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Adulteration in Ayurvedic Raw Herbs

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Abstract: ***Increased demand of medicinal plants causes the adulteration/substitution. Adulterated material can be harmful, and sometimes it is dangerous for using same preparation of end products. Substitutes have become so popular in many cases that the manufacturers have forgotten about the original plant. These substitutes do not contain the active ingredients of the plant. Some of these plants are high-valued medicinal plants and are also in endangered state. Aim: To study some of the common herbs adulterants in different stuffs.***

Keywords: Medicinal plants, Adulteration, Substitution, Preparation, Endangered state

1. Introduction

The adulterants are responsible to deteriorate the quality and lower the efficacy of the medicine. Thus, the quality, efficacy and safety of medicines manufactured from these adulterated raw materials are in questions. It is a common belief that drugs from natural origin are safe from any side effects. Therefore, demands of herbal medicines on human health have been reported, correct identification of crude drugs is an essential need. In the present scenario it is more essential because of more prevalence of adulterants in the market. The WHO database has over 16, 000 suspected herbal case reports. The common adverse effects by adulterated herbal products are hypertension, hepatitis, face, oedema, angiodema, convulsions, thrombocytopenia, dermatitis and death. There are various side effects such as, cardiovascular problem with the use of *Ephedra*, hepatoxic effect due to Kava-Kava consumption, anticholinergic effect due to *Datura betel* etc

Adulteration- The term adulteration is defined as substituting original crude drug partially or wholly with other similar looking substances. The substance, which is mixed, is free from or inferior in chemical and therapeutic property.

Or

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2. Substituents

The drug which is used during non availability of original drug is known as substituent. It has the same type of physiological active constituents. The percentage quality of the drug available may be different. Substitution occurs when a totally different substances is added in the place of original drug. Eg- mixing of buffalo milk with goat milk is substitution, whereas mixing of water in milk is adulteration.

3. Types of Adulteration

Adulteration involves different conditions such as deterioration, admixture, sophistication, substitution, inferiority and spoilage. Deterioration is impairment in the quality of drug. Types of adulteration can be classify into two groups-

1. Unintentional

a) Confusion in vernacular name between indigenous system of medicine and local name.
b) Lack of knowledge about the authentic plant
c) Non availability of the authentic plant
d) Similarity in morphology and aroma
e) Unknown reason

2. Intentional adulteration

a) Adulteration using manufactured substances
b) substitution using inferior commercial varieties
c) Substitution of superficially similar inferior natural substances
d) Substitution using exhausted drugs
e) Adulteration of toxic materials
f) Adulteration of properties
g) Adulteration of synthetic principles.

S. N.	*Name of Drug*	*Latin Name*	*Adulterant*	*Cause of Adulteration*
1.	Parpatta	Fumaria parviflora	Mollugo pentaphylla	Due to confusion in name
2.	Nagkeshar	Mesua ferrea	Calophullum inophyllum	Lack of knowledge
3.	Kapikachu	Mcuna pruriens	Mucuna utilis & Mucuna daeringiana	Lack of authentic plant
4.	Ratanjot		Ventilago madaraspatana	Similarity in color
5.	Shailaya	Permelia perlata	P. perforate & P. cirrhata	Careless collection
6.	Vidhari	Pueraria tuberose	Ipomea digitata	Unknown reason
7.	Paraffin wax		Bee wax	Using Manufactured substances
8.	Coffee berries		Chicory	Using Manufactured substances
9.	Saffron	Crocus sativa	Rose petals	Exhausted drug

