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Available online at <http://zjar.journals.ekb.eg><http://www.journals.zu.edu.eg/journalDisplay.aspx?JournalId=1&queryType=Master>**CHEMICAL COMPOSITION AND PHYTOCHEMICAL SCREENING OF *Citrus sinensis* (ORANGE) PEELS**Rabab E. Abdelazem¹, H.T. Hefnawy^{*1} and Gehan A. El-Shorbagy²

1. Biochem. Dept., Fac. Agric., Zagazig Univ., Egypt

2. Food Sci. Dept., Fac. Agric., Zagazig Univ., Egypt

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ABSTRACT: To analyse qualitative and quantitative phytochemical and evaluate in vitro antioxidant properties of various alcoholic and aqueous extracts of Orange peel. Preliminary phytochemical analysis for alkaloids, cardiac glycosides, flavonoids, glycosides, phenols, resins, saponins, steroids, tannins, terpenoids and triterpenoids and quantitative phytochemical analysis for alkaloids, total phenolics, total flavonoids, tannins and saponins were made by following standard procedures. The quantitative phytochemical analysis of this species exhibited the presence of alkaloids, total phenolics, total flavonoids, tannins and saponins in considerable quantity.

Key words: *Citrus sinensis*, orange peels, chemical composition, phytochemical.

INTRODUCTION

Fruit peels have been a valuable source for maintaining human health. The use of fruit peel extracts for antimicrobial properties can be of great significance in therapeutic treatments (Lobo *et al.*, 2010). Fruits by-products such as seeds, peels, stems, barks and leaves usually been discarded and currently the cause of a serious disposal problem in food and agricultural industries (Ghasemi *et al.*, 2009). Therefore, extensive researches on utilizing these wastes are being carried out worldwide.

The peel was found to contain much higher beneficial compounds that possessed antioxidant capacities compared to other fruit parts (Lim *et al.*, 2006). The natural bioactive compounds in fruits such as carotenoids, quercetin derivatives, phenolic acids and saponins are originally found in the peels with higher concentration towards the flesh (Goulas and Manganaris 2012). Recent studies confirmed the substantially higher amount of phenolic compounds and ascorbic acids in the peel than in the pulp of most of the fruits.

The importance of natural bioactive compounds has led to the development of a large and potential market for natural sources in pharmaceuticals and food products. Polyphenols in the plants considered to be free natural radical defense that were acknowledged to be beneficial for human health as an antioxidant, antitumor, and antimicrobial agent (Ighodaro, 2012).

Phytochemicals are non-nutritive in nature, which are found in plants and they have greater potential in curing many diseases. Some researchers have proved the existence of around 4000 phytochemicals (Mercy, 2015). Phytochemicals are grouped under many categories depending upon their basic chemical structure and its properties. Alkaloids, Anthocyanins, Flavonoids, Lignans, Phytosterols, Polyphenols, Terpenoids, Saponins, etc. (Nanna *et al.*, 2013) Amongst the various phytochemicals listed Flavonoids and Polyphenols act as potent antioxidants (Saxena *et al.*, 2012). Phenolics and flavonoids are signified as the major antioxidant compounds in *Allium* sp. Ferulic acid, Coumaric acid, Sinapic acid, Isoquercetin etc., are the significant chemicals that had exhibited antioxidant potential in *Allium* sp. reported by Parvu *et al.* (2013).

* Corresponding author: Tel. :+ 201028377005

E-mail address: Hefnawytaha2014@gmail.com

Orange peel is by products during the processing of fruit and studies show that they are good sources of bioactive compounds (Mamta and Parminder, 2013). Every year a large amount of oranges byproduct wastes are formed such as peels. 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 (Hegazy and Ibrahim, 2012). Citrus is the largest fruit crop in the world (100 million cubic tons per year) and the orange account for 60% (Oreopoulou and Tzia, 2006). The remaining orange peel account for approximately 45% of the total bulk (Yeoh *et al.*, 2008). Consequently, significant amounts of orange peel are available as a by-product. The orange peel, if treated as waste materials, may create environmental problems, particularly water pollution, due to the presence of biomaterials such as essential oil (Ferhat, 2008) and pectin (Berna *et al.*, 2000).

