International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 7.328
Peer Reviewed Bi-Monthly
Vol.4 No.12 Mar-Apr 2023

Evaluation Of Nutraceutical Property Of Orange And Banana Peel

Mohammed Anaam Shafique Ahmed Ansari[1] , Ranjana Ganesh Khade[2]
[1 2]Seva Sadan's R.K Talreja College of Arts, Science and Commerce, Ulhasnagar, Maharashtra,India.
Corresponding Author- Mohammed Anaam Shafique Ahmed Ansari

Abstract
Fruits provide a wide range of health-boosting antioxidants, flavonoids, and represent an excellent source of essential vitamins, minerals, and fiber. Eating a diet high in fruits can reduce a person's risk of developing heart disease, cancer, inflammation and diabetes. Fruit peel is generally peeled or scraped off the majority of fruits, resulting in a large amount of waste. There is a need to capture the goodness of fruit peels for health benefits. As a result, the current research aims to determine the nutritional content of fruit peel for nutraceutical properties. The fruit peels of orange and banana were collected from home kitchens and aqueous fruit peel extracts were prepared and studied for their nutraceutical properties and were found to contain anthocyanin, antioxidant and antimicrobial property. The nutraceutical property of the fruit peel indicated their potential to be used as functional food. Thus, the evaluation of fruit peel powder not only aids in the managementof fruit peel waste but also supplies nutritive and therapeutic properties to the body, in addition, orange and banana peels serve as prebiotic sources for various probiotic microorganisms that reside in the stomach environment.

Keywords – Fruit peel, nutraceutical, antioxidant, prebiotic.

Introduction

World demands for functional food which provide beneficial factor for human body and help to contribute to live healthy life. The demand is increasing day by day because of consumers searching for quality life. These factors influence natural nutraceutical market among consumers in addition of functional ingredients such as vitamins, fibers, minerals and micro-organisms.

India is the world's second largest fruits producer **(Pathak *et al.*, 2017)**. Fruit processing produces massive amounts of waste such as stalks, seeds and peels **(Vicenssuto *et al.*, 2020)**. Approximately, India produces 1.81 million tons of fruit peels annually. On an average, fruit consists 15-60% as peel, which can be discarded either municipal landfills or solid waste management department after utilization of fleshy part **(Joglekar *et al.*, 2019)**. The discarded part cause serious pollution and disposal matters in environment. Several places all over India is used to dump wastage, which utilizes lot of space. A billion of money spent yearly only for transportation of fruit peels from generation sites and treating it. After several days spotted on dumping yard, fruits peel generates unpleasant odors, which helps rats, bugs, flies, mosquitoes and various insects to come and multiply rapidly and spread diseases in nearby society or residence. Spending several days on dumping yard creates colonization of harmful bacteria on wastes and by eating it, organic waste creates several problems on a digestive tract of animals and environmental soil. Several fruit waste during decomposition, generates organic waste methane which contributes significantly to global warming. Fruit peels spends all such above issues from food utilization areasto dumping yard **(Chavan *et al.*, 2018)**. According to numerous investigations by researchers, it was noticed that the fruit peels have significant elements, which may be employed for nutraceutical purposes. In India, the peel is a remedy for dysentery and bad breath **(Shamrez *et al.*, 2013)**. Researchers also isolated variety of substances from fruit peels, which shows important elementsfor health continuity.

Orange peel is a significant by-product found in orange fruits. This includes low-molecular

weight substances such as cellulose, hemicellulose, lignin, pectin (galacturonic acid) and chlorophyll pigments (e.g. limonene) and flavonoids. Additionally, orange peel is beneficial in treating ringworm, skin inflammation, muscle soreness, stomach distress, colon and breast malignancies because to its purported germicidal, antioxidant and anti-carcinogenic properties. The orange peel has reported to reduce number of squamous cell carcinoma and flavonoid compound has impeded ability for cancer causing protein in cells **(Wang *et al.*, 2014)**.

Banana is the most common fruit crops grown for its edible fruits in tropical and subtropical areas. It is second most producible fruit with 16% of total fruit production worldwide. India is the top grower of fruit with 27% of world's total banana production. The banana weight contributes 75% of water and 25% of dry weight substances and banana peel constitutes 30–40% **(Hikal *et al.*, 2022)**. Ripe banana peel generally consists of crude protein (8%), ether extract (6.2%), soluble sugars (13.8%) and total phenolic compounds (4.8%). The primary components include cellulose, hemicellulose, chlorophyll, pectin and other low-molecular-weight substances, which generates

healthy constituents in human body. The development of valuable food products from fruit and vegetables wastes represent the best solution to capture the essential nutritive supplements for health benefit along with management of waste of fruit processing industries.

