Proximate Analysis and Vitamin Content of Canned Puerto Rican Native Dishes[1]

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INTRODUCTION

Canning of native dishes has become a major food industry during the last 2 decades in Puerto Rico. Large markets exist for these preserved foods locally as well as in Continental cities where large Puerto Rican communities have settled and developed. No information is readily available, however, on the proximate analysis and vitamin content of these canned dishes. It therefore was considered advisable to conduct an exploratory study to determine the proximate analysis and principal water soluble vitamin content in a number of these commercially-available canned foods as obtained from shelves of markets located in the Metropolitan Area of San Juan. Information resulting from these studies is essential to dietitians and nutritionists. It also might assist in determing need for a more extensive survey conducted in cooperation with local packers to help improve such products nutritionally by establishing quality grade standards.

MATERIALS AND METHODS

The cooked canned foods assayed were purchased on different dates during the past 3 years. Fourteen different kinds of such foods were subject to investigation. Because several of the same foods were packed by different concerns, 12 cans under each available trade label were assayed separately. A total of 240 cans were assayed during this investigation. Sampling was as follows: The entire content of each can was homogenized thoroughly in an Osterizer, this operation taking about 5 minutes. Samples for vitamin assay were weighed immediately after homogenization. Samples for proximate analyses were kept in a refrigerator at about 5° C. until submitted to analysis, usually within 3 to 7 days.

English and Spanish names of each dish appear in table 1. Brief descriptions of the principal ingredients of the different dishes studied follow:

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TABLE 1.—*Proximate composition (wet basis) of canned Puerto Rican native dishes*

Spanish name	English name	Water	Protein	Fat	Ash	Crude fiber	Carbohydrates	Calories
		Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Per 100 g.*
Asopao de Gandules	Pigeon Pea *Asopao*[1]	83.77 (81.88–87.02)	2.25 (1.31–2.92)	2.10 (0.90–2.95)	0.89 (0.31–1.66)	0.45 (0.24–0.69)	10.50 (8.71–12.94)	69.90 (48.18–89.99)
Asopao de Jueyes	Crabmeat *Asopao*[1]	84.19 (77.25–87.82)	2.32 (1.68–3.08)	2.36 (1.10–4.51)	1.13 (0.22–2.25)	0.37 (0.14–1.71)	9.64 (4.40–15.51)	69.08 (34.22–114.95)
Asopao de Pollo	Chicken *Asopao*[2]	85.32 (82.24–91.95)	3.26 (1.71–8.68)	1.95 (0.40–3.81)	0.91 (0.26–1.55)	0.34 (0.13–1.37)	8.24 (3.37–11.60)	63.51 (23.92–107.53)
Carey Guisado	Turtle Meat Stew[1]	83.09 (80.80–85.64)	7.76 (1.13–10.04)	1.61 (0.99–2.01)	0.73 (0.43–1.23)	0.30 (0.16–0.46)	6.50 (4.64–11.53)	71.53 (31.99–104.37)
Gandinga Guisada	Pork, Liver and Heart with Vegetable Stew[1]	82.15 (79.10–85.07)	6.36 (1.65–8.40)	3.41 (1.94–4.83)	0.93 (0.40–1.66)	0.32 (0.20–0.66)	6.82 (4.06–14.02)	83.41 (40.30–133.15)
Garbanzos Guisados	Cooked Chick Peas[2] (P.R. style)	77.16 (73.36–80.93)	5.07 (3.51–6.11)	3.10 (0.93–4.84)	1.17 (0.32–2.72)	0.67 (0.31–1.04)	12.85 (8.66–17.34)	99.56 (57.04–128.81)
Habichuelas Blancas Guisadas	Cooked White Beans[2] (P.R. style)	78.44 (74.09–82.30)	5.02 (2.62–7.10)	1.69 (0.66–3.70)	1.19 (0.63–2.12)	1.07 (0.26–1.82)	12.95 (10.43–17.75)	87.09 (63.02–132.70)
Habichuelas Coloradas Guisadas	Cooked Red Kidney Beans[2] (P.R. style)	78.59 (74.31–82.19)	5.40 (4.62–10.31)	1.17 (0.49–1.90)	0.98 (0.53–1.76)	0.99 (0.79–1.39)	12.90 (8.30–15.79)	83.71 (61.28–117.27)
Habichuelas Rosadas Guisadas	Cooked Pink Beans[2] (P.R. style)	78.27 (73.46–81.79)	4.63 (3.18–5.69)	1.18 (0.62–2.46)	1.20 (0.60–2.01)	0.98 (0.72–1.27)	13.76 (11.09–17.37)	84.14 (62.66–105.98)
Mondongo Guisado	Beef Tripe Stew[2]	85.78 (80.40–88.27)	4.44 (2.33–7.29)	1.95 (0.73–3.34)	0.75 (0.33–1.61)	0.40 (0.13–0.81)	6.72 (2.81–9.91)	62.13 (33.43–96.90)
Pasteles de Arroz	Rice *Pasteles*[1]	78.52 (74.00–84.05)	3.61 (2.30–5.12)	3.50 (1.19–6.24)	0.79 (0.29–1.56)	0.26 (0.10–0.57)	13.33 (11.11–15.74)	99.26 (64.35–139.60)
Pasteles de Plátano (masa)	Plantain *Pasteles*[1]	76.50 (72.62–84.42)	3.41 (2.06–5.57)	9.28 (3.79–18.23)	0.91 (0.27–2.81)	0.37 (0.22–0.80)	9.53 (6.71–12.92)	125.28 (69.19–197.03)
Pasteles de Yuca	Cassava *Pasteles*[1]	72.79 (62.25–77.70)	3.44 (2.28–5.17)	7.76 (4.68–10.60)	0.92 (0.45–2.16)	0.46 (0.20–1.01)	14.38 (10.51–20.48)	141.12 (93.28–198.00)
Sancocho	*Sancocho* Soup[1]	82.92 (81.52–83.92)	1.92 (1.14–4.34)	2.87 (1.60–3.45)	0.88 (0.36–1.72)	0.42 (0.28–0.87)	10.91 (9.65–12.70)	77.15 (57.56–99.21)

