



## Substitutes for *Ayurvedic* medicinal herbs: A Review

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**ABSTRACT:** Substitution practice of herbal drugs should be implemented in the current era as 247 out of 560 medicinal plants in India listed as threatened species. In the present review, substitute drugs of herbal origin are studied. There are total 47 herbal drugs enlisted, out of which 28 drugs showed similar useful part of the plant; while 19 showed different parts. Though they belong to different families and species taxonomically, almost all drugs have similar medicinal properties (*Rasapanchaka*). It proves that the concept of substitution is based on Pharmacological activity rather than Morphology or Phyto-constituents of a drug. This concept stresses upon the use of herbs that are cultivated in abundance, easily available, locally procured, cost-effective and most appropriate for the clinical condition. By the use of these substitutes conservation and sustainability of herbs is achieved; thus India can increase the quality standards of medicinal formulation in herbal drug industry. Here a sincere attempt is made to explore the concept of substitution in medicinal herbs.

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**Keywords:** *Abhav Dravya, Abhav Pratinidhi Dravya, Substitution in Ayurvedic herbs, Adulteration*

### 1. Introduction

In current era, generations are becoming aware of side effects and adverse reactions of synthetic drugs. So, there is rise in need of herbal, natural and Ayurvedic drugs. According to a report published in the scientific journal 'Science', between 22% and 42% of the world's plant species are endangered [1]. Worldwide, between 50000 and 80000 flowering plants are used medicinally. Out of these, at least 15000 may face extinction due to overharvesting and habitat loss. Experts estimate that the Earth is losing at least one potential major drug every two years [2]. The world average stands at 12.5% while India has 20% plant species that is one fifth of its plants are of medicinal value and which are in use. A total of 560 plant species of India have been included in the International union of conservation of nature and natural resources (IUCN) Red list of threatened species, out of which 247 species are in the threatened category [3].

As a result of which Adulteration in endangered *Ayurvedic* drugs has become a burning problem in herbal pharmacy and pharmaceutical industry. Factors like civilization and industrialization results in deforestation and extinction of many plant species which highly impacts on production and marketing of commercial *Ayurvedic* formulations.

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Adulteration is a practice of substituting the original crude herbal drug partially or fully with other herb which is free from or inferior in therapeutic properties or addition of low quality, spoiled or entirely different drug species similar to that of original one substituted with an intention of enhancement of profits in market. The adulterated parts may be of same or different plant species or drug which has uncertain authentication standards. This adulteration may deteriorate the standard and efficacy of *Ayurvedic* drugs [4]. Worldwide, adulteration and substitution in herbal drugs is noted. For example, *P. ginseng* is mostly substituted by *P. quinque folius* (American ginseng). *Taraxacum mongolicum* is often substituted by six species of Compositae family. Bulb of *Fritillaria cirrhosa*, an authentic drug mentioned in *Chinese Pharmacopoeia* (1995), is commonly used as an antitussive and expectorant. It has often been adulterated with similar bulbs of other related species [5].

Hence when the original drug species in its mentioned form is not available, the concept of *Pratinidhi dravyas* (substitutes for herbal drugs) arises. This concept came into focus in medieval period that means after the *Samhita* period. *Pratinidhi* means representation or substitute [6]. Our *Ayurvedic* classical texts throw light on concept of 'drug substitution'. The principle behind selection of substitute drug is based on similarity of properties (*Rasa, Guna, Virya* and *Vipaka*), but mainly on therapeutic action (*Karma*). The *Charaka* and *Sushruta* have not mentioned any references regarding substitute drugs, but *Acharya Vagbhata* has described that in case of non-availability of a specific herb in compound formulation, one should think about other species which is similarly potent and has similar *Rasa (Taste), Guna (Property), Virya (Potency)* and *Vipaka (bio-transformation of Rasa)* [7]. Detail description regarding substitute drugs can be traced from the *Bhavaprakasha* (Author *Bhavamishra*, 16th century), *Yogaratanakara* (17th century) and *Bhaishajya ratnavali* (Govind Das 14<sup>th</sup> century) [8]. *Bhavmishra* in his '*Bhavprakasha nighatu*' which is a bridge between medieval & modern period, has described *Pratinidhi dravya* in *Mishra prakarana* [9]. It includes a list of 47 drugs of herbal origin (*Sthavar*), 2 drugs of animal origin (*Jangam*), 7 drugs of Minerals and Metals origin (*Bhouma*) and 5 from food material (*Aahariya*) [10]. Similarly in *Yogaratanakar* [11] and *Bhaishajya Ratnavali* [12] also there are some references regarding *Pratinidhi dravya*. Substitute is intentionally selected plant species used to achieve the desired effect in medicinal formulation for achieving economic feasibility [13].

