

PAPAYA: Its Uses, Food Value and Preparation

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of the Plant Utilization Division

Papaya, *Carica papaya* L. is a common tropical fruit naturalized in this country. In England, it is popularly known as "paw-paw" and "melon tree," in the United States. Papaya was introduced into the Philippines by the Spaniards from Mexico, and being a tropical fruit, its propagation was so rapidly extended to many parts of the country that at present it could be found almost anywhere.

The importance of papaya in this country is as a table fruit when ripe and as a vegetable when young. The commercialization of papaya products is limited, if there is any at all in the Philippines, as compared to that in the United States and other Asiatic countries. The food value as well as the medical uses of papaya are recognized in the United States. In 1941, before the outbreak of war, the United States imported \$150,000 worth of papain from the West Indies and Ceylon.

The annual production of papaya in the Philippines (Census of the Philippines, 1939), is 54,613,524 fruits worth P1,115,616. According to Culbreth (1927) and Karter and Schlientz (1934), papain is

prepared by collecting the milky exudates of papaya obtained by incising the skin of the mature fruit and dried at not more than 40% preferably under vacuum). The dry residue is known as "papain" commercially termed as "papoid." This substance after treatment with alcohol produces a precipitate containing caricin or papayotin. It is whitish hygroscopic powder odorless, tasteless and soluble in water or glycerine; and active in neutral and acids, but more so in alkaline media. It converts starch into maltose, albuminoids into peptones, and emulsifies fats very readily. Hence, this substance is used in cases of dyspepsia to help in digesting foods. Americans of advanced age take papain in forms of candy and chewing gum or mixed with other medicinal preparations.

The papaya milky exudates besides being used as a bleacher is also used for removing freckles.

The dried seeds of papaya are commonly used as vermifuge (worm expeller). The water extract of papaya leaves removes certain cloth stains and when used in washing colored clothings prevents discoloration.

The papaya fruit is highly recommended as an economical source of Vitamins A, B and C. It contains appreciable amounts of calcium, phosphorus and iron as shown in the following table:

TABLE 1—Showing the vitamin and mineral contents of papaya as compared with some Philippine fruits. L

NAME OF FRUIT	VITAMINS				MINERALS (PER CENT)			
	A	B1	C	B2	Ash	Calcium	Phosphorus	Iron
Avocados	- -	- -	- -	- -	0.79	0.008	0.034	0.00057
Bananas	- -	- -	- -	- -	0.80	0.004	0.023	0.00007
Guavas	- -	- -	- -	- -	0.50	0.101	0.022	0.00146
Mangoes	- -	- -	- -	- -	0.37	0.006	0.015	0.00016
PAPAYAS	- -	- -	- -	- -	0.51	0.019	0.013	0.00025
Pineapple	- -	- -	- -	- -	0.28	0.018	0.012	0.00025

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Nature of Fruit	Moisture %	Ash %	Protein %	Fat %	Crude Fiber %	Carbohydrates % (by difference)
Green Papaya	93.98	0.41	1.09	0.17	0.65	3.70
Ripe Papaya	88.27	0.88	0.75	0.24	1.17	8.69

Watermelon 0.37 0.006 0.017 0.00017
 1/—Miller, C. D. and R. Robbins. Some fruits of Hawaii: their composition, nutritive value and uses. Hawaii Agricultural Experiment Station Bulletin No. 77, 1937.
 2/—Pratt, D. S. and J. I. del Rosario. Philippine fruits: their composition and characteristics. Philippine Journal of Science. 8A: 69 (1913).

According to the foregoing tables the papaya fruit has a comparatively high food value, especially in vitamins and the necessary bone building materials as calcium and phosphorus. Besides, the ripe fruit contains carotaxanthin which promotes growth, the body effect of which is similar to carotene. As food, papaya fruit when young is used as vegetable and when ripe as a table fruit. The immature papaya is popularly used in the manufacture of native "atchara" and in the preparation of fermented mixed pickles. It may be baked or boiled and served as a vegetable, or stewed and served as a sauce. In the ripe stage, it is most desirable to use as fresh, making an excellent breakfast or dessert fruit when served with lemon or lime. In cocktail or salads, it is usually combined with pineapple, mango, citrus, melon and other highly flavored fruits. The fresh papaya pulp with milk or cream makes a delicious frozen dessert.

