

**EVALUATION OF DRUG FOR BURNING PROBLEM ADULTERATION AND
SUBSTITUTION- REVIEW**Dr. Vaishali Mulke¹ and Dr. Bhushan Dhawale*²¹Assistant Professor, Dept. of Agad Tantra, K. J. Institute of Ayurveda & Research, Savli, Vadodara.²Associate Professor, Dept. of Rachana Sharir, K. J. Institute of Ayurveda & Research, Savli, Vadodara.***Corresponding Author: Bhushan Dhawale**

Associate Professor, Dept. of Rachana Sharir, K. J. Institute of Ayurveda & Research, Savli, Vadodara.

Article Received on 03/01/2022

Article Revised on 24/01/2022

Article Accepted on 13/02/2022

ABSTRACT

Due to excessive urbanization and industrialization deforestation of many species and incorrect identification of many plants has resulted in Adulteration of drug. Adulteration is a practice of substituting the original drug completely or partially with other similar looking substance. Adulteration and substitution are common in malpractice in herbal raw material trade by unintentionally and intentionally. It may be due to non-availability, similar morphology, careless collection and lack of knowledge about plants. Many substituted drugs are mentioned in classical text of Bhavprakash, Yogratnakar, Bhaishajyaratnavali. The principle for selection of substitute drug is based on similarity of properties like Rasa, guna, veerya, vipaka and prabhava. future development of analysis of herbs is largely depended upon reliable methodologies for correct identification, standardization and quality assurance of ayurvedic drug. This article throws the light on adulteration, substitution their type, reason and detection of adulteration.

KEYWORD: Adulteration, Substitution, Ayurveda, Evaluation of Adulteration.**INTRODUCTION**

Ayurveda is an Indian traditional medicinal system developing as a best alternative for the modern medicinal system. In India about 80% of population in rural area is dependent upon medicinal herb as a primary health care. At present the adulteration and substitution of herbal drug is common in mal practices. Due to excessive urbanization, deforestation and industrialization the number of species are diminishing resulting to the adulteration.^[1,2]

The term adulteration is defined as a mixing or substituting the original drug material with other inferior, defective, useless part of the same or different plant or harmful substances or drug which do not confirm with the authorised standards. A drug shall be deemed to be adulterated if it consists in whole or partial qualities of the original substance.^[3]

In ancient era ayurveda defined substitute which is known now a days as adulteration. Acharya Bhavmishra in Bhavprakash samhita (16th century AD) explained same substituted drug in their text. Adulteration causes a variety of adverse effect from mild to severe. Mild like allergic reaction, Fatigue, etc. moderate like confusion, convulsion, dermatitis, vomiting etc. and severe like metabolic acidosis, multi organ failure or death.^[5] so

adulteration in market samples is one of the greatest drawbacks in promotion of herbal product. Hence to overcome from this problem there is a need of determination of adulteration. Development of analysis of drugs is depended upon reliable methodologies for correct identification and standardization and quality assurance of Ayurvedic drug is needed.

MATERIAL AND METHODS

Information extracted from various ayurvedic texts, treatises, ayurvedic and modern pharmaceuticals, pharmacopoeias, pharmacology and pharmacognosy books also investigated. A search was taken in google scholar, MEDSCAPE, BMC, science direct, MEDLINE and other database. Using keywords adulteration and substitution and evaluation of adulterant.

Reason for Adulteration

- Excessive industrialization and urbanization.
- Excessive deforestation.
- Indiscriminate use
- Due to intention of profit.
- Non availability of many medicinal plants, species, from flora.

Conditions of adulteration

- Deterioration – Impairment in quality of the drug.

- Admixture - Addition of a substance to other due to ignorance, or by accident.
- Sophistication - Intentional type of adulteration.
- Substitution – Totally different substance is added in place of original drug.
- Inferiority – Use of any substandard drug.
- Spoilage – due to attack of microorganisms.

Types of Adulteration^[1]

A) Substitution with substandard commercial varieties

Adulterants looks like crude drug by morphological characters, chemical characters, therapeutic characters but substandard in nature and cheaper in cost.

e.g: Strychnos nux vomica with strychnos potaturum.

Medicinal ginger with Arabian, Japanese ginger.

B) Substitution with superficially similar inferior drug –

Inferior drug may or may not be having any chemical or therapeutic value as that of original drugs due to same morphology they marked as adulterants.

e.g.: 1) Saffron with Kusumbha

2) Bee wax with Japan wax

C) Substitution with exhausted drugs

The same drug is mixed but the drug is devoid of medicinally active substances as it has been extracted already. Natural characters of exhausted drugs like color and taste are manipulated by adding other adjectives and then they are substituted.

e.g.: 1) Artificial coloring of exhausted saffron.

