

Review Article

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**ADULTRATION AND SUBSTITUTION IN HERBAL DRUGS
A CRITICAL ANALYSIS**

*Poornima B

Bapuji Ayurvedic Medical College, Shimoga, Karnataka, India

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ABSTRACT

The adulteration and Substitution of the herbal drugs is the burning problem in herbal industry and it has caused a major treat in the research on commercial natural products. The deforestation and extinction of many species and incorrect identification of many plants has resulted in adulteration and substitution of raw drugs. The concept of substitution prevailed ages back and in Ayurveda we can find this in the treatise of Bhavaprakasha and Yogaratnakara. This article throws the light on the concepts of substitution given by our preceptors and analyze these with the present day prevailing trend of adulteration and substitution.

KEY WORDS: Adulteration, Substitution, Ayurveda.

***Correspondence Address**

Dr. Poornima B
Lecturer,
Department of DravyaGuna,
Bapuji Ayurvedic Medical College,
Savalanga Road, Shimoga-577201,
Karnataka State, India.
Contact no: +919844850765
E mail: ayurmini@gmail.com.

INTRODUCTION

The adulteration and substitution of herbal drugs is the major problem causing threat to the herbal drug industry and to the research on commercial natural products. The term adulteration of an article covers a number of conditions which may be intentional or accidental. The crude drugs are substituted with the inferior commercial varieties and are used as adulterants which may or may not have any therapeutic potential as that of original drug.⁵ The concept of substitution prevailed ages back and in Ayurveda we can find this in the treatise of Bhavaprakasha and Yogaratnakara. There is a need to analyse these concepts with the present trend of adulteration and substitution so that we can adopt the proper.

Need for Substitution^{5,2,3}

Non-availability of the drug.

Eg: - Substitution for Ashtavarga Dravyas.

Uncertain identity of the drug .

Eg: - for the herb *Lakshmana* different species such as *Arlia quinquefolia*, *Ipomea sepiaria* etc are considered

Cost of the drug.

Eg: - *Kumkuma* being costly herb is substituted by *Kusumbha*

Geographical distribution of the drug :-

Eg :- As *Rasna* *Plucia lanceolata* is used in Northern India while in southern parts *Alpinia galanga* is considered as the source.

The adverse reaction of the drug

Eg :- *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* , *Ashoka* etc are substituted.

Criteria for Substitution

Kadaachit dravyamekamvaa yoge yatra nalabhyate |

Tat tadgunayutam dravyam parivartena grihyate || (Oushada vignana)

A drug to be considered as a substitute should fulfill the following criteria –

Similarity in *Rasa-panchakas*.

Eg :- *Bharangi* and *Kantakari*.

Exhibit similar therapeutic effects.

Eg :- *Ativisha* and *Musta*.

In a formulation the *pradhana Dravya* I.e., the Major ingredient should never be substituted.

Eg: - while preparing *Bharangyaadi Guda* Should not Substitute *Bharangi* with any other drug.

Yoge yadapradhaanam syattasya pratinidhirmataha |

Yattu pradhanam tasyaapi sadrusham niva grihyate || (Bhava prakasha.16.167)⁴.

Substitution with Totally Different Drug^{5,3,1}

Here we can consider *Bharangi* (*Clerodendron indicum*) and *Kantakari*. *Bharangi* has tikta rasa and Laghu ,ruksha guna and has Kapha and vatahara property. While *Kantakari*(*Solanum xanthocarpam*) has katu vipaka and ushna virya. It has Glycosides – Verbascoside and Solasonin, solamargin, solasurine respectively. Both *C. indicum* and *S. xanthocarpam* have shown Anti-histaminic activity. Both *C. indicum* and *S. xanthocarpam* are commonly employed in the diseases related to the respiratory system, which are commonly associated with release of Histamines and other Autacoids.

Substitution of Different Species

Here we can consider two types of Gokshura.-*Tribulus terrestris*(zygophyllaceae) and *Pedaliium murEg* (Pedaliaceae) *T.terrestris* has the chemical constituents like Chlorogenin, Diosgenin, Rutin, Rhamnose, and Alkaloid. While *P.murex* has Sitosterol, Ursolic acid, Vanilin, Flavonoids and Alkaloids.

Both the species are proved for Nephroprotective, Lothotriptic, Diuretic and Hepatoprotective activities. If we analyse the clinical conditions where Gokshura is indicated I.e., mutrakrcra, Mutraghata, Ashmari, Prameha etc, both *T. terrestris* and *P.murex* appear to be appropriate.

Substitution of the Species Belonging to Same Family

The *Datura metal* and *Datura stramonium* can be considered here. Chemical Constituents are Alkaloids, Scopalamine, Atropin, Hyocyamin, Lyoscine. The Alkaloids are proved as Bronchodialatory and inhibitor of secretion of mucous membrane. The alcoholic extract of *D. metal* show Anthelmentic Activity The Alkaloid present in Both the species are well proven Bronchodilators and also they inhibit the secretion of Mucous membrane of the Respiratory tract. Thus as far as the diseases of the Respiratory tract are concerned both *D.metal* and *D. stramonium* are beneficial, while as Krimihara *D.metal* would be a better choice as it is a proven Anthelmentic.