An antioxidant can be broadly defined as any substance that delays or inhibits oxidative damage to a target molecule (Wang *et al.*, 2006). The characteristic feature of an antioxidant is ability to scavenge the free radicals due to their redox hydrogen donators and singlet oxygen quencher (Emran *et al.*, 2015). The free radicals can be scavenged by the natural (plants) and synthetic (butylated hydroxyl toluene, butylated hydroxyl anisol and tetra butyl hydro quinone) antioxidants (Lobo *et al.*, 2010). But the usages of these synthetic antioxidants are now replaced because the natural antioxidants could be considered as safer without any side effects (Murray, 1998). In recent decades, many researchers are interested in medicinal plants for evaluation of antioxidant phytochemicals such as phenols, flavonoids and tannins which have received more attention for their potential role in prevention of human diseases (Sen *et al.*, 2010). Antioxidant constituents of the plant material act as radical scavengers, and help in converting the radicals to less reactive species. Oxidation of biomolecules can cause generation of free radical in body. Natural antioxidants occur in all parts of plants. These antioxidants include

carotenoids, vitamins, phenols, flavonoids (Dhanani *et al.*, 2017). The objective of this research is to identify of the chemical composition, screening phytochemical and antioxidant activity from orange peels

MATERIALS AND METHODS

Plant Materials

Citrus sinensis, was purchased from market in Zagazig-Sharqiyah-Egypt. The peels were diced to smaller pieces after which the peels were shade-dried at room temperature (30-35°C). 100g of peels of oranges were coarsely powdered using a mortar and pestle and were further reduced to powder using an electric blender. The powder was dried in an oven at 40°C for 24 h.

Chemicals and Reagents

The reagents used for the study include concentrated H₂SO₄, petroleum ether, NaOH, Boric acid solution, Anhydrous Na₂SO₄, CuSO₄, distilled water, HCl, Wagner's reagent, Meyers reagent, Ferric chloride solution, Fehling's solution, Ethanol, Benzene, Ammonia solution, Methanol, Chloroform, Ethylacetate, Tannic acid, Folin-Denis reagent, Na₂CO₃, Lead acetate, Baljet reagent. All other chemicals and reagents used were of analytical grade and purchased from standard manufacturers.

Proximate Analysis

Moisture content, crude protein, total ash and crude fiber content were calculated by using AOAC Standard Method (2010). Moisture content was determined by an oven method. 5gm of sample placed in an oven at 105°C 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 with H₂SO₄ and NaOH followed by incinerating in muffle furnace at 550°C for 4 hrs. Carbohydrate content was calculated from the difference of 100 - [% moisture + % ash + % protein + % fat + % fibre].

Method of Extraction

Soxhlet extraction 10 g of powdered sample was weighed, packed and loaded in Soxhlet

apparatus, attached with a condenser to carry out the process of extraction. Sample to solvent ratio was 1:10 and the extraction was carried out for 3–4 h to achieve 5–6 cycles. Two solvents chosen for the present study were double distilled water and ethanol. Solvent free crude extract prepared through lyophilization was used for further analysis.

Yield of the extract obtained was calculated as
Yield % = yield production / total sample * 100

Digestion Procedure

Two grams of the samples were weighed into Kjeldahl's flask mixed with 20 ml of concentrated H₂SO₄ and Helder tablet. The flask was then heated at 70°C for 40 min and then, the heat was increased to 120°C. The mixture was turned to black after a period of time. Digestion was completed after the solution became clear and white fumes appeared. The digest was diluted with 20ml of distilled water and boiled for 15 min. The solution was then allowed to cool, it was then transferred into 100ml volumetric flasks and diluted to the mark with distilled water. The sample solution was then filtered through a Whatman filter paper No. 1 into a screw-capped polyethylene bottle, the procedure was repeated for all samples.

Determination of Minerals

The method applied for the assessments of mineral concentration in samples after digestion was by using the Atomic Absorption Spectrophotometric (AAS) technique (Analyst 200, Perkin Elmer, Waltham, MA, USA) as described previously (Roghini and Vijayalakshmi, 2018).

