INTERNATIONAL JOURNAL OF PHARMACEUTICS & DRUG ANALYSIS

VOL.6 ISSUE 2, 2018; 116 – 121 ; http://ijpda.com; ISSN: 2348-8948

Research Article

Pharmacognostic Investigation of *Punica granatum* L. Peel

Pardeep Kaur[1], Sanjeev Kumar Kataria[2], Balbir Singh[3], Saroj Arora[1*]

1. Department of Botanical & Environmental Sciences, Guru Nanak Dev University, Amritsar-143005
2. Drug Testing and Research Laboratory, Herbal Health Research Consortium Pvt. Ltd, Amritsar
3. Department of Pharmaceutical Sciences, Guru Nanak Dev University, Amritsar-143005

Date Received: 11th February 2018; Date accepted: 15th February 2018; Date Published: 16th February 2018

Abstract

Punica granatum L. (pomegranate) peels are used extensively to cure numerous pathologies and have wide industrial significance. However, to strengthen the efficacy, reproducibility and quality, the correct identification is required. Thus, the current study provides a detailed description of pharmacognostical features *viz*., macroscopic, microscopic and fluorescence behavior of peel of *P. granatum*. In macroscopic analysis, the peels were observed to be dark reddish brown with concavo-convex shape. The external surface has woody appearance with membranous wall on inner side. The transverse section displayed the existence of thick cuticle followed by collenchyma cells forming epicarp. The mesocarp was seen to be multi-layered consisting of parenchymatous cells. The peel powder exhibited a faint aromatic odor and astringent taste. The powder microscopy revealed the presence of different types of stone cells, xylem vessels and prismatic calcium oxalate crystals. The peel demonstrated characteristic fluorescence in response to reaction with standard chemical reagents. The present study supplements the pharmacognostic documentation of *Punica granatum* L. peel to claim its authentication and quality.

Keywords: *Punica granatum* L. peel; microscopy; pharmacognosy; standardization.

INTRODUCTION

Punica granatum L., commonly known as pomegranate belongs to the family Punicaceae. In Indian sub-continent, it is recognized as 'anar' or 'dadima'. The plant is evergreen or deciduous and bears deep pink/red colored, globose/oval shaped fruits containing crunchy seeds. All the parts of the tree i.e. fruit, leaf, flower, bark and root possess enormous therapeutic properties. Although, the peels of the fruits were underestimated as agricultural by-products for over a long period but, the recent studies have demonstrated their potential as reducing agent in the generation of silver nanoparticles. These are utilized in industries to extract natural dyes and are also employed as beef cattle feed[1]. In addition, the peels are one of the constituents in herbal formulations, cosmetics and food seasonings.

The peels are a rich reservoir of kaempferol, quercetin, proanthocyanidin, and several minerals such as calcium, potassium, phosphorous, magnesium and sodium. These are also an important source of tannins *viz*., punicalagin, punicalin and ellagitannin[2]. The various extracts/fractions of peels have been reported to scavenge free radicals, promote wound healing, suppress proliferation of cancer cells, inhibit viral and fungal growth, decrease atherosclerotic lesions, improve lipid profiles, provide protection against chronic hepatic injury and afford oral health benefits[3,4]. The consumption of pomegranate peel has risen enormously in the recent years. However, the misidentification of peels is a key obstacle to reproduce quality products and to extract their beneficial biological attributions.

With this backdrop, the correct identification of the plant materials becomes an indispensable prerequisite to achieve quality alongwith their efficacy evaluation. Keeping this in mind, the present study was planned to investigate the pharmacognostic characters of *Punica granatum* L. peel. The pharma-

cognostic studies were conceded out in terms of macroscopic, organoleptic, microscopic and fluorescence analysis.

MATERIALS AND METHODS

Collection of *Punica granatum* L. peel: The dried peels of *Punica granatum* L. were acquired from S.K. Vipin Kumar (Amritsar), supplier of herbal raw materials.

Morphological observations: The size, shape, color, taste and odor of fruit peel were examined with naked eye or with the help of a magnifying lens for morphological identification.