[1] Average of 12 cans.
[2] Average of 24 cans.

Pigeon Pea *Asopao*—Rice, pigeon peas, neck bones, *sofrito*,[3] pork lard, monosodium glutamate, and water. Has a soupy consistency.

Crabmeat *Asopao*—Rice, crabmeat, olive oil, pork lard, ham, salt pork, olives, capers, *sofrito*,[3] and water. Has a soupy consistency.

Chicken and Rice *Asopao*—Rice, chicken wing and gizzard, chicken fat, olive oil, salt pork, pork lard, marjoram, black pepper, cumin, monosodium glutamate, *sofrito*,[3] and chicken stock. Has a soupy consistency.

Turtle Meat Stew—Turtle meat, potatoes, pork lard, water, olives, and *sofrito*.[3]

Pork liver and heart with vegetable stew.—Pork livers, pork hearts, potatoes, olive oil, olives, capers, monosodium glutamate, *sofrito*,[3] and water.

Cooked White Beans (P. R. style)—White beans, lard, pig feet, pumpkin, *sofrito*,[3] ham, olive oil, and water.

Cooked Red Kidney Beans (P. R. style)—Red kidney beans, pumpkin, lard, pork fat, ham, *sofrito*,[3] and water.

Cooked Chick Peas—Chick peas, *sofrito*,[3] pork feet, olive oil, water, lard, ham, and pork fat.

Cooked Pink Beans—Pink beans, pumpkin, lard, pork fat, ham, *sofrito*,[3] olive oil, and water.

Beef Tripe Stew—Beef tripe stock, cooked beef tripe, pumpkin, celeriac (root celery, *apio* or *arracacha*), tanier, chick peas, lard, coriander, salt pork, *sofrito*,[3] and monosodium glutamate.

