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Use of Various Processing Technique with Citrus Fruits Peel to Analyze Nutritional, Physiochemical and Antioxidant Properties

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Abstract: ***Citrus fruits peel known as by products and powerful source of healthy substances such as phytochemicals, antioxidants and nutrients. The review focus on supplement formulation by using citrus fruit peels powder of-: orange, sweet lime, kinnow, lemon, grapefruit and pomelo with cinnamon and clove oil to evaluate nutritional, physio-chemical and antioxidant analysis of supplement. The proximate analysis shows the presence of the moisture, fat, fiber, protein and carbohydrate in various concentrations with help of nutrient analysis. Physico-chemical and antioxidant properties were evaluated in supplement formulated by peel powder. Antioxidants properties show the high vitamin C content in blanched orange and lemon sundry peel powder. Phenol content was observed high in boiled sundry kinnow peel powder. Ferric reducing ions were observed high in boiled and blanched grapefruit sundry peel powder. All the antioxidants properties were shown the high presence in sundry sweet lime peel powder. Oven dry pomelo peel powder was shown high vitamin C and ferric reducing ions also. Total phenol content was high in sundry peel powder. Oven dry peel powder was shows high vitamin C content. . Results recommended that consumption of these peels supplement has beneficial impact of desired physiochemical properties as sources of food fibres and low-calorie bulk ingredients in food application.***

Keywords: Phytochemical, Antioxidants, Physico-chemical, Citrus peels, Formulation

1. Introduction

Citrus fruit have long been valued as part of nutritious and tasty diet in human life and the flavors provided by citrus fruits is among the most preferred in the world. Citrus fruits are richest source of vitamin, mineral and dietary fiber. Some other biological compounds found in citrus spices that can also help to reduce the risk of many chronic diseases like heart disease. Along with vitamin C citrus fruits contain essential nutrients such as: potassium, folate, calcium, niacin, phosphorus, magnesium, copper, riboflavin, pantothenic acid and variety of phytochemical being a plant food, it contains no cholesterol, fat, sodium and other harmful substance. Citrus fruit are important among population who need to overcome and prevent micronutrient deficiencies as well as those concerned about over-nutrition, obesity and diet related chronic diseases.

Citrus fruit are highly responsible for the phytochemical properties know as the limonoids. Therefore, citrus fruits could be categorized as functional foods containing component which shown to have health promoting and anti-cancer activities. These components include the ascorbic acid, limonoids, carotenoids, folate and flavonoids. Such Substances have been shown to prevent a variety of cancers and cardiovascular diseases. Free radicals play an important role in affecting human health by causing several diseases including cancer, hypertension, heart attack and diabetes.

Peel known as by product (waste) is highly perishable and seasonal product of fruits. This is a major problem to the processing industries and pollution monitoring agencies. An increased attention in bringing useful products from such waste materials. In current scenario, Citrus industry, emphasis on fruit peels produced in great quantities during the process is mainly discarded as waste. For that, researchers have focused on the utilization of citrus products and by-products to protect environment wastage.

The waste product resulting from the processing of citrus fruits are the juices, essential oils and peel. Utilization of such residue is a fundamental requirement of food processing industry. Main by product from this residue is peel, citrus molasses, pectin, extract seed oil. By products of citrus fruits like peel, are powerful source of healthy substances which have phytochemicals, antioxidants, antimicrobial properties with vitamins and nutrients. Processing of citrus fruits peel is a valuable source of neutraceuticals.

Studies show that many kinds of antinutrient and oils are presents in peels, some processing are beneficial to reduce these factors like blanching, steaming and boiling is commonly used in food processing to inactivate enzymes and destroy microorganism. These processing exposing are vegetables or fruits to high temperatures for a short time (pasteurization). This process not important only for prolongs the shelf life of fruits by inactivating the enzymes. Processing technique like blanching, boiling and steaming conditions at a level just sufficient to cause inactivation of the deleterious enzymes but with minimal effect on other beneficial attributes.

The main aim of this study is to provide a brief overview on the processing of citrus fruit peel to formulate nutrceuticals. The nutritional analysis of processed peel proves that by products are rich in different bioactive components as well as nutrients analysis. By using various

foods processing techniques we can improve the nutritional characteristics of peel and also enhance the recent knowledge on the application of citrus fruits peel as functional ingredient for education of population.

2. Materials and Methods

Collection of raw materials

The peel powders of citrus fruits (orange, kinnow, lemon, sweet lime, grapefruit, pomelo) were prepared in BPSMV (IHL) Sonepat, Haryana. Processing of citrus peels done by different processing methods such as blanching, boiling and steaming for five minute after that drying out it by sun drying for three days and oven drying method for (35-55^0 C) for 3 minutes and then makes powder by grinding process.

Proximate nutritional composition

Proximate composition of processed citrus fruits peel powder like as moisture, fat, fiber, protein estimation was done by MicroKjeldhal method and carbohydrate were estimated by difference method.

