

Original Article

**PRITHVI MAHABHUTA DOMINANT CHARACTERS IN PUGAPHALA (ARECA CATECHU LINN.)
SCIENTIFICALLY ASSESSED THROUGH PHARMACOGNOSY AND PHARMACEUTICAL CHEMISTRY**

KAMLA MOOND^{1*}, HITESH VYAS², HARISHA C. R.³, V. J. SHUKLA⁴

^{1,2}Department of Basic Principles, ³Department of Pharmacognosy, ⁴Department of Pharmaceutical Chemistry, I. P. G. T and R. A., GAU, Jamnagar, Gujarat, India
Email: prateek.jain246@gmail.com

Received: 21 Apr 2018, Revised and Accepted: 10 Jun 2018

ABSTRACT

Objective: The *Areca catechu* L. is a tropical fruit, which is also called betel nut and is widely distributed in different parts of the world. *Areca catechu* L. is used for various treatment ailments in the form of various preparations especially in powdered form and it used extensively in Ayurveda to treat *Mukhavikara*, *Aruchi*, *Yonishaithilya*, *Shvetapradara* etc. *Areca* nut is commonly used as betel nut or supari, as it is often chewed wrapped in betel leaves (*Paan*). The aim is to assessment of *Mahabhautika* dominance in *Pugaphala* by pharmacognostical and pharmaceutical study.

Methods: Microscopic, macroscopic study and phsico-chemical analysis of *Pugaphala Churna*.

Results: In present study *Pugaphala* was selected as a *Parthiva* dominant drug according to its *Rasa Panchaka*, after that its *Mahabhautika* dominance was assessed by pharmacognostical and pharmaceutical study and results also support that in Pharmaceutical study loss on drying is 4.4%w/w, in Pharmacognostical study Rhomboidal crystal, Lignified scleroid etc. were found these characters also showed that *Pugaphala* is having dominance of *Prithvi Mahabhuta*.

Conclusion: *Prithvi* dominance in *Pugaphala* is scientifically assessed by Pharmacognostical and Pharmaceutical study.

Keywords: *Pugaphala*, *Prithvi Mahabhuta*, Pharmacognosy, Pharmaceutical study

© 2018 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)
DOI: <http://dx.doi.org/10.22159/ijcpr.2018v10i4.28473>

INTRODUCTION

The Areca Nut is the seed of the areca palm (*Areca catechu*), which grows in much of the tropical Pacific, Asia, and parts of east Africa. *Areca* nut (*Areca catechu*) is commonly used as an ingredient of betel quid, which also includes leaf of the creeping vine piper betel and lime with or without tobacco. The plant is tall, slender, unbranched palm with a crown of leaves.

In Ayurvedic medicine, betel nut is used as a Diuretic, Digestive, Anthelmintic, Astringent, cardiogenic and used extensively in Ayurveda to treat *Mukhavikara*, *Aruchi*, *Yonishaithilya*, *Shvetapradara* etc.

Areca nut forms an essential requisite for several religious and social ceremonies and its use dates back to Vedic period with high antiquities. People in India and many parts of Asia are using areca nut. Reference to areca nut is in Rig-Veda (2000 BC). *Dhanwantari Nighantu* an ancient text of Indian system of medicine mentions the use of areca nut (*Puga*) as one of the five natural aromatics (*Panchasugandhikam*) with pepper, clove, nutmeg and camphor.

The use of betel nut, as a masticator by humans has been known since the 4th century AD in different parts of the world. In old Indian scripts, such as *Vagbhatta* (4th century) and *Bhavamishra* (13th century), betel nut has been described as a therapeutic agent for leucoderma, leprosy, anemia obesity and de-worming properties. It has been used as vermifuge. *Areca* nut finds place in religious, social and cultural functions of India. The presence of the betel nut is a must in the ceremonial plate, as betel nuts are believed to increase prosperity. The nut is offered to guests, along with a betel leaf, as a

mark of respect. Betel quid chewing (betel leaf, arecanut and lime) in India is at least 2,000 y old.

The chemical entities of this plant has been used as an anti-diabetic, blood pressure regulating activity, anti ulceogenic, antioxidant activity, anticonvulsant activity, C. N. S. stimulant activity, oxytotic activity, anti fertility, anthelmintic and antiviral activity etc [1]. To justify the classical assessed *Mahabhautika* dominance in *Pugaphala* for the first time *Puga* is scientifically evaluated pharmaco-gnostically and pharmaceutical study.

