An overview of the causes of current practices in Pratini&nasw Dravyas (substitution of drugs) in Ayurveda including newer techniques for their evaluation

Pravin R. Joshi, Bhupesh R. Patel¹, Vinay J. Shukla²

Lecturer, Department of Dravyaguna, Gangadhar Shastri Gune Ayurveda Medical College, Ahmednagar, Maharashtra, ¹Assistant Professor, Department of Dravyaguna, ²Head, Pharmaceutical Chemistry Laboratory, Institute for Post Graduate Teaching and Research in Ayurveda, Jamnagar, Gujarat, India

Abstract

Many Pratini&nasw Dravyas in Ayurvedic classics are mentioned and certainly are based on a methodical approach, which involves many aspects. These principles on which Pratini&nasw Dravyas were decided are quoted nowhere; so both to understand the established Pratini&nasw Dravyas and to find new ones a rational approach is the need of the hour. This article is an effort in the direction to study this concept meticulously in light of modern techniques for its better understanding and application. As there are very few established parameters, which help for selection and evaluation of Pratini&nasw Dravyas. A rational technique like Fourier transform infrared spectroscopy may be incorporated to set a new dimension. As most of the routine analytical techniques are separation based, overall component load cannot be predicted. Thus, it is prime necessity to compare the drugs with a whole aspect, which goes in hand by hand with a holistic approach of Ayurveda “Treat the man as Whole – Take the drug as whole.”

Key words: Ayurveda, Fourier transform infrared spectroscopy, Pratini&nasw Dravya

Introduction

The world today is facing an increasingly disturbing trend of depletion of its natural resources such as petroleum, drugs, food, and lot of other materials. Intensive research is being carried out all over the world to find alternatives for these resources. Plant resources particularly medicinal plants are disappearing at an alarming rate and not enough attention is being given to seek alternate sources or substitutes for many of these plants. Although scores of medicinal species have vanished from our country or are threatened with extinction, India is blessed with one of the richest floras in the world and still there are hundreds of species, which have equal value to some of the commonly used plants and may be some of them; even be superior in their properties to those in common use.¹

Ayurvedic classics like Charaka and Sushruta have not given direct reference or listing of Pratini&nasw Dravyas, but Acharya Vaghbata explained Pratini&nasw Dravyas are explained as; when there is unavailability of any particular drug during preparation of a compound, one should try to get another drug having similar potency in terms of Rasa, Guna, Veerya, and Vipaka.² Not only this but a Vaidya can substitute a particular Dravya from a yoga (compound) based on the condition of patient, time, or disease.³ Detail description regarding Pratini&nasw Dravyas can be traced from lexicons such as Bhavaprakasha, Yogaratnakara, and Bhaishajya Ratnavali.

In terms of pharmacognosy, substitution is generally done when original material is not available or if available is in insufficient quantity. In words of Youngken, substitution indicates the replacing of one drug either in whole or in part by another drug. It is usually done with fraudulent intent but under certain condition a substitution may be justified. In case of drugs, substitutes should have proven efficacy as near as the original drug. The substitutes are of great economic importance to the country and efforts should be made for the systematic identification and evaluation by pharmacognostical and photochemical studies.⁴

Even though all the drugs have some active principles, which are predominantly responsible for their actions but at the same time these drugs also have some other fractions too, which may counteract their appalling effects, if any. Ayurveda advocates that the drug should be used as a whole, so that the desired effects may be had without side effects.⁵

As there are fewer established parameters, which support for selection and evaluation of Pratini&nasw Dravyas.

¹ Address for correspondence: Dr. Pravin R. Joshi, Trimurti Nagar, Plot No. 122, Parabhan - 431 401, Maharashtra, India. E-mail: ayurpravin@yahoo.co.in
A rational methodology like Fourier Transform Infrared Spectroscopy (FTIR) may be incorporated to set a new dimension in this regard. In Infrared (IR) spectroscopy, IR radiation is passed through a sample. Some of the infrared radiation is absorbed by the sample and remaining is passed through (transmitted). The resulting spectrum represents the molecular absorption and transmission, creating a molecular fingerprint of the sample. Like a fingerprint, no two unique molecular structures produce the same infrared spectrum. This makes infrared spectroscopy useful for several types of analysis. Important salient features which make FTIR an important tool in these aspects are:

