Vitamins in Canned Puerto Rican Fruit Juices and Nectars[1]

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INTRODUCTION

During the last two decades the canning of fruit juices and nectars has become a very important industry in Puerto Rico. Although the literature on the vitamin content of canned foods is considerable (*1,2,3,4,5,6,7,8,9,10*)[3], practically no information is readily available on the vitamin content of locally canned juices and nectars, except for one investigation conducted over 20 years ago on the vitamin C content of canned pineapple juice and guava, tamarind, mango, banana, soursop and quenepa nectars (*11*).

It was therefore considered advisable to carry out an exploratory study to determine the content of some of the principal water-soluble vitamins in a number of commercially available fruit juices and nectars obtained from the shelves of markets located in the San Juan Metropolitan Area.

Information in this connection will be very valuable to dietitians and nutritionists. It may also assist in deciding whether a more extensive survey should be undertaken in cooperation with local packers in order to help them improve their products nutritionally.

MATERIALS AND METHODS

The fruit juices and nectars assayed were purchased on different dates during the last 3 years at supermarkets located in the San Juan Metropolitan Area. Fifteen different kinds were subjected to investigation. Only three of them, pineapple F, peach F, tomato F, were not packed in Puerto Rico. Also it should be noted that the fruit pulps used were imported for at least three of them—pear, apricot, and peach.

As several of the same kind of juices and nectars were packed by different concerns, 12 cans under each trade label were assayed separately, except in the case of pear H and apricot I, of which only 5 and 6 cans were assayed respectively. A total of 299 cans was assayed throughout this investigation.

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[3] Italic numbers in parentheses refer to Literature Cited, p. 70.

Ascorbic acid was determined by the reduction of the 2,6 dichlorophenol-indophenol dye, following the titration method described in Methods of Vitamin Assay (*12*). Thiamine was determined by the thiochrome method (*12*). Niacin, riboflavin, and folic acid were determined microbiologically. For niacin determination the procedure described in the Official Methods of the Association of Official Agricultural Chemists (*13*) was followed, with the modification that Difco's dehydrated assay medium was used.

The organism used was *Lactobacillus plantarum* (arabinous 17–15). Riboflavin was determined using *Lactobacillus casei* 7469, according to the Methods of Vitamin Assay (*12*). Folic acid was determined with *Streptococcus fecalis* 8043 following also the Methods of Vitamin Assay (*12*), except that Difco's dehydrated assay medium was used.

RESULTS AND DISCUSSION

The results of this survey are summarized in table 1. The values reported are in terms of milligrams, in the case of ascorbic acid and, of micrograms in the case of riboflavin, thiamine, niacin, and folic acid, all per 100 ml. of the entire contents of the can of juice or nectar.

Vitamin-concentration values in single cans of the same product and trade label were generally in good agreement for riboflavin, thiamine, and niacin. The variations observed from can to can were, with very few exceptions, always below the threefold range. In ascorbic and folic acid the agreements were not so good. Guava nectars of two different trade labels—A and C—exhibited values of ascorbic acid that ranged from traces to 140 mg. per 100 ml. Ascorbic acid under a third trade label of guava nectar investigated, varied only within a threefold range. The remaining nectar and juices showed better agreement for ascorbic acid, varying only within a twofold range. Folic acid showed the greatest variation of all the five vitamins determined. The range of values from can to can of the same product and trade label varied eightfold. In four products it ranged from traces to measurable amounts. If pineapple B, apricot B, tamarind, and soursop were excluded, the average agreement obtained in the remaining products was much better, but still within a fourfold range.

In table 2 are recorded the highest and the lowest values observed in this survey. Orange juice showed the highest value for ascorbic acid of all the products assayed. On the other hand, practically no ascorbic acid could be detected in apricot, pear, peach, soursop, and tamarind nectars. The product with the highest content of thiamine was pineapple juice. Tomato juice showed the highest values for riboflavin, niacin, and folic acid, while mango had the lowest value for riboflavin; guava, pear, apricot, and papaya for thiamine; papaya and pear for niacin, and tamarind and soursop for folic acid.