The food products derived from papaya are many and their preparations had been tried and tested by the Plant Utilization Division. In the preparation of these papaya products, such as jelly, jams, marmalade products, such as jelly, jams, marmalades, preserves, etc., the following are the methods used:

Papaya Jelly.—The mature but not ripe papaya contains a high percentage of pectin, an important ingredient in the manufacture of fruit jellies. In view of the fact that the water extract of papaya for jelly making has no fruit flavor this material is used advantageously in the manufacture of artificially flavored fruit jellies, such as mint, strawberry, grapes, pineapples, etc., which is done as follows:

Wash the fruit, cut into halves, removed the seeds, and cut into small and thin pieces (skin not being removed). Add equal amount of water and boil for 20 minutes or until the fruit is tender. Strain through a piece of cheesecloth (without pressing) and measure. To every kilo of the water extract, add 1/2 kilo of sugar, either first or second class sugar. To mixture, add 4 tablespoons of calamansi juice. Heat to boiling and strain to remove impurities; continue boiling until a temperature of 108°C (226.4°F.) is reached. Before pouring into the jelly jars, add the fruit flavoring, the type of essence depending on what kind of jelly is to be made.

Papaya Juice.—A new product of ripe papaya is the juice, commercially known as "papaya nip". An American firm in Hawaii is the manufacturer of this prized

product. Trans-oceanic vessels includes papaya juice as the main source of Vitamins A, B, complex and C. It is prepared as follows:

Select a fully ripe papaya free from blemishes and spoiled portions. Wash carefully and cut into halves to remove the through a fine sieve. In a commercial manufacture, the ordinary tomato pulper does the job with optimum efficiency and speed. To the fine papaya pulp, add equal amount of 30 per cent syrup. To every liter of the resulting mixture, add two tablespoons of calamansi juice to impart enough acid and citrus flavor. Heat the mixture to boiling and pour while hot into No. 1 tall cans (10-ounce capacity), and then seal hermetically. Cool at once under running water; dry, label and store in cool, dry place.

Papaya Sauerkraut. — Experiments undertaken on the preparation of papaya sauerkraut produced a product similar to ordinary cabbage sauerkraut, another type of vegetable pickle. The preparation is as follows:

Peel the hard mature papaya and shred into threads as if shredding cabbage. Pack the shredded material in a jar, incorporating at least 2% salt on each layer. Put on each layer. Put on heavy stones, not bricks or iron, heavy enough to let the water ooze out of the material. Cover the container and allow to ferment at least one week, long enough to acquire about 1% lactic acid content. Pack the vegetable in cans, heat its liquid to boiling, pour while hot into the vegetable and seal the cans hermetically. Cool at once under running water to prevent the vegetable from further cooking. Store in cool, dry place.

Papaya Pickles (Native "Atchara"). — The common papaya pickle (Native "Atchara") is made differently from the fermented papaya mixed pickle. This is made by the quick process which is as follows:

Peel 5 regular sized green papaya and shred it. Add to the shredded material 2% salt and work with the hands; press to remove completely the juice and to it add the pickle syrup which is prepared as follows: may be added few crushed pieces of "dillaw"; then heat to boiling and pour while lows: To one quart of sour vinegar (4% acetic acid) add one head of garlic, twenty (20) heads of native onions sliced into thin disks; two red sweet peppers, sliced; a small amount of cut ginger; and 2 cups of brown sugar. To the mixture, may be added few crushed pieces of "dillaw"; then heat to boiling and pour while hot into the pressed papaya vegetable. The

product is ready to serve, but best if allowed to stand overnight.

Frozen Papaya.—The commercial value of papaya will be increased as soon as the United States resumes the importation of frozen papaya. Before the outbreak of War II, a private firm was exporting frozen papaya to the United States. As soon as tin cans are made available at reasonable price the same private firm would again start the exportation of frozen papaya to the United States. The simple method used in preparing the product is as follows:

Select sound ripe papaya; peel; cut into halves to remove the seeds and then cut the pulp into rectangular pieces of about 1" wide x 2" long. Pack in one-gallon can, previously coated with paraffin and to it pouf enough to cover a 30% syrup. Seal hermetically and store in a cold storage with a temperature ranging from 17-26°F. This preparation is served as fresh papaya and may be used in the manufacture of "papaya nip".