2) Volatile oil is extracted from drug like Clove, Coriander etc.

D) Substitution with artificially manufactured substances

Substances are artificially prepared to resemble original crude drugs. Practice is followed for much costly drugs.

e.g.: 1) Bee wax with Paraffin.

2) Citrus oil with Citral

E) Substitution by vegetable matter from same plant

Some miniature plants growing along with the medicinal plants are added due to their colour, odour, and constituent.

e.g: 1) Stem portion with leaf portion of senna.

2) Stem portion with root portion of sarpagandha.

F) Substitution by harmful Adulteration -

Waste material from market is collected and mixed with authentic drugs. This type of adulteration is mainly for liquid and unorganized drugs.

e.g. : 1) white oil with coconut oil.

G) Substitution in powder

As adulterants are difficult to identify in powders and easy to get mixed.

e.g: 1) Turmeric powder with chalk powder.

2) Exhausted ginger with ginger powder.

Substitution of the drug

It is the action of replacing one thing with other similar thing. When original genuine drug is not available then drug with similar action having similar or less potency and easily availability having less side effect is used.

Need for Substitution^[2,4,6]

- Non availability of genuine drug. e.g. Substitution of asthak varga.
- Uncertain identity of drug e.g. Lakshamana, Pashanbheda.
- When drug is too expensive e.g substitution of Kesari with Kusumbha.
- Geological Distribution of drug. e.g murva is taken in north as Pluchi lancolata and in south as Alpinia galanga.
- When original drug leads some undesirable side effect. e.g Vasa is used in raktapittahara but in pregnancy Ashoka is used in its place.

Types of Substitution^[2,4,7]

a) Substitution with totally different drug

e.g 1) Bharangi with Kantakari

2) Vasa with Ashoka

b) Substitution with different species:

e.g 1) Shweta Dhatura with Krishna Dhatura

2) Gokshura with Bhrihat Gokshura.

c) Substitution with species with same family:

e.g 1) Dhatura metal with Dhatura innoxia.

d) Substitution with different parts of plants:

e.g 1) Roots of Sida Cardifolia (Bala) with whole plant of Sida Cardifolia.

2) roots of Berberis Aristata (Daruharidra) with stem of Berberis Aristata.

Criteria for Substitution^[4,8]

- Similarity in Rasapanchaka – Bharangi and Kantakari (Katu, Katu, Ushna).
- Exhibit similar therapeutic effects – Ativisha and Musta (Deepana and Pachana).
- In formulation Pradhan dravya(Main Ingredient) Should never be substituted - In Arogyavardhini vati's main ingredient is Katuka which should never be substituted.

Methods of Detection of Adulterants (Drug Evaluation)

Drug evaluation is confirmation of identity and determination of quality and purity of drug the guidelines are set by WHO.^[10,11]

Methods of drug evaluation

Various properties are

- Organoleptic evaluation (Morphological)
- Microscopic evaluation
- Physical evaluation
- Chemical evaluation

1) Organoleptic evaluation (Morphological)

Organoleptic evaluation of drug is by organs of sense (Skin, Tongue, Ear, Nose, Eyes) which includes (Colour, Odour, Taste, Size, Shape etc.) it is qualitative evaluation.

e.g Aromatic odor of Apiece fruits.

2) Microscopic evaluation^[12,13]

It is mostly used for qualitative evaluation of drugs. It involves detailed examination of drugs and it can be used to identify the organized drugs by their known histological characters, which includes stumatal number and index, palisade ratio, vein islet number...etc.

e.g 1) warty trichomes of senna.

2) Cinnamomum Cassia is 10 microns hence helpful in detection of adulteration.

3) Physical evaluation

Physical analysis are sometimes taken into consideration to evaluate certain drugs which include moisture content, ash value, viscosity, melting point, foreign matter, solubility, refractive index, microbial contamination extractive, optic rotation.

4) Chemical evaluation:

It includes identification, isolation, and purification of active constituents.

Steps of chemical evaluation

- Extraction – separation of active substances from crude drug, where plant material is macerated with solvent.
- Qualitative test – detection of alkaloids, carbohydrates, glycosides, fat, fixed oils, mucilage, saponin, protein, amino acid, tannin, volatile oils, etc.
- Quantitative test – determination of percentage of phytochemical present in drug.

Procedure of chemical analysis are

- Chromatograohy techniques:

1) TLC (Thin layer chromatography)^[14]

It is one of the most known and favored chromatographic technique used of separation of compounds in the phytochemical evaluation of herbal drug, TLC is being used frequently for the following reason;

- a) It provides qualitative and semi qualitative information of the resolved compounds.
- b) Enables quantification of chemical constituents, finger prints using HPLC and GLC is also carried out in specific cases.
- c) It enables rapid analysis of herbal extracts with minimum sample clean up requirement.