TABLE 1.—*Ascorbic acid, riboflavin, thiamine, niacin, and folic acid content of canned juices and nectars*

Sample	Brand	Samples	Ascorbic Acid		Riboflavin		Thiamine		Niacin		Folic acid	
			Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
		Number	*Mg./100 ml.*	*Mg./100 ml*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*
Guava N.[1]	A	12	Traces–6.96	3.87	10–26	16	1–5	2	123–250	171	0.1–1.2	0.4
Do.	B	12	3.97–14.29	9.17	11–20	16	4–7	6	127–199	170	.4–0.8	.6
Do.	C	12	Traces–10.50	7.91	11–14	14	4–4	4	125–163	155	.6–1.6	.8
Average for all guava N.[1] samples		36	Traces–14.29	6.77	10–26	15	1–7	3	123–250	165	.1–1.6	.4
Blend of Guava N.[1] and pineapple J.[2]	A	12	1.72–7.62	4.29	21–51	30	30–77	43	217–300	241	1.0–1.6	1.9
Pineapple J.[2]	A	12	6.99–17.86	13.29	12–38	22	43–90	62	178–316	243	.8–4.8	2.3
Do.	D	12	12.0–18.87	14.96	15–36	25	46–69	56	289–384	333	.0–3.9	2.2
Do.	B	12	11.91–15.09	13.20	14–19	16	40–60	47	218–270	240	1.1–2.0	1.6
Do.[3]	F	12	8.39–9.35	8.85	15–18	16	39–61	55	163–178	171	.3–0.9	.5
Average for all pineapple J.[2] samples		36	6.99–18.87	13.82	12–38	21	40–90	55	178–384	274	.0–4.8	2.0
Blend of Pineapple J.[2] and orange J.[2]	G	12	5.50–31.28	15.65	6–28	13	13–54	38	109–184	154	.4–1.5	.9
Orange J.[2]	G	12	9.05–42.24	23.30	7–22	16	30–62	48	87–200	154	.8–12.1	2.4
Do.	B	12	35.10–69.60	43.58	12–28	19	18–80	50	128–217	168	.9–3.7	1.9

Average for all orange J.[2] samples		24	9.05–69.60	33.44	7–28	17	18–80	49	87–217	161	.8–12.1	2.1
Grapefruit J.[2]	B	12	4.33–30.54	24.75	7–16	12	26–69	45	141–335	224	.5–1.8	1.2
Do.	G	12	5.33–49.80	26.92	4–15	10	24–51	38	106–220	158	.6–1.2	.9
Average for all grapefruit J.[2] samples		24	4.33–49.80	25.84	4–16	11	24–69	41	106–335	192	.5–1.8	1.1
Pear N.[1]	H	5	Traces	—	6–8	7	0–6	3	71–89	78	.1–0.3	.2
Do.	A	12	Traces	—	6–15	10	1–3	3	65–147	86	.1–0.8	.3
Do.	B	12	Traces	—	9–17	14	2–4	3	57–115	77	.2–0.7	.4
Average for all pear N.[1] samples		29	Traces	—	6–17	11	0–6	3	57–147	81	.1–0.8	.3
Peach N.[1]	I	12	Traces	—	7–20	12	2–6	4	184–435	313	.1–0.7	.8
Do.	B	12	do.	—	13–19	16	3–4	3	244–444	357	.1–0.3	.2
Do.	A	12	do.	—	11–17	13	2–3	2	240–339	275	.1–0.3	.2
Do.[1]	F	12	do.	—	18–24	20	4–7	6	236–277	251	.2–0.7	.4
Average for all peach N.[1] samples		48	do.	—	7–24	15	2–7	4	184–444	299	.1–0.7	.3
Apricot N.[1]	I	6	do.	—	6–26	14	5–7	3	135–194	166	.1–0.5	.3
Do.	B	12	do.	—	9–16	12	2–4	3	85–201	159	0.3	.2
Do.	A	12	do.	—	8–11	9	2–3	3	86–161	138	.1–0.3	.2

