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Development Of Papaya Peel Flour Based Cookies And Evaluation Of Its Quality

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***Abstract*—The focus of this research project was to develop papaya peel flour from raw papaya and utilizing the papaya peel flour for the development of value added cookies. Fresh papaya was blanched, peeled, cut into small pieces, further washed and treated with sanitizer, tray dried and finally grinded to powder form. Prepared papaya peel flour was evaluated for chemical analysis. In the present study the moisture (%), ash (%), acidity, fat (%), insoluble solid(%),soluble solid(%), protein content(%), vitamin C, total fiber, total carbohydrate and antioxidant content of papaya peel flour were estimated as 13.63%, 5.25%, .163% ,.1%, 80%, 20%, 8.64%,.22I.U, 33.5%, 38.88% and 514.6mg/100gm respectively. Papaya peel flour fortified biscuits were formulated by incorporating 5%, 7.5% and 10% papaya peel flour with ordinary flour in the present investigation. Experimental result revealed 5% peel flour formulated cookies gives the best results in terms of physicochemical quality. The physicochemical and nutritional quality parameters viz. moisture(%), ash(%), acidity, fat(%),vitamin C, insoluble solid (%),soluble solid(%),protein content(%),total fiber, total carbohydrate and antioxidant content of all fortified varieties of cookies were determined. The best result obtained for 5% papaya peel fortified cookies and was determined as 10.35%, 4.5%, 0.02%, 15.4%, .31U, 85%, 15%,9.3%,.017%,60.43% and 9gm/100gm respectively. Now the experimental result revealed that papaya peel flour fortified cookies contains significant amount of protein and antioxidant in comparison to it's ordinary counterpart which improves it's nutritional characteristics. Sensory evaluations of all fortified varieties were also carried out and it was found that 5% papaya peel flour blend for cookies formulation was acceptable. Therefore 5% papaya peel flour based formulated cookies proves enhanced nutritional properties, physicochemical characteristics and organoleptic attributes.**

Keywords—Papaya peel flour, value addition, antioxidant, sensory evaluation, nutrition

I. INTRODUCTION

Papaya (Carica papaya L.) belongs to the family Caricaceae. Papaya (*C. papaya L.*) is the fourth most important tropical fruit around the globe (Scheldeman et al. 2007). The major producers of papaya in the world are Australia, United States, Philippines, SriLanka, South Africa, India, Bangladesh, Malaysia and a number of other countries in tropical America (Anuara et al. 2008).Some of the active compounds in papaya are ascorbic acid (108 mg/100 g), antioxidant, β-carotene, α-tocopherol, flavonoids, vitamin B1, papain and niacin (Leontowicz et al. 2007; Lim et al. 2007).Fruit processing results in large amounts of waste as by products such as peels and seeds. Thus, by-products and its further utilization in the production of food additives or supplements with high nutritional value have aroused great interest since they are high-value products It is very much interesting that such wastes are important sources of sugars, minerals, organic acids, fibber, and phenolic compounds that have a wide range of pharmacological activities, which include antitumor, antiviral, antibacterial, cardio protective, and ant mutagenic activities (Djilas et al., 2009). In addition, these components help to maintain health and prevent diseases such as cancer, cardiovascular and many other degenerative diseases (Larrauri 1999).Fortification of these nutritional constituents in processed food products is a way to increase daily cooking by creating new recipes such as jellies, pies, juice, and pastries, in addition to nutritionally enriched diets, providing more fibber, vitamins, and minerals (Storck et al., 2013). (Storck et al., 2013) elaborated preparations using papaya seed cake and papaya peel jam and observed an increase d fiber content and sensory analysis were conducted. In many countries, cookies are generally consumed and it could be considered as a vehicle for nutrient transfer (Arshad et al. 2007). A number of studies have been reported on the improved nutritive value of high protein cookies made of composite flour such as a blend of soybean (Shrestha and Noomhorm 2002) and unripe banana flour replacing the wheat flour. Rice and black bean extruded flour replacing wheat flour can be considered as a good source of protein and fiber and reducing lipids in cookies (Lund and Smoot 1982). This study was conducted with the objective to produce and analyze papaya waste (peel) flour for its chemical constituents with the purpose to use it in preparations and formulations of nutritionally enriched value added cookies in terms of nutritional properties, physicochemical characteristics and organoleptic attributes.

