes, jams and preserves. In the preparation of these products a mixture of the fruit pulp and sugar must be cooked to obtain a very high consistency. Prolonged heating is required to evaporate excess water from diluted pulp, resulting in higher cooking costs, lower yields and impaired quality products.

Canning of undiluted pulps for further use represents an additional advantage over canning of diluted pulps because less labor and fewer containers are required.

A mechanical method for extracting undiluted pulp from unpeeled mangos is described in this note. This method of pulp extraction makes possible a more complete utilization of mango crops by packing and storing the fruit pulps for remanufacturing high-quality products throughout the year.

Very limited information on the commercial extraction of mango pulps is found in the literature. Brekke *et al.*<sup>1</sup> present a brief description of a method used with a paddle-type pulper to separate the pulp from Haden mangos during which the seeds were removed by hand. They also give information on the quality evaluation of heated and unheated purees extracted from peeled and unpeeled fruits. In their study, different heat treatments were applied to the extracted pulps rather than to the fruits. These mango pulps were preserved by freezing. Sánchez-Nieva *et al.*<sup>2</sup> describe a batchwise pulp extraction method whereby diluted mango pulps are obtained by the action of a vertical blender on weighted quantities of fruit and water.

In the study herein reported, mangos of the Mayagüezano variety were used because of their relative abundance and their suitability for the preparation of high-quality nectars,<sup>3</sup> preserves, jams, and paste. Freshly harvested mangos were inspected on a roller-type sorting table upon which water sprays removed dust and soil. Only ripe fruits with firm texture and

<sup>1</sup> Brekke, J., Cavaletto, C., and Stafford, A. E., Mango puree processing, Hawaii Agr. Exp. Sta. Technol. Progr. Rep. 167, 1968.

<sup>2</sup> Sánchez-Nieva, F., Rodríguez, A. J., and Benero, J. R., Processing and canning mango nectars, Agr. Exp. Sta. Univ. P.R., Bull. 148, 1959.

<sup>3</sup> Peryam, D. R. and Pilgrim, F. J., Hedonic scale method of measuring food preferences, *Food Technol.* 11 (9): 9-14, 1957.

uniform yellow skin were selected. The sorted mangos were conveyed to a soaking tank with water containing 50 p.p.m. chlorine followed by a tap water rinse in a rod washer. The washed fruits were pretreated in two different ways prior to pulping. In one case the mangos were scalded at 200° F. for 2.5 minutes in a continuous steam scald and in the other, the

TABLE 1.—*Data on the pulping of Mayagüezano variety mangos after fruit steaming and after fruit peel-cutting treatments*

Fruit treatment prior to pulping	Run	Fruit	Pulp	Pulp extracted	Pulp recovered
		<i>Pounds</i>	<i>Pounds</i>	<i>Percent</i>	<i>Percent</i>
Steaming	1	172.0	90.0	52.3	84.1
	2	200.0	108.0	54.0	86.9
	3	200.0	105.0	52.9	84.5
Peel cutting	1	168.0	83.0	49.5	79.4
	2	200.0	96.0	48.0	77.2
	3	200.0	94.0	47.0	75.6

TABLE 2.—*Hedonic scale ratings of mango nectars manufactured from canned pulps obtained after fruit steaming and peel-cutting treatments and stored at 85° F*

Fruit treatment	Run	Hedonic scale ratings*			
		Days in storage			
		20	96	218	305
Steaming	1	7.2	6.3	7.1	—
	2	7.1	7.2	6.1	7.2
	3	7.2	7.6	7.3	7.4
Peel cutting	1	7.2	7.0	6.8	7.3
	2	6.5	7.0	6.8	7.1
	3	6.5	7.0	6.8	—

\* Hedonic ratings are based on a 9-point hedonic scale in which 9 = "like extremely," 8 = "like very much," 7 = "like moderately," 6 = "like slightly," etc.

fruits were conveyed to a mechanical peel cutter consisting of a rotating drum with knives protruding  $\frac{1}{8}$  inch from the surface of the drum.

After pretreatment, the mangos were fed into a E-Z Adjust Pulper<sup>4</sup> in which nylon brushes revolving at 650 r.p.m. separated pulp from seeds and skin through a 0.060-inch screen. The pulper performance was evalu-

<sup>4</sup> Trade names are used in this paper solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the equipment by the Agricultural Experiment Station of the University of Puerto Rico or an endorsement over other equipment not mentioned.

ated by comparing the pulp recoveries with the available pulp in the raw fruits.

Citric acid was added to the pulps to adjust the pH in the range of 3.5 to 3.8. The pulps were flash-pasteurized at 195° F. in a Votator pasteurizer, packed in No. 10 cans and cooled in a tap water bath.

Samples were stored at 85° F. for product evaluation. To ascertain the keeping quality of the canned pulps, nectars were prepared after four different storage periods and submitted to a tasting panel. The panelists were required to score the samples according to a 9-point hedonic scale.<sup>5</sup>

Pulp yields of mangos pretreated in the steam scald and of mangos pretreated in the mechanical cutter are presented in table 1. The mangos were steamed at 200° F. for 2.5 minutes because this was the highest temperature and the minimum holding time that could be obtained in the continuous scald. Although care was taken, some broken seeds were encountered when the peel-cutting pretreatment was employed, while no breakage occurred when steam-pretreated. The pulps obtained were of an attractive bright yellow color and no discoloration or gelation was observed. The pulp extraction was in the range of 52.3 to 54.0 percent when the fruits were pretreated in the scald and in the range of 47.0 to 49.5 percent when the fruits were pretreated in the peel cutter.

To obtain the pulper performance the pulp extractions were compared with the available pulp in the Mayagüezano variety, which averaged 62.2 percent. The results presented in the last row of figures in table 1 indicate the recovery of pulp from steamed fruits was in the range of 84.1 to 86.9 percent and from 75.6 to 79.4 percent for those treated mechanically. This demonstrates that steaming mangos prior to pulping produces a higher pulper performance and increases pulp recovery.

The results of the sensory evaluation of nectars prepared from each of six pulps kept under storage at 85° F. are presented in table 2. Although hedonic ratings fluctuate between 6.1 and 7.8 for intermediate storage periods, at the end of 305 days of storage all nectars samples were scored above 7.0 (like moderately) thus indicating good quality. No perceptible change in the keeping quality was observed in pulps pretreated in the scald or in the peel cutter when stored at 85° F.

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<sup>5</sup> Peryam, D. R. and Pilgrim, F. J., *op. cit.*, p. 513.