Papaya Jam.—The taste of pure papaya jam is improved by the addition, as flavoring, of small amounts of other highly flavored fruits, such as "nangka", mango or pineapple. The appearance of the finished product is much improved because of the added pectin inherent in the fruit flavoring. The method is described as follows:

Select fully ripe papaya, cut into halves to remove the seeds; then scrape the pulp, and the hard portions grated through a meat chopper. measure the total pulp and add 1/2 the amount of sugar and 1/4 the amount of any of the above-mentioned fruit flavoring. Cook to a jam consistency; pack while hot and seal hermetically at once. If packed while boiling hot which is the correct practice, sterilization is not necessary.

Papaya Preserves (Maraschino-cherries type).—The product serves as a substitute for the imported maraschino-cherries preserve, commonly used in fruit cocktail; salads, cakes and pastries. Only the mature but firm papaya is recommended to obtain a product very similar to maraschino-cherries preserve.

Cut the papaya into halves to remove the seeds; then scoop the pulp with the aid of a potato pulper (the smaller size). Try as much as possible to produce round balls of about the size of cherries. Prick the balls and soak in lime water solution (made by dissolving 1 tablespoon of common lime in 12 cups of water) for at least 12 hours. Then wash thoroughly to remove the lime and boil 10 minutes. Drain and soak in a solution of certified red food coloring (made by mixing 1/4 teaspoon of Ponceau red coloring in 1/3 cup of calamansi juice). Let it stand for 5 hours stirring occasionally to effect an even distribution of the absorption of color. Wash the balls to remove excess color and then boil for 15 minutes in 2 to 1 syrup. Allow to stand overnight and boil again until the syrup

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WITH OUR TENANTS

CULTURAL DIRECTIONS FOR

ONIONS

By PEDRO A. RODRIGO

Chief, Horticulture Research Section
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The season for Bermuda onion culture begins in September in localities or regions enjoying the first type of climate, where there is a distinct wet and dry season. Under the other climatic types, planting should start at the end of the rainy season, so that the crop will come to maturity at the height of the dry season. In this connection, it should be understood that onion matures in five months, starting from sowing the seed in the seedbed to harvesting the crop in the field.

The best soil for onion culture is a rich sandy loam, although any soil of good fertility will be able to grow a good crop of onion. The essential requirements are: (a) a good amount of moisture in the soil (supplied either by rain or irrigation water) to support a good vegetative growth,

and (b) a period of rainless days towards maturity in order to have a good quality crop.

Ordinarily, seedlings are raised in a seedbed for a period of 4 to 6 weeks. If the seedbed is rich, the seedlings should be ready for transplanting in four weeks.

In the meantime that the seedlings are being raised, the field should be put in shape. It should be freed from weeds and put in fine tilth. Raised beds of about a meter in width and of any length has been found practicable for all purposes. In a meter-wide bed, three or four rows may be established and the seedlings set at 10 cm. apart in the rows.

In transplanting, the bigger seedlings should be pulled up first—this is to be done after the seedbed has been thoroughly watered. In pulling, the roots are given a natural pruning. Because of the nature of

the leaves, they should not at all be clipped off, as is generally done with other seedlings. The onion seedlings are hardy so they can be transplanted any time of the day except during noon time.

Regular watering and weeding are necessary during the first two months of growth. If available, give the young plant a side dressing of ammonium sulphate at the rate of about 200 kilograms per hectare during the first month. Towards maturity when the bulbs are about an inch or more in diameter, irrigation should gradually be withdrawn or sparingly applied.

As soon as the tops of the plants topple down, the crop has reached maturity. The plants are then pulled up, wilted for about a day, and then put in the shade for further curing.

Papaya Its

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thickens but not sugary. Pack in jars or cans and sterilize; 30 minutes for quart jars and No. 2 tall cans; 20 minutes for pints and No. 1 tall cans.

Besides the aforementioned methods for preparing commercial products of papaya, the following is a list of some recipes of papaya that may help or guide housewives, restaurants and refreshment parlors in varying their daily menu, prepared by Miss PATROCINIO SALES, former Home Economics Agent of the Plant Utilization Division, Bureau of Plant Industry:

Baked Papaya Combination

- 1 cup green papaya, sliced
- 1/2 cup tomatoes, sliced
- 2 tablespoons onions, chopped
- 1 tablespoon green pepper, sliced
- 1-1/2 tablespoons butter
- 1 teaspoon salt

1/8 teaspoon pepper, ground

Mix all the ingredients and place in a greased baking dish. Bake in moderate oven 30 minutes.