Microscopical observations:

Preparation of transverse sections: The fruit peels were dipped in a borosilicate beaker containing water to achieve adequate moistening for cutting of sections. Then the free hand transverse sections were prepared and the finest sections were observed under light microscope. The prominent cellular structures were observed and then photographed[5].

Powder microscopy: The peels were grinded in an electric grinder to obtain powder. The powder was then mounted in glycerine on a clean glass slide and observed under microscope[5].

Fluorescence analysis: The analysis of fluorescence behavior was done by treating the peel powder of *Punica* with few drops of different solvents and observations were recorded in the day light as well as under exposure to UV light.

Determination of pH value: The pH of freshly prepared 1% and 10% peel powder suspension in distilled water was evaluated using an electronic pH meter (Lab India).

Determination of bulk density, tap density and Hausner's ratio: The known weight of pomegranate peel powder was introduced into a graduated cylinder cautiously to determine its bulk density. The tap density was observed by using tap density meter (Make: Lab India TD1025) and then compressibility index and Hausner's ratio were calculated.

RESULTS AND DISCUSSION

The expansion of phytopharmaceuticals has generated enthusiasm to develop herbal medicines to cure chronic diseases and restore human health. The folklore information and ancient literature data reveals that various tribal groups and communities around the globe depend on the traditional medicinal plants for the diverse purposes. However, the ability to differentiate the medicinal plants from their close genus, inferior substitutes and adulterants pose a challenge to herbal efficacy. A number of safety-related issues have also emerged worldwide because of the incorrect recognition and identification of herbal drugs[6,7]. Therefore, the correct identification of medicinal plants is crucial for their safe utilization. The traditional approaches employ morphological, microscopical and chemical identification to authenticate crude herbal drugs. These methods play an essential role either individually or in combination to set standards for quality control. The various physicochemical parameters of *P. granatum* L. peel have been reported in our previous study. It was elucidated that the initial physico-chemical characteristics may advocate the superior bioactive potential of herbals substantiating their better pharmaceutical relevance[8].

Morphological features:

The primary step to set authentication of a plant material is the evaluation of its external appearance such as size, shape, texture, color, along with taste and odor[9]. In the present investigation, the dried peels of *P. granatum* L. are dark reddish brown in color with variations in size and are brittle. The pieces of peel appear to be concavo-convex in shape. The external surface is woody and smooth. The internal pith is yellowish brown, septate with membranous wall. It also bears impressions of the seeds **(Fig. 1a)**. The peel powder has a faint aromatic odor and astringent taste[10,11] **(Fig. 1b).**

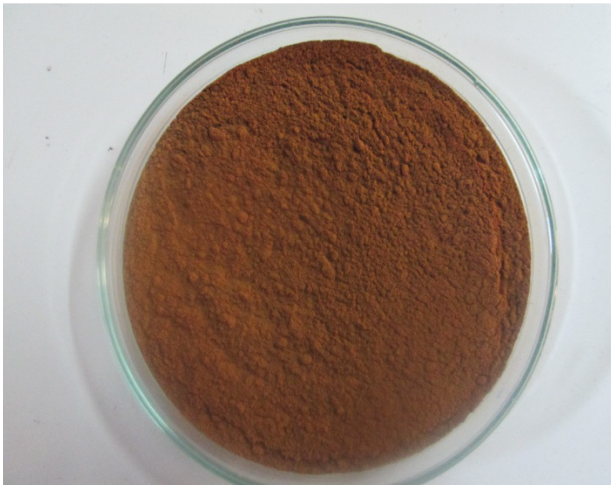
Microscopic features:

The microscopic analysis provides exhaustive details of internal anatomical characteristics and is one of the quickest, simplest and cheapest methods. It facilitates the determination of cell structures and tissue organization to differentiate narrowly related species belonging to same genera[12]. In the current study, both the anatomical section and powder microscopic analysis were carried out to establish the identity of *P. granatum* peel. The

observations documented are described below.

