

Pharmacognosy



Adulteration and Evaluation of Crude drugs
Unit 3rd

Objectives

On completion of this lesson, you would be able to know:

- Methods of adulteration of Crude Drugs
- Commonly used substitutes in adulteration
- Evaluation for determining adulterants

Adulteration and Evaluation

- Adulteration involves incorporation of impurities.
- Includes spoilage deterioration admixture.
- Genuine drugs are intentionally substituted.
- With spurious, inferior, defective or harmful substances.

Adulteration of Crude Drugs

- Adulteration is the debasement of Genuine materials
- Adulteration is done when
 - There is scarcity of crude drugs or
 - Cost of the drug is high even though there is no scarcity
- The drug is either partially or completely substituted
- The adulterant used must be having same morphological characters as that of genuine drug
- In case of powdered drugs colour, texture and density taken into consideration

Methods of Adulteration

1. Manufacture of Substitutes:

Adulterants are artificially manufactured so as to resemble the genuine drug morphologically.

Ex. Pieces of Basswood into correct size & shape of
Nutmeg and sprayed with volatile oil

Flour dough moulded into correct size & shape
and dipped into red ink and writing ink so as to
resemble Ergot

Methods of Adulteration

2. Substitution of superficially similar but cheaper natural materials obtained from same species

Ex. Addition of Clove stalks to genuine Cloves

Substitution of *Digitalis purpurea* with leaves of
Digitalis thapsi

3. Substitution of inferior commercial varieties

Ex. Substitution of Alexandrian Senna with Indian Senna

Substitution of *Capsicum annum* fruits with
Capsicum minimum

Methods of Adulteration

4. Substitution with exhausted materials

Ex. Exhausted Cloves substituted to genuine Cloves

Exhausted Ginger to genuine Ginger

Exhausted Benzoin to genuine Benzoin

5. The presence of extraneous matter if in excess forms adulteration

Ex. Presence of clove stalks and fruits in Cloves

Presence of stems and other parts in Belladonna

Methods of Adulteration

6. Addition of synthetic principles to fortify inferior varieties

Ex. Addition of synthetic Citral to oil of Lemon

Addition of synthetic balsamic acids to Tolu Balsam

7. Powdered drugs

Ex. In case of powdered drugs colour, texture and density of the powder taken into consideration irrespective of its origin.

Faulty collection

- In some cases the quantity of medicinal constituents reaches the maximum at a particular season.

<u>Drug</u>	<u>Season age stage of maximum activity</u>
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Solanaceous drugs	- Summer flowering stage of Plant
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Rauwolfia	- Autumn 3 to 4 years old plant
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Coriander	- When fully grown and ripe
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Linseed	- When fully ripe
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Colchicum corm	- Early summer
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Pyrethrum flower

- Half or 2/3rd open flower

Wild cherry bark

- Autumn bark of young stem

Male fern

- Late autumn

Belladonna root

- Root of 3 to 4 years old plant

Rasna

- 4 to 10 years of age

Opium

-Collected in afternoon when

sky is clear

Drug		Official drug	Substituent
Aconite	-	Aconitum	-Aconitum
		napellus	deinorhizum
Guggul	-	Commiphora	- Commiphora
		mukul	roxburghii
Myrrh	-	Commiphora	- Commiphora
		molmol	erythaea
Pale catechu	-	Uncaria gambier	- Acacia deinorhizum

Belladonna	-	Atropa	Scopola
		belladonna	carniolica
			Phytolacca
			decandra
Digitalis	-	Digitalis purpurea	Verbascum
(Species)	-	Adulterants	thapsus
			Symphytum Officinale
			Primula Vulgaris

Cascara bark

Rhamnus

Rhamnus californica

purshiana

Tragacanth

Astragalus

Sterculia urens

Cinnamon

Cinnamonum

Cinnamonum

zeylanicum

cassia

Improper Preparation

- Before marketing several drugs are to be prepared inert or undesirable part is discarded if not done lead to adulteration.

<u>Drug</u>	<u>Officially used part</u>	<u>Unwanted part</u>
• Ginger	- Rhizome freed from cork	- Cork
• Male Fern	- Rhizome and leaf bases	- Roots
• Orange	- Dried out part	- Spongy inner
• Lemon peel	pericarp	part of pericarp
• Quillaia bark	- Inner part of bark	- Rhytidoma

- Tamarind - Fruits free from brittle outer part - Outer part of pericarp
- Clove - Freed from stalks - Excess stalk

- Neglect of proper conditions for drying
- Leads to adulteration in some drugs

Drug

Faulty Treatment

- Cochicum corm - Drying at temperature 65⁰ which accelerate the rate of hydrolysis of colchicines

- Digitalis
 - Leaves in wet condition for period which provide suitable atmosphere for hydrolysis of glycosides by enzyme or drying above 60°C also leads to hydrolysis of glycosides

- Gentian - Allowing excessive fermentation before drying in which sugars are converted into alcohol and carbon dioxide which leads to reduction in water soluble extractive value.