Creamed Papaya Soup

- 1 cup ripe papaya
- 2 cups water
- 2 pieces bay leaves
- 1 medium sized onion, sliced
- 2 tablespoons margarine
- 1/2 cup evaporated milk (add water to make 2/3 cup)
- 1/2 teaspoon salt
- a pinch of pepper

Boil papaya with bay leaves, water and onion, 10 minutes. Pass through a sieve

and set aside. Melt margarine; stir in the flour; add the milk and cook until thick. Mix the strained papaya and heat to boiling. Then season with salt and pepper. Serve hot.

Papaya Escabeche

- 2 cups green papaya, cut in strips
- 1 medium sized fish
- 1 large onion, sliced
- 1 head garlic, sliced thin
- 1 tablespoon ginger, sliced into strips
- 1 sweet-red pepper, cut in strips
- 3 tablespoons vinegar
- 1 hot pepper, cut in strips
- 1-1/2 cups water
- 3 tablespoons toyo
- 1-1/2 tablespoons flour
- 4 tablespoons sugar
- 2 tablespoons lard
- 2 tablespoons salt

fat for frying fish

Clean fish and sprinkle with salt. Let stand about 15 minutes, and drain well. Fry in hot fat until brown and set aside. Saute the papaya together with garlic, ginger and onions until half cooked; then add the salt and a mixture of hot pepper, vinegar, water, sugar, toyo and flour. Continue cooking until the sauce thickens and the papaya is almost tender. Place fish on a platter and pour over it the gravy mixture. Garnish with sliced red-sweet pepper.

Papaya Fritter

- 2 cups half ripe papaya, cut in small tubes
- 1-1/4 cups flour
- 2/3 cup milk, diluted with equal amount of water
- 2 teaspoons baking powder
- 1/4 teaspoon salt

1 egg

Mix the well beaten egg with milk; add to sifted dry ingredients; add papaya and mix well. Drop the mixture by teaspoonfuls in deep hot fat and fry until golden brown. Roll in sugar.

Papaya Salad

- 1 cup ripe papaya, cut in cubes
- 1 tablespoon cut boiled shrimps
- 1/2 tablespoon onion, chopped
- French dressing
- parsley
- fresh lettuce leaves

Mix papaya, shrimps and onions. Add the French dressing. Arrange on a bed of lettuce leaves on a salad plate, and garnish with parsley. Chill and serve cold if necessary.

Papaya Tidbits

- 1 cup candied papaya
- 1/2 cup papaya maraschino, well drained
- 1/2 cup roasted peanuts (other nuts may be used)
- 1/2 cup confectioner's sugar
- 1/4 teaspoon salt

Mix papaya, peanuts and maraschino and pass through a food chopper. Add salt and sugar and mix well. If somewhat dry, add a small amount of calamansi juice. Roll to a long, cylindrical form and dust with sugar. Let stand about 2 hours. Slice before serving.

Papaya-Pili Nut Roll

- 4 cups ripe papaya pulp, mashed
 - 2 cups sugar
 - 1 cup-pili nuts, roasted and chopped
 - 4 tablespoons glucose
 - 4 tablespoons calamansi juice
 - 1' teaspoon vanilla or any other flavoring
- Mix papaya pulp, sugar, glucose and ca-

lamansi juice and cook with continuous stirring until a paste consistency is reached (223°F). Remove from fire, add flavoring and nuts, and stir well. Pour on a greased pan and roll to about ¼ inch thick. Upon cooling, sprinkle the sugar. Roll as an ordinary roll, using a piece of clean cloth or oiled paper to effect a tight rolling. Cut crosswise to desired thickness.

Papaya Pudding

- 2 cups mature papaya pulp, mashed (boiled to softness)
- 1/2 cup bread crumbs
- 1 cup flour
- 1/4 cup butter
- 3/4 cup sugar
- 1/6 teaspoon salt
- 1 teaspoon flavoring (use vanilla, grated lime or orange rind)

Cream butter and sugar. Add well beaten egg, then flour. Add papaya, salt and bread crumbs, then flavoring. Steam in a buttered pan for 2-1/2 hours, or until done. Serve with sauce made as follows:

SAUCE:

- 1 cup milk
- 1/2 cup ripe papaya pulp, mashed
- 1/3 cup sugar
- 2 tablespoons flour
- 1/4 teaspoon vanilla

Mix all ingredients except flavoring and boil with continuous stirring, until thick. Add flavoring immediately after removing from fire.