- Identification of unknown materials.
- Determination of the quality or consistency of a sample.
- Determination the amount of multiple components in a mixture.
- The instrument measures all the infrared frequencies simultaneously, rather than individually.
- The sensitivity benefits enable identification of even the smallest of contaminants. This makes FTIR an invaluable tool for quality control or quality assurance applications, whether it is batch-to-batch comparisons to quality standards or analysis of an unknown contaminant.
- The sensitivity and accuracy of FTIR detectors, along with a wide variety of software algorithms, have dramatically increased the practical use of infrared for quantitative analysis.
- Quantitative methods can be easily developed and calibrated and can be incorporated into simple procedures for routine analysis.[6]

**Materials and Methods**

Available Ayurvedic and allied literatures were studied for comprehensive understanding of concept of Pratinidhi Dravyas. Relevant information from various different texts, journals, and internet media was also utilized based on availability and necessity for comprehensive understanding of the subject. A detailed list of classical drugs and their Pratinidhis with botanical names was prepared, which was critically studied and divided under various subclasses with possible logic involved them. Here, an attempt has been made to light on certain newer technique like FTIR which may be useful as one of the tool to analyze the concept of Pratinidhi Dravya.

**Discussion**

**Factors to be considered for selection of Pratinidhi Dravya**

1. Uncertain identity
2. Regional substitutes
3. Non-availability of the drug
4. Seasonal availability of the part
5. Shelf life of the drug
6. ambiguity due to synonym and homonyms
7. Cost of the drug
8. Preparation form of the drug
9. Geographical distribution of the drug
10. Conclusive aspects for regional substitution
11. On the basis of similar properties
12. Indications and contra indications of the drug
13. Usage of synthetic material
14. On the basis of morphological resemblance
15. Regional substitutes on the basis of vernacular names as linguistics
16. Usage of other parts of the same drug.

**Uncertain identity**

In Ayurvedic classics, certain drugs were unidentified, for these drugs the nearest matching characteristics, i.e., Nama (nomenclature), Rupa (morphological and other organoleptic characteristics), Guna (properties of the drugs), and Karma (action of the drug) were taken into consideration.[7]

For example:

i. Soma - Ephedra gerardiana (Wall) Stapf - Gnetaceae
ii. Tryamana - Gentiana kurroo Royle ex Benth - Scrophulariaceae
iii. Substitution for Ashtavargya Dravyas

- Jivaka, Rushabhaka - Vidarikanda. (Pueraria tuberosa DC. - Leguminosaceae).
- Meda, Mahameda - Shattavari. (Asparagaceae - Leguminosaceae).
- Kakoli, Kshirakakoli - Ashwagandha. (Withania somnifera Dunal - Solanaceae).
- Ruddhi, Vridhi - Varahikanda. (Dioscorea bulbifera Linn. - Dioscoreaceae).

**Regional substitutes**

Under one name, various drugs were used in various regions as there are changes in vernaculars, misidentification or adulteration practices, traditions practicing of Vâda community and specific drug action on the available source may be the cause of introduction of regional substitute.[8]

**Rasna**

- Pluchea lanceolata Oliver and Hiren - Asteraceae - Punjab and Gujarat
- Alpinia galanga Willd - Zingiberaceae - South India
- Vanda roxburghii R. Br. - Orchidaeae - Bengal.

**Shankhpushpi**

- Clitoria ternatea Linn. - Papilionaceae - Kerala
- Evolvulus alsinoides Linn. - Convolulaceae - North India
- Canscora decussata Schult - Gentianaceae - In some other regions.

**Non-availability of the drug**

In case of the non-availability of Talisâ patra, i.e., Abies webiana Lindl - Pinaceae leaf of the Taxus baccata Linn. - Taxaceae are used.[9]

**Seasonal availability of the part**

Certain part of drugs are available seasonally in these cases, other drug can be introduced, which is having the same action.

**Rakta Panarnava** (Boerhaavia diffusa Linn. - Nyctaginaceae) can be substituted for Shveta Panarnava (Trianthema portulaceous Linn. - Ficidaceae) in case of non-availability.[10]

**Shelf life of the drug**

Dravyas like Ativisha (Aconitum heterophyllum Wall - Ranunculaceae), which get infected easily by cankers, thus may be substituted by drug like Musta (Cyperus rotundus Linn. - Cyperaceae). If Purana Gada (old jaggery) is not
available then Gada (jaggery) should be taken by heating it in sun rays for 4 h.[19,22]

Ambiguity due to synonym and homonyms
Jivanti is a synonym of several other drugs such as Guduchi, Abhaya, Meda, Kakoli, and Vrikshadani resulting a lot of confusion in identity of the drug thus one should always refer to the source plant.[17]

Cost of the drug
Rasna moola (Pluchea lanceolata Oliver and Hiern - Compositae) value in the market is near about 700 Rs per kg instead of that pharmacies are using leaf of Rasna.

