

PHARMACOGNOSY

Different Systems of Classification of Crude Drugs

Dr. Showkat Rasool Mir

Lecturer

Department of Pharmacognosy and Phytochemistry

Faculty of Pharmacy

Jamia Hamdard

Hamdard Nagar

New Delhi-110062

(12-9-2007)

CONTENTS

[Classification of Crude Drugs](#)

[Alphabetical Classification](#)

[Morphological Classification](#)

[Taxonomic Classification](#)

[Pharmacological Classification](#)

[Chemical Classification](#)

[Chemotaxonomical Classification](#)

Keywords

Crude drug, Systems of Classification, Chemical Classification, Pharmacological classification, Morphological Classification, Chemotaxonomical classification

Crude drugs of vegetable, animal and mineral sources form the subject matter of pharmacognosy. Although pharmacognosy is concerned mainly with naturally occurring substance of medicinal importance, it is not entirely limited to such substances. Thus, surgical dressings prepared from natural fibres, flavouring and suspending agents, disintegrants, filtering and support media etc. are included within the subject along with poisonous and hallucinogenic plants and raw materials for oral contraceptives.

The term *crude drug* generally applies to the products from plant and animal origin found in a raw form. However, the term is also applied to include pharmaceutical products from mineral kingdom in original form and not necessarily only of organic origin such as kaolin, bentonite etc. Crude drugs can thus be defined as to the natural products that has not been advanced in value or improved in condition by any process or treatment beyond that which is essential for its proper packing and prevention from deterioration.

Classification of Crude Drugs

The most important natural sources of drugs are higher plant, microbes and animals and marine organisms. Some useful products are obtained from minerals that are both organic and inorganic in nature. In order to pursue (or to follow) the study of the individual drugs, one must adopt some particular sequence of arrangement and this is referred to a system of classification of drugs. A method of classification should be

- (a) Simple
- (b) Easy to use
- (c) Free from confusion and ambiguities.

Because of their wide distribution, each arrangement of classification has its own merits and demerits, but for the purpose of study the drugs are classified in the following different ways:

1. Alphabetical classification
2. Morphological classification
3. Taxonomic classification
4. Pharmacological classification
5. Chemical classification
6. Chemotaxonomical classification

Alphabetical Classification

Alphabetical classification is the simplest way of classification of any disconnected items. Crude drugs are arranged in alphabetical order of their Latin and English names (common names) or sometimes local language names (vernacular names).

Some of the pharmacopoeias, dictionaries and reference books which classify crude drugs according to this system are as follows.

1. Indian Pharmacopoeia
2. British Pharmacopoeia
3. British Herbal Pharmacopoeia
4. United States Pharmacopoeia and National Formulary

5. British Pharmaceutical Codex.
6. European Pharmacopoeia

In European Pharmacopoeia these are arranged according to their names in Latin where in U.S.P. and B.P.C., these are arranged in English.

Merits:

- It is easy and quick to use
- There is no repetition of entries and is devoid of confusion.
- In this system location, tracing and addition of drug entries is easy.

Demerits: There is no relationship between previous and successive drug entries.

Examples: Acacia, Benzoin, Cinchona, Dill, Ergot, Fennel, Gentian, Hyoscyamus, Ipecacuanha, Jalap, Kurchi, Liquorice, Mints, Nuxvomica, Opium, Podophyllum, Quassia, Rauwolfia, