PATNA WOMEN'S COLLEGE 1940

Botany

Explore–Journal of Research for UG and PG Students
ISSN 2278 – 0297 **(Print)**
ISSN 2278 – 6414 **(Online)**

http://www.patnawomenscollege.in/journal

Comparative Assessment of Phytochemicals in Fresh and One Week Old *Carica Papaya*

• **Afrien Naz** • **Akanksha** • **Mishu Mukherjee**
• **Pinky Prasad**

Received : November 2014
Accepted : March 2015
Corresponding Author : Pinky Prasad

Abstract : *Papaya (Carica papaya L. cv. Eksotika) of Caricaceae family is one of the most consumed fruits and has been used as a remedy against a variety of diseases. In the present study, a comparative assessment of phytochemicals present in fresh and one week old Carica papaya was done and it was found that except for the phenolic content of the samples which was 30 µg ml^{-1} for fresh papaya extract and 25 µg ml^{-1} for the one week old papaya extract, the flavonoid content (2 µg ml^{-1} for fresh papaya extract and 2.5 µg ml^{-1} for the one week old papaya extract), the sugar content (50 µg ml^{-1} for fresh papaya extract and 110 µg ml^{-1} for the one week old papaya extract) and the protein content (1 mg ml^{-1} for fresh papaya extract and 1.6 mg ml^{-1} for the one week old papaya extract) were more in one week old papaya sample than that in the fresh papaya sample. The freeze-dried sample minimized the loss of phytochemical components in the sample. Freeze-drying of foods can preserve the labile analytes and at the same time rupture the cell compartments. This rupturing by lyophilization could result in better extraction efficiency compared to extracting fresh materials.*

Keywords: *Papaya, photochemical, antioxidants, tannin, flavonoid, phenol.*

Afrien Naz
B.Sc. III year, Botany (Hons.), Session: 2012-2015,
Patna Women's College, Patna University, Patna,
Bihar, India

Akanksha
B.Sc. III year, Botany (Hons.), Session: 2012-2015,
Patna Women's College, Patna University, Patna,
Bihar, India

Mishu Mukherjee
B.Sc. III year, Botany (Hons.), Session: 2012-2015,
Patna Women's College, Patna University, Patna,
Bihar, India

Pinky Prasad
Assistant Professor, Deptt. of Botany,
Patna Women's College, Bailey Road,
Patna–800 001, Bihar, India
E-mail : dr.pinky.prasad@gmail.com

Introduction :

Work on natural products has gained a wide popularity due to the potential of discovering active compounds. Plants are endowed with various phytochemical molecules such as vitamins, terpenoids, phenolic acids, lignins, stilbenes, tannins, flavonoids, quinones, coumarins, alkaloids, amines, betalains, and other metabolites, which are rich in antioxidant activity (Zheng and Wang, 2001; Cai *et al*., 2003). Phenolic compounds have been considered to have high antioxidant ability, protecting the human body against oxidative damage by free radicals (Jayakumar, 2011). Free radicals are naturally produced in the body through normal metabolism of carbohydrates, amino acids and fats. Other

factors known to increase free radicals in our body include chronic diseases, smoking, environmental poisons, alcohol and ionizing radiation. Overproduction of free radicals can result in oxidative stress, a deleterious process that damages the cell structure.

Papaya (*Carica papaya* L. cv. Eksotika) of Caricaceae family is one of the most consumed fruits and several species of Caricaceae have been used as remedy against a variety of diseases (Mello *et al*., 2008; Munoz *et al*., 2000). Papaya plants may reach heights of 9 m, and are thus described as giant herbs. Papaya originated in Mexico and Central America and is cultivated in most subtropical and tropical countries for its fruits and its proteolytic enzymes (McGrath and Karahadian, 1994).

The scientific studies have proved that Papaya fruits contain components that can increase the total antioxidant power in blood and reduce the lipid per oxidation level. These components include α-tocopherol, ascorbic acid, beta carotene, flavonoids, vitamin B1, and niacin (Ross, 1999). A study by Krishna *et al*. (2008) indicated that the consumption of papaya fruits reduced oxidative stress and altered lipid profiles. Thus, it could reduce the risk of diseases caused by free radical activities such as cancer, and cardiovascular disease.

Several food components such as carotenoids, vitamin C, vitamin E and phenolic compounds and their interactions contribute to the overall antioxidant activity of foods. Hence, the total antioxidant activity is difficult to measure based on individual active components (Pinelo *et al*., 2004).

