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# **Commercial Uses and Consumer Preferences for HAWAIIAN GUAVA PRODUCTS**

**A GUIDE TO MARKET DEVELOPMENT**

Frank S. Scott, Jr.

		<b>FROZEN GUAVA NECTAR BASE</b>		<b>CANNED GUAVA NECTAR</b>
	<b>GUAVA SHERBET</b>		<b>CHILLED GUAVA NECTAR</b>	
		<b>GUAVA JELLY</b>		<b>FRUIT PUNCH</b>

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# COMMERCIAL USES AND CONSUMER PREFERENCES FOR HAWAIIAN GUAVA PRODUCTS

## A Guide to Market Development

Frank S. Scott, Jr.<sup>1</sup>

### INTRODUCTION

This report on uses and consumer preferences for guava nectar is based largely upon market surveys in Kailua, Oahu, T. H.; San Jose, California; and Decatur, Illinois. The bulletin is designed primarily as a guide to product improvement and mainland market development.

### OUTLET BY TYPE OF PRODUCT PROCESSED

The largest outlet for processed guava products during 1956 in Kailua, Oahu, T. H., with population characteristics comparable to those of a number of Pacific Coast localities, was for chilled nectar bottled by dairies. An annual equivalent of 74 cases of 24 6-ounce cans of frozen guava nectar base per 1,000 capita was sold in this form. On the same basis, Kailua consumers bought an equivalent of 46 cases of canned heat processed guava nectar and 30 cases of frozen guava nectar base per 1,000 capita.<sup>2</sup>

The only other sizeable outlet for guava products was in the form of guava sherbet which required an amount of guava puree per 1,000 capita equivalent to that in about one case of frozen guava nectar base. Small amounts were sold in the form of jams, jellies, and related products.

A different pattern of preference by type of processing can be expected to prevail in Hawaii as consumers learn to appreciate the superior qualities of the frozen product. On the U. S. Mainland, per capita consumption of frozen juice concentrates has increased remarkably during recent years mostly at the expense of heat processed canned juices. The percentage of the Florida orange crop going into frozen orange juice concentrate increased from less than one percent during the 1945-46 season to 54 percent during 1955-56.<sup>3</sup> The percentage going into canned single-strength juice and other processed products declined from 40 percent during 1945-46 to 13 percent during 1955-56. Twenty-nine percent of the 1955-56 crop was sold as fresh fruit and 4 percent as chilled juice or sections. The transition has been slower for California orange juice and for juices other than orange.

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<sup>2</sup>The base for frozen guava nectar is composed of full-strength guava puree plus sugar. It is not dehydrated and is technically not a concentrate. However, since the frozen base is diluted with 3 cans of water for consumer use, it is in effect a concentrate insofar as the consumer is concerned.

<sup>3</sup>Scott, Frank S., Jr., *Consumer Uses of Passion Fruit Juice—A Guide To Market Development*, University of Hawaii Agricultural Experiment Station, Agricultural Economics Report 31, July, 1957.

With present methods of processing, frozen juices have a flavor and freshness which is not retained in the canned heat processed products. Also, the concentrate is a far less bulky item for the customer's shopping bag. Yet the cost of the frozen concentrate per ounce of reconstituted juice is about the same as that of the canned product.

Since guava is not marketed commercially as a fresh fruit, it is reasonable to assume that the proportion going into the frozen form for consumer outlets will eventually exceed that of oranges.

Small quantities of Hawaiian guava juice are now being used in mainland fruit punches. This use at the present time looms large for the relatively small guava industry. However, it appears evident that as guava processing is expanded, the outlet for the product as one of a number of ingredients in fruit punch will expand at a slower rate than the outlet for straight frozen nectar base or perhaps a blend with one other juice or nectar going directly into retail channels.

Based on the pattern of sale of competing fruit juices, institutional sales can be expected to be small in relation to sales of frozen guava nectar base in 6-ounce cans once the market is developed.

At the 1957 rate of guava sherbet consumption in Hawaii, it would require the equivalent of puree in only 175,000 gallons of frozen guava nectar base to supply the needs of all mainland sherbet manufacturers. Faced with strong competition from time-tested mainland flavors, such a potential would be unreasonably optimistic.

Preliminary testing of a 50-50 blend of frozen guava nectar base and frozen pineapple juice concentrate indicates that marketing of a blend of this type may expand the sales for both products. Based on limited testing, the blend is considered superior in both flavor and body to either product individually.