P. R. Rice Pasteles—Filling: Pork meat, pork lard, smoked pork, chick peas, coriander, *sofrito*,[3] and monosodium glutamate. Filling enveloped in water-softened rice. The whole *pastel* is wrapped in banana leaves and boiled.

P. R. Plantain *Pasteles*—Filling: Pork meat, tanier, lard, milk, potatoes, pumpkin, *sofrito*,[3] smoked pork, chick peas, coriander, and monosodium glutamate. Filling enveloped with grated green plantain. The whole *pastel* is wrapped in banana leaves and boiled.

P. R. Cassava *Pasteles*—Filling: Milk, butter, pork meat, coriander, lard, and *sofrito*.[3] Filling enveloped with grated cassava. The whole *pastel* is wrapped in banana leaves and boiled.

P. R. *Sancocho*—Taniers, green bananas, pumpkin, green plantains, celeriac (root celery, *apio* or *arracacha*), cabbage, pork neck bones, ham, pork fat, chick peas, *sofrito*,[3] lard, and monosodium glutamate.

The proximate analyses were carried out at the Central Laboratory of

[3] *Sofrito*—consists of onions, tomato sauce, baby sweet peppers, green peppers, garlic, herbs, and spices. All of these ingredients are chopped finely and sautéed with lard colored with annatto seed. Salt is added to taste.

the Agricultural Experiment Station,[4] according to the Official Methods of the Association of Official Agricultural Chemists (*3*).[5]

Thiamine was determined by the thiochrome method, as described in Methods of Vitámin Assay (*2*).

Niacin, riboflavin and folic acid were determined microbiologically. For niacin determination the procedure described in the Official Methods of the Association of Agricultural Chemists (*3*) was followed with the modification that Difco's dehydrated assay medium was used. The assay organism used was *Lactobacillus plantarum* (*arabinosus* 17-5).

Riboflavin was determined by using *Lactobacillus casei* 7469, according to the Methods of Vitamin Assay (*2*).

Folic acid was determined with *Lactobacillus casei* 7469, according to the method of Baker *et al.* (*1*).

RESULTS AND DISCUSSION

The results of this preliminary survey are summarized in tables 1 and 2. Table 1 presents the proximate composition (wet basis) with the average and range values. The most water found in the products analyzed was in the beef tripe stew (*mondongo guisado*), the *asopaos*, the turtle meat stew, *sancocho*, and the pork liver and heart with vegetable stew (*gandinga guisada*) (average range from 85.78 to 82.15 percent). These products, of course, contained the smallest amount of solids. On the other hand the *pasteles* contained the least water (average range from 78.52 to 72.79 percent) and thus the largest amount of solids.

The highest protein content recorded among the dishes analyzed occurred in the turtle stew (7.76-percent average) and the pork liver and heart with vegetable stew (*gandinga guisada*) (6.36-percent average). A peculiarity was observed in these two dishes; they showed the greatest spread in protein content from can to can in the survey. In the case of the turtle stew, the recorded protein values ranged from 1.13 to 10.04 percent, and in the case of the pork liver and heart with vegetable stew from 1.65 to 8.40 percent. Because the sampling for analysis strictly followed the methodology described under Material and Methods, which minimized variation, it must be concluded that the wide range of values observed from can to can in these dishes is due probably to a significant disproportion of protein-contributing ingredients in each of the cans analyzed.

Beans (three different varieties of *Phaseolus* from two different canners), in general showed a range of protein values from a maximum of 5.40-per-

[4] We are indebted to Mr. Alfonso Riera and his staff for this cooperation.

[5] Italic numbers in parentheses refer to Literature Cited, p. 313.