Context Specific Substitution

The Amalaki (*Embelica officinalis*) and Bhallataka (*Semicarpus anacardium*) can be considered. The Amalaki has Laghu guna and lavana vargitha pancharasa, Madhura vipaka, sheeta virya and tridoshahara property. It has chemical constituents such as Vitamin C, phyllembin, Linolic acid, Indole Acetic acid, Ellagic acid, salts etc. While Bhallataka has Laghu, Teekshna, Snigdha guna, Katu, Tikta, Kashaya rasa, mardhura vipaka, ushna virya and Kapha vatahara properties. Biflavonoids, Anacardic acid, Nicotinic acid, riboflavin, thiamine and essential oils. Research profile of *E.officinalis* shows Anti-oxidant, HepatoProtective, Microbial, Hypoglycemic Hypolipidemic action. The research profile of *Semecarpus* shows Anti-tumour, Hypotensive, Anti – Cytotoxic and anticancerous properties etc. Both Amalaki and Bhallataka are Rasayana drugs. Amalaki is commonly employed as Kamyas Rasayana and Bhallataka as Nimittika Rasayana. In current practice the Rasayana formulations are being employed as an adjuvant therapy in Chronic as well as Malignant diseases. Amalaki can be employed as Rasayana in Chronic debilitating diseases like Bronchial Asthma, Diabetes etc, while Bhallataka would be better choice in Malignant conditions, both in Solid tumors and in Leukaemia.

Substitution of different parts of the plant

The root of *Sida cordifolia* and the whole plant of *Sida cordifolia* can be considered. Root has the chemical constituents such as Siterindoside, Acylsteryglycoside. While the whole plant has Alkaloid, Hydrocarbons, Fatty acids, Ephedrine. Various extracts of the whole plant showed Anti-bacterial, Anti-oxidant, Hypoglycemic, Hepatoprotective and Cardio tonic activities. Though it is the root which is mentioned as officinal part of *S.cordifolia* in the classics as Balya, Brumhana, Shotahara etc, modern researches prove that even the aerial parts are also equally effective.

ADULTERATION

It is the substitution of the original crude drug partially or fully with other substances which is either free from or inferior in therapeutic and chemical properties⁵.

Types of Adulteration

Adulteration with inferior commercial varieties

Eg: Maricha (*Piper nigrum*) adulterated by papaya seeds.

Adulteration by artificially manufactured substitutes.

Eg: Artificial invert Sugar for Honey

Adulteration by Exhausted drugs.

Eg: Clove, Fennel.

Adulteration by addition of Heavy Metals.

Eg: Pieces of Limestone in Asafoetida, Lead in pieces of Opium.

Adulteration by Synthetic Principles.

Eg: Adding Citral to Oil of Lime.

DISCUSSION

Our ancient Acharyas were able to identify the substitute which are context specific and in such condition rather than giving importance to Gunas, Karma were taken into consideration.

During the medieval period with the identification of newer species many more drugs were added to the list of substitutes. This provided the physician a great scope for selection of drug, which is most appropriate and easily available.

Acharya Yogaratnakara, Govindadas etc, even provided the substitutes for the various plant products which contributed tremendously for better clinical approach.

Later during the modern era in an attempt to conserve the flora, various plant parts especially the aerial parts were screened for different Pharmacological activities and emerged with encouraging results. This provided a new dimension for Substitution.

CONCLUSION

Substitution of the herbs is the need of the hour with more than 300 medicinal plants becoming red listed. The most essential criteria for substitution is the Pharmacological activity rather than Morphology or Phytoconstituents. Substitution of herbs achieved many goals though basic idea was to provide similar therapeutic effect as that of original drug. It provided a greater scope for the physician to utilize herbs that are easily available, cost effective and most appropriate for the clinical condition. It enriched the Materia Medica with the survey of natural resources, and contributed for conservation of flora. The manufacturers need to identify the source plant and utilize to achieve better therapeutic efficacy. Ideally the Geographical sources of herbal medicine, chemical treatments made if any pesticides, Fumigants used or not should be studied. The appropriate level of testing must therefore be carefully assessed. Using the raw materials based on monographs available in different official books and various regulatory guidelines including W.H.O guidelines.

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Table 1: List of Substitutes³

Jeevaka	Guduchi(<i>Tinospora cordifolia</i>)
Ativisha(<i>Aconitum heterophyllum</i>)	Musta(<i>Cyperus rotundus linn</i>)
Rishabaka	Vamshalochana(<i>Bambusa arundinacea willd</i>)
Chitraka(<i>Plumbago zyleneica</i>)	Danti(<i>Baliospermum montanum</i>)
Meda	Ashwagandha(<i>Withania somnifera</i>)
Lakshmana(<i>Ipomea sepiaria</i>)	Mayurashika(<i>Elephantopus scaber</i>)
Mahameda	Sariva(<i>Hemidesmus indicus</i>)
Pushkaramula(<i>Iris germanica Linn</i>)	Kushta(<i>Saussurea lappa C.B</i>)
Kakoli dwaya	Shatavari(<i>Asperagus racemosus</i>)
Kokilaksha (<i>Hygrophila spinosa.T</i>)	Gokshura(<i>Tribulus terrestris</i>)
Ridhhi	Bala(<i>Sida cordifolia Linn</i>)
Arka dugdha(Latex of <i>Calotropis procera</i>)	Arka swaras(Juice of <i>Calotropis procera</i>)
Vrudhhi	Mahabala(<i>Sida rombifolia Linn</i>)
Murva(<i>Marsedenia tenacissima</i>)	Manjishta twak (Bark of <i>Rubia cordifolia</i>)
Nagakesara(<i>Messua ferrea</i>)	Padmakesara(<i>Crocus sativus Linn</i>)
Saindhava Lavana(Rock salt)	Saamudra lavana(Salt)

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