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Orange Peel: A Potential Source of Phytochemical Compounds

Sulekha Gotmare*, Jaya Gade[1]

[1]Department of Analytical Chemistry, SNDT Women's University, Santacruz, Mumbai, India

Abstract : The study aimed to evaluate the phytochemical content of orange peel. The conventional extraction technique (soxhlet extraction) and the aqueous extraction were carried out. The extraction of orange peel with solvents; Hexane, methanol, Acetone was carried out. Phytochemical analysis indicated the presence of tannins, terpenoidssaponinsetc. Anthraquiones were completely absent in orange peel.
Keywords : Orange peel, Phytochemical, Soxhlet, Aqueous.

Introduction

Orange peel is by products during the processing of fruit and studies show that they are good sources of bioactive compounds.[1] Every year a large amount of oranges byproduct wastes are formed such as peels [2] India produces around 25 Lakh tonnes of Orange every year. Main orange producing states of India are Punjab, Madhya Pradesh, Andhra Pradesh, Maharashtra Rajasthan, Assam and Karnataka.[3]During the production of orange juice and other orange products, the orange peel accumulates in the bulk and will produce environmental problem. Therefore, it is essential to find the applications for these peels. The orange peels are rich in nutrients and contain many phytochemicals; therefore they can be useful in many drugs and food items.[4]This research work is aimed to extract orange peel by conventional extraction technique and aqueous extraction and to evaluate the phytochemical content of orange peel.

Materials and Methods

Orange fruits were purchased from local market of Mumbai, in the month of May 2016. The fresh oranges were washed with tap water. The peel was separated and cut into small pieces followed by shed drying for 92 hrs.Dried peels were ground to make coarse powder by using pestle and mortar and stored in zip lock bags for further use.

Proximate Analysis

Moisture content, crude protein, total ash and crude fiber content were calculated by using AOAC standard method.[5]Moisture content was determined by an oven method. 5gm of sample placed in an oven at 105 ℃ to a constant weight. Crude Protein was determined by the Kjeldahl method; Ash content was determined by using a muffle furnace maintained at 550℃C for five hours .Crude fiber was obtained by digesting sample

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with H2SO4 and NaOH followed by incinerating in muffle furnace at 550℃ for 4 hrs.. Carbohydrate content was calculated from the difference of 100 – [% moisture + % ash + % protein + % fat + %fibre].

Soxhlet Extraction

The Orange peel powder was extracted with different solvents:Hexane, methanol, Acetone by using Soxhlet Extractor. 100gm of orange peel powderused for the extraction with 750 ml of solvent (hexane or methanol or acetone) at 50℃by Soxhlet extraction method for 5 hrs. Aferextraction the extract filtered through a Whatman No. 2 filter paper for removal of any peel particles present in extract. The filtered extract then evaporated to dryness under vaccum at 60°C by a rotary evaporator. The extracts were stored in refrigerator at 4°C until further use.[6]

Aqueous Extraction

Aqueous extraction of orange peel powder was done by referring Hegazy A.E. et al method with minor modifications.20gm of orange peel powder was soaked in 250 ml distilled water for 24 hrs at room temperature under constant stirring condition.The extract then filtered and water bath was used for concentrating the orange peel extract.Waterbath was maintained at 75℃ during process.Then concentrating extract was weigh and stored in refrigerator at 4℃ for further use.[6]

Phytochemical Analysis [7,8]

Phytochemical screening was performed using standard procedures.

Test for Anthroquinones

0.5 g of the extract was boiled with 10 ml of sulphuric acid (H_2SO_4) and filtered while hot. 5ml of Chloroform used to shake the filtrate.1 ml of dilute ammonia was added in the chloroformlayer. The resulting solution was observed for colour changes.

Test for Tannin

About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. After that 3-4drops of 0.1% ferricchloride was added and wait for brownish green or a blue-black colouration.

Test for Terpenoids

To 0.5 g each of the extract was added 2 ml ofchloroform. To form a layer,concentrated H_2S0_4 (3 ml) wascarefully added. A reddishbrown appearance of the interface indicatesthe presence of terpenoids.

Test for Flavanoids

A few drops of 1% aluminium solution were added to a portion of the filtrate. A yellow colouration indicates the presence of flavonoids.

Test for Saponins

2g of Orange peel extract was mixed and boiled with 20 ml of the water and then filtered. 5 ml of distilled water is added in 10ml of this filtrate and was shaken vigorously for stable persistent froth. The formation of froth shows the presence of the saponins in extract.

Results and Discussion

Proximate Composition of Orange Peel Powder

The proximate compositions of orange peel powder are described in Table No 1. The moisture content of the shade dried powdered sample was found to be 9.2 %. Protein Content was in range of 12%- 13% on dry

weight basis (DW). This implies that the orangepeel may also be a source of important nutrients. Carbohydrate content by difference was (52.90 ± 0.43).

Table 1 Results of Proximate analysis of Orange peel

Sr. No	Proximate Analysis	% Content
01	Moisture Content	9.2±0..01
02	Crude Fibre	14.17±0.36
03	Crude Protein	12.43±0.20
04	Ash Content	7.8±0.01
05	Carbohydrate Content	52.90±0.43

Extraction of orange peel extract by using various solvents

The soxhlet extraction of the orange peel using various solvents showed different yield in each experiment of this research study. Yield of extract differs from solvent to solvent. By using Methanol as a solvent we got 55.6% yield which is higher as compared to other solvents. Hexane and Acetone gave poor yield respectively 1.8% and 2.2%.Aqueous extraction of the orange peel gave 3.2% yield.

Table 2 Yield of Orange peel extract by different solvent using soxhlet extractor

Solvent	Yield per 100 gm
Hexane	1.8
Methanol	55.6
Acetone	2.2

Table 3: Yield of Orange peel extract by aqueous extraction

Material	Yield per 100 gm
Orange peel	3.2 gm

Phytochemical screening of the orange peel extract

The phytochemical screening of the various solvent extracts showed the presence of Flavanoids, Tannin, Saponins and Terpenoids (Table 4.).

Table 4: Phytochemical constituents of Orange peel extracts by soxhlet extractor

Extract	Anthroquinones	Tannis	Terpenoids	Saponins	Flavanoids
Hexane	-	+	+	-	+
Methanol	-	+	+	-	+
Acetone	-	+	-	+	-

Table 5: Phytochemical constituents of Orange peel extracts by aqueous extraction

Extract	Anthroquinones	Tannis	Terpenoids	Saponins	Flavanoids
Aqueous	-	+	+	+	+

As shown in table 4 and 5, Anthroquinones was completely absent in orange peel extract of both the method. While on other hand Hexane, Methanol and Aqueous extract showed the presence of Tannis, Terpenoids and Flavanoids. Acetone extract showed presence of Tannis and Saponins.Aqueous extract also showed presence of saponins.

Conclusion

Phytochemical analysis of Orange peel extract showed the presence of tannins, terpenoids, flavonoids and saponins. Antraquiones were completely absent in both the method extract.The most common technique used to obtain the extracts with the antioxidant activity is the extraction using organic solvent. The extraction of the orange peel with methanol and hexane was efficient in extracting the phytochemical compounds Methanol is effective than other solvents for extracting orange peel extract. This study was focused on waste minimization in fruit juice processing industry.

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