Fourier Transform Infrared Spectroscopy (FT-IR)

Spectra analysis Infrared spectra of freeze-dried orange peel powder was recorded on a Perkin Elmer FT-IR Spectrum 100 fitted with an ATR accessory (Wallace *et al.*, 2014). To powdered sample of extract were loaded on the sample chamber of FT-IR spectrophotometer and scanned at room temperature (25 ± 2°C) with a scan range from 500 to 4000 cm⁻¹ at a resolution of 2 cm⁻¹.

Phytochemical screening

Qualitative assay, for the presence of plant secondary metabolites such as reducing sugar,

saponnins, anthracene glycosides, deoxysugar cardiac glycosides, tannins, flavonoids and alkaloids were carried out on the extract of the *Citrus sinensis* peels following standard procedure (Harbone, 1973; Trease and Evans, 2003).

Preparation of extracts

Aqueous and alcoholic extracts of orange peels were prepared by soaking 3.0 g of dried rind and 5.0 g of dried aril in 80 mL distilled water, separately, for 24 hours, followed by filtration.

Chloroform and petroleum ether extracts of orange peels were prepared by soaking 0.5 g of dried rind and 0.5 g of dried aril in 5 mL chloroform, separately, for 24 hours, followed by filtration.

Quantification of total phenols

The amount of total phenols in peel crude extracts was determined by Folin Ciocalteu (FC) method as modified by Singleton and Rossi (1965). Gallic acid (GA, 5%) from Sigma was used to construct a calibration curve. Ten µl extracts were placed in test tubes. Then 0.5 ml of FC reagent were added and waited for 4 min. one milliliter of Na₂CO₃ (7.5%, W/V) was added, and kept for 2h in darkness and finally the absorbance of each sample was measured at 760 nm.

Total flavonoid content

Total flavonoid content was measured by the aluminium chloride colorimetric (AlCl₃) method (Lee *et al.*, 2012). Ten microliters of each extract was added to 100 µl of sodium nitrite (5%, W/V) and allowed to stand for 5 min. then 100 µl AlCl₃ (10%, W/V) were added and incubated for 5 min, followed by the addition of 1 ml sodium hydroxide NaOH (1M) and volume was made up to 5 ml with distilled water. After 15 min, the solution was mixed completely and the absorbance was measured against blank at 510 nm. Total flavonoid content was expressed as µg Catechin (BOH chemicals ltd., poole, England) equivalent (CE) per ml of crude extract.

Total alkaloids determination

Bromocresol green (BCG, Aldrich chemicals) dye was used to estimate total alkaloids (Shamsa *et al.*, 2008). BCG solution was prepared by

heating 69.8 mg BCG with 3ml NaOH (2N) and 5 ml of distilled water until completely dissolving. The solution was then completed to 1 liter with distilled water. Ten microliters of the crude extracts were thoroughly mixed with 3 ml of BCG solution. Thirty minutes later, 5 ml of chloroform were added, and shaken for 2 min. The lower layer was separated after 30 min. The extraction was continued for three times. A set of reference standard solutions of 0.1% atropine (Merck, Darmstadt) was prepared, and followed the steps described above. The absorbance of color was read at 418 nm. The total alkaloid content was expressed as Atropine equivalent (AE)/gm crude extract.

Estimation of tannins content

Tannins content of orange peels was estimated by the method of **Siddhuraju and Manian (2007)**. A total of 500 μ L of the extracts were taken in test tube separately and treated with 100 mg of polyvinyl polypyrrolidone and 500 μ L of distilled water. This solution was incubated at 4°C for 4 h. Then the sample was centrifuged at 5000 rpm for 5 min and 20 μ L of the supernatant was taken. This supernatant has only simple phenolics free of tannins (the tannins would have been precipitated along with the polyvinyl polypyrrolidone). The phenolics content of the supernatant was measured at 725 nm and expressed as the content of free phenolics on a dry matter basis. From the above results, the tannins content of the extract was calculated as follows:

$$\text{Tannins (mg GAE/g extract)} = \text{Total phenolics (mg GAE/g extract)} - \text{Free phenolics (mg GAE/g extract)}$$

