



Review Article

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

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Abstract

Many *Pratinidhi Dravyas* in Ayurvedic classics are mentioned and certainly are based on a methodical approach, which involves many aspects. These principles on which *Pratinidhis* were decided are quoted nowhere; so both to understand the established *Pratinidhis* 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 *Pratinidhi 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, *Pratinidhi 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 *Pratinidhi Dravyas*, but *Acharya Vagbhata* explained *Pratinidhi* 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 *Pratinidhi Dravyas* can be traced from lexicons such as *Bhavaprakasha*, *Yogaratanakara*, 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 *Pratinidhi Dravyas*.

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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]
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 *Ashtavarga Dravyas*
 - *Jivaka*, *Rushabhaka* - *Vidarikanda*. (*Pueraria tuberosa* DC - Leguminosae)
 - *Meda*, *Mahameda* - *Shatavari*. (*Asparagus racemosus* Willd - Liliaceae)
 - *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 *Vaidya* 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. - Orchidaceae - Bengal.

Shankhapuspi

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

Non-availability of the drug

In case of the non-availability of *Talisa 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 Punarnava (*Boerhaavia diffusa* Linn. - Nyctaginaceae) can be substituted for *Shweta Punarnava* (*Trianthema portulacastrum* Linn. - Ficoideaceae) 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 Guda* (old jaggery) is not

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

available then *Guda* (jaggery) should be taken by heating it in sun rays for 4 h.^[11,12]

Ambiguity due to synonym and homonyms

Jivanti is a homonym 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 depend on the source plant.^[13]

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 *Kusumbha* (*Carthamus tinctorius* Linn. - Compositae). Though here it is mentioned as substitute rather; the drugs used as adulterant in which *Guna Karmas* will not match.^[14]

Preparation form of the drug

Ayurvedic classics like *Yogaratanakara* 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.^[15]

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* (*Aconitum 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* (*Pluchea lanceolata* Oliver and Hiern - Compositae), *Patra* (*Vinca rosea* L. - Apocynaceae) and *Truna* (*Vanda roxburghii* R. Br. - Orchidaceae) as varieties of *Rasna*.^[17]

On the basis of similar properties

Although *Dhamasa* 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.^[18]

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. - Anacardaceae) *Godambi*, i.e., *Phalasthi* is indicated in *Narsimha 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 - Gramine).^[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* (*Oroxylum indicum* Vent) by *Dalhana*.

The root tubers and bulbils 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 *Pindluka*. So, as the drug *Spirulina* (*Spirulina platensis* - Oscillatoriaceae) this resembles *Chlorella* and *Aphanizomenon flos* - Aquae; which are also called as blue green algae.^[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 picta* 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 lexiciflorum* 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, *Shankapushpi* 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.^[26] These are the initial outputs of the results as there are no work carried out yet on *Pratinidhi Dravya* by FTIR, the research is under progress by the scholar in I.P.G.T. and R.A., Gujarat Ayurved University, Jamnagar.

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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हिन्दी सारांश

सद्य परिस्थिति में आयुर्वेदीय प्रतिनिधि द्रव्यों का आँकलन एवं नयी उपकरण परीक्षण विधि से मानकीकरण

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

आयुर्वेद शास्त्र में प्रतिनिधि द्रव्यों का उल्लेख मिलता है। प्रतिनिधि द्रव्यों का उपयोग सैद्धांतिक रूप से उपयुक्त है एवं उसके पीछे निश्चित धारणाएँ जुड़ी हुई हैं। शास्त्रों में प्रतिनिधि द्रव्य की समझ विशद रूप से नहीं दी गयी है, इसलिये इस क्षेत्र में और स्पष्टीकरण आवश्यक है। कतिपय नयी तकनीकों को लेकर प्रतिनिधि द्रव्यों को स्पष्ट करने की जरूरत है, ताकि हमें यह पाठ पूर्णतया अनुज्ञत हो। प्रतिनिधि द्रव्यों को स्थापित करने के बहुत कम तकनीकी साधन उपलब्ध हैं। बहुत सारे उपकरणीय आधार द्रव्यतः भिन्नता दिखाते हैं, इसीलिये 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 सिद्धान्त सम्मत भी है। तात्पर्य यही है कि सम्पूर्ण देह की चिकित्सा करते समय सम्पूर्ण द्रव्य का अध्ययन आवश्यक है।