Ayurvedic properties [2]

Rasa: *Kashaya*

Guna: *Ruksha, Guru*

Veerya: *Sheeta*

Vipaka: *Katu*

Parts used: Fruit, Bark, Root

Chemical constituents

Alkaloids (*Arecoline*, *Arecaidine*, *Guvacoline* and *Guvacine*), tannin, lipids, volatile oils and gums.

MATERIALS AND METHODS

Collection of raw drugs

Raw drug was collected from the pharmacy department, I. P. G. T. and R. A., Gujarat Ayurveda University, Jamnagar. The botanical name and part used are given in table 1.

Table 1: Botanical name and part used

Sanskrit name	Botanical name	Part used
<i>Puga</i>	<i>Areca catechu</i>	Fruit

Pharmacognostical evaluation

The raw drug was identified and authenticated by the Pharmacognosy laboratory, I. P. G. T. and R. A., Gujarat Ayurved University, Jamnagar. The identification was carried out based on morphological features, organoleptic characters and powder microscopy of the drug.

The initial purpose of study was to confirm the authenticity of the drug. First studied the dried powder under the Corl Zeiss Trinocular microscope attached with camera with and without staining. Microphotographs were also taken under the microscope [3].

Physicochemical parameters

The drug was analyzed by using qualitative and quantitative parameters at Pharmaceutical Chemistry Laboratory of I. P. G. T. and R. A., Gujarat Ayurved University, Jamnagar [4].

HPTLC

Extract of *Pugaphala* was spotted on pre-coated silica gel GF 60254 aluminium plates as 5 mm bands, 5 mm apart and 1 cm from the edge of the plates, by means of a Camag Linomate V sample applicator fitted with a 100 µL Hamilton syringe. Toluene (7 ml), Ethyl acetate (2 ml), Acetic acid (1 ml) were used as the mobile phase. After development, Densitometric scanning was performed with a Camag T. L. C. scanner III in reflectance absorbance mode at 254 nm and 366 nm under control of win CATS software (V 1.2.1

Camag). The slit dimensions were 6 mm x 0.45 mm and the scanning speed was 20 mm s⁻¹.

OBSERVATIONS AND RESULTS

Pharmacognostical evaluation

Organoleptic characters

The colour, odour, taste etc. of the powder was recorded and placed in table 2.

Microscopic evaluation of *Pugaphala* powder

The diagnostic characters observed under the microscope are Rhomboidal crystal, Epicarp cells, Iodine stained Simple Starch grain, Starch grain with hilum, Bordered pitted vessels, Group of Simple fiber, Bright yellowish content, Brown content, Oil globule, Lignified scleroids, Parenchyma cells with starch grain and Parenchyma cells (Microphotographs Plate 1. 1-12)

Physico-chemical parameters

Drug was evaluated for various physicochemical parameters like loss on drying, water-soluble extract, alcohol soluble extract, total ash value, pH value. The results are placed at table 3.

HPTLC

Methanol extracts of drugs were spotted on pre-coated silica gel at 254 nm and 366 nm Results are depicted in the table 4 and Plate 2.

Table 2: Organoleptic features of fruit powder

S. No.	Organoleptic parameter	Result
1	Texture	Course fine
2	Colour	Chocolate Brown
3	Odour	Slightly Aromatic
4	Taste	Astringent

Table 3: Physicochemical parameters of *Pugaphala*

S. No.	Physico-chemical parameter	Result
1	Loss on drying	4.4 % w/w
2	Ash value	3.8 % w/w
3	Water soluble extract	18% w/w
4	Methanol soluble extract	16.4% w/w
5	pH value	6

Table 4: Results of HPTLC of *Pugaphala Churna*

Track	Solvent system	Observation under UV radiation			
		254 nm		366 nm	
		No. of spots	Rf value	No. of spots	Rf value
<i>Pugaphala Churna</i>	Toluene (7 ml): Ethyl acetate (2 ml): Acetic acid (1 ml)	7	0.01, 0.21, 0.46, 0.48, 0.76, 0.81, 0.95	5	0.01, 0.21, 0.46, 0.47, 0.94

DISCUSSION

Acharya Charaka, Sushruta and Vagbhatta all had described the properties of *Pancha Bhautika Dravyas* by their *Guna* and *Karma*, out of them the *Dravyas* (drugs), which are predominant in properties of *Guru, Sthoola, Kathina, Sthira, Sandra, Khara, Vishada* etc. are *Parthiva* in *Mahabhautika* dominancy. They exert actions like *Upachaya, Gaurava, Sanghaata, and Sthairya*. *Acharya Sushruta* also described that *Parthiva Dravyas* are mostly *Madhura* and *Kashaya* in *Rasa* and are having downward movement instinctively due to their heaviness [5]. *Ayurveda Sutra* also mentioned that *Kashaya Rasa* is originates from *Prithvi Mahabhuta* [6].