In TLC the data can be recorded using a high-performance TLC (HPTLC) Scanner includes the chromatogram, retardation factor (RF) values, the color of the separated bonds, their absorption spectra all together with the data on derivation with different reagent, represents the TLC finger print of the sample

collected. The information so generated has potential application in identification of an authentic drug in excluding the adulterants and maintaining the quality of drug.

2) HPTLC (high performance thin layer chromatography)^[15,16]

HPTLC technique is popularly used procedure in industry to process of identification, development and detection of adulterants in herbal products. Also helps in quality control of herbs. It has been reported that mobile phase of PH8 and above can be used for HPTLC and also it is the repeated detection of chromatogram with the same or different conditions. HPTLC has been investigated for simultaneous assay of several components in multi component formulation. With that technique authentication of various species of plant possible. By HPTLC method phytoconstituents in crude drugs is detected.

3) HPLC^[17,18]

Analytical and preparative HPLC are widely used in pharmaceutical industry for isolating and purification of herbal compounds.

There are two types of HPLC a) Low pressure HPLC (< 5 bar)

b) High pressure HPLC (> 20 bar)

The important parameter to be considered are resolution, sensitivity, and fast analysis time in analytical HPLC whereas both the degree of solute purifies as well as the amount of compound that can produced per unit time.

In preparative HPLC (Pressure >20 bar), larger stainless-steel columns and packing materials particle since 10-30 mm are needed, the aim to isolate or purify compounds. HPLC is important is pharmaceutical industry for herbal drug.

4) Gas chromatography/ Gas liquid chromatography^[19,20]

It is a technique for separation of mixture into components by process which depends on the redistribution of the components between a stationary phase or the support material in the form of liquid, solid, or combination of both and a gaseous mobile phase.

Many pharmacological active components in herbal medicines are volatile chemical compounds. thus, analysis of volatile compounds by gas chromatography is very important in the analysis of herbal medicine. GC analysis of the volatile oil gives a reasonable 'finger print' which can used in identification of plant and impurities in the volatile oil is detected and the extraction of the volatile oil is relatively straight forward and can be standardized and the components can be identified using GC-MS analysis. The relatively quantities of the components can be used to monitor or assess certain characteristics of herbal drug. Changes in composition of volatile oil may also be used as indicator of oxidation,

enzymatic changes or microbial fermentation. The advantages of GC clearly lie in its high sensitivity of detection for almost all the volatile chemical compounds. With GC-MS instrument reliable information on the identity of the compounds is available as well as GC is most popular and useful analytical tool in research field of herbal medicines but disadvantage of GC are that it is not convenient for its analysis of samples of the polar and nonvolatile compounds.

DNA finger printing^[21,22]

DNA analysis has been proved as an important tool in herbal drug evaluation this technique is useful for the identification of phytochemically indistinguishable genuine drug from substituted or adulterated drug. It has been reported that DNA fingerprint genome remain the same irrespective of plant part used. While the phytochemical content will vary with the plant part used, physiology and environment. The other useful application of DNA fingerprint is the availability of intact genomic DNA specificity in commercial herbal drugs which helps in distinguishing adulterants in processed sample.

Types of DNA fingerprint techniques used in plant genome analysis.

- 1) Hybridization based method – which include
 - a) RFLP (Restriction fragment length polymorphism)
 - b) VNTR (variable number tandem repeats)
- 2) Polymerase chain reaction (PCR)- which includes
 - a) RAPD (Randomly amplified polymorphic DNA)
 - b) AP-PCR (Arbitrarily primed polymerize chain reaction)
 - c) AFLP (amplified fragment length polymorphism)
 - d) SSR (Simple sequence repeats)
- 3) Sequencing based methods

For detection of adulteration / substitution AP-PCR, RAPD and RFLP have successfully applied for differentiation of these plants and to detect substitution by other closely related species.^[23]

CONCLUSION

The use of herbal drug is tremendous in herbal industry most of drug are available in market in adulterated and substituted from the safety quality and efficacy of herbal product are dependent upon the evaluation of adulteration/ standardization of herbal drug. Hence need to more advanced techniques of standardization of herbal drugs. The organoleptic/ microscopic /physical evaluation are basically used. The chromatographic fingerprinting is based on the chromatographic separation and identification of marker compound from other constituents. For these purpose TLC, HPTLC, HPLC, GC methods are used. The other method DNA fingerprinting is the DNA fingerprint of genome remain the same irrespective of the plant part used while the phytochemical content will vary with the plant part used. Physiology and environment, the problem of quality

assurance of herbal medicine have been solved to great extent with help of chromatographic DNA fingerprint analysis.

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