Estimation of total saponins content

Estimation of total saponins content was determined by the method described by **Makkar *et al.* (2007)**. Based on vanillin-sulphuric acid colorimetric reaction with some modifications. About 50 μ L of plant extract was added with 250 μ L of distilled water. To this, about 250 μ L of vanillin reagent (800 mg of vanillin in 10 mL of 99.5% ethanol) was added. Then 2.5 mL of 72% H₂SO₄ was added and it was mixed well. This solution was kept in a water bath at 60 °C for 10 min. After 10 min, it was cooled in ice cold water and the absorbance

was read at 544 nm. The values were expressed as diosgenin equivalents (mg DE/g extract) derived from a standard curve.

Statistical Analysis

All the results were expressed as mean values \pm standard deviation. Comparisons will be performed by analysis of variance (ANOVA). Statistical analyses will be run using SPSS V. 6.0 software. The correlations among the data were calculated using Pearson's correlation coefficient (r) and $P < 0.05$ was considered significantly different.

RESULTS AND DISCUSSION

Proximate Composition of Orange Peel Powder

The results obtained for the compositional content of protein, fat, carbohydrate, energy value, moisture, ash and pH of orange peel are shown in Fig.1. The moisture content of the shade dried powdered sample was found to be 9.2 %. Protein Content was found to be 12% on dry weight basis (DW). This implies that the orange peel may also be a source of important nutrients. The carbohydrate value was obtained via difference i.e. 100 – (Values of ash + crude fiber + protein + fat + Moisture content). The above values are expressed as % by weight.

These results are consistent with that was mentioned by **Sulekha and Jaya (2018)** since they made a preliminary analysis of orange peel residue, and the obtained results were as follows: moisture (9.0%), protein (13.2%), crude fat (6.8%), fiber (15.3%), ash (7.8%) and carbohydrate (48.9%).

Minerals Content of Orange Peels

The data presented in Table 1 show the minerals content of orange peels. Calcium, nitrogen, phosphorus, potassium, sodium, manganese, copper, zinc and iron were detected. The results also showed that the calcium and potassium content of orange peels was larger amount (1340 and 480 mg/100 g) followed by nitrogen (230 mg/100 g). At the same time, sodium and phosphorus content was found in moderate amounts (55 and 51 mg/100 g). In addition, it contained the lowest amount of iron,

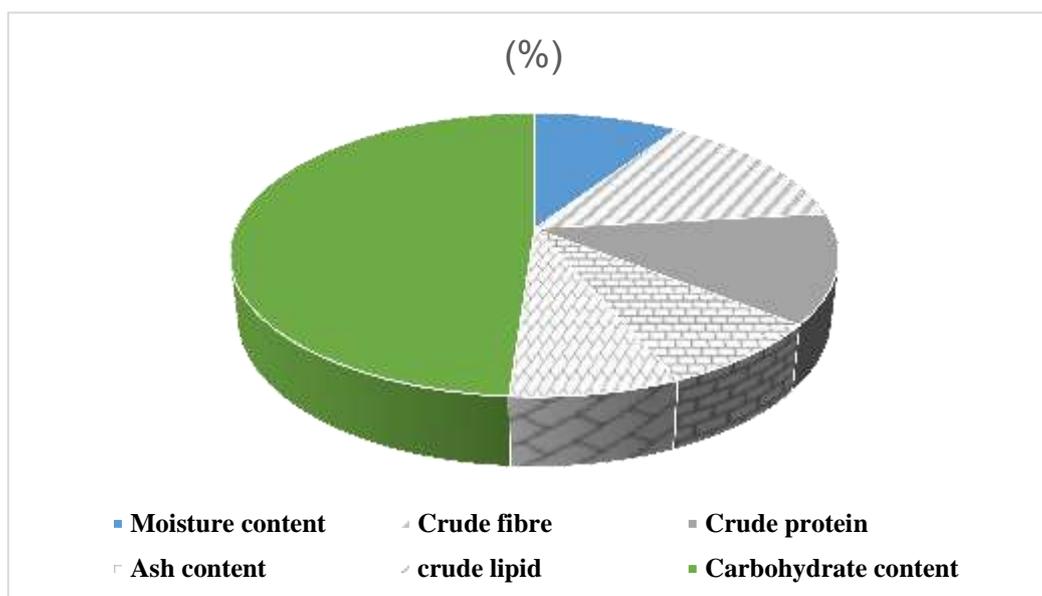


Fig. 1. Proximate analysis of orange peel

Table 1. Minerals content (mg/100g) of orange peels

Sample	Minerals (mg/100g)								
	Ca	N	P	K	Na	Mn	Cu	Zn	Fe
Orange peels	134	230	51	480	55	0.40	3.27	0.30	9.37