In the present work, an attempt has been made to understand the concept of *Abhava Pratinidhi Dravya* (Drug substitution) which will decrease the severity of problems arising in cultivation, propagation of some species as well as production of some formulations in herbal industry.

## 2. Material and methods

Concept of *Abhava Pratinidhi Dravya* (drug substitution) studied in available *Ayurvedic* Literature and compiled along with their Latin names and families. Details regarding substitute drugs of herbal origin from *Ayurvedic* texts, various journals and Internet media were studied together and used for comprehensive understanding of the subject. A detail list of classical herbal drugs and their substitutes with their botanical names was prepared and explored further.

## 3. Observation and results

**Table 1: Substitute herbal drugs from *Ayurvedic* lexicon *Shaligram Nighantu*: [14], [15]**

Sr. no.	Main Drug with Botanical name	Part Used	Substituted drug with Botanical name	Part used
1.	<i>Chitraka</i> <i>Plumbago zeylanica</i> Linn. Plumbaginaceae	Root bark	<i>Dantimula</i> <i>Baliospermum montanum</i> Muell.- Arg.- Euphorbiaceae	Root
			<i>Apamargakshara</i> <i>Achyranthes aspera</i> Linn. Amaranthaceae	Whole plant & <i>Kshar</i>

2.	<i>Dhanvayas (Dusparsha)</i> <i>Alhagi camelorum</i> Fisch.- Fabaceae	Whole plant	<i>Duralabha (Dhamasa)</i> <i>Fagonia Arabica</i> Linn. Zygophyllaceae	Whole plant
3.	<i>Tagara</i> <i>Valeriana wallichii</i> DC. Valerianaceae	Root	<i>Kushtha</i> <i>Saussurea lappa</i> C.B.Clarke- Compositae	Root
4.	<i>Moorva</i> <i>Marsdenia tenacissima</i> W.&A. Asclepiadaceae	Root	<i>Zinginitwaka</i> <i>Odina woodier</i> Roxb.- Anacardiaceae Or <i>Lannea coromandelica</i>	Stem Bark
5.	<i>Ahinsra</i> <i>Capparis sepiaria</i> Linn. Capparidaceae	Root	<i>Mankand</i> <i>Alocasia indica</i> Scott. Araceae	Rhizome/Corn
6.	<i>Lakshmana</i> <i>Ipomea sepearia</i> Koen. Convolvulaceae	Root, whole plant	<i>Nilkanthashikha (Mayurshikha)</i> <i>Elephantopus scober</i> Linn.- Polypodiaceae/ <i>Actinopteris dichotoma</i> Bedd/ <i>Adiantum caudatum</i> Linn.	Whole plant
7.	<i>Bakul</i> <i>Mimusops elengi</i> Linn. Sapotaceae	Flower, bark	<i>Kamal, Utpal</i> <i>Nelumbo nucifera</i> Willd. Nymphaeaceae	flower,
8.	<i>Nilotpal</i> <i>Nymphaea stellate</i> Willd Nymphaeaceae	Flower, stamens	<i>Kumud</i> <i>Nymphaea alba</i> Linn. Nymphaeaceae	flower, stamens
9.	<i>Jatipushpa (Javitri)</i> <i>Myristica fragrans</i> Hoult. Myristicaceae	Fruit aril	<i>Lavanga</i> <i>Syzygium aromaticum</i> Merr.& L.M. Perry- Myrtaceae	Flower bud
10.	<i>Arkadugdha</i> <i>Calotropis procera</i> R. Br. Asclepiadaceae	Latex	<i>Arkaparna</i> <i>Calotropis procera</i> R. Br.- Asclepiadaceae	Leaf juice
11.	<i>Pushkarmula</i> <i>Inula racemosa</i> Hook.f. Compositae	Roots	<i>kushtha</i> <i>Saussurea lappa</i> C.B.Clarke Asteraceae	Root
	<i>Langali</i> <i>Gloriosa superba</i> Linn. Liliaceae	Bulb		
	<i>Sthouneyaka</i> <i>Clerodendrum infortunatum</i> Linn.- Verbenaceae	Leaves Root		
12.	<i>Chavya (Gajapippali)</i> <i>Piper chaba</i> Hunter Piperaceae	Root	<i>Pippalimula</i> <i>Piper longum</i> Linn. Piperaceae	Root
13.	<i>Somaraji (Bakuchi)</i> <i>Psoralea corylifolia</i> Linn. Fabaceae	Seeds, Seed-oil	<i>Prapunnat (Chakamarda)</i> <i>Cassia tora</i> Linn. Caesalpiniaceae	Fruit
14.	<i>Daruharidra</i> <i>Berberis aristata</i> DC. Berberidaceae	Stem bark	<i>Haridra</i> <i>Curcuma longa</i> Linn. Zingiberceae	Rhizome
15.	<i>Rasanjan</i> Extractum Berberis	Extract	<i>Daruharidra</i> <i>Berberis aristata</i> DC.	Stem- Bark