Physico-chemical analysis

Physico-chemical analysis of processed citrus fruits peel powder like ash, Water acidity and pH of processed citrus fruits peel powder was determined using the methods described by the Analytical association of Official Chemist.

Antioxidant analysis

The aqueous extraction of citrus fruits peel powder was extracted for the antioxidants analysis were done on processed citrus fruits peel powder like as total phenol, vitamin C and ferric reducing ions.

3. Results and Discussion

Proximate nutritional composition of sundry peel powder

Table 1: Effects of different processing on the proximate composition of sundry peel powder

Nutrient composition %	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Moisture	9.80	13.00	13.30	12.80	12.10	17.50
Fat	1.50	1.50	1.50	0.50	0.50	0.50
Fiber	4.70	4.50	4.60	3.30	3.40	4.50
Protein	4.50	4.60	4.50	4.40	4.00	4.20
Carbohydrate	73.80	75.10	74.60	77.70	78.70	71.90

Table 1 showed that Effect of different processing on the proximate composition of sundry peel powder after processing. Moisture content of the steamed sundry kinnow (17.50%) and mosambi (13.30%) peel powder was high, fat content was same in all processing methods, fiber content of boiled orange sundry peel powder was high 4.70% in the comparison of other processing, protein content from other sundry peel powder was high 4.6% compare to other ingredient and carbohydrate was 78.70% in grapefruit than the others processing methods.

Proximate nutritional composition of oven dry peel powder

Table 2: Effects of different processing on the proximate composition of oven dry peel powder

Nutrient composition %	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Moisture	14.70	14.60	14.70	16.50	15.00	13.60
Fat	1.50	1.50	1.50	0.50	0.50	0.50
Fiber	4.50	4.70	4.70	3.50	3.30	3.40
Protein	5.70	4.60	4.40	5.50	3.70	5.40
Carbohydrate	72.30	73.50	73.40	72.90	74.40	75.50

Table 2 showed that Effect of different processing on the proximate composition of oven dry peel powder showed that, moisture content of boiled pomelo was increased 16.50%. Fat content was same in all processing. Fiber content of the blanched and steamed oven dry (Lemon and Mosambi) peel powder was increased 4.70%. Protein content of the boiled oven dry orange peel powder was increased 5.70% and carbohydrate of the blanched oven dry kinnow peel powder was increases 75.50% than the other processing method.

Physico-chemical composition of sundry kinnow and mosambi peel powder.

Table 3: Effects of different processing on the physico-chemical composition of sundry peel powder

Physico-chemical composition%	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Ash%	1.5	1.5	1.5	1.2	1.3	5.5
Acidity %	1.1	1.0	1.0	0.8	1.0	1.2
pH	5.5	5.5	5.5	5.5	5.5	5.5

Table 3 showed that effect of different processing on the physico-chemical composition of sundry peel powder. Ash composition of the processed sundry kinnow peel powder was high in all processing method. Acidity in the steaming sundry kinnow peel powder was high 1.2% comparison to other processing methods. pH content in all processing were same.

Physico-chemical composition of oven dry peel powder.

Table 4: Effects of different processing on the physico-chemical composition of oven dry peel powder

Physico-chemical composition%	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Ash%	1.3	1.1	1.3	1.1	1.3	1.4
Acidity %	1.0	1.2	1.3	0.8	0.9	1.2
pH	5.5	5.5	5.5	5.5	5.5	5.5

Table 4 showed that effects of different processing on the physico-chemical composition of oven dry peel powder. Ash composition of the processed oven dry peel powder has no bigger difference in each other. Acidity of the steamed mosambi peel powder was increased 1.3% than the others. pH content in all processed peel powder were same.

Antioxidant analysis of sundry peel aqueous extract

Table 5: Effects of different processing on the antioxidant analysis of sundry peel aqueous extract

Antioxidant analysis %	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Vitamin C	23.50	27.60	25.90	21.30	25.90	34.00
Total phenol	103.60	82.10	56.70	48.10	45.10	111.40
Ferric reducing ions	0.47	0.47	0.46	0.25	0.29	0.53

Table 5 showed that effects of different processing on the antioxidants content of sundry peel powder. Vitamin C content of the steamed kinnow peel powder was increased 34.0%. Total phenol content of the boiled sundry kinnow peel powder was high 111.40%. Ferric reducing ions have no bigger difference in each other processing.

Antioxidant analysis of oven dry peel aqueous extract

Table 6: Effects of different processing on the antioxidant analysis of oven dry peel aqueous extract

Antioxidant analysis %	Boiling	Blanching	Steaming	Boiling	Blanching	Steaming
	Orange Lemon Mosambi			Pomelo Grapefruit Kinnow		
Vitamin C	20.00	28.00	28.00	23.50	31.00	21.40
Total phenol	96.10	91.50	77.50	95.60	91.30	45.60
Ferric reducing ions	0.37	0.42	0.47	0.35	0.29	0.49

Table 6 showed that effects of different processing on the antioxidants content of sundry peel powder. Vitamin C content of the blanched grapefruit peel powder was increased 31.00%. Total phenol content of the boiled sundry orange peel powder was high 96.10%. Ferric reducing ions have no bigger difference in value.

