FOOD AND NUTRITION NEWS

ACHARYA N. G. RANGA AGRICULTURAL UNIVERSITY

Vol. 3 August 1998 No. 2

Nutrient Composition, Processing & Potential Uses of Papaya *(Carica papaya L)*

Papaya is a native of Tropical America and spread to all the tropical regions of the world. India's climatic conditions are highly suitable for the cultivation of papaya and grows well round the year. The annual production of papaya in the world is 55 lakh tonnes while in India it is estimated at about 4.5 lakh tonnes from an area of 40,000 hectares. In India, the largest producers of papaya are Assam, Maharashtra and Gujarat. But the varieties produced in Karnataka, Tamil Nadu, Bihar and Madhya Pradesh are more popular. Apart from domestic consumption, during 1992-'93, 339.55 tonnes valued at Rs.37.98 lakhs was exported.

The common Indian varieties are Co.1, Co.2, Co.3, Co.4, Co.5 and Co.6 from Coimbatore, Pusa Giant, Pusa Majesty, Pusa Nanha, Pusa Delicious and Pusa Dwarf from Bihar, Pant Papaya 1, Pant Papaya 2 and Pant Papaya 3 from Pantnagar and Honey Dew, Coorg Honey Dew, Washington and Solo varieties from Bangalore. Out of these, eight are commercially popular.

Papaya is a rich to moderate source of micronutrients and other constituents of commercial importance. Apart from these uses, papaya is given great importance in Ayurvedic medicine. Raw and ripe fruit, leaves, seeds, milk (latex) and roots, are used to treat various disorders.

NUTRIENT COMPOSITION

Papaya fruit is a rich source of sugars, riboflavin, vitamin C, beta carotene apart from other nutrients in less concentration. Factors such as ripening, maturity and colour influence nutrient concentration. Carbohydrate content is highest in full ripe fruit and decreases on over ripening. Papaya contains higher starch initially and as ripening progresses, starch content decreases. The principle sugars in papaya are sucrose, glucose and fructose and these increase on ripening. It contains very low amount of fat (0.2%) and protein (0.34 to 0.57) and moderate amount of fibre (0.8 to 0.9%). Papaya contains beta carotene which is precursor of vitamin A. The vitamin A content ranges between 1599 IU and 6347 IU in different papaya varieties. Papaya contains many other carotenoids and of these beta cryptoxanthin is most important as it promotes utilization and conversion of beta carotene to vitamin A in the body. Papaya contains vitamins like thiamin (0.04 mg%), riboflavin (0.03 mg%) and niacin (0.77 mg%). Papaya contains highest amount of riboflavin, among all the fruits. Papaya is reported to be a good source of vitamin C and full ripe ones contain greater amounts (50.17 to 74 mg%) than half ripe ones (20.33 to 58.33 mg%).

OTHER CONSTITUENTS

Papaya contains moderate amount of tannin (21.1 to 34 mg%), pectin (1.5 and 6 %), total soluble solids (TSS) (8 to 13%) and acidity (0.08%). Fresh papaya fruit contains 106 volatile compounds. Linalool is identified as a major component followed by benzyl isothiocyanate. Methyl butanoate is identified as the major constituent responsible for the pronounced sweety odour of the fruit. The milk of papaya is a good source of enzymes like papain, chymopapain, peptidase, thioglucosidase, pectic esterase, invertase, catalase, peroxidase, acid phosphatase, lipoxidase, nitrate reductase, ascorbic acid oxidase and other proteases. Carpaine is an alkaloid and is present in green parts of papaya tree i.e., skin of fruits and leaves, seeds and roots.

PROCESSED PRODUCTS FROM PAPAYA

Papaya is marketed commonly as fresh fruit but the processed products are also becoming common. The unripe and mature fruit is used in South India for making curries and soups either alone or in combination with other vegetables. Raw papaya is used for the preparation of pickle, candy,

preserve, tuity fruity etc. The mature fruit at its various stages of ripening is suggested for the preparation of jam, jelly, canned papaya, canned papaya beverage, nectar, puree, concentrate, slab/ *thandra*/ bar, powder, cereal flakes, baby foods, toffee etc.