II. MATERIALS AND METHODS

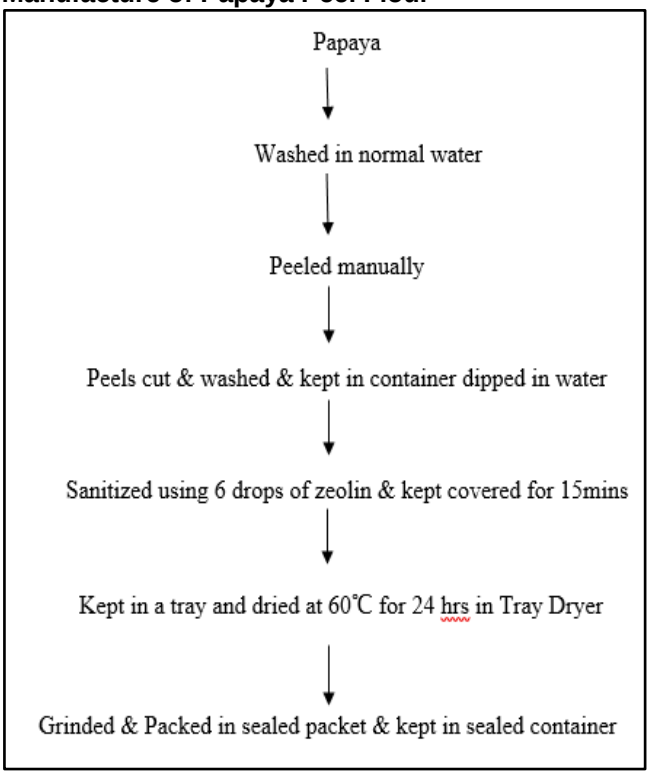
Papaya fruits were brought from the local market of Sodepur, Kolkata. They were selected according to the ripening stage (completely yellow peel, when the fruit is suitable for consumption), to color uniformity, average size, and absence of defects. The criteria reported by (Basulto et al., 2009) were used to determine the maturity indices of the fruit and according to this, the ripe fruit was selected for this purpose. Figure 1, figure 2 and figure 3 represents ripe papaya, papaya peel flour and papaya peel flour fortified cookies respectively. Moreover manufacturing of papaya peel flour and papaya peel flour based cookies were represented by flow charts 1 and 2. The finely grinded papaya peel flour was then considered for further analyses. This flour was then incorporated for the preparation of papaya peel flour based cookies.

Fig 1.Papaya Peel

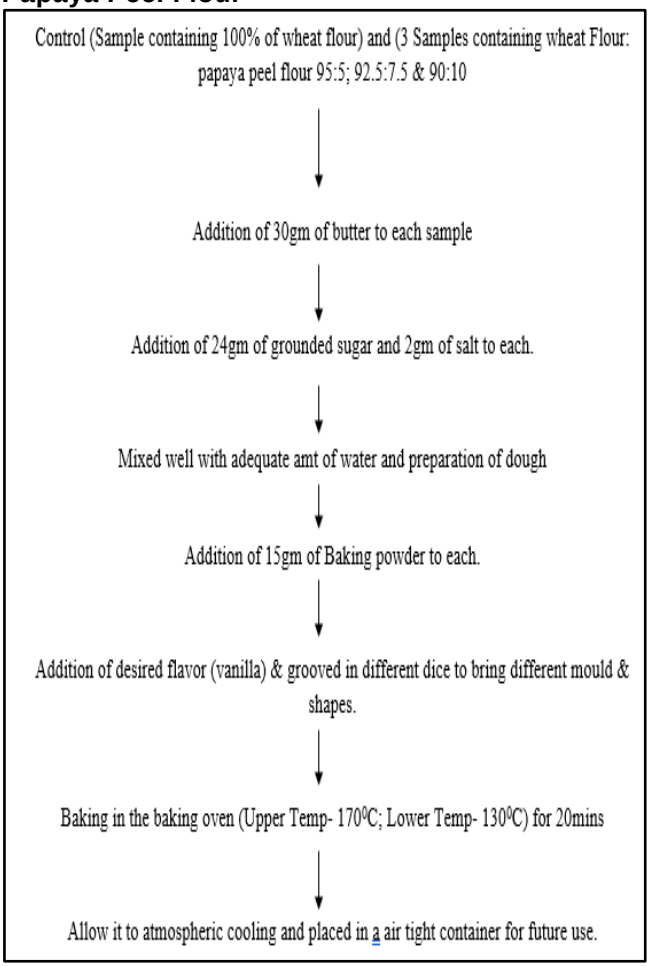
Fig 2.Papaya Peel Flour

Fig 3.Papaya Peel Flour fortified cookies

Flow Chart 1.
Manufacture of Papaya Peel Flour



Flow Chart 2.
Production of Value Added Cookies from Papaya Peel Flour



Determination Of Physicochemical And Nutritional Characteristis Of Papaya Peel Flour And Papaya Peel Flour Base Cookies

All the samples are analyzed for acidity, ash content, moisture content, lipid, soluble protein, soluble solid, insoluble solid and total antioxidant (polyphenols content) and determined by using (AOAC,2012).