Biological properties of edible fruits can vary depending on stage of ripeness, whether the fruit is fresh or dried, storage conditions, and the fruit part like seed, peel, pulp, etc. considered (Hou *et al*., 2008; Kondo *et al*., 2005).

In this context, the present study was conducted to compare the total phenolic, flavonoid, tannin, protein and sugar content of fresh and one week old papaya.

Materials and Methods :

Collection of sample: Papaya (500 g) was bought from the local market. Half of papaya was kept in the fridge for one week and rest half was used for assessment of phytochemicals in fresh form.

Preparation of fruit extract: Fresh and frozen papaya (50 g each) were separately peeled, cut into small pieces and homogenized in the grinder. From this ground papaya, 10 g was weighed and mixed thoroughly with 250 ml of 80% ethanol and was filtered. The solution was kept in the shaker incubator at 50°C for 90 minutes at 200 rpm and then centrifuged at 3000 rpm for 10 minutes. The extract was stored in a refrigerator for further use. This extract was used for determination of photochemicals following standard methods. For phenols, Folin-Ciocalteu method (Singleton and Rossi, 1965); for flavonoid, Aluminium trichloride colorimetric method (Lamaison and Carnat, 1990); for sugar, Phenol–Sulfuric Acid method (DuBois et al., 1956) and for protein, Lowry's method (Lowry *et al.* 1951) was followed.

Results :

1. Tannin : Tannin plays a very important role in papaya by protecting it against microbial attack, predations and also acts as pesticides, and in plant growth and regulation. These are plant phenolic polymer widely distributed in plants and are found in bark, leaves, etc. It is also used for medicinal purposes and is very useful in many treatments but should not be taken in excess by humans as it can also lead to many disorders like stomach irritation, liver damage, etc. (Haslam and Edwin, 2007).

Tannin was found in both fresh and one week old papaya. It was determined using lead acetate which resulted in the formation of precipitation in both the samples indicating its presence.

2. Total phenolic content : The comparative assessment of the phenolic content of fresh and one week old papaya samples is shown in Figure 1. It was found that the total phenolic content in fresh papaya sample was 30 µg ml^{-1} while that in one week old papaya sample was 25 µg ml^{-1}. This indicates that total phenolic content was higher in fresh papaya as compared to one week old papaya.

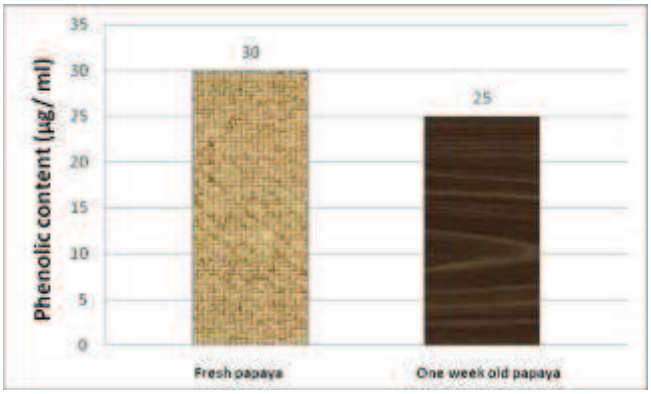

Figure 1: Total phenolic content of samples assayed by folin-ciocalteu method

3. Total flavonoid content : The comparative assessment of the flavonoid content of fresh and one week old papaya samples is shown in Figure 2. It was found that the total flavonoid content in fresh papaya sample was 2 µg ml^{-1} while that in one week old papaya sample was 2.5 µg ml^{-1}. This indicates that total flavonoid content was higher in one week old papaya as compared to fresh papaya.

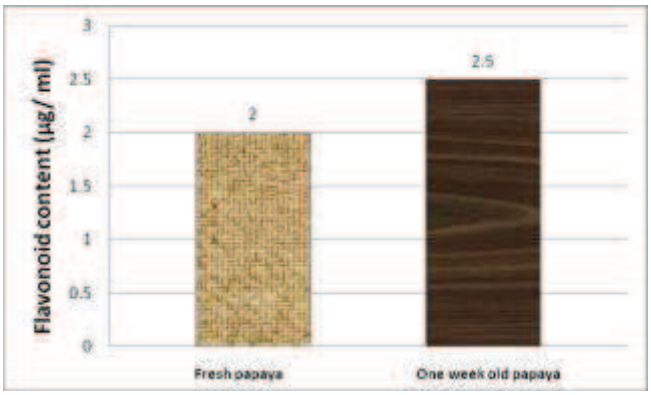

Figure 2: Total flavonoid content of samples assayed by aluminium trichloride method

4. Total sugar content : The comparative assessment of the sugar content of fresh and one week old papaya samples is shown in Figure 3. It was found that the total sugar content in fresh papaya sample was 50 µg ml^{-1} while that in one week old papaya sample was 110 µg ml^{-1}. This indicates that total sugar content was higher in one week old papaya as compared to fresh papaya.