Thirst Quenching Papaya Nectar

Nectar is a fruit drink that can be consumed directly, preferably after chilling. Nectars are usually made from mango and recently nectars are being made from juicy or pulpy or bends of fruits. Nectar is easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally superior to many synthetic and aerated drinks.

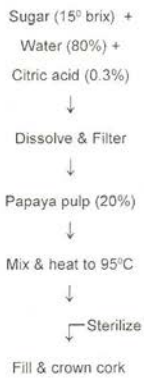


Fig. 1 : Preparation of Nectar

Nectar was developed from papaya as it is a good source of beta-carotene and vitamin C. The method of preparation of Papaya nectar is given in the fig. 1.

Significant storage changes were not observed in bulk density, total acids, acid insoluble ash, total ash and non-reducing sugars, in nectar.

Significant changes were noticed in pH, non-enzymatic browning, TSS, moisture, total sugars, reducing sugars, vitamin C, total carotene and beta carotene. On storage, the retention of vitamin C, total carotene and beta carotene was 58, 61 and 58 per cent respectively. Colour and appearance were excellent throughout the storage period except in the ninth month. Even the non-enzymatic browning doubled on nine months storage and resulted in reduced mean scores for appearance and colour. However, a gradual decline was noticed in scores for mouth feel, flavour, taste and consistency but the decrease was not significant. The overall quality revealed a decline from six months storage. Bacterial count was not observed in nectar upto three months after that low count (4.0×10^1) was observed on storage for six months.

K. Aruna
V.Vimala
N.Giridhar
D.G.Rao

Blending of Fruits Improves Quality

Nectar blends have many advantageous over ordinary nectars and these include improvement in colour, flavour and nutritional quality. The juicy and pulpy fruits if they are combined, the quality can be enhanced. Papaya nectar blend was prepared by blending with juicy fruits - grape, pineapple and sweet lime in three proportions (1:1, 1:3 and 3:1). Blends with pineapple and grape in the proportion of 1:3 were judged superior. During storage, substantial loss of vitamin C (44%) and total carotene (50%) was observed, in the blends. The organoleptic qualities of both the blends were not altered significantly except in the case of taste of papaya : grape nectar. Because of organoleptic acceptability, papaya : pineapple nectar was ranked superior to papaya : grape nectar. In both nectar blends, yeast and mould count was not observed but viable bacterial count was observed from one month onwards. The cost of the two nectar blends consisting 200ml was less than Rs. 2/-.

G. Lakshmi Prasanna
K. Aruna

Delicious Papaya *Thandra*

Traditionally thandra is only prepared from mango pulp and sugar. But it is also possible to prepare *thandra* from a fruit like papaya. Papaya *thandra* is nutritious due to concentration of the pulp which is a rich source of beta-carotene and vitamin C. Papaya *thandra* which was developed had sour and sweet taste, devoid of foreign matter and had attractive colour.

In the prepared (Fig. 2) *thandra*, significant changes were not observed in acid insoluble ash and reducing sugars, on storage. Significant changes were noticed in bulk density, total acids, pH, non-enzymatic browning, sulphur dioxide, pectin, TSS, moisture, total sugars,

Processed Papaya Products

Sugar (30° brix) +
Citric acid (0.7%) +
Water
↓
Dissolve & filter
↓ ← Papaya pulp
Mix
↓
Heat to 65°C
↓ ← KMS (1000 PPM)
Mix
↓
Grease trays & pour 250 g/Sq.ft.
↓
Dry at 60°C
↓
Pour 4 - 6 layers & dry
↓
Cut & Pack

Fig. 2 : Preparation of *Thandra*

non-reducing sugars, vitamin C, total carotene and beta carotene. The loss of total carotene (46%) and beta carotene (43%) was significantly high. Significant differences were noticed in colour and appearance. The non-enzymatic browning doubled (0.19 OD), on nine months storage and thus resulted a decrease in mean scores of colour and appearance. Significant changes were not noticed in other sensory parameters, even on 9 months storage. A significant decrease in TSS of papaya thandra was observed on 9 months storage. This may be attributed to increase in yeast and mould (3 x 10^1) and bacterial (2 x 10^1) counts.

K. Aruna
V. Vimala
K. Dhanalakshmi
Vinodini Reddy

Cheery Cheese From Papaya

In the market apple cheese is available, which is a source of calories alone. As cheese is highly relished by school children and teen-agers, to make the cheese more nutri-ent dense, papaya has been selected for cheese preparation.

