

Abhava pratinidhi dravya: A Comparative Phytochemical Study of *Bharangi* and *Kantakari*

Research Article

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Abstract

Abhava pratinidhi dravya excites the scientific curiosity concerning the Ayurvedic principles behind selection of the substitute drug. Present study had reported a comparative phytochemical study of one such Ayurvedic substitution pair: *Solanum surattense* Burm.f., a substitute for *Clerodendrum serratum* L. The study was conducted to understand the logic behind the *Abhava pratinidhi dravya* (Drug substitution). The strategy was to scrutinize and compare their Ayurvedic properties by literary studies and test the phytochemical profile of these two herbs for biochemical similarities and differences. On analyzing their Ayurvedic pharmacology (*Dravyaguna* properties), findings show that both the drugs possess *katu* and *tikta rasa*, but *Bharangi* is *katu rasa* dominant and *Kantakari* is *tikta rasa* dominant drug. Along with this, both drug possess *laghu*, *ruksha* and *ushna guna* in common. *Kantakari* which contain different properties i.e. *sara* and *tikshna guna*. Both drug possess *katu vipaka* and *ushna veerya*. Both drugs had been stated to treat majority of respiratory ailments. Phytochemical observations suggest that in *Bharangi* root extract alkaloids and tannins was present whereas *Kantakari* root extract was rich in flavonoids content. Saponins was present in maximum amount in both the plant extracts. Despite taxonomically unrelated and morphologically dissimilar, *Bharangi* has been substituted by *Kantakari* drug. In Ayurveda, more importance was given to pharmacological properties of raw drug rather than its botanical classification. Further comparative pre-clinical studies and bio-equivalence clinical studies has been needed to explore the different pharmacological properties.

Key Words: *Abhava pratinidhi dravya*, *Ayurved materia medica*, *Bharangi*, *Clerodendrum serratum*(Linn) Moon, *Drug substitution*, *Kantakari*, *Solanum surattense* Burm. f., *Substitute*.

Introduction

Classical Ayurveda had recommended use of a functionally similar substitute. *Abhava pratinidhi dravya* is one of the concept mentioned in Ayurvedic texts like Yogratnakar, Bhavaprakasha and Bhashajya Ratnavali.(1,2,3) Bhavaprakasha was the first who mentioned this concept in 16 th century A.D. and then repeated subsequently in forthcoming Ayurvedic literature. *Abhava pratinidhi dravya* (drug substitution) concept is based upon the *dravyaguna vigyana* principles. For substitution, each drug is identified and characterized on the basis of its *rasapanchaka* attributes i.e. *Rasa* (taste), *Guna* (properties), *Veerya* (potency), *Vipaka* (metabolism), *Prabhava* (specific action) and *Karma* (pharmacological action).(2,3) In the present article, a preliminary study of one such Ayurvedic substitution

pair: *Kantakari* (*Solanum surattense* Burm. f., Solanaceae), a common drug for the seasonally available species, *Bharangi* (*Clerodendrum serratum* L., Verbenaceae).

The objective this study was to analyze and compare Ayurvedic properties by literary studies and test the phytochemical profile of these two herbs for biochemical similarities and differences. No previous studies had been recorded to compare these two drugs chemical profiles. *Kantakari* and *Bharangi*, despite being taxonomically unrelated, are not only similar in Ayurvedic pharmacology (*Dravyaguna*) profile but also phytochemically.

Methodology

After brainstorming with the Supervisor, a structured strategy was planned. APD (*Abhava pratinidhi dravya*) was enlisted from the Ayurvedic texts, Bhavaprakasha Nighantu, (2) Yogratnakar (1) and Bhashajya Ratnavali (3). *Kantakari* and *Bharangi* was selected from the list due to striking dissimilarities in taxonomy. The comparison was done at two different levels i.e. *Dravyaguna* (Ayurvedic pharmacology), chemical profiles (using phytochemical screening).

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Plant material

Field samples of *Solanum surattense* Burm.f. and *Bharangi Clerodendrum serratum* L. were collected and authenticated by an authorized field botanist and an Ayurvedic practitioner. Voucher specimens were deposited with the Herbarium at B.S.I. Pune. The herbarium voucher specimen number of *Solanum surattense* Burm.f., was DDC 02 and of *Clerodendrum serratum* L. was DDC 01 respectively. (Ref. letter no. BSI/WRC/IDEN.CER./2020/H3 Dated 28/02/2020.)