Sensory Analysis Of Papaya Peel Flour Based Cookiis Of Different Formulations

A 9 point hedonic scale (1= lowest desirability, 9= highest desirability) is designed to evaluate the sensory characteristics of ordinary cookies and formulated (wheat flour: papaya peel flour) based cookies by using ten trained panelists (Lim, 2011)

III. Results And Discussions

Evaluation of physicochemical and nutritional composition of papaya peel flour

The results of the proximate composition obtained for papaya waste peel flour are shown in Table 1.

Table 1.Average values of the proximate composition of papaya peel flour

Sl No.	Physicochemical & nutritional quality parameters (%)	Papaya peel flour
1.	Ash content	5.25
2.	Acidity as citric acid	.163
	Vitamin C(I.U)	.22
3.	Moisture	13.63
4.	Lipid	0.1
5.	Soluble protein	8.64
6.	Soluble solid	20
7.	Insoluble solid	80
8.	Antioxidant content(mg/100gm GA equivalent)	514.6
9.	Total fiber	33.2
10.	Total carbohydrate	38.88

Experimental result shows the significant physicochemical and nutritional characteristics in terms of all nutritional constituents. Moreover, the significant availability of antioxidant and high dietary fiber content proves its health beneficial importance.

Determination of physicochemical and nutritional characteristics of papaya peel flour based cookies of different formulations

Physicochemical and nutritional characteristics of papaya peel flour based cookies of different formulations are determined. Results are represented by the following table (table-2A and 2B)

Table 2A.Average values of the proximate composition of papaya peel flour based cookies of different formulations

Formulated cookies	Moisture (%)	Ash (%)	Acidity (%),	Fat (%),	Vitamin C
Control (100:0)	12.75	0.93	0.12	.42	-
90:10	12.12	3.8	0.05	12.4	-
92.5:7.5	11.64	4.0	0.03	13.6	.28
95:5	10.35	4.5	0.02	15.4	.31U,

Table 2B.Average values of the proximate composition of papaya peel flour based cookies of different formulations

Formulated cookies	Insoluble solid (%)	Soluble solid (%)	Protein (%)	Total fiber	Total carbo-hydrate	Anti-oxidant (gm/-100 gm)
Control (100:0)	95	5	1.08	.08	84.74	-
90:10	90	10	8.14	.012	63.53	7.8
92.5:7.5	88	12	8.6	.014	62.14	8.4
95:5	85	15	9.3	.017	60.43	9

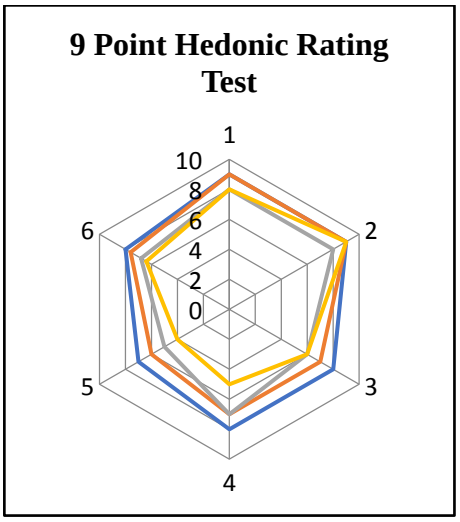
The analytical datas of control and different formulated papaya peel flour based cookies are represented by table 2. The experimental results clearly shows the significance of 5% formulated papaya peel flour based cookies in terms of nutritional constituents and antioxidant content in comparison to other formulated cookies(92.5%:7.5%,90%:10%) and control(100%:0%).The significant dietary fiber of 5% formulated papaya peel flour based cookies contributes high digestibility and consumers acceptance in terms of health benefit. Therefore this formulated variety will be considered for further studies

Evaluation of sensory characteristics of papaya peel flour based cookies of different formulations in comparison to ordinary cookies

Sensory or organoleptic characteristics of ordinary cookies and formulated cookies (i.e. wheat flour: 95:5; 92.5:7.5 &90:10) are represented in figure 6.In this

studies all organoleptic parameters e.g. appearance, color, body and texture, flavor, mouthfeelness and overall acceptability i.e. six attributes are considered.

