



CURRENT SCENARIO OF ADULTERANTS AND SUBSTITUTES OF MEDICINAL PLANTS: A REVIEW

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ABSTRACT

Medicinal plants constitute an effective source of traditional and modern medicine. In India, about 80% of the rural population depends on medicinal plants and indigenous system of medicine for primary health care. Adulterants and substitutes are the common malpractices in herbal raw material trade. Adulteration is considered as an intentional addition of foreign substances to increase the weight of the product or to decrease its cost. It may be due to- confusion in vernacular names, lack of knowledge about authentic plants, non availability, similarity in morphology, activity, aroma, careless collection and other unknown reasons. Many Substitutes are mentioned in Ayurvedic texts. In the present article, an attempt has been made to document the list of adulterants and substitutes of the ayurvedic drugs that are currently available and sold in the world market.

Key words: Ayurveda, Adulteration, Substitute drug, Market.

INTRODUCTION

Ayurveda is a system of Indian traditional form of alternative medicine. Adulteration and Substitution are frequent in raw material trade of medicinal plants. Herbal adulteration is one of the common malpractices in herbal raw material trade. At present the adulteration and substitution of herbal drugs is the burning problem in herbal industry. The deforestation and extinction of many species and incorrect identification of many plants has resulted in adulteration and substitution of raw drugs^{1,2}. The term adulteration of an article covers a number of conditions which may be intentional or accidental. It is a practice of adding foreign substance in place of original crude drug partially or fully which is inferior or substandard in therapeutic and chemical properties or addition of low grade or spoiled drugs or entirely different drug similar to that of original drug adding which an intention of enhancement of profits^{3,4,5}. Due to adulteration, faith in herbal drugs has declined. Adulteration in

market samples is one of the greatest drawbacks in promotion of herbal products. In adulterated drugs, it is invariably found that the Adverse Event Reports are not due to the intended herb, but rather due to the presence of an unintended herb^{6,7,8}. Medicinal plant dealers have discovered the scientific methods in creating adulteration of such a high quality that without microscopic and chemical analysis, it is very difficult to trace these adulterations^{9,10}. Many substitute drugs are mentioned in Ayurvedic texts. The principles to select substitute drugs is based on similarity of properties (Rasa, Guna Virya and Vipaka) but most important factor is therapeutic action (Karma). In terms of pharmacy, substitute is generally used when original drugs are not available or may be available in small quantity. In ancient time, Vaidya had to collect the drug by own. The drugs which were less available in local area were replaced by other drugs known as substitute drugs (Pratinidhi Dravyas).

Difference between Adulterants Substitutes¹¹

Sr. No.	Adulterant	Substitute
1.	Adulteration is the intentional addition of foreign substances to increase the weight of product and to decrease its cost.	Substitute drugs are that drugs which are based on similar properties i.e Rasa, Guna, Virya and Vipaka and most important is Karma.
2.	In simple words- Adulteration is the debasement of an article.	Substitution is generally done when original drugs are non-available or available in small quantity.
3.	It is added partially or fully which is inferior or substandard in therapeutic and chemical properties.	Vaidya called substitute drugs as Pratinidhi Dravya.
4.	Adding low grade or spoiled drugs or entirely different drugs similar to that of original drugs.	Acharya Charak and Susruta have not given direct references but Acharya Vagbhat has stated about substitutes.
5.	Purpose is for enhancement of profits.	Detail description regarding substitute drugs can be traced from the text books of Bhavaprakasha, Yogaratnakara and Bhaishajya ratnavali.
6.	Adulterant drugs are similar to crude drugs in morphology and therapeutically but substandard in nature and cheaper in cost.	Substitution can be done by using totally different drugs species belonging to same family or different species.

List of Medicinal plants^{13,14}

Bilva (*Aegle marmelos*)

Bael fruits are often substituted with wood apple (*Feronia limonia*) and mangosten (*Garcinia magostana*)

Bharangi (*Clerodendrum serratum*)

Clerodendrum serratum and *Clerodendrum indicum*, both are used as Bharangi.

Bark of *Gardenia turgida* is reported to be sold as Bharangi bark. *Picrasma quassioides* is used as Bharangi in Bengal.

Chitraka (*Plumbago zeylanicum*)

Plumbago indica commonly known as Rakta chitraka is used for same condition as *Plumbago zeylanica*

Danti (*Baliospermum montanum*)

The vernacular names of *Baliospermum montanum*, *Croton tiglium* and *Jatropha curcaas* are confounded with each other in most districts of India. They are often sold in the market under the name of Jamalgota. The root of Danti is sometimes used as a substitute for *Croton tiglium*

Daruharidra (*Berberis aristata*)

Curcuma longa is sometimes used as a substitute. *Berberis lycium* and *Berberis asiatica* are also used in medicine as Daruharidra. In South India and Sri Lanka, *Coscinium fenestratum* is known and used as Daruharidra.