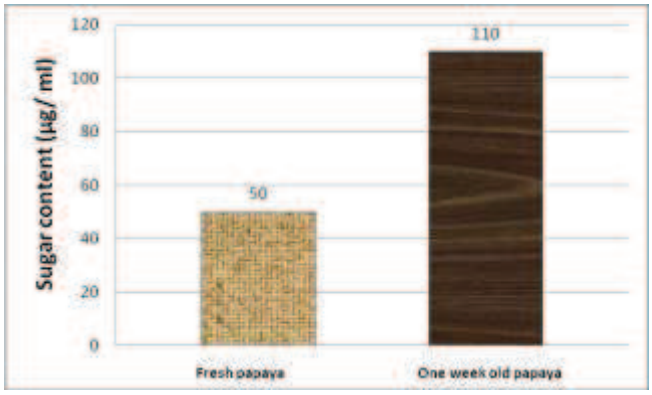

Figure 3: Total sugar content of samples assayed by Phenol–Sulfuric Acid method

5. Total protein content : The comparative assessment of the protein content of fresh and one week old papaya samples is shown in Figure 4. It was found that the fresh papaya had total protein content of 1 mg ml^{-1} while one week old papaya had 1.6 mg ml^{-1}. This indicates that total protein content was higher in one week old papaya as compared to fresh papaya.

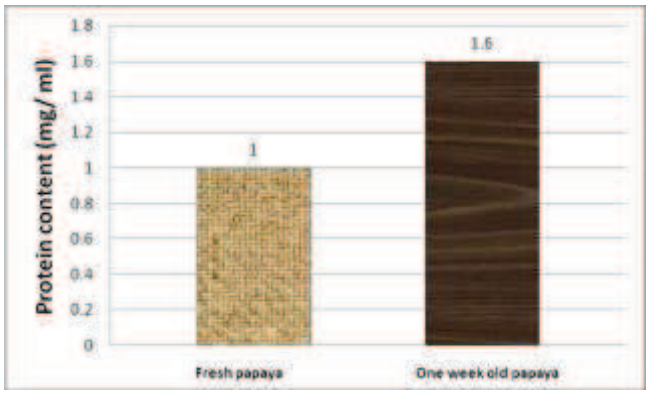

Figure 4: Total protein content of samples assayed by Lowry's method

Discussion :

In the present investigation, it was found that the phenolic content of the samples was more (30

μg ml^{-1}) in fresh papaya extract than that in one week old papaya extract (25 μg $ml^{-1)}$. Our findings do not support the fact that high sugar content in one week old papaya may cause falsely elevated phenolic concentrations as reported by Prior *et al*. (2005). The different results obtained from the previous studies (Lim *et al*., 2007; Lako *et al*., 2007) may be attributed to different cultivars, growing conditions, stages of ripening at harvest, or the storage conditions and time elapsed before the fruits were analyzed. Sample preparation method may also have influenced the results. In our study, it was found that the flavonoid, sugar and protein contents were more in one week old papaya sample than that in the fresh papaya sample. Previous studies have also supported this view. Earlier reports suggest that this is due to the fact that the freeze-dried sample minimized the loss of phytochemical components in the sample. Freeze- drying of foods can preserve the labile analytes and at the same time rupture the cell compartments. This rupturing by lyophilization could result in better extraction efficiency compared to extracting fresh materials.

Acknowledgement :

The authors are thankful to Dr. Sister Doris D'Souza A.C., Principal, Patna Women's College, Patna University for giving an opportunity to do this research work and for the facilities provided in carrying out this work.

References :

Cai, Y.Z., Sun, M. and Corke, H. (2003). 'Antioxidant activity of battalions from plants of the Amaranthaceae'. *J. Agric. Food Chem.,* 51(8): 2288-2294.