The present study attempted to evaluate nutraceutical potential of the orange and banana peel. The management of fruit waste generated from food processing industries would help to utilize the goodness of fruits.

Materials And Methods

1) Collection of materials

Orange and banana peels were collected from home kitchen, weighed, washed under tap water andchopped down into small pieces for better drying in natural sunlight for 2-3 weeks. The dried peels were grinded into powder form and stored in airtight glass bottles for further study.

2) Nutritional characterization of fruits peels

Preparation of fruit peel extracts: Aqueous extract of fruit peels were prepared by taking 10% of each powdered sample in distilled water and mixture were refluxed for two hours and later evaporated by a distillation apparatus. Each extract was stored in dark bottles and kept in a refrigerator at 4°C for further use.

Anthocyanin content: Anthocyanin content of the fruit peel extract was determined according to **Shehata *et al.*, (2020)** with slight modifications. Peels (1 g) were weighed in a 15 ml test tube separately and as a mixture. 5 ml of methanol containing 1% concentrated Hydrochloric acid was added to the peel sample. The tubes were vortexed, and samples were centrifuged at 15000 rpm for 20 min. The supernatant was mixed with 4 ml of pH buffer (4.5). The absorbance was measuredat 530 nm.

Antioxidant Activity: Antioxidant activity (DPPH free radical scavenging activity) of the fruit peel extracts was measured as per the standard method **(Brand-Williams *et al.*, 1995)** with slight modifications. The peel (1 g) solution were prepared by mixing in methanol (25 ml). The 2,2diphenyl-1-picrylhydrazyl (DPPH) solution were prepared by mixing (3.94 mg) of DPPH in (100 ml) methanol and incubated for 30 minutes at room temperature (30±1°C) in dark place. The test sample absorbance was measured in spectrophotometer at 517 nm. Ascorbic acid was used as a control in which assay was conducted in the same manner. The per cent inhibition of DPPH was calculated as follows:

Antioxidant activity (%) = Absorbance of control–Absorbance of sample/Absorbance of control ×100

III) *In Vitro* antimicrobial study of fruit peel extract

Antimicrobial activity of fruit peel extract extracts (Orange and banana peels) was studied by the agar-well diffusion method against gram positive bacteria (*Staphylococcus aureus*), gram positivefungus (*Candida albicans*), and gram negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*). Muller-Hinton agar molten butts were mixed with culture suspensions and poured into sterile petri plates. Using the cork borer, wells were constructed and later extracts were added to the well. The zone of inhibition after incubation was measured in mm.

Result And Discussion

The waste generation is a major problem from health sector to environmental aspects. The fruit waste generation from processing

units leads to several hazardous substance in dumping yard, which provides disadvantages by the neighborhood society due to an invitation of various rats, flies, insects, etc. The waste is not treated properly in the municipal lands and treatment of waste cost is higher. The fruit waste includes the loss of essential commodities in the criteria of peel (outer layer). I*n Vitro* and *In Vivo* studies have stated the importance of orange and banana peel waste as a treasure of nutritional value for a human body. Orange has a different property from banana, and it is necessary to take a mixture of both for a wide range of nutraceutical purposes. The collected orange and banana peels were weighed and washed for few minutes to improve their water holding capacity and after drying fruit peel powder was made (Fig.1).

Fig. 1: Preparation of Fruit Peel Powder

The banana and orange powder were then studied for their nutraceutical property with respect to anthocyanin and antioxidant activity (Table 1). The anthocyanin content of orange was found to be more than and banana peel. **Pathak *et al.*, (2017)** have reported the potential applications of fruit peel due to their nutritive value.

Table 1: Anthocyanin and antioxidant activity of the orange and banana peel.

Peel Sample	Anthocyanin activity (O.D at 530 nm)	Antioxidant activity	
		Ascorbic acid as Control (%)	Test Solution (%)
Orange	1.97	89.69 ± 0.85	64.93 ± 0.12
Banana	1.75	91.48 ± 0.42	51.11 ± 0.71
Mixture	1.67	82.74 ± 0.12	73.42 ± 0.92

Free radicals are harmful by-products generated during normal cellular metabolism and can initiate oxidative damage. Antioxidants are playing a considerable role against free radicals. The DPPH free-radical is considered as simple and very fast method for determining antioxidant activity. It can only be dissolved in organic media, especially in methanol, which is an important limitation when interpreting the role of hydrophilic antioxidants. DPPH is a stable organic free radical with an absorption band around 515-528 nm which usually used as a reagent to

measure free radical scavenging activity of antioxidants. It is sensitive sufficient to detect active ingredients at low concentrations and widely used for screening antiradical activities of fruit and vegetable juices orextracts **(Yi, *et al.*, 2008)**. The antioxidant activity orange peel was found to be more as compared to banana peel however mixture showed highest activity. Compared to control sample (Ascorbic acid), both the peels separately and in mixture showed comparatively less activity. The solvent plays a necessary role in extraction of the plant constituents. **Hegazy and Ibrahium, (2012)** have reported highest antioxidant activity with methanol extract of orange peel.