* Calculated on dry weight basis.

copper, zinc and manganese. These results agree with those recorded by **Roghini and Vijayalakshmi (2018)** and **Barros *et al.* (2012)**. The mineral content of plants can be significantly influenced by variety, location and environmental conditions (**Osagie and Eka, 1998**).

The importance of minerals in normal nutrition and metabolism cannot be overemphasized. The mineral composition of fruits largely depends on many factors such as soil type, stage of maturity, variety of cultivars, topography, and other geographical factors.

Extraction of Orange Peel Extract by Using Various Solvents

Table 2 shows the percentage of yield of crude successive extracts (petroleum ether, chloroform, ethanol, methanol and water) of orange peels. The soxhlet extraction of the orange peel using various solvents showed different yield in each experiment of this

research study (**Siddhuraju and Becker, 2003**) Yield of extract differs from solvent to solvent. By using Methanol as a solvent we got 22.6% yield which is higher as compared to other solvents. Hexane and chloroform gave poor yield respectively 2.8% and 3.2%. Aqueous and ethanol extraction of the orange peel gave 6.7% and 15.4% yield, respectively. Fig. 2 yield of Orange peel extract by different solvent using soxhlet extractor (**Kumar *et al.*, 2011**).

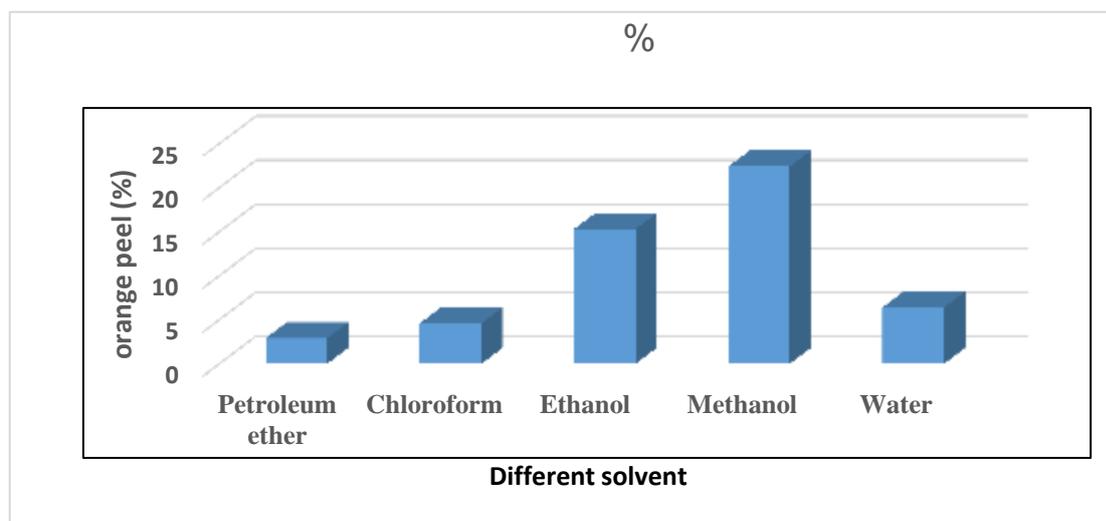
Phytochemical Screening of the Orange Peel Extract

The present study revealed that the various alcoholic and aqueous extracts of orange peel contained alkaloids, cardiac glycosides, flavonoids, glycosides, phenols, resins, saponins, steroids, tannins, terpenoids and triterpenoids (Table 2). However, phenols were detected only in methanolic extracts of both parts and the cardiac glycosides were found in root extracts of the solvents chloroform, ethyl acetate and methanol.