Figure 6. Sensory quality of papaya peel flour formulated cookies



Sensory evaluation revealed that formulated cookies of wheat flour: papaya peel flour (95:5) shows better overall acceptability of 7.6 in comparison to other formulations like wheat flour: papaya peel flour 92.5:7.5 and 90:10 of 6.8 and 6.4 respectively. Moreover consistent values of other sensory attributes are observed in the former formulations. It is interestingly recorded that though the overall acceptability of the control i.e. wheat flour: papaya peel flour(100:0) is higher i.e.8.0 than 95:5 formulation but due to significant antioxidant and dietary fiber content the later one is considered for further studies

IV. Conclusion

The knowledge about the chemical composition of papaya peel provides useful information for industries interested in using papaya by-products, reducing waste, and adding value to the fruit bringing benefits to the environment. It is important to analyze the composition of the papaya peel flour to utilize properly for the production of papaya peel flour based cookies. Evaluation of physicochemical and nutritional quality of papaya peel flour and different formulated papaya peel flour based cookies and it's sensory characteristics for quality enhancement are considered in our study. It is interestingly observed that the antioxidative potential as well as keeping qualities are improved in case of formulated wheat flour and papaya peel flour based cookies. It is found from the sensory evaluation that the overall acceptability of 5% formulated papaya peel flour based cookies is more in comparison to the other fortified variety. Therefore papaya peel flour fortified cookies of specific formulation is found suitable for its better nutritional value as well as sensory characteristics in comparison to other formulated cookies.

V. Acknowledgment

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VI. References

[1] Scheldeman X, Willemen L, Coppens d'Eeckenbrugge G, Romeijn-Peeters E, Restrepo M. T, Romero Motoche J, Jiménez D,. Lobo M, Medina C. I, . Reyes C, Rodríguez D,. Ocampo. J. A, Van Damme P, and Goetgebeur P, 2007,Distribution,diversity and environmental adaptation of highland papayas (Vasconcellea spp)in tropical and subtropical America, Biodiversity and conversion,16(6),pp.1867-1884

[2] Anuara, N.S., Zaharia, S.S., Taiba, I.A. and Rahaman,M.T. 2008. Effect of green and ripe Carica papaya epicarpextracts on wound healing and during pregnancy. FoodChem. Toxicol. 46, 2384–2389.

[3] Leontowicz, M., Leontowicz, H., Drzewiecki, J.Jastrzebski, Z., Haruenkit, R., Poovarodom, S.,Park, Y.-S., Jung, S.T., Kang, S.G. and Trakhtenberg, S. 2007. Two exotic fruits positively affect rat's plasma composition. Food Chem. 102, 192–200.

[4] 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.

[5] Djilas, S., Canadanovic-Brunet, J., &Cetkovic, G. (2009). By-products of fruits processing as a source of phytochemicals. Chemical Industry and Chemical Engineering Quarterly 15(4) 191-202. http://dx.doi.org/10.2298/CICEQ0904191D
Larrauri, J., Ruperez, P., Borroto, B. and SauraCalixto, F. 1996. Mango peels as a new tropical fibre: Preparation and characterization. LWT – Food Sci.Technol. 29, 729–733.

[6] Storck, C. R., Nunes, G. L., Oliveira, B. B., & Basso, C. (2013). Folhas,talos, cascas e sementes de vegetais: composição nutricional,aproveitamento na alimentação e análise sensorial de preparações.*Ciência Rural*, *43*(3), 537-543. http://dx.doi.org/10.1590/S0103-84782013000300027

[7] Arshad, M.U., Anjum, F.M. and Zahoor, T. 2007.Nutritional assessment of cookies supplemented with defatted wheat germ. Food Chem. 102, 123–128

[8] Shrestha, A. K. and Noomhorm, A. 2002. Comparison of physicochemical properties of biscuits supplemented with soy and kinema flours. International Journal of Food Science and Technology 37: 361-368.

[9] Lund, E.D. and Smoot, J.M. 1982. Dietary fiber content of some tropical fruits and vegetables. J. Agric. Food Chem. 30,1123–1127.

[10] Basulto, F.S., Duch, E.S., Y Gil, F.E., Diazplaza, R.,Saavedra, A.L. and Santamaria, J.M. 2009. Postharvestripening and maturity indices for maradol papaya.Interciencia 34, 583–588.

[11] Association of Official Analytical Chemists - AOAC. (2012). Official methods of analysis of AOAC International (19th ed.). Gaithersburg: AOAC International

[12] Lim J (2011) Hedonic scaling: A review of methods and theory, Food Quality and Preference, 22:733-747