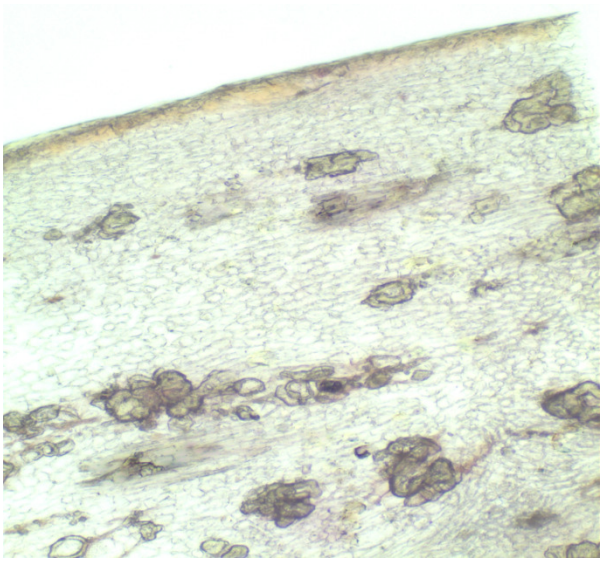
***Transverse section of peel*:** T.S. of *Punica granatum.* L. peel is shown in **Fig. 2a**. It represents the existence of thick cuticle followed by 3-4 layers of collenchyma cells comprising epicarp. The section displays the presence of brownish orange pigments also **(Fig. 2b)**. The mesocarp is wide, parenchymatous and multi-layered. This region also contains stone cells, starch grains and prismatic crystals of calcium oxalate. The vascular bundles are also seen traversing this portion[10,11].