4. Conclusion

In conclusion, the evaluations of the proximate composition of processed citrus fruits peel powder are valuable source of nutrients. The elemental analysis shows that it contains some nutrients required for normal functioning of the body system. Previous work revealed that it is a good source of total polyphenols and has good antioxidant properties which will make it a useful ingredient in the preparation of various food products. Overall, the results suggested that citrus peel waste could be used as a raw material for many products. From industrial point of view, fruit peel which is the residues from processing industry could be further processed for value addition of various food products.

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References

[1] Fernández-Lopez J, Sendra E, Sayas-Barberá E, Navarro C, Pérez-Alvarez JA. (2008) Physico-chemical and microbiological profiles of "salchich" (Spanish dry-fermented sausage) enriched with orange fiber. Meat Sci, **80**, pg. no 410–417.
[2] Glasscock SJ, Axelson JM., Palmer JK, Phillips JA, Taper LJ. (1982) Microwave blanching of vegetables for frozen storage. Home Economics Research Journal, **11** (2), pg. no 149-158.
[3] Janati F, Beheshti HR, Feizy J, Fahim NK. (2012) Chemical composition of lemon (Citrus limon) and peels is consideration as animal food. GIDA, **37** (5), pg. no 267-271.
[4] Javed S, Ahmad R, Shahzad K, Nawaz S, Saeed S, Saleem Y. (2015) Chemical constituents, antimicrobial and antioxidant activity of essential oil of Citrus limetta var. Mitha (sweet lime) peel in Pakistan). African Journal of Microbiology Research, **7** (24), pg. no 3071-3077.
[5] Kanmani P, Dhivya E, Aravind J, Kumaresan K. (2014) Extraction and analysis of pectin from citrus peels: Augmenting the yield from Citrus limon using statistical experimental design. Iranica Journal of Energy & Environment, **5** (3), pg. no 303-312.
[6] Kubo K, Kiyose C, Ogino S, Saito M. (2005) Suppressive effect of Citrusaurantium against body fat accumulation and its safety. Journal of Clinical Biochemistry and Nutrition, **36,** pg. no 11-17.
[7] Kumar SP, Pushpak A, Mangal S, Kirar, A, Vishwakarma S. (2014) Phytochemical analysis of Citrus limonum and Citrus sinesis peels and identification of beta carotene pigmentethanolic extract. International Research Journal of Pharmacy, **5** (10), pg. no 789-791.
[8] Madhuri S, Ashwinni U, Hedge, Srilakshmi NS, Prashith KTR. (2014) Antimicrobial activity of Citrus sineses and Citrus aurantium peel extracts). Journal of Pharmaceutical and Scientific Innovation, **3** (4), pg. no 366-368.
[9] Maniyan A, John R, Mathew A. (2015) Evaluation of Fruit Peels for Some Selected Nutritional and Anti-Nutritional Factors). Emer Life Sci Resh, **1** (2), pg. no 13-19.
[10] Manjarres-pinzon K, Cortes-rodriguez M, Rodriguez-sandoval. (2013) Effect of drying condition on the physical properties of impregnated orange peel. Brazilian Journal of Chemical Engineering, **30** (3), pg. no 667-676.
[11] Mann S, Aggarwal KSMP. (2013) Development of Phytochemical Rich Ice Cream Incorporating kinnow peel. Global Journal of Science Frontier Research Agriculture and Veterinary, **13** (4), pg. no 2-4.
[12] Alam MDN, Brisi NJ, Rafiquxxaman MD. (2013) Review on in vivo and in vitro methods evaluation of antioxidant activity. Saudi Pharmaceutical Journal, **21** (2), pg. no 143-152.
[13] Ali M, Hamdollah D, Hamidreza M. (2014) The effect of cooking methods on antioxidant activity and phenol content in vegetables. World Journal of Pharmacy and Pharmaceutical Sciences, **3** (7), pg. no 242-252.
[14] Armel FZ, Lessory TZ, Niamkey JA, Sebastein LN. (2015) Effect of sun drying on nutritive and antioxidant properties of leafy vegetables consumed in western cote divoire. African Journal of Science and Research, **5** (4), pg. no 24-31.
[15] Arora M, Kaur P. (2013) Antimicrobial & antioxidant activity of orange pulp and peel. International Journal of Science and Research, **2** (11), pg. no 412-415.
[16] Arora M, Kaur P. (2012) Phytochemical screening of orange peel and pulp). International Journal of research in Engineering and Technology, **2** (12), pg. no 517-522.
[17] Association of official analytical chemistry, official method of analysis of the association of analytical chemistry. (1992) **11**th ed pg. no-115. Washington.
[18] Charles T, Paa-Nii T, Johnson, Ted S, Matilde M, Theo T. (2013) Physicochemical, proximate and sensory properties of pineapple (Ananas sp.) syrup developed from its organic side-stream. Food and Nutrition Sciences, **4**, pg. no 163-168.