Crude Drug:

The term “Crude”, is used in relation to natural products.

A crude drug is a natural drug of plant or animal origin which has undergone no treatment other than collection and drying, that is, the quality or appearance of the drug has not been advanced in values or improved in conditions by any physical or chemical treatment.

For example: Digitalis leaf, Rauwolfia root etc.

Preparation of Drugs for Commercial Market

- Following are different steps performed for preparation of drugs for market.
    - Collection
    - Harvesting
    - Drying
    - Garbling
    - Packaging, storage, and preservation
- **1. Collection**
- Collection of drugs from cultivated plants always insures a true natural source and a reliable product. This may, or may not, be the case when drugs are collected from wild plants. Carelessness or ignorance on the part of the collector can result in complete or partial substitution. This is especially true when drugs are difficult to collect or the natural source is scarce.
- Many drugs are collected from wild plants sometimes on a fairly extensive scale (tragacanth, senna) when collection is the vocation of the gatherer, and sometimes on a limited scale when collection is an avocation (podophyllum, hydrastis).
- Because drugs come from all over the world, collection areas are almost universal, and collectors may vary from uneducated natives to highly skilled botanists.

- **Time of collecting:**

- The proper time of collecting is particularly important because the nature and quantity of constituents vary greatly in some species according to the season.
- The most advantageous collection time is when the part of the plant that constitutes the drug is highest in its content of active principles and when the material will dry to give the maximum quality and appearance.
    - 1. Collecting of medicinal plants

A. ***Suitable time for collection***

- The amount of a constituent is usually not constant throughout the life of a plant.
- The stage at which a plant is collected or harvested is, therefore, very important for maximizing the yield of the desired constituent.
- The differences are sometimes not only quantitative but also qualitative.

B. ***Rules for collection***

- The following general rules are based on assuming that the material is best collected when the organ in question has reached its optimal state of development:

1. ***Roots and rhizomes*** are collected at the end of the vegetation period, i.e. usually in the autumn. In most cases they must be washed free of adhering soil and sand.
2. ***Bark*** is collected in the spring.
3. ***Leaves*** and ***herbs*** are collected at the flowering stage.
4. ***Flowers*** are usually gathered when fully developed.
5. ***Fruits*** and ***seeds*** are collected when fully ripe.

. ***Methods of collection***

- Medicinal plants must be largely collected by hand. This is especially true in the case of wild plants.

- With cultivation on a large scale, it may be possible to use modern agricultural harvesters, but in many cases, e.g. barks, manual collection is unavoidable. Thus, the cost of drug production is largely the cost of the labor involved.

- **2. <u>Harvesting</u>**
- The mode of harvesting varies with each drug produced and with the pharmaceutical requirements of each drug. Some drugs may be collected by hand labor; however, when the cost of labor is an important factor, the use of mechanical devices is often more successful in economic production of the drug.
- With some drugs, where the skillful selection of plant parts is an important factor (digitalis), mechanical devices cannot replace hand labor.

3. <u>Drying</u>

By drying the plant material, one removes sufficient moisture to ensure good keeping qualities and to prevent molding, the action of enzymes, the action of bacteria, and chemicals or other possible changes.

Drying fixes the constituents, facilitates grinding and milling, and converts the drug into a more convenient form for commercial handling.

Proper and successful drying involves two main principles:

- ✓ Control of temperature.and
- ✓ Regulation of air flow.

✓ Control of the drying operation is determined by the nature of the material to be dried and by the desired appearance of the finished product. The plant material can be dried either by the sun or by the use of artificial heat.

✓ With some natural products, such as vanilla, processes of fermentation or sweating are necessary to bring about changes in the constituents. Such drugs require special drying processes, usually called "curing."

"YOU ONLY LIVE ONCE, BUT IF YOU DO IT RIGHT, ONCE IS ENOUGH."

✓ **4. <u>Garbling</u>**

✓ Garbling is the final step in the preparation of a crude drug. Garbling consists of the removal of extraneous matter, such as other parts of the plant, dirt, and added adulterants.

✓ This step is done to some extent during collection, but should be carried out after the drug is dried and before the drug is baled or packaged. Although garbling may be done by mechanical means in some cases, it is usually a semiskilled operation.