(a) *P. granatum* L. peel

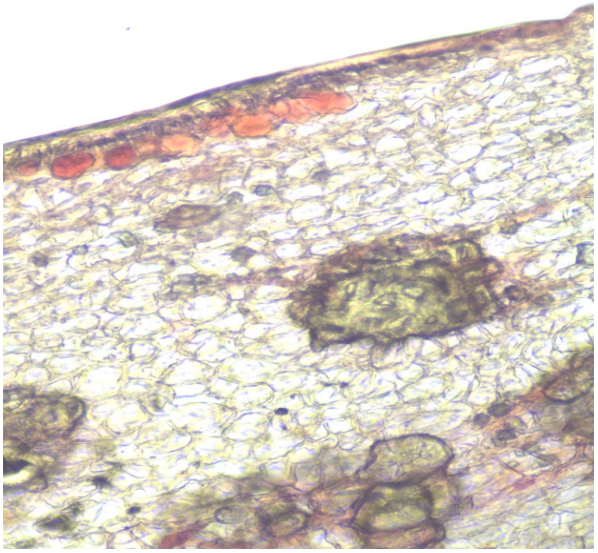


(b) *P. granatum* L. peel powder

Fig. 1: Morphological features of *Punica granatum* L. peel and its powder

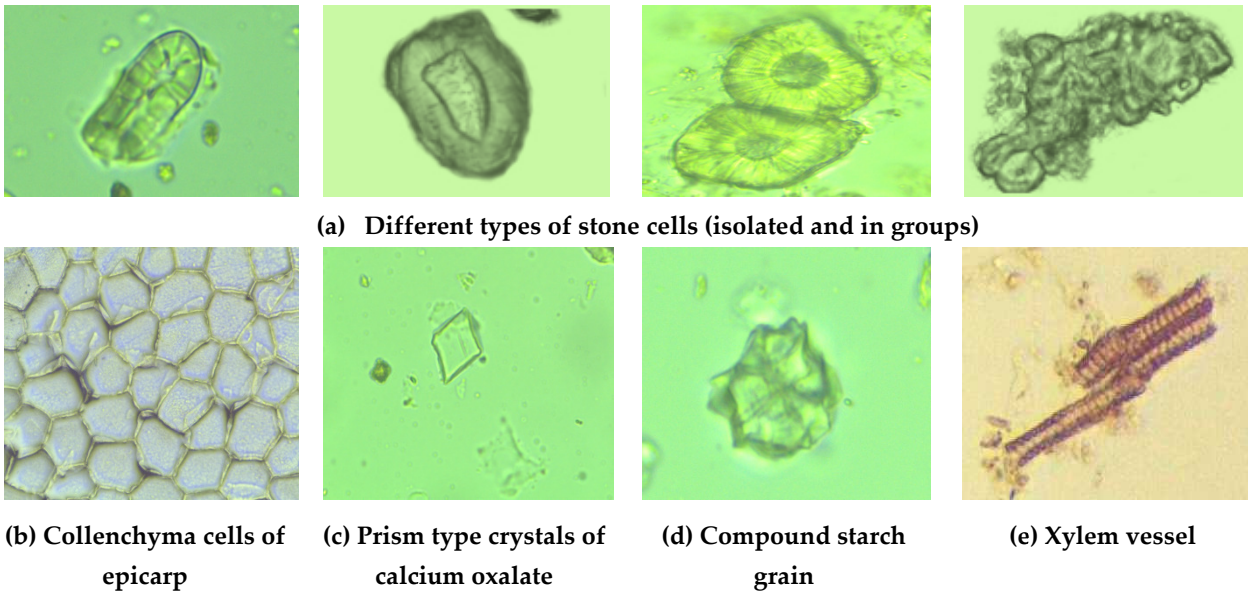


(a) Transverse section of *P. granatum* L. peel



(b) Outermost layer representing orange pigment cells and group of stone cells in mesocarp

Fig. 2: Transverse section of *Punica granatum* L. peel



(a) Different types of stone cells (isolated and in groups)

(b) Collenchyma cells of epicarp

(c) Prism type crystals of calcium oxalate

(d) Compound starch grain

(e) Xylem vessel

Fig. 3: Powder microscopy of *Punica granatum* L. peel

Table 1: Fluorescence behavior of *Punica granatum* L. peel powder on application of various chemicals reagents.

S. No.	Peel powder + Chemical Reagent	Day Light	254 nm	366 nm
1.	Peel powder as such	Brown	Brownish black	Dark brown
2.	Peel powder + Distilled water	Dark brown	Black	Brownish black
3.	Peel powder + Methanol	Dark brown	Brownish black	Brown
4.	Peel powder + Hydrochloric acid	Yellowish orange	Light Purple	Dark purple
5.	Peel powder + Nitric acid	Dark brown	Black	Purple
6.	Peel powder + Sulphuric acid	Black	Black	Black
7.	Peel powder + Glacial acetic acid	Dark brown	Purplish black	Purple
8.	Peel powder + Chloroform	Dark brown	Black	Purple
9.	Peel powder + Petroleum ether	Dark brown	Brownish black	Dark brown
10.	Peel powder + Acetone	Dark brown	Black	Purple
11.	Peel powder + Diethyl ether	Dark brown	Purplish black	Purple
12.	Peel powder + Ethyl acetate	Dark brown	Dark blue	Purple
13.	Peel powder + Dichloromethane	Dark brown	Purplish black	Purplish black
14.	Peel powder + Toulene	Dark brown	Black	Black
15.	Peel powder + Butanol	Dark brown	Black	Purple
16.	Peel powder + Dimethyl sulfoxide	Dark brown	Dark brown	Light brown

Table 2: pH of *Punica granatum* L. peel powder

S. No.	Concentration (% w/v)	pH value
1.	1 %	4.733 ± 0.05
2.	10 %	4.840 ± 0.09

Table 3: Powder flow characteristics of *Punica granatum* L. peel powder

Bulk density (g/ml)	Tap density (g/ml)	Compressibility index	Hausner's ratio
0.4778 ± 0.26	1.004 ± 0.19	52.381 ± 2.41	2.10 ± 0.11

Powder microscopic analysis: The fruit peel powder shows the presence of different types of stone cells. These cells exist either singly or/and in clusters. As represented in **Fig. 3a**, the cells vary in their shape, size, and thickness. The cells of epicarp are hexagonal to rectangular. The calcium oxalate prisms, compound starch grains and xylem vessels are also present[10,11] **(Fig. 3b-e)**.

Fluorescence behavior: The application of various chemical reagents to the peel powder exhibited characteristic fluorescence in visible and ultra violet light. The observations recorded in day light, short and long wavelengths are presented in **Table 1**.

This evaluation aids in the determination of type of constituents and their chemical nature. These constituents may exhibit fluorescence due to the formation of particular fluorescent derivatives formed after reaction with the chemical reagents[13].

pH value: The pH of peel powder was observed to be 4.733±0.05 and 4.840±0.09 at 1 and 10% w/v suspension in distilled water (Table 2).

Bulk density, tap density and Hausner's ratio: The bulk density, tap density and Hausner's ratio are given in Table 3. These physical parameters determine the flow behavior of powders which is an imperative requirement in pharmaceutical industries during various operations like filling and packaging, blending, transportation and scaling up processes[14]. As seen from the Table 3, pomegranate peel powder reflected high value of compressibility index and Hausner's ratio indicating that the powder is slight difficult to flow.

CONCLUSION

The data generated from the present pharmacobotanical parameters would help in the authentication of *Punica granatum* L. peel. This study may serve as an important source of information to ascertain its quality, purity and accurate recognition during preparation of various herbal formulations.

ACKNOWLEDGEMENT: The first author duly acknowledges the University Grants Commission, New Delhi for providing the scholarship under the MANF scheme (vide grant no. 201312-MANF-2012-13-SIK-PUN-16650). The Director, Herbal Health Research Consortium Pvt. Ltd. is also duly acknowledged for providing necessary facilities to carry out this work.

CONFLICT OF INTEREST: The authors declare no conflict of interest.

REFERENCES

1. Middha SK, Usha T, Pande V. A review on antihyperglycemic and antihepatoprotective activity of eco-friendly *Punica granatum* peel waste. Evidence Based Complementary and Alternative Medicine. 2013; http://dx.doi.org/10.1155/2013/656172.
2. Christaki EV, Bonos EM, Florou-Paneri PC. Dietary benefits of pomegranates in humans and animals. Journal of Food, Agriculture & Environment. 2011, 9: 142-144.
3. Ibrahim MI. Efficiency of pomegranate peel extract as antimicrobial, antioxidant and protective agents. World Journal of Agricultural Sciences. 2010; 6: 338-344.
4. Viuda-Martos M, Fernandez-Lopez and Perez-Alvarez JA. Pomegranate and its many functional components as related to human health: A review. Comprehensive Reviews in Food Science and Food Safety. 2010, 9: 635-654.
5. WHO. Macroscopic and microscopic Examination: Quality Control Methods for Medicinal Plant Materials. World Health Organisation, Geneva. 1998
6. Bellamakondi PK, Godavarthi A, Ibrahim M, Naik R and Patel RK. Pharmacognostic evaluation of selected species of *Caralluma* genus. The Journal of Phytopharmacology. 2015, 4: 34-40.
7. Kumar D, Kumar K, Kumar S, Kumar T, Kumar A and Prakash O. Pharmacognostic evaluation of leaf and root bark of *Holoptelea integrifolia* Roxb. Asian Pacific Journal of Tropical Biomedicine. 2012, 2: 169-175.
8. Kaur P, Kataria SK, Singh Balbir and Arora S. Comparison of physicochemical characteristics and radical scavenging potential of *Punica granatum* L. peel procured from two different herb suppliers. International Journal of Pharmaceutics and Drug Analysis. 2018, 6: 41-44.

9. Nikam PH, Kareparamban J, Jadhav A, Kadam V. Future Trends in Standardization of Herbal Drugs. Journal of Applied Pharmaceutical Science. 2012; 2: 38-44.

10. The Ayurvedic Pharmacopoeia of India, Part-I, Vol. IV. Government of India, Ministry of Health and Family Welfare, Deptt. of Ayurveda, Yoga-Naturopathy, Unani, Siddha & Homeopathy (AYUSH), New Delhi, 2004, pp. 19-20.

11. Quality Standards of Indian Medicinal Plants, Vol. III. Indian Council of Medical Research, New Delhi, 2005, pp. 299-305.

12. Nayak M, Nagarajan A, Majeed M. Pharmacognostic evaluation of leaf and stem wood extracts of *Artocarpus hirsuitus* Lam. Pharmacognosy Journal. 2017; 9: 887-894.

13. Akbar S, Hanif U, Ali J, Ishtiaq S. Pharmacognostic studies of stem, roots and leaves of *Malva parviflora* L. Asian Pacific Journal of Tropical Biomedicine. 2014; 4: 410-415.

14. Etti CJ, Yusof YA, Chin NL, Mohd Tahir, S. Flowability properties of *Labisia pumila* herbal powder. Agriculture and Agricultural Science Procedia. 2014; 2: 120-127.