Pharmacopeia of India as *Bharangi*. It is blue flowered shrub, which is widely distributed throughout India. (4) It is 0.9-2.4 m. high, glabrous, bluntly quadrangular stem, opposite and ternate leaves, mostly serrate, stout and 6mm. long. Flowers are numerous, in lax pubescent dichotomous cymes. (5)

Kantakari also recognized as plant of *Solanum surattense* Burm. f., (Fam. Solanaceae, perennial, by Ayurvedic Pharmacopeia of India, very prickly diffused herb of waste land, available throughout India. (6) Stem zigzag, with numerous branches, younger ones clothed with dense stellate tomentum; compressed prickles, straight, yellow, glabrous and shining, often exceeding 1.3cm long. Leaves 5-10 by 2.5-5.7 cm., ovate or elliptic, sinuate or subpinnatifid stellately hairy beneath. Flowers in extra-axillary, few flowered cymes sometimes reduced to a single flower. Berry yellow, 1.3-2 cm in diameter with green veins, surrounded by enlarged calyx. Seeds glabrous and 2.5 mm in diameter. (7)

Figure 1: *Clerodendrum serratum* (L.) Moon



Plant

Root

Figure 2 : *Solanum surattense* Burm. f.



Plant

Root

Dravyaguna studies

Raspanchaka i.e. Ayurvedic pharmacological parameters of *Bharangi* and *Kantakari* was compiled from Charaka Samhita (8,9), Sushruta Samhita (10,11), Ashtanga Hridaya (12,13), Yogaratnakar(1) and Bhaishajya Ratnavali(3) and from Lexicons like Bhavaprakasha, (14,15) Dhanvantari (16,17), Raja (18,19) and Kaiyadeva Nighantu. (20,21). Contemporary scholars understanding was also consider like work of authors Deshpande et. al (22,23) and Sharma (24,25) and Shastry respectively. (26,27)

Information about similarities and differences based on Ayurvedic Pharmacology (Dravyaguna) was analysed in terms of their *Rasa*(Taste), *Guna* (Properties), *Veerya*(Potency) and *Vipaka* (Metabolic stage). Two extensive review article has already been published on this topic. (28,29).

Pharmacognostical Studies

Clerodendrum serratum (Linn.) Moon (Fam. Verbenaceae); is accepted by Ayurvedic

Table 1: Summary of properties and actions (*Raspanchakas*) of *Bharangi* and *Kantakari*

Sr. No.	Properties	<i>Bharangi</i>	<i>Kantakari</i>	Similarities
1	Rasa (Taste)	Katu (14,26) (Pungent), Tikta(14,26) (Bitter)	Tikta (15,27) (Bitter), Katu(15,27) (Pungent)	Tikta (Bitter), Katu (Pungent)
2	Guna (Property)	Laghu(14,26) (Light), Ruksha(14,26) (Dry), Ushna (14,26) (Hot)	Laghu(15,27) (Light), Ruksha(15,27) (Dry), Ushna (15) (Hot), Sara (15) (Increases intestinal activity), Tikshna (27) (Irritable)	Laghu (Light), Ruksha (Dry), Ushna (Hot)
3	Virya (Potency)	Ushna(14,26) (Hot)	Ushna(15,27) (Hot)	Ushna (Hot)
4	Vipaka (Stage of digestion)	Katu (14,26) (Pungent)	Katu (15,27) (Pungent)	Katu (Pungent)

5	Karma (Actions)	Kapha-marutaghna(14,26) (Reduces Kapha-vata), Pachani(14) (Digests undigested food material), Dipana(14) (Increases digestive fire), Gulmanashaka(14) (Decreases lump), Raktadoshanashaka (14) (Decreases blood disorder), Shothahara (14) (Decreases inflammation), Kasahara(14,26) (Anti-tussive), Kapha-shwasahara(14) (Anti-asthmatic), Jwarahara(14,26) (Anti-pyretic), Pinasa nashaka(14) (Lowers upper respiratory tract infection), Marutahara(14) (Decreases vata).	Pachani(15) (Digests undigested food material), Dipana(15) (Increases digestive fire), Kasahara(15) (Anti-tussive), Kapha-shwasahara(15) (Anti-asthmatic), Jwarahara(15) (Anti-pyretic), Anilnashaka (15) (Stabilizes vata), Pinasa nashaka(15) (Lowers upper respiratory tract infection), Parshwapida (15) (pain in upper abdomen), Kruminashaka (15) (Anti-bacterial), Hridayoganashaka(15) (Heart diseases)	Dipana (Increases digestive fire), Pachani (Digests undigested food material), Kasahara (Anti-tussive), Kapha-shwasahara (Anti-asthmatic), Jwarahara (Anti-pyretic), Pinasa nashaka (Lowers upper respiratory tract infection).
6	Indications	Shwasa(14,26) (Asthma), Kasa(14,26) (Cough), Pratishtyaya(14) (Upper respiratory infection), Yakshmaja Kasa(14) (), Vata-kaphaja Jwara(14,26) (Fever), Amavata(14) (Rheumatoid arthritis), Shotha (26) (inflammation), Vrana (26) (Wound), Krumi (26) (Anti-bacterial), Daha (26) (Heat reducing), Pinasa nashaka(26) (Lowers upper respiratory tract infection).	Kasa(15,27) (Cough), Shwasa(15,27) (Asthma), Pratishtyaya(15,27) (Upper respiratory infection), Jwara(15) (Fever), Angamarda(15) (Bodyache), Parshwapida (15) (Pain in upper abdomen), Hridayaroga(15) (Heart diseases), Admana (15) (Bloating), Vibandha (15) (Constipation), Ashmari (15,27) (Renal calculus), Vamananashaka (15) (Anti-emetic), Shotha (27) (Inflammation), Hikka (27) (Hiccough), Mutrakruchha (27) (Difficulty in urination).	Kasa (Cough), Shwasa (Asthma), Pratishtyaya (Upper respiratory infection), Jwara (Fever), Shotha (Inflammation).
7	Part used	Roots(26)	Roots, Seeds, Fruits, Panchanga, Whole plant (27)	Roots