Pugaphala also possess *Kashaya Rasa, Guru, Ruksha Guna* and *Sheeta Veerya*. So, by seeing its *Rasa Panchaka, Pugaphala* was selected as a *Parthiva* dominant *Dravya* and after that, pharmacognostical and pharmaceutical study were also supported the *Prithvi* dominance of

Pugaphala. In powder microscopy of *Pugaphala*, there are many structures which are hard, dense, compactly packed and gives physical strength like Rhomboidal crystal, Epicarp cells, Iodine stained Simple Starch grain, Starch grain with hilum, Group of Simple fiber, Lignified scleroid, etc. these characters are strongly dominated by *Prithvi Mahabhuta*.

Sclereids are a reduced form of sclerenchyma cells with highly thickened, lignified cellular walls that form small bundles of durable layers of tissue in most plants. The presence of numerous sclereids produces the gritty texture [7]. Sclereids are roughly isodiametric, and clumps of these "stone cells" give its distinctive grittiness.

Epicarp is a botanical term for the outermost layer of the pericarp (or fruit). The epicarp forms the tough outer skin of the fruit [8]. These features of *Pugaphala* can be correlated with *Kathina, Sthira, Murta* and *Sthoola Swaroop* of *Prithvi Mahabhuta*.

In physico-chemical parameters loss on drying in *Puga* is 4.4%w/w, this shows that on drying, loss is less because of dryness due to *Khara*, *Vishada* and *Kathina Guna* of *Prithvi Mahabhuta*. HPTLC also

shows 7 spots on 254 nm while only 5 spots on 366 nm, this shows that due to *Sthira Guna* of *Prithvi Mahabhuta*, drug was not spreads more.

Plate 1: Microscopic characters of *Pugaphala Churna*

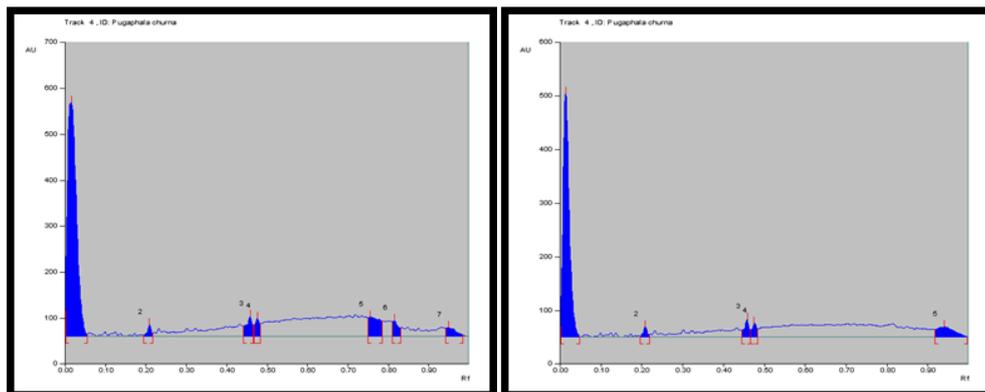
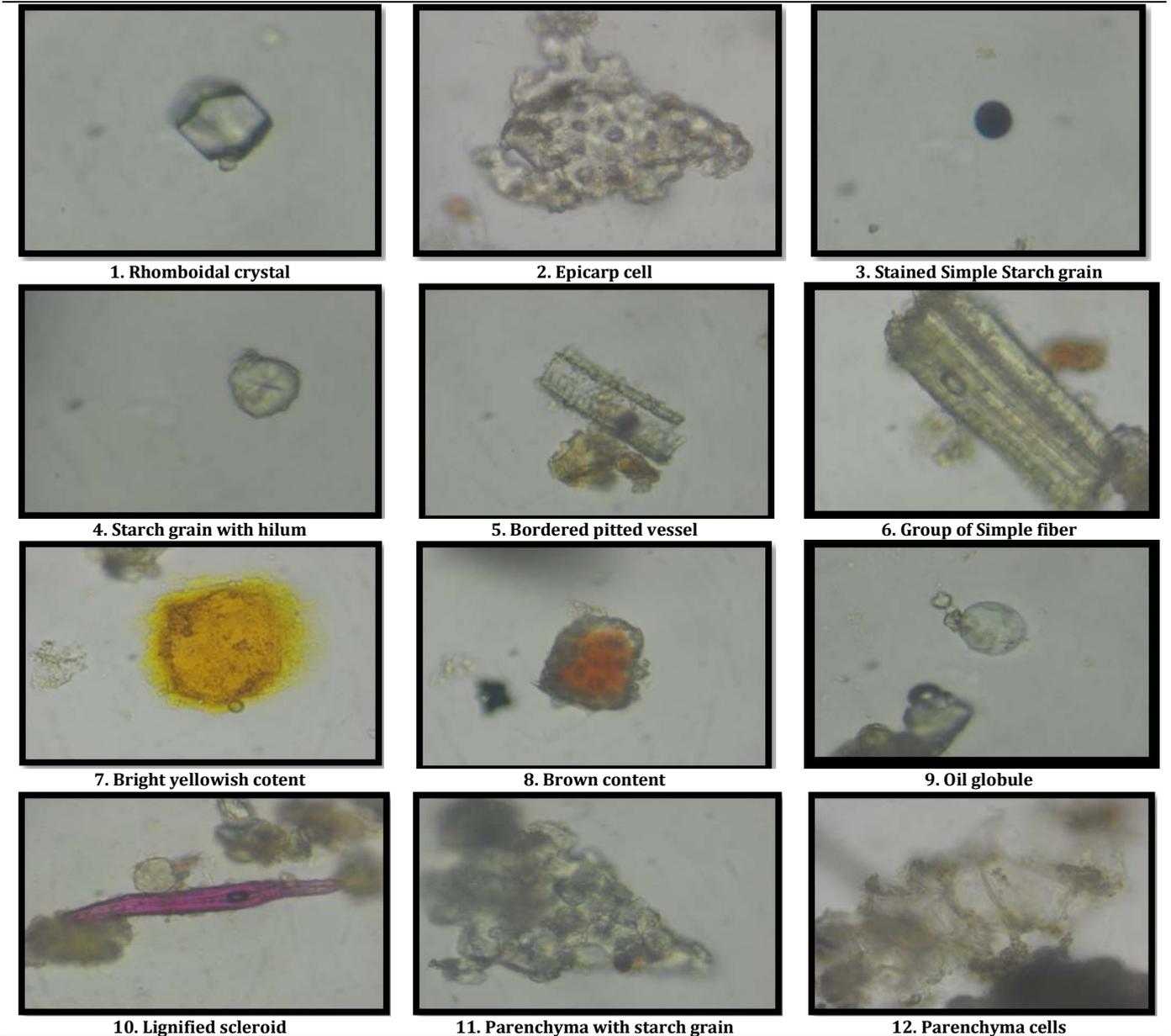