TABLE 1.—*Continued*

Sample	Brand	Samples	Ascorbic Acid		Riboflavin		Thiamine		Niacin		Folic acid	
			Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
		Number	*Mg./100 ml.*	*Mg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*	*µg./100 ml.*
Average for all apricot samples		30	do.	—	8–26	11	2–7	3	85–201	152	.1–0.5	.2
Tamarind N.[1]	B	12	do.	—	10–23	14	22–48	37	113–138	127	0.3	.1
Soursop N.[1]	B	12	do.	—	10–25	15	9–22	15	230–300	261	0.3	.1
Papaya N.[1]	B	12	4.07–25.06	8.26	6–17	8	1–5	3	71–93	80	.2–1.9	.9
Mango N.[1]	B	12	0.99–2.36	1.60	5–14	7	3–6	5	102–122	114	.2–1.2	.5
Tomato J.[2]	J	12	6.11–16.87	11.27	10–30	22	30–84	44	517–1,149	813	1.3–13.2	6.2
Do.[4]	F	12	13.09–20.65	16.73	20–32	25	43–73	61	698–961	799	5.2–7.5	6.6
Average for all tomato J.[2] samples		24	6.11–20.65	13.99	10–32	23	30–84	52	517–1,149	778	1.3–13.2	6.4

[1] N. stands for nectar.
[2] J. stands for juice.
[3] Canned in the Philippines.
[4] Canned in the United States.

We believe this investigation should be extended in the future to include, not only the five vitamins already determined, but also carotene, pyridoxine, pantothenic acid, potassium, sodium, pH, and total acidity. It will be interesting to obtain samples from the manufacturers before the juices and nectars are canned, immediately after canning, and after a reasonable period of shelf life. This type of study will provide information of great practical value which might permit the establishment of quality control standards for these important local food products.

TABLE 2.—*Highest and lowest vitamin contents of the juices*[1] *and nectars*[2] *studied*

Vitamin	Highest	Lowest
Ascorbic acid mg./100 ml.	Orange J. 33.44 (9.05–69.60)	Apricot, pear, peach, soursop, and tamarind N., Traces
Riboflavin μg./100 ml.	Tomato J. 23 (10–32)	Mango N. 7 (5–14)
Thiamine μg./100 ml.	Pineapple J. 55 (39–90)	Guava, pear, apricot, and papaya N. 3 (0–7)
Niacin μg./100 ml.	Tomato J. 778 (517–1,149)	Papaya and pear N. 81 (57–147)
Folic acid μg./100 ml.	Tomato J. 6.4 (1.3–13.2)	Tamarind and soursop N. 0.1 (0–0.3)

[1] J stands for juice.
[2] N stands for nectar.

SUMMARY AND CONCLUSIONS

The ascorbic acid, thiamine, riboflavin, niacin, and folic acid contents of commercial canned juices or nectars of apricot, grapefruit, guava, guava-pineapple, mango, orange, papaya, peach, pear, pineapple, pineapple-orange, soursop, tamarind, and tomato were determined by chemical or microbiological procedures.

The vitamin content of the same product and trade label from can to can was generally in good agreement for riboflavin, thiamine, and niacin, but the agreements were not as good for ascorbic and folic acid.

Orange juice had the highest content of ascorbic acid, tomato juice of riboflavin, niacin, and folic acid, respectively, and pineapple juice of thiamine. However, the thiamine content of tomato juice was just slightly below that of pineapple juice. The nectars in general exhibited values well below those of the juices; particularly poor in the above vitamins were apricot, pear, peach, tamarind, and soursop nectars.

RESUMEN Y CONCLUSIONES

Se determinaron mediante procedimientos químicos o microbiológicos los contenidos de ácido ascórbico, tiamina, riboflavina, niacina y ácido

fólico de los jugos y néctares comerciales enlatados de albaricoque, toronja, guayaba, guayaba-piña, mango, china, papaya, melocotón, pera, piña, piña-china, guanábana, tamarindo y tomate.

El contenido de vitamina del mismo producto y marca resultó estar, generalmente, en buen acuerdo, de lata a lata, en cuanto a riboflavina, tiamina y niacina. No estuvo tan de acuerdo en el caso de los ácidos ascórbico y fólico.

El jugo de china demostró tener el contenido mayor de ácido ascórbico; el de tomate de riboflavina, niacina y ácido fólico, en ese orden respectivo, y el de piña de tiamina. Sin embargo, el contenido de tiamina del jugo de tomate fue un poco menor que el del jugo de piña. En general, los néctares tuvieron valores bien por debajo de los de los jugos; particularmente resultaron pobres en las vitaminas mencionadas los néctares de albaricoque, pera, melocotón, tamarindo y guanábana.

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