Table 2: Physico-chemical Standards of *Clerodendrum serratum* and *Solanum surattense*

Sr. No.	Tests	<i>Clerodendrum serratum</i>	<i>Solanum surattense</i>	Comment
1	Foreign Matter	Nil	Nil	Nil
2	Moisture Content	11.70%	7.88%	Values as per API standard
3	Ash Value	3.97%	5.52%	Values as per API standard
4	Acid insoluble Ash	0.93%	1.94%	Values as per API standard
5	Water soluble extractive value	12.62%	41.91%	More in <i>Kantakari</i>
6	Alcohol soluble extractive value	8.99%	0.55%	More in <i>Bharangi</i>
7	Ph Value (5% solution)	6.03	6.04	Same
8	Specific gravity	1.00	1.00	Same

Table 3: Qualitative chemical screening of *Clerodendrum serratum* and *Solanum surattense*

Sr. No.	Phytoconstituents	<i>Clerodendrum serratum</i>	<i>Solanum surattense</i>
1	Alkaloids (Water)	+	-
2	Cardiac Glycosides	-	-
3	Anthraquinone Glycosides	-	-
4	Saponins	+	+
5	Flavonoids	-	+
6	Tannins	+	-

Discussion

Abhava and Abhava Pratinidhi Dravya from 16 th to 19 th century of Ayurveda referred texts has not mentioned any logic of selection of substitutes, parts used and details of usage in what pharmaceutical form. Two drugs can be substituted for each other only on the basis of botanical, pharmacognostical, phytochemical and pharmacological similarities or by Linking and observing, accessing its chemistry and bioactivity.

An analysis of the Table 1 indicates that the Dravyaguna qualities of the two drugs i.e. *Rasa* (Taste), *Guna* (Properties), *Vipaka* (Stage of digestion) , *Veerya* (potency) and *Karma* (Actions) were very similar. On analyzing their Ayurvedic pharmacology (*Dravyaguna* properties), findings show that both the drugs possess *katu* and *tikta rasa*, but *Bharangi* is *katu rasa* dominant and *Kantakari* is *tikta rasa* dominant drug. Along with this, both drug possess *laghu*, *ruksha* and *ushna guna* in common. *Kantakari* which contain different properties i.e. *sara* and *tikshna guna*. Both drugs possess *katu*

vipaka and *ushna veerya*. Both drugs have been stated to treat majority of respiratory ailments.

Table 2. shows the physico-chemical standard of the two drugs. Absence of foreign matter in both the drugs suggests purity of sample. All the physico-chemical parameters tested were as per Ayurvedic Pharmacopoeial Standard. (4,6) On analyzing in detail, it was found that water soluble extractive value of *Solanum surattense* Burm. f. is higher (41.91%) as compared to water soluble extractive value of *Clerodendrum serratum* (L.) Moon (12.62%). In case of alcohol soluble extractive value, *Clerodendrum serratum* (L.) Moon (8.99%) value is higher than alcohol soluble extractive value of *Solanum surattense* Burm. f. (0.55%). Ph value of both the drug is same i.e. 6.04. Both the drug have same Specific gravity i.e. 1.

Table 3. Phytochemical observations suggest that in *Bharangi* root extract alkaloids and tannins was present whereas *Kantakari* root extract was rich in flavonoids content. Saponins was present in maximum amount in both the plant extracts. Despite taxonomically unrelated and morphologically dissimilar, *Bharangi* has been substituted by *Kantakari* drug. In Ayurveda, more importance was given to pharmacological properties of raw drug rather than its botanical classification. Further comparative pre-clinical studies and bio-equivalence clinical studies has been needed to explore the different pharmacological properties.

Conclusion

After analyzing and comparing Ayurvedic properties by literary studies it was found that both the drugs possess similar Ayurvedic pharmacological properties and could be substituted for each other. But the chemical profile of two drugs was completely different. *Kantakari* and *Bharangi*, also taxonomically unrelated but have similar ayurvedic pharmacology (Dravyaguna) profile. From the above study it can be concluded that more integrative ayurvedic studies are needed to evaluate any herbal drug. Botanical classification is relevant for identification and quality control, but techniques to evaluate medicinal uses are more relevant for treatment/ practice purpose. Even though the current study is preliminary, it provides a different perspective that can be applied to study drug substitutes. For further scope of drug evaluation more comparative pre-clinical and clinical studies should be planned.

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