Available research findings indicate no additional uses for guava which might be expected to require large quantities of fruit.

In light of these observations, it seems rather conclusive that if a large guava industry is to develop, a major effort must be directed toward development of the market for sales of the frozen nectar base in 6-ounce cans, either as a straight nectar or as a blend. There may also be opportunity for selling frozen nectar base in bulk for distribution by mainland dairies in spite of anticipated strong competition from better known juice products. There is also justification for further market development designed to expand the sales of heat processed guava nectar, guava sherbet, and miscellaneous guava products, such as jellies and jams.

### **CONSUMER USES OF GUAVA NECTAR**

Of the 86 percent of Kailua, Oahu, residents who had used guava nectar in one form or another, 93 percent had used it as a straight nectar and 40 percent as a blend with other juices or nectar (table 1).

As to use in conjunction with particular meals, 90 percent had used the nectar as a between-meal refreshment at one time or another; 63 percent had used it at breakfast time; 42 percent, at other meals; and 15 percent, as a picnic drink.

The percentage of consumers using guava nectar for a variety of purposes was greater in the higher income groups, with the exception of use with meals other than breakfast which was highest for the middle-income group and lowest for the high-income group (table 1).

Percent

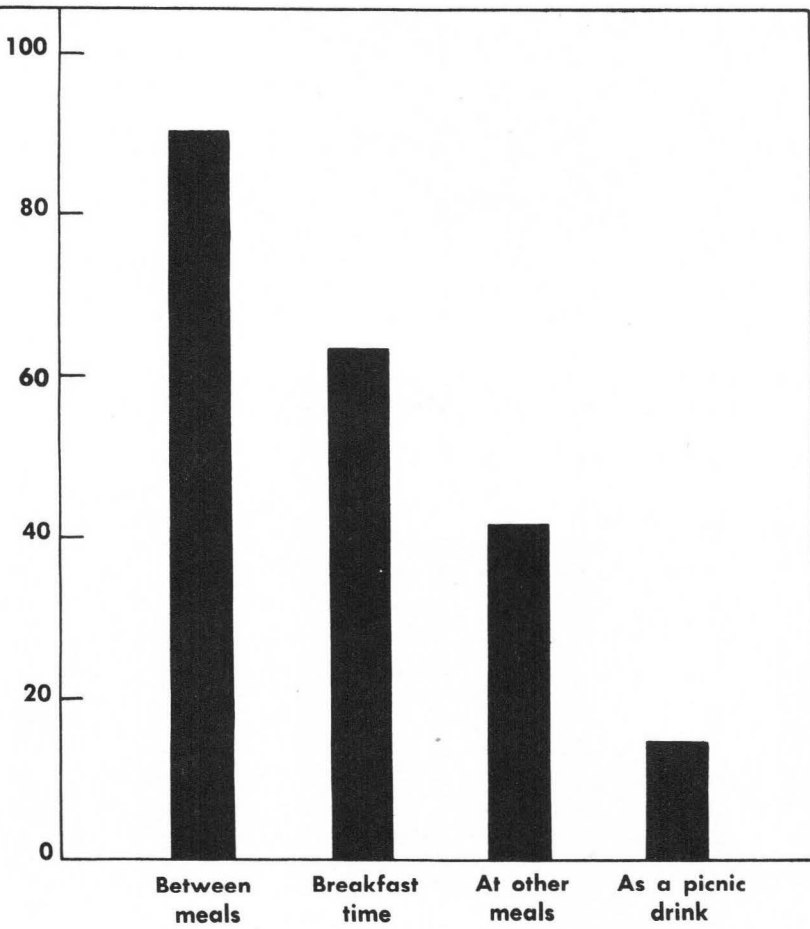


FIGURE 1. Percentage of consumers using guava nectar for various purposes, Kailua, Oahu, T. H., 1956.