Papaya Gulaman

- 2-1/2 cups crushed ripe papaya
- 1/2 cup gulaman (agar)
- 2/3 cup sugar
- 1/2 cup milk
- 1 cup water
- 1 tablespoon *calamansi* juice

Boil *gulaman* in water; add sugar and 1/2

tablespoon *calamansi* juice. When gulaman is all dissolved, remove from fire and strain well. Add the rest of the *calamansi* juice to the papaya and mix well and drain. Add *gulaman* and coconut milk. Pour in a mould. Serve when cold.

Papaya Okoy

- 2 cups green papaya, shredded
- 2 tablespoons onions, sliced
- 1 cup shrimp extract (made by pounding the heads and tails of shrimps, mixed with water and strained)
- 3/4 cup corn or cassava starch
- 1 teaspoon salt
- 1 tablespoon green onions, cut to small pieces a few small shrimps
- 1 egg
- 3 tablespoons coarse salt lard for frying

Work the shredded papaya with the coarse salt, wash and press out the water. Mix the onions and set aside.

Make a thin batter by mixing the shrimp extract, cornstarch, slightly beaten egg, and salt add the green onions. Place a tablespoon of papaya in a saucer and pour over it 1-1/2 tablespoons of batter. Place on top two or more shrimps, and fry in deep hot fat until brown. Serve with a mixture of vinegar, pounded garlic and salt to taste.

Papaya Chopsuey

- 2 cups green papaya, sliced thin and long
- 1/4 cup pork, cut into small pieces
- 1/4 cup shrimps, whole
- 1/4 cup liver, cut in pieces
- 1/4 cup cabbage, cut in pieces
- 3/4 cup broth
- 1 tablespoon flour
- 2 tablespoons lard

- 2-1/2 tablespoons *toyo*
- 1/4 teaspoon sugar
- 1 teaspoon kinchay, cut in pieces
- 2 small onions
- 1 Chinese sausage, cut crosswise to thin slices

Saute the pork, then shrimps, liver and sausage. Season with *toyo*. Add kinchay and papaya, then the broth. Boil until papaya is tender. Add onions, cabbage and sugar. Add a thin paste made with flour and about 4 tablespoons water. Boil until gravy thickens. Remove from fire and serve hot.

Papaya Lumpia

- 3 cups green papaya, shredded in long narrow pieces
- 1/2 cup pork, sliced in small pieces
- 1/4 cup shrimp, sliced
- 2 segments garlic, shopped fine
- 12 *lumpia* wrappers
- 1/4 cup broth or shrimp extract
- 1/2 cup sauce
- 2 tablespoons onion, sliced

Saute garlic in 2 tablespoons lard; add onions, pork, and shrimps and continue sauteing until done. Stir in the shrimp extract. Add papaya and cook until papaya is tender. Add sauce and mix well. Wrap in *lumpia* wrapper, just before serving and serve with sauce, which is prepared as follows:

Sauce

- 1-1/2 cups water
- 1/2 cup *toyo*
- 12 tablespoons cornstarch
- 12 tablespoons brown sugar

Mix all the ingredients and boil until thick, stirring constantly to prevent scorching.

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Cooperative

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would remedy the immediate need and at the same time keep the association from financial embarrassment.

It would be a good policy if the amounts assessed for special purposes be refunded to the members as soon as the crisis shall have been lived through and the association's finances are once again back to normal. These refunds may be credited with interest.

3. Withholding payments.—The idea it involves is this: Instead of playing the farmer-members when they deliver their products to the association, settlement is paid only after the products are sold and the necessary expenses paid. Therefore, no immediate outlay of capital is required, but the association virtually operates on a financial policy similar to that of commission houses.

This system of financing may be unpopular because ordinarily the farmer wants to get or to secure payments immediately. But, where the spirit of cooperation is borne in mind, there is no doubt but that farmer-

members would see in this system a practical method of operating with the least outlay of capital. It cannot be doubted that this system is economical and at the same time equitable because the expense thus borne by each grower is apportioned according to his direct use of the services of the association.

The question may arise as to whether or not the payment of certain amount in advance should be guaranteed to the farmer-members. This is a question of policy which may be solved by the farmers themselves. They are best in position to agree on terms which should be most adaptable to the conditions of their locality.

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