Table 2. Preliminary qualitative phytochemical analysis of various alcoholic and aqueous extracts of orange peel

Plant constituents	Petroleum ether	Chloroform	Ethyl acetate	Methanol	Water
Alkaloids	–	+	–	+++	+
Cardiac glycosides	+	–	–	+	+
Flavonoids	–	–	+	+++	+++
Glycosides	–	–	+	+++	
Phenols	–	–	–	+++	–
Resins	–	+	+	+	+
Saponins	–	+	–	+++	–
Steroids	–	–	–	+++	++
Tannins	+	–	–	+++	–
Terpenoids	–	–	–	+++	++
Triterpenoids	–	+		+	++

+++ : highly present, ++ : moderately present, + : Low, - : absent.

**Fig. 2. Yield of Orange peel extract by different solvent**

Next to methanol extract, ethyl acetate extracts of orange peel showed the presence of rich variety of secondary metabolites. Petroleum ether, chloroform and water extracts showed the less variety of these secondary metabolites. Compared to all other solvent extracts, methanolic leaf and root extracts had higher number of secondary metabolites with high degree of precipitation (+++). Triterpenoids and

resins were determined to be present with lesser amount (+) only in all extracts.

Preliminary qualitative phytochemical analysis made for orange peel revealed the presence of alkaloids, cardiac glycosides, flavonoids, glycosides, phenols, resins, saponins, steroids, tannins, terpenoids and triterpenoids. These secondary metabolites are reported to have many

biological and therapeutic properties (**Gul et al., 2017**), the extraction yield calculated for petroleum ether, chloroform, ethyl acetate, methanol and water extracts of orange peel showed that methanol extract registered higher percentage of yield. It may be due to high polarity of methanolic solvent which can draw high variety of plant constituents than the other solvents did (**Manivannan et al., 2016**). Generally, majority of the secondary metabolites studied, flavonoids and saponins were rich in ethyl acetate extracts. It is explained that the polarity level and species nature are playing major role in extracting the secondary metabolites (**Pooja and Vidyasagar, 2016**). The biological property, antioxidant activity was determined to be effective through various assays for orange peel.

Phytochemicals are non-nutritive plant chemicals possessing varying degrees of disease-preventive properties. They are invaluable sources of raw materials for both traditional and orthodox medicine. Phytochemicals may display their health-protective effects in diverse ways. They can act as antioxidants and protect cells against free radical damage, e.g. polyphenols, carotenoids etc. (**Omoriegie and Osagie, 2012**). They may also help in reducing risk for cancer by inhibiting tumor production (**Devasagayam et al., 2004**). Other modes of action are via antibacterial activity and hormonal stimulation (**Mathew et al., 2012**). The citrus peels are rich in nutrients and contain many phytochemicals with strong potential for use in drug production or as food supplements (**Chede et al., 2013**). The obtained results are in agreement with these assertions as a range of phytochemicals viz; alkaloids, terpenoids, tannins, flavonoids, saponins, cardiac glycosides, steroids were detected in the orange peels and seeds extracts.

Phytochemical screening of the peel powder extract of citrus peel shows the present Saponin of which are steroid or saponin. Triterpenoid glycoside characterized by their bitter or astringent taste, forming properties and hemolytic effect on red blood cells (**Gul et al., 2017**). Saponin possess both of beneficial (cholesterol-lowering) and deleterious (cytotoxic permeabilization of the intestine) properties and also exhibit structure dependent biological

activities. Saponin cause reduction of blood cholesterol by preventing its reabsorption which make it useful in cardiovascular disease (**Lawal et al., 2013**). In addition, it has been documented that saponin have antitumor and antimutagenic activity and can lower risk of human cancer cell from growing saponin are believed to react with the cholesterol rich membranes of cancer cell, thereby limiting their growth and visibility plants produce saponin has potential to fight infection by parasites and in humans saponin serves as immune system booster and also protect against viruses and bacteria (**Roghini and Vijayalakshmi, 2018**).