TABLE 1. Percentage of consumers using guava nectar for various purposes, by income groups, Kailua, Oahu, T. H., 1956

INCOME GROUP	PERCENTAGE OF GUAVA NECTAR CONSUMERS USING THE PRODUCT FOR THE FOLLOWING PURPOSES					
	Straight nectar	Blended with other juices or nectars	Between meals	Breakfast time	At other meals	As a picnic drink
Under \$4,000.....	94	39	84	60	39	14
\$4,000-\$6,999.....	93	44	90	63	48	14
\$7,000 and over.....	93	48	97	66	28	18
All groups.....	93	40	90	63	42	15

The high percentage using the product as a breakfast drink is an important factor in determining seasonality of sales. In fact, monthly sales of frozen guava nectar base in Kailua during 1956 were approximately 75 percent as high during the winter months as during the summer months. On the Mainland where there is more seasonal variation in climate, a somewhat greater variation between winter and summer sales would be expected. Yet for the entire United States there is little seasonal variation in consumption of frozen orange juice concentrate. This is because it is the favorite breakfast juice throughout the year and faces strong competition from other juice products, especially lemonade, during the summer months.

Thus it is reasonable to assume that the use pattern for guava nectar will be similar to that for orange juice, with resulting year around sales on the Mainland as well as in Hawaii.

### **PREFERENCES FOR FROZEN GUAVA NECTAR BASE IN RELATION TO COMPETING FROZEN JUICE CONCENTRATES**

Kailua consumers indicated a preference for frozen orange juice concentrate over all other frozen juice concentrates (figure 2 and table 2). Frozen guava nectar base ranked second, with only a slightly lower rating than for frozen orange juice concentrate. As indicated in table 2, the percentage of consumers who liked frozen guava nectar base better than competing frozen juice concentrates ranged from 62 percent in relation to grapefruit and limeade to 32 percent for passion fruit juice. Although the percentage liking frozen guava nectar base best was higher in relation to orange juice than in relation to passion fruit juice, the percentage not liking it as well was also greater in relation to orange juice, thus placing frozen orange juice concentrate slightly ahead of both frozen guava nectar base and frozen passion fruit juice.

Preferences for frozen guava nectar base in relation to other frozen concentrates or nectars varied considerably according to income. Preferences for guava nectar in relation to orange juice and passion fruit juice were greater among the lower income groups. But in relation to frozen grape juice concentrate, the preference for frozen guava nectar base was greater in the higher income bracket. Guava was rated highest in relation to lemonade, tangerine, grapefruit, and limeade by the middle income group.

Kailua consumers indicated a strong preference for frozen guava nectar base in relation to canned heat processed guava nectar. In relation to the canned guava nectar, 61 percent of the people in all income groups liked the frozen product better, 25 percent liked it about the same, and 14 percent didn't like it as well. Although all income groups expressed a preference for frozen guava nectar base in relation to canned heat processed guava nectar, the preference for the frozen product was greater among the higher income groups. Whereas in the lowest income group only 42 percent liked the frozen product better and 16 percent didn't like it as well, in the income group of \$7,000 and over, 70 percent liked it better and only 14 percent not as well.

### **PREFERENCES OF CHILDREN IN RELATION TO ADULTS**

In Kailua, a somewhat higher percentage of children than adults expressed a strong preference for frozen guava nectar base (table 3). Sixty-two percent of the

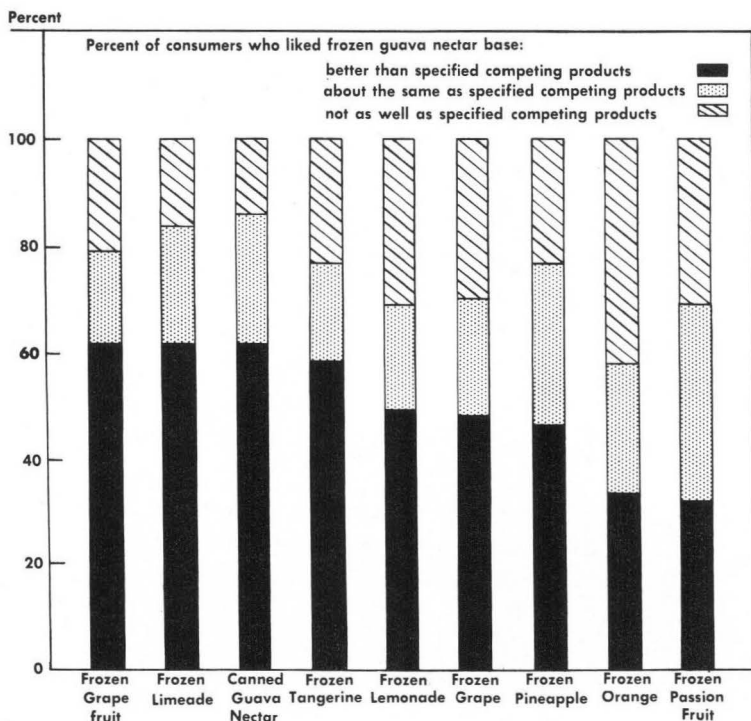


FIGURE 2. Consumer preferences for frozen guava nectar base in relation to specified frozen juice products (6-ounce cans) and canned guava nectar, Kailua, Oahu, T. H.