The antibacterial activity of the aqueous fruit peel extracts was evaluated against the common bacteria and fungi. The zone of inhibition obtained from agar well diffusion method is depicted in Table 2. The well diffusion method results are presented as the mean of three values. All the extracts showed promising antimicrobial activity, although the highest activity was seen against *Pseudomonas aeruginosa* by orange extract. Due to the presence of coumarin and tartrazine chemicals in the orange peel extract, it has a potent antibacterial agent against gram negative *Pseudomonas aeruginosa* followed by *Escherichia coli*. The antimicrobial activity of banana wasfound to be comparatively less than orange peel extract. The antimicrobial activity of fruit peel has been reported by **Pathak *et al.*, (2017).**

Table 2: Antimicrobial activity of aqueous extract of banana and orange peel.

Organism	Diameter of zone of inhibition (mm)		
	Orange peel extract	**Banana peel extract**	**Mixture**
Staphylococcus aureus	13 ± 0.3	12 ± 0.2	12 ± 0.2
Candida albicans	13 ± 0.2	11 ± 0.4	11 ± 0.1
Pseudomonas aeruginosa	24 ± 0.4	13 ± 0.8	18 ± 0.3
Escherichia coli	18 ± 0.4	11 ± 0.3	16 ± 0.1

Conclusion

The present study highlights nutraceutical property of orange and banana peels and their potential to recruit for making functional food. The management of fruit waste would not only provide beneficial nutrients to the human body but would also reduce the environment pollution with reference to some extent of economic growth. The future planning of this study clears the path to manufacture a confectionery product, such as a peel sachet burst enriched with nutraceutical properties.

References

1. *Brand-Williams, W., Cuvelier, M. E., & Berset, C. L. W. T. (1995). Use of a free radical method to evaluate antioxidant activity. LWT-Food science and Technology, 28(1), 25-30.*
2. *Chavan, P., Singh, A. K., & Kaur, G. (2018). Recent progress in the utilization of industrial waste and by-products of citrus fruits: A review. Journal of Food Process Engineering, 41(8), e12895.*
3. *Hegazy, A. E., & Ibrahium, M. I. (2012). Antioxidant activities of orange peel extracts. World applied sciences journal, 18(5), 684-688.*
4. *Hikal, W. M., Ahl, S. A., Hussein, A. H., Bratovcic, A., Tkachenko, K. G., Sharifi-Rad, J., & Atanassova, M. (2022). Banana Peels: A Waste Treasure for Human Being. Evidence- Based Complementary and Alternative Medicine, 2022.*
5. *Joglekar, S. N., Pathak, P. D., Mandavgane, S. A., & Kulkarni, B. D. (2019). Process of fruit peel waste biorefinery: a case study of citrus waste biorefinery, its environmental impacts and recommendations. Environmental Science and Pollution Research, 26(34), 34713-34722.*
6. *Pathak, P. D., Mandavgane, S. A., & Kulkarni, B. D. (2017). Fruit peel waste: characterization and its potential uses. Current Science, 444-454.*
7. *Shamrez, B., Aftab, S., Junaid, M., Ahmed, N., & Ahmed, S. (2013).*

Preparation and evaluation of candies from citron peel. J Environ Sci Toxic and Food Technol, 7, 21-24.

8. *Shehata, W. A., Akhtar, S., & Alam, T. (2020). Extraction and estimation of anthocyanin content and antioxidant activity of some common fruits. Trends in Applied Sciences Research, 15, 179-86.*
9. *Vicenssuto, G. M., & de Castro, R. J. S. (2020). Development of a novel probiotic milk product with enhanced antioxidant properties using mango peel as a fermentation substrate. Biocatalysis and Agricultural Biotechnology, 24, 101564.*
10. *Wang, L., Wang, J., Fang, L., Zheng, Z., Zhi, D., Wang, S., & Zhao, H. (2014). Anticancer activities of citrus peel polymethoxyflavones related to angiogenesis and others. BioMed research international, 2014.*
11. *Yi, Z., Yu, Y., Liang, Y., & Zeng, B. (2008). In vitro antioxidant and antimicrobial activities of the extract of Pericarpium Citri Reticulatae of a new Citrus cultivar and its main flavonoids. LWT-Food Science and technology, 41(4), 597-603.*