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Review Article

ADULTERATION AND NEED OF SUBSTITUTION OF RAW MATERIALS – A REVIEW

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ABSTRACT

Experiencing challenges of modern medicine, globe is shifting towards the *Ayurvedic* theory of health management. In the treatment of disease use of medicine is practiced rampantly. This increased the demand of raw material exponentially. But, growth in production is still linear in nature. Fast depletion of resources is creating the major trouble. To meet the deficit, practices of adulteration and substitution are going on wildly. This adulteration and substitution became burning problem in industry threatening the integrity of Ayurveda. The deforestation, extinction or evolution of many species, insufficient knowledge, unauthenticated practices about identification, collection, storage and transport of raw material collectively resulted in adulteration. Strategic planning and integrated approach towards mass production, supply chain management, IEC, proper advocacy and knowledge sharing is needed to trim down the gravity of adulteration. "Prevention of Food Adulteration act 1954" describes technical definitions and guidelines for quality maintenance. Government is enforcing quality maintenance by implementation of "The Drug and Cosmetics Act 1940" For quality assurance, proper pharmacovigillance monitoring of raw materials and processes is very necessary. The concept of substitution is known in Ayurveda as it is enlightened prominently in *Bhavprakash* and *Yogratnakar*. However in scenario of crises, selection of substitute drugs may have upper edge over adulteration of the raw material. Scope of this article advocates that how adulteration and substitution are creating problems with respect to production of inferior quality medicines.

KEYWORDS: Adulteration, Substitution, Raw Material, Quality Assuarance, Phamacovigillance.

INTRODUCTION

Today the Ayurvedic Medical science is a Global science, after experiencing upper edge of it, many people are shifting towards herbal medication and Ayurvedic therapy. This is leading to exponential increased demand of Ayurvedic medicines in very short period of time. In India, Ayurvedic pharmacies, 90% of them are preparing medicines having low quality. A single plant or drug of mineral or animal origin may have varying properties depending upon the various influential situations like natural factors, climatic conditions and place of availability etc. In order to achieve better and sustainable results, it becomes inevitable to bring uniformity in this aspect through repeated studies. Adulteration is a practice of substituting the original crude drug. It is partially or fully, with the other substances which is either free from or inferior in therapeutic and chemical properties. The drugs which are morphologically similar and cannot be distinguished easily are generally adulterated. The deforestation, extinction or evolution of many species, insufficient knowledge, and unauthenticated practices about identification, collection, storage and transport of raw material collectively resulted in adulteration.[13,14] The quality of medicine was optimum as the section of raw materials and preparation of drugs was under direct supervision of physician. However, in recent period this tradition became unfeasible and constantly declining, reviews suggest some of the possible reasons for his depreciation.

- Change in the way of practice and lifestyle of physicians and beneficiaries.
- Exponential multiplication of demand of raw materials.
- Decreased production due to deforestation, urbanization, less cultivation and
- Lack of awareness and Climate change leading to extinction of species.

- Because of adulteration the faith in herbal medicine may be decline. Adulteration in market samples is one of the biggest drawbacks in promotion of herbal products. It becomes human nature to earn as much money as possible in industry with minimal capital investment. Low of demand supply equation governs the market, so does production industry. Therefore, to obtain maximum profit, rarely available/costlier drugs are substituted or adulterated with low quality/ quantity/both during preparations. Adulteration may cause hazardous effects or the drug may be ineffective too in either of the cases, integrity of Ayurveda becomes questionable. Herbal adulteration and substitutions is one of the common malpractices in herbal raw material trade. Substitution may be involved offering one substance in place of another more expensive or substance that might not be readily available at given prizes. Aware of constrain, many substitute drugs are mentioned in Ayurvedic classics. The principles to selection of substitute drugs is based on similarity of basic properties *(Rasa, Guna, Vipaka, Virysa)* and importantly the *karma* i.e. the therapeutic action of the drug. But, substitute is generally used when original drugs are available in very small quantity or completely not available. It is also explained in Ayurvedic texts that the drugs which are not available or less available were replaced by other drugs called as substitute drugs (*Pratinidhi dravyas*).

AIM AND OBJECTIVES

AIM

To identify the adulterated raw materials and its need of substitution.

OBJECTIVES

1. To evaluate the adulteration of raw materials.
2. To study the need of substitution to overcome the adulteration of raw materials.

MATERIALS AND METHODS

Published research papers and available Ayurvedic Literatures were studied for better understanding of concept of Adulteration and Substitution of drugs. Information regarding adulterant drugs and substitute drugs from various journals, Ayurvedic texts and authentic Internet media was also used for availability and necessity for better understanding of the topic. A list of classical drugs and their substitutes with their botanical names was also prepared, which was studied. The reasons for adulteration are given below:

Reasons for Adulteration

1) Confusion in vernacular names: Because of similarity in the names of the drugs in traditional system of Indian medicine, adulteration may cause.

2) Lack of knowledge about authentic plant source: Lack of knowledge about the proper source of the raw drug. For e.g. *Nagkeshar* i.e. *Mesua ferra* is one of the most important drugs in Ayurveda but it is adulterated with flowers of *Calophyllum indophyllum*. *Nagkeshar* is available in parts of Himalayas and Western Ghats. That makes it difficult to collect. Flowers of *C. indophyllum* are easily available in plains areas, so it is used to replace *Nagkeshar*.

3) Morphological similarity: The drugs which looks similar i.e. morphologically similar are generally adulterated e.g. *Mucuna prurience* is usually adulterated and it is with the papilionceae seeds having similarity in morphology.