Sugar 2/3 rd +
Glucose 1/3 rd (68° brix) +
Citric acid (0.7%) + Water
↓
Dissolve & filter
↓ ← Heat to 1/3rd Volume ← Papaya pulp
Mix
↓ ← Pec tin (1%)
Heat to a mass
↓
Pour in greased trays
↓
Cool, Cut & pack

Fig. 3 : Preparation of Cheese

Cheese preparation (Fig. 3) involves use of high temperature that reduces usual strong flavour. Cheese is sour in taste, has acceptable fruity flavour and is less expensive. It is more nutritious than available apple cheese due to the presence of beta-carotene and vitamin C.

K. Aruna
V. Vimala
K. Dhanalakshmi

Yummy Yummy Toffees from Papaya

Earlier toffees were prepared from sugar and improvements were made by incorporation of various ingredients and are cailed as modified tofees. Modified toffees can contain ingredients like salt, edible ground flour, starches, gelatin food grade, gur, honey, malt or its byproducts, liquid glucose, acidulants, invert sugar or syrup, cream of tartar, sorbital, vitamins, protein isolates, soya flour, milk / milk products in any form, permitted colours and flavours. In addition; chocolate, coffee, cocoa, fruits, nuts or their products are permitted for fruit based toffees apart from the mentioned ingredients. Certain specifications like colour, shape, size, flavour, and taste were given by Bureau of Indian Standards (ISI). It was also stated that dirt, adulterants and harmful foreign material should not be present. All the above requirements were considered in the preparation of papaya toffees (Fig. 4). Papaya toffees have advantages like mild flavour and soft texture due to use of milk powder and fruit, good taste and provides variety from routine sugar confectioneries.

Sugar 2/3 + Glucose 1/3rd
+ Butter 5 % + Milk powder 20% +
Papaya pulp 1 kg
↓
Heat to 1/3rd volume
↓
Mix & Heat to a mass
↓
Grease tray & pour
↓
Dry at 60°C to 5% moisture

Fig. 4 : Preparation of Toffee's

K. Aruna
K. Dhanalakshmi
V. Vimala

Cereal Based Powder From Papaya for Culinary use

Papaya powder was developed by using starch as base material. Cereal based papaya powder was developed from starch and papaya pulp and dried at 60°C till moisture reduced to 2 per cent. This was meant for incorporation into various products such as weaning foods, ice creams, custard powders, curries, sweets, soups etc. Cereal based papaya powder was incorporated into ice cream, custard powder and weaning mixture at 20, 40, 60 and 80 per cent level. Ice cream prepared by incorporating at 40 per cent, weaning mixture at 60 per cent and custard powder at 40 and 60 per cent incorporation, were

superior. When cereal based powder was stored for 9 months, the retention of vitamin C, total carotene and beta carotene was 38, 47 and 49 per cent, respectively. Papaya powder secured good scores for colour, appearance and texture during initial, three and six months storage but the mean score for these qualities declined on 9 months storage. The overall quality of the developed powder was good with no major defects.

K. Aruna
K. Dhanalakshmi
V. Vimala

USES OF PAPAYA

Therapeutic Uses

Every part of the papaya tree has medicinal value especially in Ayurvedic medicine. The ripe fruit is digestive, carminative and diuretic. Ripe fruit is used for curing piles, for blood purification, eczema and skin diseases and to improve lactation performance. Unripe mature papaya is laxative, diuretic and possess ecbolic properties. Ripe as well as unripe papaya is used for curing menstrual disturbances, liver enlargement, dark freckles and pimples. Seeds of papaya are used for oil extraction, as a source of protein, as medicine to quench thirst and as a vermifuge. Seeds are also used to treat diarrhoea, plague, cholera, and scorpion bite. The black seeds contain carpaine which is used to depress nervous system and to lower pulse rate. Due to this, carpaine is used to lower blood pressure, to stimulate heart etc. Carpaine hydrochloride has also been listed as a cardiac tonic and as a diuretic. Leaves are used to relieve body pains, high fever, elephantoid growth, to control amoebic dysentery and to relieve from trapped wind. The root of papaya tree is used to cure yaws, piles, elephantiasis, gall bladder stones and act as generative tonic. Papain is used for treating infected wounds, to reduce blood clots following surgery, for neck and throat disorders and to a less extent, it is used as protein digester, in the formulations for dyspepsia and other digestive disorders. It acts like pepsin that is present in the gut. Pectin has therapeutic uses like blood agglutination, control of intestinal hemorrhage, diarrhoea and dysentery. Pectin is also used as a stabilizer in some pharmaceutical pastes and ointments.