Dubois, M., Gilles, K., Hamilton, J., Rebers, P. and Smith, F. (1956). 'Colorimetric method for determination of sugars and related substances'. *Anal. Chem*., 28(3): 350–356.

Haslam and Edwin 2007. 'Vegetables tannins-lessons of a phytochemical lifetime'. *Phytochemistry*, 68: 2713-2721.

Hou, C.Y., Lin, Y.S., Wang, Y.T. *et al*. (2008). 'Effect of storage conditions on methanol content of fruit and vegetable juices'. *J. Food Compos. Anal*., 21: 410-415.

Jayakumar, T., Thomas, P.A., Sheu, J. R. and Geraldine, P. (2011). *'In-vitro* and *in-vivo* antioxidant effects of the oyster mushroom *Pleurotus ostreatus'*. *Food Res. Int.*, 44: 815-861.

Kondo, S., Kittikorn, M. and Kanlayanarat, S. (2005). 'Preharvest antioxidant activities of tropical fruit and the effect of low temperature storage on antioxidants and jasmonates'. *Postharvest Biol. Technol.,* 36: 309-318.

Krishna, K.L., Paridhavi, M. and Patel, J.A. (2008). 'Review on nutritional, medicinal and pharmacological properties of Papaya' (*Carica papaya*). *Natural Product Radiance*, 7(4): 364-373.

Lako, J., Trenerry, V., Wahlqvist, M., Wattanapenpaiboon, N., Sotheeswaran, S. and Premier, R. (2007). 'Phytochemical flavonols, carotenoids and the antioxidant properties of a wide selection of fijian fruit, vegetables and other readily available foods'. *Food Chem*., 101:1727-1741.

Lamaison, J.L. and Carnat, A. (1990). 'Content of principal flavonoids of the flowers and leaves of *Carataegus monogyna* Jacq. and *Cragaegus laevigata* (Poiret) DC'. (Rosaceae). *Pharmaceutical Acta Helvetiae*., 65: 315-320.

Lim, Y.Y., Lim, T.T. and Tee, J.J. (2007). 'Antioxidant properties of several tropical fruits: A comparative study'. *Food Chem.*, 103: 1003-1008.

Lowry, O.H., Rosebrough, N.J., Farr, A.L. and Randall, R.J. (1951). 'Protein measurement with the Folin phenol reagent'. *J. Biol. Chem.,* 193(1): 265-75.

McGrath, M.J. and Karahadian, C. (1994). 'Evaluation of physical, chemical and sensory properties of pawpaw fruit (*Asimina triloba*) as indicators of ripeness'. *J. Agric. Food Chem.,* 42(4): 968-974.

Mello, V. J., Gomes, M.T.R., Lemos, F.O., Delfino, J.L., Andrade, S.P., Lopes, M.T.P. and Salas, C.E. (2008). 'The gastric ulcer protective and healing role of cysteine proteinases from *Carica candamarcensis'*. *Phytomedicine*. 15(4): 237-244.

Munoz, V., Sauvain, M., Bourdy, G., Callapa, J., Rojas, I., Vargas, L., Tae, A. and Deharo, E. (2000). 'The search for natural bioactive compounds through a multidisciplinary approach in Bolivia. Part II. Antimalarial activity of some plants used by Mosetene indians'. *J. Ethnopharmacol*., 69(2): 139-155.

Pinelo, M., Rubilar, M., Sineiro, J. and Nunez, M.J. (2004). 'Extraction of antioxidant phenolics from almond hulls (*Prunus amygdalus*) and pine sawdust (*Pinus pinaster*)'. *Food Chem.*, 85(2): 267-273.

Prior, R.L., Wu, X. and Schaich, K. (2005). 'Standardized methods for the determination of antioxidant capacity and phenolics in foods and dietary supplements'. *J. Agr. Food Chem.,* 53 (10): 4290–4302.

Ross, I. (1999). *Carica papaya*. In: *Medicinal Plants of the World*. Humana Press; pp. 87-100.

Singleton, V.L. and Rossi, J.A. (1965). 'Colorimetry of total phenolics with phosphomolybdic phosphotungstic acid reagents'. *Am. J. Enol. Viticult.,* 16: 144-158.

Zheng, W. and Wang, S.Y. (2001). 'Antioxidant activity and phenolic compounds in selected herbs'. *J. Agric. Food Chem.*, 49(11): 5165-5170.