Chapter – 3 Quality Control of Crude Drugs

2.1 Introduction

(a) Drug adulteration: It is broadly defined as admixture or substitution of original articles with defective, inferior or harmful substances.

The reasons for adulteration are:

1) Scarcity (shortage) of the drug.
2) High price of original drug.

Following are the various methods used for drug adulteration:

a) Replacement by exhausted drug: This is observed in case of costly drugs such as cloves, tea.

b) Substitution with superficially similar but inferior drug: The common example of substitution is adulteration of cloves by mother cloves.

c) Substitution by artificially manufactured substances: For example artificial invert sugar is mixed with honey.

d) Substitution by sub-standards commercial varieties: Nux-vomica seeds are adulterated with strychnos nux- blanda.

e) Presence of organic matter obtained from the same plant: For example cloves are mixed with cloves stalks.

f) Adulteration with non-plant material: Many a times waste from the market like amber colour glass is mixed in colophony.

2.2 Evaluation

It means confirmation of its identity and determination of its quality & purity and detection of nature of adulteration.

Evaluation of a drug is mainly done through different types:

a) Morphological (Organoleptic) evaluation.
b) Microscopic evaluation.
c) Chemical evaluation.
d) Biological evaluation.

1. Morphological (Organoleptic) evaluation: This type of evaluation involves test carried with the help of sense organs. It refers to evaluation of drug by colour, odour, taste, size, shape and special features like touch, texture etc.

a) **Color:** Some drugs are green in colour when dried in shade but become pale exposure to sunlight.

b) **Smell:** Some drugs have characteristic smell which help in their easy identification, **example:** Cardamom, cinnamon, clove i.e., the drugs that contain volatile oil.

c) **Taste:** Drug can be evaluated by taste also, **example:** liquorice sweet in taste, ginger and capsicum has a pungent taste.

2. Microscopic evaluation: This evaluation is very useful in identification of different varieties of drug and its adulterants. The drug is examined under microscope which can be done after powdering or cutting a thin section of drug, i.e., cell contains starch grains, calcium oxalate, trichomes, fibers, vessels that can be studied in this evaluation. For **examples:** lignified trichomes in nux-vomica, glandular trichomes of mint.

a) **Qualitative & quantitative evaluation:** This can be achieved by specific feature such as stomatal index, stomatal number, vein islet number, palisade ratio, vein termination number. Lycopodium spore methods are used for the determination of starch grains in wheat or ginger powder.

b) **Physical evaluation:** It is very essential for the determination of quality and purity of drug. In this evaluation physical constants are determined, **example:** viscosity for drug containing gum and swelling factors for mucilage containing drugs. The various parameters used for physical evaluation of drug are:

I. **Moisture content:** The presence of excessive moisture content in a drug will destroy its quality due to growth of micro-organism. For **example:** digitalis should not contain moisture content more than 5%.

II. **Melting point:** It is a useful parameter for determining the purity of crude drug. It is very helpful for the evaluation of solid fixed oil and waxes, **example**: the melting point of coca butter should be in between 30–330C.

III. **Refractive index:** It is a ratio of velocity of light in vacuum to velocity in the substance. It is a physical constant and very useful for standardization of volatile and fixed oil.

IV. **Volatile oil content:** Volatile oil content present in the crude drugs like clove, cardamom, rose, cinnamon etc. is determined, **example:** clove contains not less than 15% volatile oil.

3. Chemical evaluation: It is determination of active constituents in drug by chemical methods. The following are various methods used in chemical evaluation of crude drugs:

a) **Instrumental Methods:** Various types of instruments are used for evaluation of crude drugs **like** colorimetry, fluorimetery & spectrophotometery etc.

b) **Chemical constants:** Some chemical constants **like** acid value, iodine value & ester value are also used for theidentification of fixed oil and fats etc.

c) **Individual chemical test:** Chemical test are also used for identifying particular drugs, **example:** various tests are done to detect alkaloids i.e., Mayer's reagent test, Hager's reagent test etc, Iodine test is done for detection of starch.

4. Biological evaluation: When physical or chemical means are not able to produce satisfactory result in crude drugs then the drugs are evaluated by biological methods. In this evaluation the tests are performed on living animals, animal preparations, isolated living tissues, microorganisms and intact organs and this method is known as bioassay.

For example Antibiotics and vitamins are microbiologically evaluated on yeast, mold and the living bacteria. Biological evaluation is expensive, time consuming and less precise than chemical evaluation.