	Berberidaceae		Berberidaceae	
16.	<i>Talispatra</i> <i>Abies webbiana</i> Lindl. Pinaceae	Leaves	<i>Swarnatalis</i>	
17.	<i>Bharangi</i> <i>Clerodendrum serratum</i> Spreng. Verbenaceae	Roots	<i>Talispatra- Abies webbiana</i> Lindl. Pinaceae <i>Kantakari-Solanum xanthocarpum</i> Schrad & Wendl. Solanaceae <i>Jatamansi- Nordostachysjatamansi</i>	Leaves Roots
18.	<i>Yashtimadhu</i> <i>Glycyrrhiza glabra</i> Linn. Fabaceae	Root	<i>Dhataki</i> <i>Woodfordia fruticosa</i> Kurtz. Lytharaceae	Flowers
19.	<i>Amlavetas</i> <i>Garcinia pedunculata</i> Roxb. Guttiferae	Fruit	<i>Chukra</i> <i>Rumex vesicularis</i> Linn. Polygonaceae	Leaves, Whole plant
20.	<i>Draksha</i> <i>Vitis vinifera</i> Linn. Vitaceae	Fruit	<i>Kashmariphala</i> <i>Gmelina arborea</i> Linn. Verbinaceae	Fruit
21.	<i>Kashmariphala</i> <i>Gmelina arborea</i> Linn. Verbinaceae	Fruit	<i>Bandhukapushpa (Japapushpa)</i> <i>Hibiscus rosa-sinensis</i> Linn. Malvaceae	Flowers
22.	<i>Kankol</i> <i>Piper cubeba</i> Linn. f. Piperaceae	Fruit	<i>Jatipushpa</i> <i>Jasminum grandiflorum</i> Linn. Myristicaceae	Flowers
23.	Karpur <i>Cinnamomum camphora</i> Nees & Eberm Lauraceae	Extract	<i>Sugandhimusta</i> <i>Cyperus rotundus</i> Linn Cyperaceae , <i>Granthiparna</i> <i>Polygonum aviculare</i> Linn.	Tubers
24.	<i>Kumkum</i> <i>Crocus sativus</i> Linn. Iridaceae	Stamens/ Stigma	<i>Nava kusumbhapushpa (karadai)</i> Flowers of <i>Carthamus tinctorius</i> Linn.- Compositae	Fresh Flower
25.	<i>Shwetachandan</i> <i>Santalum album</i> Linn. Santalaceae	Heart- wood	<i>Karpur</i> <i>Cinnamomum camphora</i> Nees & Eberm Lauraceae	Extract
26.	<i>Chandan- Santalum album</i> Linn. Santalaceae	Heart- wood	<i>Raktachandan</i> <i>Pterocarpus santalinus</i> Linn. F. Fabaceae	Heart wood
	<i>Karpur- Camphora</i> Lauraceae			
27.	<i>Raktachandan</i> <i>Pterocarpus santalinus</i> Linn. F. Fabaceae	Heart wood	<i>Nava ushir</i> <i>Vetivera zizanioides</i> Linn. Gramineae	Fresh Fibrous Root
28.	<i>Ativisha</i> <i>Aconitum heterophyllum</i> Wall. Ranunculaceae	Tuberous root	<i>Musta</i> <i>Cyperus rotundus</i> Linn. Cyperaceae	Tuberous roots