children and 50 percent of the adults indicated that they liked the product exceptionally well. In narrowing the classification to contrast only between those who liked the product and those who didn't, there was no significant difference between preferences between children and adults.

The difference between children and adults as to the percentage who liked the product exceptionally well was greater among the families with higher incomes.

Among 2,286 adults and 226 children questioned during store demonstrations in San Jose, California, there were no significant differences in preferences expressed by children as compared with adults.

These tests indicate that children may have a somewhat stronger liking for frozen guava nectar than have adults. Since children are substantial consumers of frozen juices this is an important consideration both in contemplating future sales and in designing promotional programs.

### PREFERENCES BY RACIAL GROUPS

The Kailua survey indicated important differences among racial and nationality groups with regard to preferences for frozen guava nectar base. Hawaiians and Part Hawaiians as a group indicated a considerably greater liking for the product than any other group, with 69 percent liking it exceptionally well and only 1 percent not liking it at all (table 4). Forty-nine percent of the Caucasians, but only 34 percent of



TABLE 2. Percentage of consumers who liked frozen guava nectar base better than, about the same as, or not as well as specified frozen juice products and canned guava nectar, Kailua, Oahu, T. H., 1956

INCOME GROUP AND PREFERENCE CATEGORY	FROZEN JUICE CONCENTRATES								CANNED GUAVA NECTAR
	Grapefruit	Limeade	Tangerine	Lemonade	Grape	Pineapple	Orange	Passion fruit	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
<i>Under \$4,000</i>									
Better than . . . . .	58	54	25	39	45	48	37	37	42
About the same as . . . . .	16	23	0	26	31	28	37	45	42
Not as well as . . . . .	26	23	75	35	24	24	26	18	16
<i>\$4,000-\$6,999</i>									
Better than . . . . .	65	66	65	54	42	45	36	32	63
About the same as . . . . .	19	18	19	21	23	29	22	36	23
Not as well as . . . . .	16	16	16	25	35	26	42	32	14
<i>\$7,000 and up</i>									
Better than . . . . .	57	60	54	45	62	48	25	30	70
About the same as . . . . .	12	28	23	17	16	35	21	32	16
Not as well as . . . . .	31	12	23	38	22	17	54	38	14
<i>All income groups</i>									
Better than . . . . .	62	62	58	49	48	46	33	32	61
About the same as . . . . .	17	22	19	20	22	31	25	37	25
Not as well as . . . . .	21	16	23	31	30	23	42	31	14

TABLE 3. Preferences of children in relation to adults for frozen guava nectar base, Kailua, Oahu\*

CLASSIFICATION	INCOME GROUP	PERCENTAGE OF CONSUMERS WHO LIKED THE NECTAR			
		Exceptionally well	Fairly well	Slightly	Not at all
Adults.....	Under \$4,000	55	33	5	7
Children.....	Under \$4,000	59	29	5	7
Adults.....	\$4,000-\$6,999	53	37	8	2
Children.....	\$4,000-\$6,999	66	25	5	4
Adults.....	\$7,000 up	41	47	5	7
Children.....	\$7,000 up	56	30	9	5
Adults.....	All income groups	50	39	7	4
Children.....	All income groups	62	27	6	5

\*Based on a 25 percent sample of Kailua households (804 usable schedules).

TABLE 4. Preferences for frozen guava nectar base by racial groups

RACIAL GROUP	PERCENT OF ADULTS WHO LIKED GUAVA NECTAR MADE FROM THE FROZEN BASE			
	Exceptionally well	Fairly well	Slightly	Not at all
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Japanese.....	34	48	17	1
Chinese.....	25	46	19	10
Caucasian.....	49	35	8	8
Hawaiian and Part Hawaiian.....	69	22	8	1
Weighted average of all groups*....	52	33	9	6

\*Samples of other racial groups were too small to allow separate breakdowns but were used in determining the weighted averages of all groups. They included Filipinos, Koreans, Puerto Ricans, and others.

the Japanese and 25 percent of the Chinese, indicated that they liked the nectar made from the frozen base exceptionally well.