The non sugar part of saponins has direct antioxidant activity which may result in reduced risk of cancer and heart disease. Flavonoids are also responsible for the colouring of fruits, vegetable and Herbs. Alkaloid are very important in medicine and constituent most of the valuable drugs. They have marketed physiological effect on animal. **Okwu and Josiah (2006)** have documented and important of tannin in promoting wound healing. **Iwu (1983)** have also reported that tannin containing antidiabetic properties. The presence of phenol in citrus peel serves as antiseptic and reduces inflammation when taken internally.

FT-IR spectral analysis

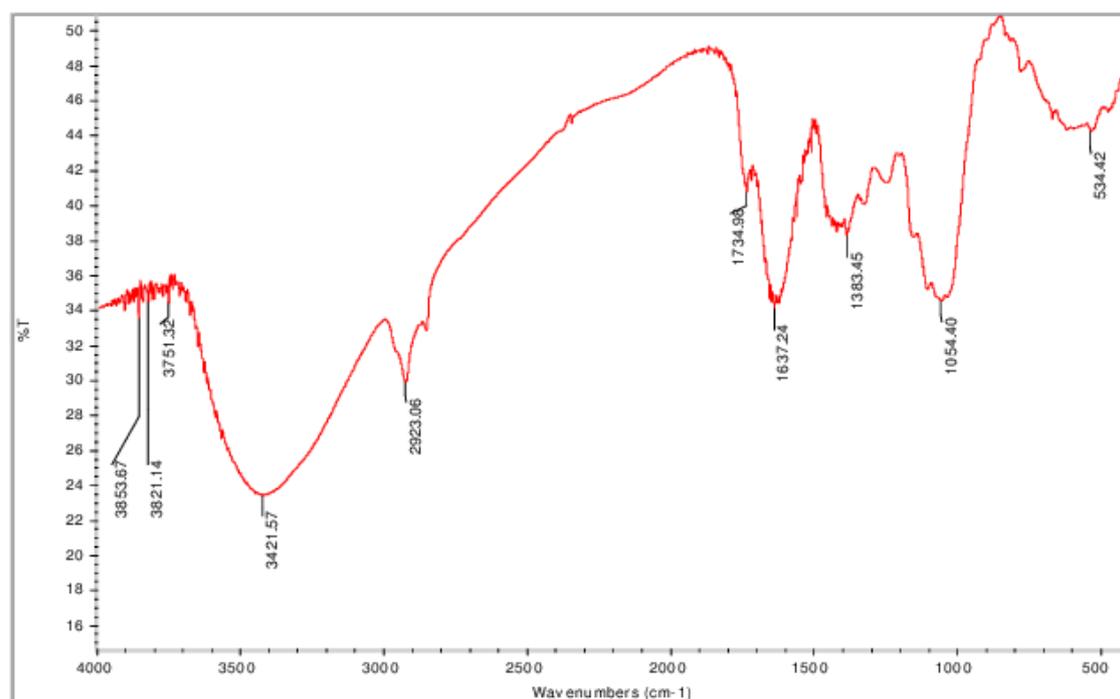
FT-IR spectral analysis data for orange peel revealed the existence of multiple functional groups in the extracts. The spectral features of the extract were shown in Fig. 3. For all extracts, the very strong absorption bands were observed at 3603.8 cm^{-1} of orange peel, could be attributed to N-H stretching of proteins and O-H stretching of carbohydrates and water, which indicate hydroxyl groups existed in all extracts. The bands at 2112.8 cm^{-1} of orange peel was due to the $\text{-C}\equiv\text{C-}$ group. The bands between the wave numbers of $1800\text{-}750\text{ cm}^{-1}$ reflected the biochemical compositions, especially the moieties of carbohydrate, lipid, protein and polyphenols in plant. The absorptions around 1669.3 cm^{-1} could be assigned to ring C-C stretch of phenyl (**Lu et al., 2011**), which is present at high levels in the polyphenolic components of orange peel. Absorptions peak at 1407.1 cm^{-1} for orange peel, corresponding to

Table 3. Total phenolics, total flavonoids, and tannins contents of various alcoholic and aqueous extracts of orange peel