Food Uses

Leaves are used by native islanders as food, as vegetable, as greens and to brew tea that helps to relax from days stress. Majority of papain is used in food and beverage industries and mainly as a stabilizer in beer. Papain is used as a tenderizer of tough meat, chicken, turkey etc. The pectin from mature papaya is rich in ester groups and impart high jelling strength to jellies. Papaya is a rich source of pectin, which is most popularly used for jelly preparation and for jellying various food products. Pectin is used in the preparation of gellies, sweets, salad dressings, ketchup, sauces and ice-creams. Pectin is used as an emulsifier, flavouring agent, in the preparation of glues and mucilages. Papaya pectin is now commercially available in liquid form for variety of applications.

Miscellaneous Uses

Africans use papaya as a detergent for highly soiled linen and other clothes. Papain is used in leather industry, textile industry for degumming silk, in dry cleaning and laundry as a detergent, it gives shining to wool and softens wool, reduces shrinkage of wool and facilitates easy washing of wool. Papain is extensively used in shampoos, conditioners, tooth pastes etc. Pectin is used in the manufacture of explosives, lacquers and for sizing textiles.

INTERVENTION PROGRAMMES CAN HELP TO IMPROVE PAPAYA CONSUMPTION

Food habits are formed in early childhood, passed on from the elders in the family and perpetuated into adulthood. As a result of this, food beliefs / taboos develop and these taboos either promote or discourage or restrict consumption of specific foods. Thus, results in imbalanced diet which further affect nutrient intake. As a result of these taboos, foods which contain protective nutrients in abundance are not consumed and thereby deprived of the nutrients present in these. Among many foods to which taboos are attached, papaya is the most important. Thus exaggerated beneficial or harmful claims in respect of papaya, without scientific basis constitute food fads. The taboos attached to papaya are related to cultivation and consumption. Some

of the taboos related to papaya cultivation and consumption are listed below.

TABOOS RELATED TO CULTIVATION

* Papaya should not be grown in the kitchen garden
* Should not see papaya tree, after rising from the bed

TABOOS RELATED TO CONSUMPTION

* Papaya is a 'hot' food and consumption causes 'heat'
* Papaya consumption causes boils in winter and prickly heat in summer
* Papaya consumption by old and sick people and lactating mothers cause diarrhoea in them and also in infants
* Papaya consumption by men results in impotency
* Papaya consumption by women in child bearing age results in excess bleeding during menstruation
* Papaya consumption promotes urinary complications
* Papaya is not digestible to vulnerable groups, sick and old people
* Papaya consumption by pregnant women causes abortion

present in it. All the taboos listed above are not proved but they exist among all, specially in rural families.

To improve papaya consumption, a study was undertaken in two villages where one was control and the other was experimental village. In experimental village, along with papaya seedlings distribution, mothers and school going siblings of pre-school children were educated on cultivation, nutritive value, consumption and processing aspects of papaya. Nutrition education along with seedlings distribution helped to improve consumption of papaya and its products among the villagers, specially in pre-school children. The prevalence rate of risk of vitamin A deficiency among pre-school children has decreased after intervention programmes (Table 1). In the control village, no change was observed in vitamin A risk status.

Table 1 : Impact of intervention programmes on vitamin A status of pre-school

Intervention	Vitamin A status	Control village no. = 47	Experimental village no. = 50
Before	High risk	38	49
	Medium risk	6	1
	Low risk	3	0
After	High risk	39	17
	Medium risk	8	25
	Low risk	0	8

In the case of papaya, cultivation and consumption is discouraged inspite of protective nutrients

Such specific nutrition education programmes help to improve cultivation and consumption of papaya and other vitamin A rich foods. Thus to minimize the taboos relating to cultivation and consumption of papaya, number of nutrition education programmes should be undertaken.

Papaya is nutritious, has therapeutic and many other uses. Number of products can be developed from papaya which has nutritional and commercial importance.