### SUGAR RATIO PREFERENCES

Consumer response to the sweetness factor in test cities indicates that an adjustment in the sugar-juice ratio would likely result in higher sales in certain areas. Twelve percent of the consumers in Kailua and 13 percent in San Jose considered the guava nectar made from the frozen base too sweet (figure 3 and table 5). Only 7 percent and 1 percent, respectively, considered it too tart. In Decatur, Illinois, 6 percent of those who sampled the product considered it too sweet, but an equal

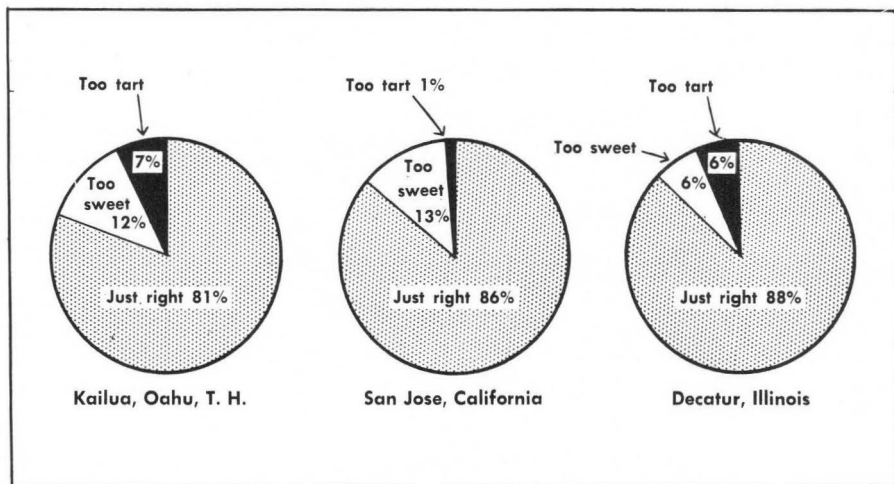


FIGURE 3. Consumer reaction to sweetness factor of frozen guava nectar base in specified test areas.

percentage considered it too tart. Sugar-juice ratios of the products sampled in the two cities were essentially the same.

There appears to be some correlation between family income and reaction to the sweetness factor. The percentage of Kailua consumers who considered the product too sweet was largest, 14 percent, among the highest income group. The middle income group contained the largest percentage of people who thought the nectar was too tart.

In addition to sweetness there were other important objections to frozen guava nectar base. There were numerous reports of an unfavorable reaction to the grittiness of the product. This was particularly true in Decatur where 24 percent of the people who tasted it didn't like it at all. Only 6 percent of the Kailua people and 9 percent of the San Jose people expressed a definite dislike for the product.

TABLE 5. Consumer reaction to sweetness factor of frozen guava nectar base in specified test areas

TEST AREA AND INCOME GROUP	DATE	NUMBER OF CONSUMERS TESTED	SWEETNESS FACTOR			PERCENT WHO DISLIKED GUAVA NECTAR MADE FROM THE FROZEN BASE
			Just right	Too sweet	Too tart	
<i>Kailua</i>						
Under \$4,000....	June 1956	47	85	9	6	7
\$4,000-\$6,999....		138	78	13	9	3
\$7,000 up.....		63	83	14	3	6
All groups.....		248	81	12	7	6
<i>San Jose</i>						
All groups.....	June 1956	2,286	86	13	1	9
<i>Decatur</i>						
All groups.....	July 1956	152	88	6	6	24

According to reports of demonstrators, large numbers of Decatur people expressed a disinterest in trying a new and different fruit juice and made it clear that they were perfectly satisfied in restricting their choice of frozen juice concentrates to orange and lemonade. This supports the belief that people on the West Coast and in Hawaii are more venturesome in their choice of foods. Part of this, of course, stems from an environment where the production of exotic fruit products is more varied.

In light of these findings, processors might well consider using somewhat less sugar in frozen guava nectar base for distribution on the West Coast and in Hawaii. Also, if feasible technologically, effort might be directed at a means of reducing the grittiness of the frozen nectar base.