Gunja (*Abrus precatorius*)

Root of Gunja has been used a substitute for Yashtimadhu.

Kapikacchu (*Mucuna prurita*)

Mucuna utilis are often sold in the market in the name of Kapikacchu.

Arka (*Calotropis procera*)

Calotropis procera and *Calotropis gigantea* are often used as substitute for one another.

Vijaysaar (*Pterocarpus marsupium*)

Terminalia tomentosa is often used as a substitute.

Dried juice of *Butea monosperma* trunk is called Bengal kino and is used as adulterant and substitute of Indian kino.

Madyantika (*Lawsonia inermis*)

Henna powder is often adulterated with organic and inorganic articles like sand, stems and fruits of Henna plant and husks of paddy (*Oryza sativa*), arhar (*Cajanus cajan*) and Moong (*Vigna mungo*)

Naagkeshar (*Messua ferra*)

Calophyllum inophyllum, *Cinnamomum wightii* and *Myristica fragrans* are sold as substitute for *Messua ferra*. In the markets of Gujarat and Bombay, *Ochrocarpus longifolius* are sold in the market in the name of Ratan Nagkeshar. Unripe fruits of *Cinnamomum tamala* and *C. wightii* are sold as Kala Nagkeshar.

Nagkeshar sold in Bazaars of South India is reported to be fruits of *Dillenia pentagyna* (Malabar Nagkeshar). Natu Nagkeshar used by Siddha/ Tamil Vaidyas resembles to *Cinnamomum wightii*. Buds of *Mammea sewiga* and *Callophyllum inophyllum* are reported to be used as adulterants.

Rakta Punarnava (*Boerhavia diffusa*)

Market samples of Rakta punarnava are often adulterated with *Trianthema portulacastrum*.

Saariva (*Hemidesmus indicus*)

Three species *Cryptolepis buchanani*, *Decalepis hamiltonii* and *Ichnocarpus frutescens* are used as substitutes due to non availability of *Hemidesmus indicus*.

Shatavari (*Asparagus racemosus*)

Roots of *Asparagus sarmentosus*, *A. cirrulus*, *A. filicinus* and *A. sprengeri* are also being sold in the name of Shatavari.

Sthula Ela (*Amomum subulatum*)

Common adulterant in South India is *Heracleum rigens*. *Peucedanum grande* is reported to be used instead of *A. subulatum* as Sthula Ela in Kerala. *A. dealbatum* seeds are reported to be used as substitute for true large cardamom seeds.

Vacha (*Acorus calamus*)

Alpinia officinarum and *Alpinia galanga* are adulterant of Vacha.

Vaasa (*Adhatoda vasica*)

Adhatoda beddomei is commonly used as substitute in Kerala. *Ailanthus excelsa* is a common adulterant of Vaasa leaves.

Agnimantha (*Clerodendrum phlomidis*)

In Ayurveda Formulary Of India Part – I, *Clerodendrum phlomidis* has been accepted as Agnimantha; whereas *Premna mucronata* and *Premna integrifolia* are considered as substitutes.

Bakuchi (*Psoralea corylifolia*)

Bakuchi seeds are often substituted with *Cassia tora* seeds.

Bhrungaraj (*Eclipta alba*)

Wedelia chinensis known as Peeta Bhrungaraj is used as substitute to *Eclipta alba*.

Chakramarda (*Cassia tora*)

Cassia occidentalis is sometimes used as a substitute for *Cassia tora*. *Cassia tora* seeds are used as a substitute for coffee.

Guggulu (*Commiphora mukul*)

Gum resin of *C. mukul* is common adulterant to *C. myrrha*. Indian adulterant of gum resin of *Commiphora wightii* are gums of *Boswellia serrata*, *Hymenodictyon excelsum*, *Commiphora roxburghii* and *Commiphora opobalsamum*.

Jyotishmati (*Celastrus paniculatus*)

Clove oil is used as a substitute for Celastrus Oil.

Kutaj (*Holarrhena antidysentrica*)

Wrightia tinctoria and *Wrightia tomentosa* are used as adulterants. *Ailanthus excels* are good substitute for *H. antidysentrica*. *H. antidysentrica* is used as a substitute for *Cephalis ipecacuanha* and its seeds are sold in market as adulterant of *Strophanthus* seeds.

Musta (*Cyperus rotundus*)

Cyperus scariosus and *C. arundinaceae* are used as a substitute.

Pippali (*Piper longum*)

The fruiting spikes of *Piper longum* are often adulterated with *Piper peepuloides*, *Piper retrofractum* and *Piper beetle*.