29.	<i>Nagkeshar</i> <i>Mesua ferrea</i> Linn. Guttiferae	Flower stamens	<i>Padmakeshar</i> <i>Nelumbium speciosum</i> Willd Nymphaeaceae	Flower stamens
30.	<i>Meda, Mahameda</i> [16], [18] <i>Polygonatum cirrifolium</i> Linn Liliaceae	Bulbs	<i>Shatavari</i> <i>Asparagus racemosus</i> Willd. Liliaceae	Fasci- culate Roots
31.	<i>Jivaka</i> [16], [18] <i>Microstylis wallichii</i> Linn Orchidaceae <i>Rishabhaka</i> [16], [18] <i>Microstysis muscifera</i> Orchidaceae	Bulbs	<i>Vidarikanda</i> <i>Pueraria tuberosa</i> DC. Fabaceae	Bulb
32.	<i>Kakoli-</i> [16] <i>Fritillaria roylei</i> Liliaceae <i>Kshirkakoli-</i> [16], [18] <i>Lilium polyphyllum</i> D.Don Liliaceae	Bulbs	<i>Ashwagandha</i> <i>Withania somnifera</i> Dunal Solanaceae	Roots
33.	<i>Riddhi</i> [16], [18] <i>Habenaria edgeworthii</i> Orchidaceae <i>Vridhhi</i> [16], [18] <i>Habenaria latilabris</i> Orchidaceae	Bulbs	<i>Varahikanda</i> <i>Dioscorea bulbifera</i> Linn. Dioscoreaceae	Bulb
34.	<i>Varahikanda</i> [17], [18] <i>Dioscorea bulbifera</i> Linn. Dioscoreaceae	Bulb	<i>Charmakaraluka</i> <i>Tacca aspera</i> Roxb. Taccaceae	Bulb
35.	<i>Bhallataka</i> <i>Semicarpus anacardium</i> Linn.F Anacardiaceae	Fruits	<i>Raktachandan</i> <i>Pterocarpus santalinus</i> Linn. F. Fabaceae	Heart-wood
			<i>Chitraka</i> <i>Plumbago zeylanica</i> Linn. Plumbaginaceae	Root bark
36.	<i>Ikshu</i> <i>Saccharum officinarum</i> Gramineae	Stem, roots	<i>Nala</i> <i>Phragmites kirka</i> Trin.ex.Steud or <i>Lobelia</i> Graminae	Roots, stems

**Table 2: Substitute herbal drugs from Ayurvedic text [19]**

Sr. no.	Main Drug name With Botanical name	Substituted drug name With Botanical name
1.	<i>Khadiratwak</i> Bark of <i>Acacia catechu</i> Willd.	<i>Nimbatwak</i> Bark of <i>Azadirachta indica</i> A.Juss.
2.	<i>Pathamula</i> Root of <i>Cissampelos pareira</i> Linn.	<i>Shweta musali mula</i> Root of <i>Asparagus adscendens</i> Roxb.

3.	<i>Pippali</i> fruit <i>Piper longum</i> Linn.	<i>Marich</i> fruit <i>Piper nigrum</i> Linn.
4.	<i>Pippali mula</i> Root of <i>Piper longum</i> Linn	<i>Marich mula</i> Root of <i>Piper nigrum</i> Linn.
5.	<i>Bala bija</i> Seeds of <i>Sida cordifolia</i> Linn.	<i>Atibala bija</i> Seeds of <i>Abutilon indicum</i>
6.	<i>Balharitaki</i> fruit <i>Terminalia chebula</i>	<i>Aamalaki</i> fruit <i>Embelica officinalis</i>
7.	<i>Bhumi kushmanda</i> fruit	<i>Ashwagandha</i> root <i>Withania somnifera</i> Dunal
		<i>Varahikanda</i> bulb <i>Dioscorea bulbifera</i> Linn.
8.	<i>Ushir</i> root <i>Vetivera zizanioides</i> Linn.	<i>Musta</i> root <i>Cyperus rotundus</i> Linn.
9.	<i>Vacha</i> root <i>Acorus calamus</i>	<i>Morvel</i> root <i>Marsdenia tenacissima</i> W.&A.
10.	<i>Samudrashok</i> root <i>Argyreia speciosa</i> Linn.F.	<i>Vidhara</i> root <i>Argyreia speciosa</i> Linn.F.
11.	<i>Shunthi</i> rhizome <i>Zinziber officinale</i>	<i>Aardraka</i> rhizome <i>Zinziber officinale</i>

### Need for substitution

#### 1 Non-availability or less availability of the drug

In case of non-availability of leaves of the *Abies webbiana* (*Talisapatra*) leaves of the *Abies baccata* are used. *Ashtavarga dravya* (group of 8 herbs) are rare and listed in endangered medicinal plants as they are found in high altitude area from 2000 to 4000 m height in Himachal Pradesh and northern Himalayan valleys. [20]

So these herbs are substituted by following drugs having more availability and similar properties:

<i>Meda,</i> <i>Mahameda</i>	<i>Polygonatum cirrifolium</i> Linn	<i>Shatavari</i>	<i>Asparagus racemosus</i> Willd.
<i>Jivaka,</i> <i>Rishabhaka</i>	<i>Microstylis wallichii</i> Linn <i>Microstylis muscifera</i>	<i>Vidarikanda</i>	<i>Pueraria tuberosa</i> DC.
<i>Kakoli,</i> <i>Kshirkakoli</i>	<i>Lilium polyphyllum</i> <i>Fritillaria roylei</i>	<i>Ashwagandha</i>	<i>Withania somnifera</i> Dunal
<i>Riddhi,</i> <i>Vridhhi</i>	<i>Habenaria edgeworthii</i> <i>Habenaria latilabris</i>	<i>Varahikanda</i>	<i>Dioscorea bulbifera</i> Linn.

#### 2 Unsure identity of the drug

For the herb *Lakshmana* different species such as *Aralia quinquefolia*, *Ipomea sepiaria* etc are considered.

### 3 Over exploitation of herbs

As drug like *Daruharidra* (*Berberis aristata* DC.) from Berberidaceae family is in high demand due to over exploitation, its stem-bark is substituted by rhizome of *Haridra* (*Curcuma longa* Linn.) from Zingiberaceae family.

### 4 High Cost of the drug

*Kumkuma* (*Crocus sativus*) being expensive herb cannot be affordable to lower socio-economic class of people; therefore is substituted by *Kusumbha* (*Carthamus tinctorius*).

### 5 Deficiency of plant species distribution in specific Geographical area

In North India *Premna integrifolia* (*Bruhat Agnimantha*) is used as *Agnimantha*; while in South India *Arani* (*Clerodendrum phlomidis*) (*Laghu Agnimantha*) is used.

### 6 The adverse reaction of the drug

*Vasa* (*Adhatoda vasica*) is abortifacient in nature so it is contraindicated in pregnancy. Therefore, *Laksha*, *Ashoka* (*Saraca indica*) are substituted for similar *raktapittahar* activity.

### 7 Seasonal availability of drugs

Some drugs are available in specific season so other drugs can be introduced, which have same action. For example: *Trianthema portulacastrum* can be used in seasonal absences of *Boerhavia diffusa*.

## Discussion

In the present review, substitute drugs of herbal origin are studied (Table 1,2). There are total 47 herbal drugs enlisted, out of which 28 drugs showed similar useful part of the plant; while 19 showed different parts. Though they belong to different families and species taxonomically, almost all drugs have similar medicinal properties that mean *Rasapanchaka*. It proves that the concept of substitution is based on Pharmacological activity rather than Morphology or Phyto-constituents of a drug.

(*Kadaachit dravyamekam vaa yoge yatra na labhyate*)

(*Tattad gunayutam dravyam, parivarten ghruhyate*) | -*Oushadhi vignana*)

Substitute is rational replacement of a drug to get similar therapeutic action from replaced material. For some drugs substitutes are mentioned of different species of same family like *arkadugdha- arkaparna, nilotpal-kumud, chavya- pippalimula* and *rasanjan- daruharidra*. In some places, multiple drugs can be substituted by a single drug like *pushkarmula, tagar, langali* and *sthouneyaka* are substituted by *kushtha*. Some expensive herbs like *Kumkuma* (*Crocus sativus*) are substituted by cost-effective *Kusumbha* (*Carthamus tinctorius*).

These substitutes are for a guideline for practitioner, one should always procure a species with similar properties, easy availability and good therapeutic efficacy.

## Conclusion

Substitution practice of herbal drugs should be implemented in the current era as 247 out of 560 medicinal plants in India listed as threatened species [21]. This concept is of great advantage as it stresses upon these herbs that are cultivated in abundance, easily available, locally procured, cost-effective and most appropriate for the clinical condition. By the use of these substitutes conservation and sustainability of herbs is achieved; thus India can increase the quality standards of medicinal formulation in herbal drug industry. Here a sincere attempt is made to explore the concept of substitution in medicinal herbs. However, further research in pharmacological screening, in vitro lab tests, in vivo animal trials and clinical case studies to prove the efficacy of *Abhav Pratinidhi Dravya* (Substitutes) is needed.

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