Tests which are Perform for Adulteration

Name of Drug	Adulterant	Method of Detecting
Cinnamon Bark	Cassia Bark	Cinnamon bark is very thin and can be rolled around a pencil or pen. It also has a distinct smell. Cassia bark is very thick and stiff and cannot be rolled. Cassia bark comprises of several layers in between the rough outer and inner most, smooth layers. On examination of the bark closely, a clear distinction can be made
Whole spices	Dust, pebble, straw, weed seeds, damaged grain, insects, rodent excreta, hair, etc.	Visual examination can help you distinguish between pure and impure form.
Cloves	Exhausted or De-oiled Cloves	Using the magnifying glass, observe the individually spread cloves closely. Exhausted cloves can be identified by its small size and shrunken appearance. The characteristic pungent taste of genuine cloves is less pronounced in
Cumin Seed / Jeera	Grass seeds coloured with charcoal	Rub the cumin seeds on your palm. If palm turns back, adulteration with charcoal is indicted
Saffron	Dried tendrils of maize cob (Artificial saffron is prepared by drying tendrils of maize cob and colouring them with food colour)	Try breaking a saffron strand. Genuine saffron does not break on pressing but artificial saffron easily crumbles under pressure. Also, try dissolving saffron in water, pure saffron will keep on giving colour until it completely dissolves.
Cumin seeds	Grass sees coloured with charcoal dust	Rub the cumin seeds on your palms. Colouration of your palms indicates adulteration.
Cinnamon	Cassia bark	Cinnamon bark is very thin and can be easily rolled around a pencil or a pen and also have a distinct smell. Cassia barks are tougher and thick.
	Starch	Add a drop of iodine solution (easily available in medical stores or the one from your first-aid box). Formation of blue colour indicates adulteration.
Asafoetida (Hing)	Soap stone or other earthy material	Add some water to the sample and shake it vigorously. Earthy material or soap stone will settle at the bottom.
Whole spices	Dust, pebble, straw, weed seeds, damaged grain, insects, rodent excreta, hair, etc.	Visual examination can help you distinguish between pure and impure form.
Turmeric powder	Metanil yellow	Take 1/4 tsp of turmeric powder in a test tube, add 3 ml alcohol to it and shake vigorously. Add 10 drops of hydrochloric acid to it. Appearance of pink colour indicates presence of this chemical.
Black pepper	Papaya seeds	On visual examination you will find that papaya seeds are shrunken and oval in shape. They are greenish or brownish black in colour.
Cloves	Exhausted cloves (All the oil is extracted from them.)	The small size and shrunken appearance of cloves make them easy to distinguish. Also, the smell is less pungent as compared to true cloves.
	Artificial colours	Sprinkle some chilli powder on a glass of water. Artificial colours will leave a coloured streak.
Chilli powder	Brick powder, salt powder or talc powder	Add a tsp of chilli powder to a glass of water. If it is artificially coloured, the water will change its colour.
		Rub some chilli powder at the bottom of a glass. If any grittiness is felt, it indicates the presence of brick powder/sand.
	Table salt	Tasting the spice will help you distinguish between adulterated and pure spices.
Mustard seeds	Argemone seed	On close observation they are easy to separate as, mustard seeds have a smooth appearance, whereas argemone seeds have a grainy and rough surface and are black in colour. You can also press the mustard seed. Genuine mustard seeds have a yellow core, whereas argemone seeds have a white core.
Powdered spices	Added starch (Not applicable to turmeric.)	Add a drop of iodine solution (easily available in medical stores or the one from your first-aid box). Formation of blue colour indicates adulteration.
	Chalk powder or yellow soap stone powder	Add some dilute hydrochloric acid, if it effervesces; chalk powder or yellow soap stone powder is present.
Turmeric whole	Lead chromate (Gives a bright appearance to the spice)	Add a piece of whole turmeric to water. If the water turns yellow, it indicates adulteration with lead chromate.

Adulterants & Diseases

S.N.	*Name of Product*	*Common Adulterant*	*Disease Caused*
1	Black pepper	Dried papaya seeds	Stomach irritation, liver damage, cancer
2	Arahar	Yellow dye, Kesari dal	Leprosy, paralysis
3	Coffee powder	Chicory	Deprived from nutrition Value
4	Gram dal	Kesari dal, clay, stone	Lathyrism
5	Butter and pure desi ghee	Starch, Vanaspati ghee	Food poisoning
6	Milk Water	starch, fatless milk	Stomach disorder
7	Jeera	Stone, alike seeds from wild Plants	Stomach disorder, liver damage
8	Chilly powder	Brick powder, artificial colours	Liver damage, stomach irritation
9	Sugar	Fine white sand, chalk powder, rawa	Stomach disorder
10	Cereals	Stone pieces, mud, ergot seeds	Stomach disorder

4. Some Common Ways of Detecting Food Adulteration

1) Papaya seeds are used to adulterate black pepper seeds. Add some of the adulterated sample to glass water. Papaya seeds float while pepper seeds do not.
2) Kesari dal is an adulterant in arahar dal and chana dal. Kesari dal pointed and wedge shaped. chana dal/ arahar dal is smooth and round.
3) Starch is used as an adulterant in milk. put few drops of iodine solution in milk. A blue or black colour indicates starch.
4) Old used spices are often mixing with spices sold as fresh. Smell the spice. no or less smell indicates the adulteration.
5) Cheap edible oil in vanaspati. Add a solution of washing soda to vanaspati and shake well. If froth appears on top, cheap oil has been added to vanaspati.
6) Artificial dye in tea leaves. Put tea leaves or moistened blotting paper. Artificial color leaves will impart color to blotting paper.