Vata (*Ficus bengalensis*)

The powder prepared from *F. bengalensis* is used to adulterate *Kampillaka (Mallotus philippinensis)*

Yashtimadhu (*Glycyrrhiza glabra*)

Roots of *G. uralensis* and *Abrus precatorius* are often adulterated with liquorice.

Arjuna (*Terminalia arjuna*)

Stem bark of *Lagerstroemia speciosa* is reported to be an adulterant of *Terminalia arjuna*. It is also reported that bark of several other species of *Terminalia* are being sold indiscriminately under the name *Arjuna*; *Terminalia bialata*, *T. belliricia*, *T. alata*, *T. myriocarpa*, *T. catappa*. The bark of *T. alata* is also used as an adulterant to *T. arjuna*

Ashoka (*Saraca asoca*)

Polyalthia longifolia goes by the same name *Ashoka* and is often used as an adulterant or as a substitute of genuine *Ashoka (Saraca asoca)*. There are few more plants viz. *Bauhinia variegata*, *Trema orientalis* and *Shorea robusta*; the barks of which are sold in drug market under the name of *Ashoka*.

Ashwagandha (*Withania somnifera*)

It is used as a substitute for *Kakoli* and *Kshirkakoli* of *Ashtavarga* which are identified as *Zilium polyphyllum*, *Fritillaria roylei* as *Ayurvedic Formulary of India* published by Govt. Of India.

Bibhitaka (*Terminalia belliricia*)

The bark of *T. belliricia* is used as adulterant to bark of *Terminalia arjuna*. The fruits of *T. belliricia* are reported be used as a substitute in tanning industry for *Terminalia chebula*.

Chandan (*Santalum album*)

The wood of *Erythroxylum monogynum* is perfumed and is reported to be used as adulterant for *Sandalwood*. Cheaper materials like polyethylene glycol and dicotyl phthalate and other colourless high boiling oils are used to adulterate *sandalwood oil*.

Ashwatha (*Ficus religiosa*)

The stem or root of *F. religiosa* is employed as a substitute for *Soma (Ephedra gerardiana)*

Gokshur (*Tribulus terrestris*)

The fruits of *Pedaliium murex* are occasionally substituted to *T. Terrestris* being considered as large *Gokharu*. The fruits of *Acanthospermum hispidum* resemble to cocci of *Tribulus* are frequently mixed with later.

Haridra (*Curcuma longa*)

Haridra is a substitute for *Daruharidra*.

Trivrutta (*Operculina turpethum*)

The drug available in the market in the name of *Safed Nishotha* consists of roots of *Marsdenia taeniocissima*. Besides these some other rhizomes, roots, barks other than those of *Operculina turpethum* are reported to be sold in the market under the name of *Nishotha* eg. *Argyrea speciosa*. Stem pieces of *O. Turpethum* are reported to be sold as *Black Nishotha*.

Krushna Saariva (*Cryptolepis buchanani*)

It is used as a substitute to *H. Indicus. Icnocarpus fruteoscens* is used as *Krushna Saariva* in *Kerala & South India*.

Madanphal (*Randia spinosa*)

Fruit pulp is a valuable emetic and is used as a substitute for *Cephalis ipecacuanha*

Mahanimba (*Melia azedarakh*)

It is used as a substitute to *Azadirachta indica*.

Paaribhadra (*Erythrina variegata*)

Erythrina suberosa and *Erythrina stricta* are reported to be used as substitute for *Erythrina variegata*

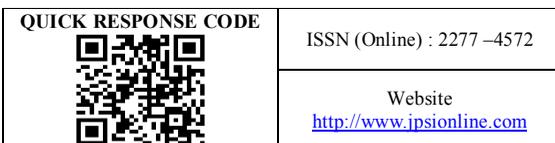
CONCLUSION

Substitution of the herbs is the need of the hour with more than 300 medicinal plants becoming red listed. It has provided greater scope for the physician to utilize herbs that are easily available, cost effective and most appropriate for the clinical condition. It is not that all adulterations are intentional malpractice as stated in many literatures. With our experience it is noted that the herbal drugs are adulterated unintentionally also. Suppliers are illiterate and not aware about their spurious supply. Major reasons are confusion in name, non availability and lack of knowledge about authentic plant. Even scientific community and traditional physicians are unaware of it. Nowadays, *Ayurvedic drug industries* follow high quality standards using modern techniques and instruments to maintain their quality. *World Health Organization (WHO)*, in its publication on quality standards for medicinal plant materials, recommends rejecting any batch of raw material, which has more than 5% of any other plant part of the same plant (e.g. stem in leaf drugs), never the less if they are derived from the authentic plant. Based on these standards, adulteration whether, intentional or unintentional, should be rejected. Also, suppliers and traders should be educated about the authentic sources.

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