4**) Careless collection of raw materials:** Some of the adulterants are due to carelessness of collectors and suppliers. *Shaileya* (*Pamelia perlata*) herb is most commonly mixed with other species (*P.Perforata* and *P.Cirrhata*). *Usnea* species is also known to mix with *Shaileya.* [6]

Type of Adulterants

1) Adulteration with standard commercial varieties- Adulterants commonly resemble the original crude drug which are morphologically, chemically and therapeutically, but they are below standard and cheaper in cost. E.g. *Nux vomica* seeds are adulterated with *Strychnos nux-blanda* or *Strychnos potatorium* seed**.**

2) Adulteration with superficially similar but inferior Drugs- This type of adulteration commonly done with cloves with mother cloves and saffron with dried flowers of *Carthamus tinctoria* (safflower). Inferior drugs resemble the original drug only morphologically but not chemically and therapeutically.

3) Adulteration with exhausted drugs- Adulteration occurs mainly volatile oil containing drugs like clove, coriander and fennel. Because, it is devoid of colour and taste due to extraction, natural colour and taste is manipulated by additives**.**

4) Adulteration with artificially manufactured substances- This type of adulteration and observed in case of drugs which are very costly. E.g. paraffin wax is adulterated with yellow bees wax.

5) Adulteration with synthetic chemicals to enhance Natural characters- Synthetic chemicals which are used to enhance natural character of the drug. E.g. Citral is added to citrus oils like orange and lemon oils.

6) Substitution by powders-The drugs which are in powdered form is most frequently adulterated. E.g. red sandalwood powder is added in capsicum powder and powdered bark of the drugs adulterated with brick powder. [2]

Substituent

The drug used during non availability of original drug is known as substituent. It may have the same type of physiological active constituents. The percentage of quality of the drug available may be different. Substitution occurs when a totally different substance is added in the place of original drug.[16] There are some reasons for substitution given below:

Reasons for Substitution

1) **Non-availability of the drug:** Sometimes there may be non-availability of drugs. E.g: *Astavarga dravyas* (group of 8 crude drugs).
2) **Cost of the drug:** It is very essential component for economy of the drug.eg. As *Kumkum* being costly drug can be substituted by *Kusumbha*.
3) **Adverse reaction of the drug**: Due to the adverse reaction of the drug on patient there is necessity of substitution. *Vasa* having abortificiant activity its use is limited for pregnant women besides that *Laksha, Ashoka* can be substituted.
4) **Shelf life of the drug**: Shelf life of the drug is also another reason for substitution e.g. non-availability of old jagerry, new jagerry after heating in sun rays for four hours can be used.
5) **Uncertain identity of the drug**: Herb *Lakshmana* and different species such as *Aralia quinquefolia* and *Ipomea sepiaria* etc. are considered.
6) **Seasonal availability of drugs**: Due to limited availability of the drug round the year, other available drugs, having similar actions are used. E.g. *Trianthema portulacastrum* can be used in seasonal absence of *Boerhavia diffusa*. [11,12]

DISCUSSION

There is enormous commendable work being published in various journals about adulteration and substitution. Many papers and Ayurvedic literatures discuss about challenges and opportunity. Reviewing the analysis draws results-

- There is continuously increase in demand of raw materials for Ayurvedic preparation.
- Production of Ayurvedic raw material is not increasing in proportion to meet the demand.
- Suppliers and traders should be educated about the authentic sources.
- Using the raw materials based on monographs available in different official books even various regulatory guidelines including W.H.O. guidelines.
- The drugs should be assessed on the basis of their *Gunas* and *Karmas* i.e. properties and action for further evaluation.
- Regional substitution is the current need on the basis of its local use.
- Proper pharmacovigilance monitoring of raw materials is necessary to develop highly effacious, pure, safe with quality assured products.

List of Some Substitutes[5]

Jeevaka	*Guduchi* (*Tinospora cordifolia*)
Rishabaka	*Vamshalochana* (*Bambusa arundinacea* willd)
Meda	*Ashwagandha* (*Withania somnifera*)
Mahameda	*Sariva* (*Hemidesmus indicus*)
Kakoli	*Shatavari* (*Asperagus racemosus*)
Kokilaksha (*Hygrophila spinosa* T)	*Gokshura* (*Tribulus terrestris*)
Ridhhi	*Bala* (*Sida cordifolia* Linn)
Vrudhhi	*Mahabala* (*Sida rombifolia* Linn)

CONCLUSION

Sometimes adulteration may be intentional or unintentional. Unintentional adulteration is the official substitute which is scientifically proven. Intentional adulteration is not original and is not scientifically proved. It is not that all adulterations are intentional malpractice as mentioned in literature. Suppliers are illiterate and unaware about authentic supply. The reasons for that is confusion in vernacular names, lack of knowledge about authentic source, non availability of drug and careless collection causing adulteration. Some of the adulterations are unintentional as well. To overcome the situation, concept of substitution may come handy. Most essential criteria for substitution is pharmacological activity rather than morphology or phytoconstituents. Our ancient Acharyas were able to identify the substitute giving importance to *Gunas* and *Karmas*. Substitution of herbs achieved many goals though basic idea to provide similar therapeutic effect as that of original drug. With more than 300 plants becoming red listed, substitution may help resolving up to large extent. Substitution may involve offering one substance in place of another having same properties. It basically integrates the scope for the physician to utilize the drugs in better way those are easily available, cost effective and gives maximum therapeutic effect. Now days, *Ayurvedic* drug

industries also follows high quality standards using modern techniques and instruments. Based on World Health Organization, in its publication on quality standards like rejecting batches if raw material of the batch has more than 5% of their unacceptable drug mixed.[15] Based on these certain laid down standards, issue of adulteration may be addressed. Acharya Govindadas sen, Acharya Yogratnakar, Acharya Bhavmishra etc. provided the substitutes for various plant parts which have contributed tremendously for better clinical approach.

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