A. ***<u>Drying</u>***

- The most common method for preserving plant material is drying.
- Enzymatic processes take place in aqueous solution. Rapid removal of the water from the cell will, therefore, largely prevent degradation of the cell constituents.
- Drying also decreases the risk of external attack, e.g. by moulds.
- ***<u>Living plant material has a high water content:</u>*** **leaves** may contain **<u>60-90%</u>** water, **roots and rhizomes <u>70-85%</u>**, and **wood <u>40-50%</u>**. The lowest percentage, often no more than **<u>5-10%</u>**, is found in **seeds**.
- To stop the enzymic processes, the water content must be brought down to about 10 %.
- Drying must be done quickly, in other words at raised temperatures and with rapid and efficient removal of the water vapor.
- The most efficient drying is achieved in large driers of the tunnel type. The plant material is spread out on shallow trays, which are placed on mobile racks and passed into a tunnel where they meet a stream of warm air.
- The air temperature is kept at **<u>20-40 °C</u>** for thin materials such as **leaves**, but is often raised to **<u>60-70 °C</u>** for plant parts that are harder to dry, e.g. **roots** and **barks**.

- When the crude drug has been collected under primitive conditions, without access to a drier, it must be dried in the open air. Even then, the material should be spread out in shallow layers with good ventilation to facilitate the drying. The choice of sunshine or shade is determined by the sensitivity to light of the constituents.
- *In a dried drug the enzymes are not destroyed but only rendered inactive due to the low water content. As soon as water is added, they become active again. Hence, dried drugs must be protected from moisture during storage.*

✓ **5: <u>Packaging, storage, and preservation</u>**

✓ The packaging of drugs depends on their final disposition.

✓ In commerce, if transportation, storage, and ultimate use for manufacturing purposes are involved, it is customary to choose the type of packaging that provides ample protection to the drug and gives economy of space.

✓ Leaf and herb material is usually baled with power balers into a solid compact mass that is then sewn into a burlap cover.

✓ Senna leaves from India come in bales of 400 lb; stramonium from Argentina in bales of 700 lb.

✓ Drugs that are likely to deteriorate from absorbed moisture (digitalis, ergot) are packed in moisture-proof cans. Gums, resins, and extracts are shipped in barrels, boxes, or casks.

✓ Proper storage and preservation are important factors in maintaining a high degree of quality of the drug. Hard-packed bales, barks and resinous drugs usually reabsorb little moisture. But leaf, herb and root drugs that are not well packed tend to absorb amounts of moisture that reach 10, 15, or even 30% of the weight of the drug. Excessive moisture not only increases the weight of the drug, thus reducing the %age of *active constituents, but also favors* enzymatic activity and facilitates fungal growth.

✓ Light adversely affects drugs that are highly colored, rendering them unattractive and possibly causing undesirable changes in constituents.

- ✓ The oxygen of the air increases oxidation of the constituents of drugs, especially when oxidases are present. Therefore, the warehouse should be cool, dark, and well ventilated with dry air.

The protection of drugs against attacks by insects must not be overlooked. The insects that infest vegetable drugs belong chiefly to the orders *Lepidoptera*, *Coleoptera*, and *Diptera.*

For destruction of insects and prevention of their attacks, a number of methods have been employed.

- ✓ The simplest & the most efficient method is to expose the drug to a temperature of 65°C which not only prevents insect attacks, but also many other forms of deterioration.
- ✓ For the fumigation of large lots of crude drugs, such as those stored in warehouses and manufacturing plants, the use of methyl bromide has met with considerable success.
- ✓ Small lots of drugs may readily be stored in tight, light-resistant containers e.g. tin cans, covered metal bins, or amber glass containers.
- ✓ Drugs should not be stored in wooden boxes or in drawers and never in paper bags. Not only is deterioration hastened, but odors are communicated from one drug to another, attacks by insects are facilitated, and destruction by mice and rats may occur.
- ✓ If drugs in small quantities are stored in tight containers, insect attack can he controlled by adding to the container a few drops of chloroform or CCl_4 from time to time.
- ✓ In the case of digitalis and ergot, whose low moisture content must be maintained at all times, the insertion of a suitable cartridge or device containing a non-liquefying, inert, dehydrating substance may be introduced into the tight container.
- ✓ Because high temperatures accelerate all chemical reactions, including those involved in deterioration, drugs must always be stored at as low temperature as much as possible.

- ✓ The ideal temperature is just above freezing, but since this is impractical in most cases, the warehouse or other storage place should be as cool as possible.
- ✓ Certain drugs such as the biologicals, must be stored at a temperature between 2 and *8ċ.*