### NUTRITIONAL VALUES

From a nutritional standpoint, guava nectar is superior to many other fruit juices in vitamin content (table 6). Some wild guavas in Hawaii contain as much as 700 milligrams of vitamin C per 100 grams of fruit.<sup>4</sup> However, most of the guava processed in Hawaii contains only 100 to 300 milligrams of vitamin C per 100 grams and the frozen nectar base after dilution has a natural vitamin C content of only 22 to 25 milligrams per 100 grams. This compares with 47.2 milligrams per 100 grams for reconstituted frozen orange juice concentrate. It seems apparent that through plant selection the vitamin C content of frozen guava nectar base could be increased to a point where it exceeds that of frozen orange juice concentrate.

Realizing the influence of vitamin content on consumer demand for fruit juices, many juice products are fortified with ascorbic acid to the extent that one glass of juice supplies at least the daily minimum adult needs for vitamin C. This, of course, tends to reduce the comparative sales advantages of juices that are naturally high in vitamin C. Nevertheless, a juice which is naturally high in vitamin C would be expected to have some advantage in consumer appeal over a juice which requires the addition of ascorbic acid in order to have a satisfactory amount of vitamin C.

Hawaiian-grown guavas provide a fair source of vitamin A, calcium, and phosphorus and contain some iron, thiamine, and niacin.<sup>5</sup>

### SUMMARY AND CONCLUSIONS

1. Hawaiian guavas are marketed in a variety of processed forms. The fresh fruit is not considered adaptable to marketing at the retail level and the major outlet is in the form of nectar. In Kailua, Oahu, T. H., which was used as a test area because of its similarity to West Coast communities, the largest single outlet during 1956 was in the form of chilled guava nectar bottled by dairies. An equivalent of the amount of guava puree used in 74 cases of 24 6-ounce cans of frozen guava nectar base per 1,000 capita was sold annually in dairy bottles. On the same basis, Kailua consumers bought an equivalent of 46 cases of canned heat processed guava nectar and 30 cases of frozen guava nectar base per 1,000 capita. The guava puree required for

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<sup>4</sup>Boyle, Frank P., Henry Seagrave-Smith, Seiji Sakata, and G. Donald Sherman, *Commercial Guava Processing in Hawaii*, University of Hawaii Agricultural Experiment Station, Bulletin 111, June, 1957, page 6.

<sup>5</sup>*Ibid.*

TABLE 6. Vitamin and mineral contents of specified fruit juices and nectars\*

	Vitamin A (as B. Carotene) (i.u.)	Vitamin C (Ascorbic Acid) (mg./ 100 gm.)	Vitamin B <sub>1</sub> Thiamine (mg./ 100 gm.)	Vitamin B <sub>2</sub> (Riboflavin) (mg./ 100 gm.)	Niacin (mg./ 100 gm.)	Ash (mg./ 100 gm.)	Calcium (mg./ 100 gm.)	Phos- phorus (mg./ 100 gm.)	Iron (mg./ 100 gm.)
Apple Juice, fresh or canned.....	40	1	.02	.03	Trace	.3	6	10	.5
Grape Juice, bottled, commercial.....	—	Trace	.04	.05	(.2)	.4	10	10	.3
Grapefruit Juice, canned.....	Trace	33.2	.028	.017	.17	.4	8	13	.4
Grapefruit Juice Concentrate, frozen, reconstituted.....	7.5†	38.1	.048	.006	.26	.4	8	12	.1
Guava, common, raw.....	250	100-300	.07	.04	1.2	.7	30	29	.7
Guava Nectar, common, frozen nectar base, reconstituted.....	—	22-25	—	—	—	—	—	—	—
Lemon Juice, canned, unsweetened.....	0	42	.04	Trace	.1	.3	14	11	.1
Lime Juice, fresh.....	0	27	(.04)	(Trace)	(.1)	.3	(14)	(11)	(.1)
Orange Juice, canned (sweetened and unsweetened).....	100	35.0	.073	.020	.24	.5	10	19	.5
Orange Juice Concentrate, frozen, reconstituted.....	(83)†	47.2	.085	.013	.33	.4	9.2	16	.12
Passion Fruit Juice, yellow, fresh.....	570	10-20	Trace	.101	2.24	—	5	18	.3
Passion Fruit, frozen base diluted†.....	143	2.5-5	.02	.03	.56	—	1	5	.1
Pineapple Juice, canned.....	80	8.5	.053	.018	.18	.2	15	9	.3
Pineapple Juice, frozen, reconstituted.....	—	13	.066	.016	.25	.4	10.8	8.3	.32
Prune Juice, canned.....	—	(1)	(.03)	(.08)	.4	.3	(25)	(40)	(1.8)
Tangerine Juice, canned, unsweetened.....	(420)	(26)	(.06)	(.03)	(.2)	.4	19	16	.2
Tomato Juice, canned.....	1,050	16	.05	.03	.8	1.0	(7)	(15)	(.4)