TABLE 2.—*Vitamin content of canned Puerto Rican native dishes*

Spanish name	English name	Niacin	Thiamine	Riboflavin	Folic acid
		Mg./100 g.	*Mg./100 g.*	*Mg./100 g.*	*Mg./100 g.*
Asopao de Gandules	Pigeon Pea *Asopao*[1]	0.815 (0.536–1.059)	0.038 (0.024–0.054)	0.040 (0.021–0.057)	0.0044 (0.0027–0.0069)
Asopao de Jueyes	Crabmeat *Asopao*[1]	0.743 (0.285–1.048)	0.016 (0.006–0.040)	0.041 (0.021–0.070)	0.0013 (0.0006–0.0026)
Asopao de Pollo	Chicken *Asopao*[2]	1.123 (0.649–1.919)	0.036 (0.012–0.101)	0.038 (Traces–0.064)	0.0020 (0.0007–0.0053)
Carey Guisado	Turtle Meat Stew[1]	1.468 (0.916–2.154)	0.040 (0.015–0.064)	0.106 (0.065–0.147)	0.0062 (0.0034–0.0086)
Gandinga Guisada	Pork Liver and Heart with Vegetable Stew[1]	2.882 (1.207–4.408)	0.043 (0.019–0.067)	0.502 (0.294–0.732)	0.027 (0.01–0.05)
Garbanzos Guisados	Cooked Chick Peas (P.R. style)[2]	0.394 (0.225–0.544)	0.047 (0.019–0.083)	0.047 (0.024–0.094)	0.0049 (0.0024–0.0095)
Habichuelas Blancas Guisadas	Cooked White Beans (P. R. style)[2]	0.342 (0.187–0.452)	0.084 (0.052–0.148)	0.040 (0.025–0.073)	0.0036 (0.0014–0.0093)
Habichuelas Coloradas Guisadas	Cooked Red Kidney Beans (P.R. style)[2]	0.461 (0.197–0.641)	0.098 (0.055–0.164)	0.059 (0.036–0.105)	0.0036 (0.0018–0.0064)
Habichuelas Rosadas Guisadas	Cooked Pink Beans (P.R. style)[2]	0.395 (0.202–0.575)	0.098 (0.047–0.214)	0.048 (0.030–0.073)	0.0046 (0.0023–0.0080)
Mondongo Guisado	Beef Tripe Stew[2]	0.823 (0.213–1.269)	0.020 (0.003–0.045)	0.038 (0.020–0.076)	0.0025 (0.0008–0.0064)
Pasteles de Arroz	Puerto Rican Rice *Pasteles*[1]	1.114 (0.750–1.589)	0.033 (0.010–0.064)	0.052 (0.043–0.061)	0.0058 (0.0018–0.0090)
Pasteles de Plátano (masa)	Puerto Rican *Pasteles*[1]	0.681 (0.454–1.318)	0.043 (0.017–0.087)	0.084 (0.053–0.104)	0.0057 (0.0030–0.0114)
Pasteles de Yuca	Puerto Rican Cassava *Pasteles*[1]	0.757 (0.569–0.999)	0.048 (0.024–0.077)	0.073 (0.047–0.105)	0.0072 (0.0026–0.0131)
Sancocho	Puerto Rican *Sancocho*[1]	0.607 (0.286–1.128)	0.032 (0.018–0.071)	0.032 (0.016–0.049)	0.0029 (0.0013–0.0060)

[1] Average of 12 cans.
[2] Average of 24 cans.

cent average in the case of red kidney beans to a minimum of 4.63-percent-average in the case of pink beans.

Chick peas under two different trade labels contained an average of 5.07-percent protein.

The *pasteles* exhibited the highest fat content: Plantain or *pasteles de masa* 9.28-percent average and cassava *pasteles*, 7.76-percent average. Next to the *pasteles*, the pork liver and heart with vegetable stew followed with 3.41-percent average fat. The dishes with the lowest fat content were red kidney beans with 1.17-percent average and pink beans with 1.18-percent average.

The highest mineral (ash) content recorded corresponded to the beans and in particular to pink beans (1.20-percent average). Crabmeat *asopao* also showed an unusually high mineral content (1.13-percent average). Beef tripe stew and turtle meat stew had the lowest mineral values.

Crude fiber was highest in those dishes in which legumes predominate (range from 0.99-percent average to 1.07-percent average). Rice *pasteles* exhibited the lowest crude fiber values (0.10- to 0.57-percent range). All the other *pasteles*, turtle meat stew, the *asopaos*, the *sancocho* and the pork liver and heart with vegetable stew also were low in crude fiber.