5. Factors Responsible For Adulteration-

1) Demand of raw herbs increasing day by day.
2) Economic value
3) Different herbs are used for the same name in the different regions of the country.
4) Various species are used to treat peoples for the same drug so a lot of confusion is there.
5) There is a wide gap between demand and supply of herbs.
6) Lack of proper knowledge for proper identification of herbs.
7) Usually untrained peoples collect the herbs form forest areas.
8) To get a lot of profit in the business people adulterate in higher value of herbs.
9) Some species of herbs are endangered.
10) Lack of proper government control.
11) Habitat loss of herbs due to either industrialization or cultivation.

6. Harmful Effects of Adulteration

1) ADRs on using herbs.
2) Herbs using to treat disease are not having reliable results.
3) Substitution of substandard variety
4) Variation in the content of active principle
5) Herb-drug interaction
6) Adulteration also affect the efficacy of medicinal plants
7) Herbal products are not completely free from side-effects. Adulteration in herbal drugs can cause damage to human body

7. How to Control Adulteration-

a) Precautions

By taking a few precautions, we can escape from consuming adulterated products.

1) Take only packed items of well known companies.
2) Buy items from reliable retail shops and recognized outlets.
3) Check the ISI mark or Agmark.
4) Buy products of only air tight popular brands.
5) Avoid craziness for artificially colored sweets and buy only from reputed shops.
6) Do not purchase sweets or snacks kept in open.
7) Avoid buying things from street side vendors.

b) Government Measures

1) The government has passed a stringent act which is known as preservation of food Adulteration Act (PFA Act). It covers safety from risks involved due to poisonous elements. PFA Act covers minimum basic characteristics Of the Products Below which it is deemed to be adulterated and also covers the maximum limit of contaminant not considered being safe for human beings beyond a certain level.
2) Herbal drugs regulation is established in the different countries.
3) Drug controllers are appointed in each state of India for Ayurvedic medicine system.
4) For checking the quality control of durgs DTL (Drug Testing Laboratary) are established.
5) Drugs and cosmetics act-Ayurvedic manufacturing industry covered by this act and it has also provision for new license, renewal, definition regarding manufacturing, Guidelines for GMP etc.
6) Legal necessity-It is necessary to obtain a drug manufacturing licenses for the sale of Ayurvedic medicine and/or cosmetics in India and for export and equally applicable across the country.
7) Drug and cosmetic act-In the absence of official standards published by Government for statutory purposes, Ayurvedic Pharmaceutical Industry in particular has been experiencing several handicaps in implementing in house standards, as in any case, they need to comply with official standards. The AFI and API would now enable the Government to implement the Drugs and Cosmetic Act, 1940 in respect of quality control for the ASU drug manufacturers, distributed and sold in India

8. Present Status

Ayurveda manufacturing Units

Total	GMP-compliance	Non GMP
10080	5402	4517

9. Drawback of Improper Quality Control in Ayurveda

GMP / GCP are not practical and should not apply to Ayurvedic drugs, as it would involve a huge amount of cost. Drug control system in allopathy is very good but in ayurved there is no proper quality control for drugs and there are not all the drugs are DTL tasted so we are going backward from other countries.

10. Observations and Result

S.N.	*Food Stuff*	*Observation*	*Adulterant*
1	Sugar	No brisk effervsence seen	No Chalk powder or washing soda present.
2	Ghee	Pink color obtained	Vanaspati ghee Present
3	Butter	gm Orange red color not obtained	Nil
4	Chilly powder	i) No yellow ppt. ii) settling of brick powder	No lead salts and brick powder present
5	Turmaric powder	No effervescence	Nil
6	Fat	Red colour obtained	Dye

11. Conclusion

The increasing number of food products and the outstanding amounts of imported food stuffs enables the producers to mislead and cheat consumers. To differentiate of those who take advantage of legal rules from the once who commit food adulteration is very difficult. The consciousness of consumers has become very crucial. However, how can we expect consequent behavior from them regarding controversial issues emerging day by day. In addition, ignorance and unfair market behaviors is endangering consumer health. And we also focus our self on other options like substations rather than adulteration.