Kumkuma (Crocus sativus Linn. - Iridaceae) being costly herb is substituted by Kasumbha (Carthamus tinctorius Linn. - Compositae). Though here it is mentioned as substitute rather, the drugs used as adulterant in which Guna Karnas will not match.[15]

Preparation form of the drug
Ayurvedic classics like Yogaratnakara suggests that substitution can be done in the form preparation in case of unavailable prepared material and which can be used in emergency conditions.

For example, in case of unavailability of Guduchi Sattva (aqueous extract of Tinospora cordifolia (Willd.) Miers - Menispermaceae); Guduchi Swarasa (juice) can be used.[14]

Geographical distribution of the drug
Though India is one among the richest bio-diversity all over the world, geographical variations are always there as some plants like Vastanabha (Acoinitum ferox Wall - Ranunculaceae) are available in Himalaya, which are not found in Southern parts of India.

Calotropis procera (Ait) R. Br. - Asclepiadaceae is not available in Kerala, where Calotropis gigantea (Linn.) R. Br. ex Ait. - Asclepiadaceae is commonly seen in south India.[16]

Conclusive aspects for regional substitution
To avoid the controversy of the drugs, Raj Nighantu finds mid-way, as he mentioned Mula (Plucheia lanceolata Oliver and Hiern - Compositae), Patra (Vinca rosea L. - Apocynaceae) and Truma (Vanda roxburghii R. Br. - Orchidaceae) as varieties of Rasna.[17]

On the basis of similar properties
Although Dhamsasa and Yavasa are identified with Fagonia cretica Linn. and Alhagi pseudalhagi (Bieb.) Desv., respectively; and they are belonging to different families, they are considered to be almost identical in their properties and have been used as substitute.[19]

Indications and contra indications of the drug
When it is found that different drugs having similar nomenclature are mentioned in a single formulation then the purpose, the context, the treatise, and the reasoning should be taken into consideration for their proper usage. For example, Vasa is a well-known Rakta-Pittahara drug, but due to its abortifacient activity its utility in pregnant women is limited, instead drugs such as Laksha and Ashoka can be substituted.

Instead of Bhallatka (Semicarpus anacardium Linn. f. - Anacardeae) Godambi, i.e., Phalasthi is indicated in Narasinha Churna in case of Pitta Prakruti.[19,20]

Usage of synthetic material
As procurement of these drugs in natural sources are difficult and are easily available in synthetic form, such forms can be substituted in case of unavailability.

For example, Camphor (Cinnamomum camphora Nees and Eberm - Lauraceae) and Vamsarochana (Bambusa arundinacea Willd - Gramineae).[21]

On the basis of morphological resemblance
Morphological resemblance play an important role in case of plant substitution as synonym of Nimba tree (Azadirachta indica A. Juss) is mentioned for Aralu (Ailanthus excelsa Roxb.) on the basis of resemblance and further substituted for Shyonaka (Orosyllum indicum Vent) by Dalhanka.

The root tubers and bultilbs of many Dioscorea species are used as articles for food by the tribal people of the forest. They are the Yams known by different names such as Pitalu, Kasalu, and Pinndluka. So, as the drug Spirulina (Spirulina platensis - Oscillatoriaceae) this resembles Chlorella and Aphaniizomenon flos - Aquae; which are also called as blue green algac.[22,23]

Regional substitutes on the basis of vernacular names as linguistics
More than one official substitute is used on the basis of the regional variation. One has to include region-wise traditionally used substitutes in study of substitutes.

For example, as in Gujarat region Uraria pica de Desv - Fabaceae is known as Pilo Sameravo and as that of Alysicarpus longifolius W. and A. Prodr - Fabaceae is known as Ubho Sameravo. Shaliparni (Desmodium gangeticum DC - Fabaceae) as Pandadiyo and that of Desmodium lexifiolorum DC - Fabaceae is known as Ruchalo Pandadiyo.[24]

Usage of other parts of the same drug
Rather than exploitation of the whole drug, the easily available parts of the same plants may be used to enrich the introduction of Pratinidhi Dravya. For example, leaves in place of fruits.

Procurement of authentic Dashamoola in the market is a herculean task, so the parts of these plants may be useful.[25]

In case of unavailability of a drug; from classical botanical perspective, it is not necessary that the drug must and should possess the same/single botanical source as regional variations are there. Thus, to encounter this problem of unavailability, resemblance and synonyms based on morphology of the drug should be assessed for selection of different botanical species, which can be used as source plants for a particular drug.

To overcome this problem of depletion in depots of medicinal plants, measures such as cultivation and propagation are good options. Both the Government as well as the private sectors is trying to overcome this problem. By looking in the overall scenario, it seems that this option has its own limitations as up to some extent it is true that some plants grow properly only in their natural habitat.
When particular medicinal substances are specifically mentioned then there should not be any question of substitute. Use of pure authentic substitute instead of adulterated original substances is becoming the order of the day at the present time. To cross this barrier, we can use the drugs, which are not explained in the Ayurvedic literatures but which are available in natural sources abundantly. Before such usage, these drugs should be assessed based on synonym, homonym, or regional language, similarity and usage. Thus, the region-wise introduction of the substitutes is the only criteria to achieve the task of herbal practices in Indian sub-continent. Along with efficacy, the safety and efficacy of the drug should also be analyzed on various parameters. Though there are very few established tools to find out substitutes of drugs. Efforts in this direction are also needed.

The holistic approach of treatment in Ayurveda believes that there will not be encouraging pharmaco-dynamic or chemotherapeutic actions; these drugs show only pharmaco-therapeutic action. For example, Shankpushpi reduces hypertension, but does not cause hypotension in healthy volunteers. Thus, it is the need of the hour that Ayurvedic drugs should be assessed as a whole rather than a single moiety.

The analytical tools like FTIR may be rational for finding out substitutes, as routine analysis techniques are separation based so overall component load cannot be predicted hence it is prime necessity to compare the drugs with a whole aspect. Using application of recent advanced absorption techniques like FTIR, is the new dimension which is need of the situation to be applied for standardization of herbal drugs. By FTIR solid, liquid, or gaseous material can be analyzed as a whole mixture. FTIR is a non-destructive technique; it provides a precise measurement method which requires no external calibration. It can identify unknown materials as well as quality or consistency of a sample and the amount of components in a mixture.

To support this claim, a previous research has proved that; assessment of herbal medicines by chemo metrics-assisted interpretation of FTIR spectra was done successfully. The research has dealt with 10 different species of Orthosiphon stamineus from different geographical origins and varieties having varied complex mixture. It has been concluded as this model may be of great use for quality inspection of raw herbal material on a continuous basis as new batches are produced. Chemo metrics analysis of spectra data is rapid and simple since no chemical treatments of samples are required. The research incorporated to testimony scientific base and assessment of scientific evaluation of the drug should be applied for standardization of herbal drugs. By FTIR analysis, IJRAP 2010, 1 (1); 8-12. Available from: http://www.ijrap.net/ 2005. p. 178.

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Conclusion

Resemblance, synonym based on morphology, regional adaptation of the drugs as vernaculars, which relates to various pharmacological actions under the guidance of ethical teamwork can narrate Pratinidhi Dravya on parallel lines of Ayurvedic principles. Selection of Pratinidhi Dravyas on the basis of Ayurvedic tools and current newer methodologies should incorporate to testimony scientific base and assessment of scientific evaluation of the drug.

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हिंदी सारांश

सद्य परिस्थिति में आयुर्वेदीय प्रतिनिधि द्वारा का आकलन एवं नयी उपकरण परीक्षण विधि से मानकीकरण

प्रबीण आर. जोशी, भूपेश आर. पटेल, विनय जे. शुक्ला

आयुर्वेद शास्त्र में प्रतिनिधि द्रव्यों का उपयोग लिखित मिलता है। प्रतिनिधि द्रव्य का उपयोग सामान्यता रूप से उपयुक्त है एवं उसके पीछे निभित धारणाओं जुड़ी हुई हैं। शास्त्रों में प्रतिनिधि द्रव्य की समझ विशद रूप से नहीं दी गयी है, इसलिए इस क्षेत्र में और स्पष्टीकरण आवश्यक है। कल्पना नयी तकनीकों को लेकर प्रतिनिधि द्रव्यों को स्पष्ट करने की जरूरत है, ताकि हमें यह पाठ पूर्णतया अनुभव हो। प्रतिनिधि द्रव्यों को स्थापित करने के बहुत कम तकनीकी साधन उपलब्ध हैं। बहुत सारे उपकरणीय आधार ज्ञापन: समिति दिखायें हैं, इसीलिए सम्पूर्ण द्रव्य का अध्ययन मुश्किल होता है। अतः एफ.टी. आई. आर. जैसी उपकरण परीक्षण विधि से हम पूरे द्रव्य का अध्ययन कर सकते हैं और यह आयुर्वेदीय सिद्धांत सम्पूर्ण भी है। तत्पर्य यही है कि सम्पूर्ण देह की विकल्पा करने समय सम्पूर्ण द्रव्य का अध्ययन आवश्यक है।