K. Aruna
V. Vimala
B.V. Sudarshan Rao

ICAR Award for outstanding Teachers for the biennium

The outstanding teachers award for the biennium 1996 - '97 is presented to Dr. V. Vimala, Associate professor, Department of Foods and Nutrition, College of Home Science, Acharya N.G. Ranga Agricultural University, Hyderabad on 16th July,1998 for her outstanding teaching contribution in the field of Home Science.

She has received the "Meritorious Teacher's Award" of the Acharya N.G. Ranga Agricultural University in 1986 and also of the state of Andhra Pradesh in 1997.

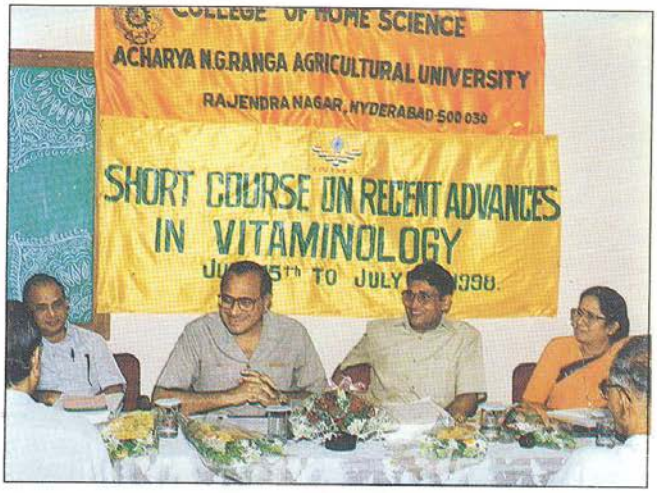
SHORT COURSE ON "RECENT ADVANCES IN VITAMINOLOGY"

A short course on "Recent Advances in Vitaminology" was conducted from 15th June to 4th July, 1998 at the Centre of Advanced Studies to fulfil one of the objectives of training and upgradation of faculty members of the Departments of Foods & Nutrition from State Agricultural Universities. Participants were selected from SAUs., like Assam Agricultural University, Jorhat; University of Agricultural Sciences, Bangalore and Dharwad; Acharya N.G. Ranga Agricultural University; Marathwada Agricultural Unviersity, Parbhani; Rajendra Agricultural University, Pusa and also from General Universities like Avinashlingam Deemed University, Coimbatore and SNDT University, Mumbai. Representatives from Government and Intenational Organisations like Food and Nutrition Board and CARE were also slelected.

Host faculty members from the Department of Foods and Nutrition, College of Home Science, ANGRAU and guest faculty members from National Institute of Nutrition, Gandhi Medical College, Central University and Institute of Genetics delivered lectures on various aspects of vitaminology, starting with metabolism and general functions, new roles of vitamins, effects of supplementation, combating deficiencies in population, vitamin nutritional status assessment and analysis in foods and body fluids.

The course was successfully completed and the valedictory function was organised with the Vice-Chancellor of Acharya N.G. Ranga Agricultural University, Dr. I.V. Subba Rao as President and Dr. S.L. Mehta, D.D.G. (Edn.), I.C.A.R., New Delhi as the Chief Guest. Certificates and course manuals were presented to the participants.

The course was conducted under the supervision of the course Director, Dr.(Mrs.) Vijaya Khader, Professor & Director, C.A.S., and the Course Coordinators, Dr.(Mrs.) S. Sumathi (Assoc. Professor) and Dr. (Mrs.) R. Manorama (Asst. Professor), Department of Foods & Nutrition, P.G. & Research Centre, A.N.G.R. Agricultural University, Rajendranagar, Hyderabad.



The Food and Nutrition News is published by the Centre of Advanced Studies, Department of Foods & Nutrition, College of Home Science, A.N.G.R. Agricultural University. The funds for the centre have been granted by the Indian Council of Agricultural Research, New Delhi.

For any correspondence

Address to

Editor :

Dr. (Mrs) Vijaya Khader

Director

Centre of Advanced Studies
Post graduate and Research Centre
ANGR Agricultural University
Rajendranagar, Hyderabad 500 030

Issue Editor :

Dr. K. Aruna

Associate Professor
Dept. of Foods & Nutrition

FOOD AND NUTRITION NEWS

Mail to :