Plate 2: Densitogram of *Pugaphala Churna*

CONCLUSION

Any *Panchabhautika* molecule has some shape (*Akara*). This shape is obtained because of compact and dense (*Kathinya*) of the elementary particles. This compactness and density (*Kathinya*) is also because of the material form (*Murti*) of that substance, obtained due to the generic principle *Prithvi*. Thus, *Prithvi Mahabhuta* is responsible for giving structure, shape and strength by their *Sthoola*, *Sthira*, *Kathina*, *Sandra* etc *Guna* and *Karma* also assessed in *Pugaphala* by Pharmacognostical and Pharmaceutical study thus, dominance of *Prithvi Mahabhuta* in *Pugaphala* was assessed scientifically.

AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Declared none

REFERENCES

1. Amudhan MS, Begum VH, Hebbar KB. A review on phytochemical and pharmacological potential of areca catechu L. seed. Int J Pharm Sci Res 2012;3:4151-7.
2. Bhavaprakasha Nighantu Purvakhanda. Chaukhambha bharti academy. Varanasi-Patna 1954;7:42-4.
3. Kokate CK, Purohit AP, Gokhale SB. Analytical pharmacognosy. 42nd ed. Pune: Nirali Prakashan; 2008.
4. The Ayurvedic Pharmacopia of India. Part I. Vol. I. Government of India, Ministry of Health and Family welfare. Department of Ayush; New Delhi; 2010. p. 160-2.
5. Sushruta: *Sushruta Samhita* with commentary of Dalhana, edited by vaidya jadavji Trikamji Acharya, *Chaukhambha Surbharti Prakashan*, Varanasi 8th edition, *Sutra Sthana*, chapter 41, verse 4, Reprint; 2014. p. 181.
6. *Ayurveda Sutram Sabhashyam*, by Yoganandnath, 8/3; 2013.
7. Sclereids. Available from: <https://en.m.wikipedia.org>. [Last accessed on 10 Mar 2018]
8. Fruit anatomy. Available from: <https://en.m.wikipedia.org>. [Last accessed on 10 Mar 2018]