\*Sources: (a) Bernice K. Watt and Annabel L. Merrill, *Composition of Foods*, USDA Handbook No. 8, June, 1950;

(b) Carey D. Miller, *et al.*, *Vitamin Values of Foods in Hawaii*, University of Hawaii Agricultural Experiment Station Technical Bulletin 30, May, 1956;

(c) Food Processing Laboratory, University of Hawaii;

(d) Quick Frozen Foods, June, 1956.

†Estimated by the writer on basis of dilution for reconstituting, except for the vitamin C value of diluted frozen passion fruit juice concentrate which was determined by the University of Hawaii Food Processing Laboratory.

guava sherbet consumed per 1,000 Kailua families amounted to approximately the equivalent of that in one case of frozen guava nectar base. Guava requirements for jellies and jams are small in relation to those for other uses.

In relation to current production, an important amount of guava is used in mainland processed fruit punches. These outlets, however, are easily saturated.

On the Mainland, and to a lesser extent in Hawaii, frozen concentrates are displacing heat processed canned juices and fresh fruit at the retail level. The percentage of the Florida orange crop sold in the form of a frozen juice concentrate increased from less than 1 percent during 1945-46 to 54 percent during 1955-56. During the same period, the proportion of total sales in the form of canned single-strength juice plus other processed products decreased from 40 percent to 13 percent. The frozen concentrate provides a superior and more convenient product at about the same cost per ounce of reconstituted juice.

In light of the increasing popularity of frozen juice concentrates and in face of the difficulty in making inroads on accepted juices now delivered by mainland dairies, it seems reasonable to conclude that the primary mainland market for guava nectar will be in the form of frozen guava nectar base either as a straight nectar or as a blend.

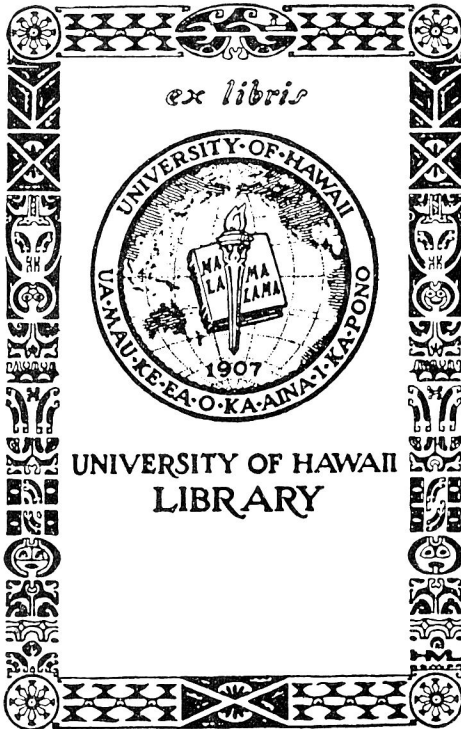
2. Sixty-three percent of Kailua consumers had used guava nectar as a breakfast drink. Guava nectar sales can be expected to be less seasonal than those of lemonade, even in mainland areas where climate changes are more extreme than in Hawaii.

3. Kailua consumers preferred frozen orange juice concentrate to frozen guava nectar base but liked the guava product about the same as frozen passion fruit juice and preferred it to all other frozen juice concentrates.

4. The relatively high nutritional value of guava nectar is considered an important factor in contemplating potential sales.

5. In test areas, children showed a somewhat stronger preference for guava nectar than did adults. This is important since children are large potential users of fruit juices.

6. A substantial percentage of consumers in test areas considered the guava nectar made from the frozen base too sweet and too gritty. In fact, many people who tried the product during store demonstrations expressed a complete dislike for the product for one or both of these reasons. Processors might well benefit by making a slight reduction in the sugar-juice ratio and developing a method for reducing grittiness.



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