Carbohydrates (by difference) were highest in cassava *pasteles*, with 14.38-percent average. Pink beans followed with 13.76-percent average. Turtle meat, beef tripe stew and pork liver and heart with vegetable stew (6.50-, 6.72-, and 6.82-percent average, respectively) were the dishes with the lowest carbohydrate content.

The highest calorie content, as served per 100 g., occurred in the *pasteles* and the chick peas (100 calories and above). All others were well below this value.

The highest niacin content occurred in the pork liver and heart with vegetable stew, 2.882 mg. per 100 g., followed by turtle meat stew with 1.468 mg. per 100 g. The chicken *asopaos* and rice *pasteles* also were relatively high in this vitamin. The lowest niacin content occurred in cooked white beans with 0.342 mg. per 100 g. Chick peas and beans, in general, also were relatively low in niacin.

The highest values for thiamine were found in the pink beans and the red kidney beans, 0.098 mg. per 100 g. White beans also were high in thiamine. The lowest values recorded for thiamine occurred in the crabmeat *asopao*, 0.016 mg. per 100 g. and beef tripe stew, 0.020 mg. per 100 g.

The highest content of riboflavin was found in the pork liver and heart with vegetable stew, 0.502 mg. per 100 g.; turtle meat stew followed with 0.106 mg. per 100 g. The dishes with the lowest values for riboflavin were *sancocho*, 0.032 mg. per 100 g., chicken *asopao*, 0.038 mg. per 100 g., and beef tripe stew, 0.038 mg. per 100 g.

Pork liver and heart with vegetable stew contained the highest values for folic acid, 0.027 mg. per 100 g., followed by cassava *pasteles* with 0.0072 mg. per 100 g. The lowest folic acid values were found in the crabmeat *asopao* with 0.0013 mg. per 100 g., followed by chicken *asopao*, 0.0020 mg. per 100 g. and beef tripe stew, 0.0025 mg. per 100 g.

This investigation should be extended to include other nutritional factors such as carotene, vitamin A, pyridoxine, pantothenic acid, potassium, and sodium content. It would be helpful in establishing quality control to analyze samples before canning, immediately after canning, and after a known period of shelf life.

SUMMARY

The proximate analysis, as well as the niacin, thiamine, riboflavin and folic acid content of 14 different kinds of cooked canned Puerto Rican dishes were determined by chemical or microbiological procedures. Some of the more important findings follow: Turtle meat stew and pork liver and heart with vegetable stew exhibited the highest values for protein, niacin and riboflavin; on the other hand, *sancocho*, white beans, chicken *asopao* and beef tripe stew showed the lowest values. Pink and red kidney beans were high in thiamine, while crabmeat *asopao* and beef tripe stew were low. Pork liver and heart with vegetable stew showed the highest folic acid content, while crabmeat *asopao* exhibited the lowest. In general, *pasteles* had the highest fat content, while red kidney and pink beans had the lowest. Cassava *pasteles* and pink beans had the highest content of carbohydrates, and turtle meat stew, beef tripe stew and pork liver and heart with vegetable stew the lowest.

The variations observed are discussed and recommendations are made.

RESUMEN

Se hizo un análisis aproximado y se determinó mediante métodos químicos o microbiológicos el contenido de niacina, tiamina, riboflavina y ácido fólico de 14 enlatados de diferentes platos típicos puertorriqueños. Algunos de los resultados más importantes se mencionan a continuación: El carey guisado y la gandinga guisada tuvieron los valores más altos en cuanto al contenido de proteína, niacina y riboflavina; y el sancocho, las habichuelas blancas guisadas, el asopao de pollo y el mondongo los más bajos. Los valores más altos en tiamina correspondieron a las habichuelas rosadas y coloradas guisadas, respectivamente, mientras que en el asopao de jueyes y el mondongo se observaron los valores más bajos. El nivel más alto de ácido fólico se encontró en la gandinga guisada y el más bajo en el asopao de jueyes.

Se señalan las variaciones observadas y se formulan recomendaciones.

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