Sample	Total phenolics	Total flavonoids	Tannins	Saponins
PE	0.77 ± 0.01	–	0.17 ± 0.02	13.1 ± 0.06
CH	0.45 ± 0.02	–	0.12 ± 0.03	12.8 ± 0.02
EA	0.11 ± 0.04	0.79 ± 0.09	0.03 ± 0.01	0.6 ± 0.02
ME	3.75 ± 0.01	12.84 ± 0.08	1.61 ± 0.05	16.2 ± 0.02
WA	0.32 ± 0.03	16.68 ± 0.1	14.07 ± 0.02	13.4 ± 0.01

Values were performed in triplicates and represented as mean ± SD. PE: petroleum ether, CH: chloroform, ET: ethanol, ME: methanol, WA: water, -: not detected.

Mean values followed by different superscript in a column are significantly different ($P < 0.05$).

**Fig. 3. The FTIR spectrum of the orange peel powder**

CH₃ asymmetric deformation (Agarwal *et al.*, 2006). The minor bands obtained at 1261.7 cm⁻¹ from orange peel, were ascribed to O–H (–COOH) variable angle vibration (Zhao *et al.*, 2014). The wavenumber region between 1200 and 950 cm⁻¹ contains functional groups mainly from carbohydrates, while absorption peak at 1034.3 cm⁻¹ are attributed of –CH₂OH groups of carbohydrates (Lu *et al.*, 2011). The various functional groups observed in orange peel

reflected the biochemical compositions, especially the phenolic compounds, carboxylic acids, alcohols, carbohydrates, and proteins in the plant, responsible for several medicinal properties and biological activities which is confirmed by our investigation in chemical composition. The presence of phytochemicals carrying hydrogen functional group –OH bonded found that the hydroxyl functionality is an integral part of most of phenolic phytochemicals

such as polyphenols and flavonoids to provide a relative ranking of extracts in term of antioxidant activity. Therefore, the presence of characteristic functional groups that are responsible for various medicinal properties may be influence considerably the biological properties and contribute significantly to their solubility, partition coefficient, stereochemistry and inherent acid–base properties (Knittel and Zavod, 2008).

Conclusion

Based on the chemical composition of orange peels, the crude fibre and protein of orange peels can serve as non-caloric bulking agents. Phytochemical analysis of Orange peel extract showed the presence of tannins, terpenoids, flavonoids and saponins. Antraquinones 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. The various functional groups observed in the different extracts probably confirmed by FT-IR analysis indicate the richness of orange peels in polyphenols. The orange peel powder which has an excellent aroma can be incorporated into various recipes to enhance the flavour, taste and nutritive value of recipes.

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التركيب الكيميائي وتقدير المواد الفيتوكيميائية لقشور البرتقال

رباب السيد عبدالعظيم¹ - حفناوي طه حفناوي¹ - جيهان عبدالله الشوربجي²

1- قسم الكيمياء الحيوية - كلية الزراعة - جامعة الزقازيق - الزقازيق - مصر

2- قسم علوم الاغذية - كلية الزراعة - جامعة الزقازيق - الزقازيق - مصر

تحليل المواد الكيميائية النباتية النوعية والكمية وتقييم الخصائص المضادة للأكسدة في المختبر للمستخلصات المائية وغير المائية من قشر البرتقال. التحليل الكيميائي النباتي الأولي للقلويدات، الجليكوسيدات القلبية، الفلافونويد، الجليكوسيدات، الفينولات، الراتجات، الصابونين، المنشطات، العفص، التربينويدات، الترايثيربينويدات والتحليل الكمي الكيميائي للقلويدات، الفينولات الكلية، الفلافونويدات الكلية، التانينات، الصابونين القياسي أظهر التحليل الكيميائي النباتي الكمي لهذا النوع وجود قلويدات، الفينولات الكلية، الفلافونويد الكلي، التانينات والصابونين بكميات كبيرة.

المحكمون:

- 1- أ.د. محسن محمد سليم عسكر
- 2- أ.د. سيد سليمان السيد السعدني

أستاذ التكنولوجيا الحيوية - المركز القومي للبحوث - القاهرة.
أستاذ الكيمياء الحيوية المتفرغ - كلية الزراعة - جامعة الزقازيق.