- Cod-liver oil - Excessive heat used in separating the oil from liver tissues effect the vitamin content as well as odour and colour.

- **Improper Storage:**

- The quality value and medicinal potency
- Impaired or destroyed by action of
 - Moisture
 - Temperature
 - Microorganisms
 - Drug becomes unfit for human consumption
 - To be considered adulterated

- Cascara bark - To be stored at least for one year
before being medicinally utilized
- Ergot - Should be kept entire after
removal of fat and stored in cool
place to prevent attack by insects
moulds and bacteria

- Colophony
 - Should be stored only in lump form
- Male Fern
 - To be used after the internal green colour is lost.
- Digitalis
 - To be stored in air tight
- Belladonna
 - containers protected from sunlight
- Hyoscyamus
- Stramonium
- Cord-liver oil
 - Air tight amber coloured bottles away from sunlight in cool place.

- **Deliberate Adulteration:**

Gross Substitution by entirely different Plant Material

Some times in place of genuine drug substitute

Product similar in appearance to the genuine

Due to scarcity or purely for making profit.

Due to their morphological resemblance

- They are marketed as adulterant

Drug	Substitutional Drug
• Ashoka:	
• Saraca indica	Tremna orientalis
• Kurchi:	
• Holarrhena antidysentrica	Wrightia tinctoria

- Rauwolfia - Rauwolfia canescens
(Rauwolfia serpentina)
- Senna (Cassia aungustifolia) - Cassia auriculata
- Nux vomica - S. nuxblanda
(Strychnos nux-vomica) - S. potatorum

- Substitution by spent or exhausted material
 - Many costly crude drugs are extracted
 - For one or more active constituents or
 - Essential oil partially or completely
 - Same drug is admixed with the genuine drug

Drug

- Fennel
- Clove
- Coriander
- Liquorice
- Jalap

Component extracted

- Volatile oil
- Glycyrrhizin and other
water soluble components
- Resin

- Capsicum - Capsaicin

Pungent Principle

- Ginger - Gingerol

Resin

Volatile oil

- Tolu balsam - Benzoic and
Benzoin Cinnamic acid
Storax
- Tea and Coffee - Caffeine
- Cannabis - Tetra hydro
Cannabinol

Adulteration with non-Plant Material

- Some times foreign / fictitious material mixed
- With the authentic drug.
- Artificially manufactured similar looking
- Material is sued as substitute

<u>Drug</u>		<u>Component Extracted</u>
• Myrrh	-	Quartz and other mineral substances
• Resins	-	Colophony
• Clove and Caraway	-	Imitation material made of clay

- Balsam of Peru - Admixture of synthetic Benzyl benzoate storax

Benzoin and Balsam of Tolu

- Nutmeg - Broken kernels moulded with clay or similarly shaped pieces of wood
- Oil of lemon - Mixture of terpenes and Citral
- Opium - Lead shots
- Asafoetida - Lime stones

- Substitution or Adulteration due to confusion in Vernacular name:
 - Several plants in India known by different vernacular
 - More confusion exists between common vernacular

causes of this type of adulteration

<u>Common Name</u>	<u>Biologically different plants</u>
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|-------------|--------------------------|
| • Punarnava | - Boerhavia diffusa |
| | - Trianthema species |
| | - Portulacastrum species |
| • Brahmi | - Hydrocotyl asiatica |
| | Herpestris monniera |

- Shankhpushpi -Evolvulus alsinoides

Convolvulus pluricaulis

and Clitoria ternatea
- Rasna - Acorus calamus

Alpinia officinarum

Anacyclus pyrethrum

Adulteration in Powdered Drugs

- Besides the entire drugs the powdered drugs
- Also found to be adulterated.

<u>Drug</u>		<u>Adulterant</u>
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Ipecacuanha	-	Dextrin
Colocynth Ginger	-	Exhausted ginger powder
Barks	-	Brick powder
Olive stone	-	Liquorice
		Gentian powder
Capsicum	-	Red sanders wood

Evaluation Detection of Adulteration:

- Evaluation of crude drug involves
- Confirmation of its Identity
- Determination of its Quality and Purity.

- If adulterated requires detection of nature of adulteration in the identified drug
- Before use of any plant drug
- Its identity should be thoroughly confirmed comparing morphological and microscopic characters
- Listed in Pharmacopoeial monograph comparing characters with authentic drug from herbarium.

- Considering the wide variations in source
- Crude drugs their chemical nature
- Biological activity
- Standard by different techniques

Summary

In this class we learnt about

- Types of adulterations
- Commonly used substitutes in adulteration
- Evaluation for determining adulterants

Quiz

1. Volatile oil is not extracted from one of the following
 - a. Fennel
 - b. Coriander
 - c. Jalap
 - d. Clove

Quiz

1. Total balsamic acids are

- a. Benzoic and Cinnamic acid
- b. Cinnamic and salicylic acids
- c. Benzoic and salicylic acids
- d. All correct

Frequently Asked Questions

1. What are different types of adulterations
2. What are the common substituents used for adulteration in crude drugs.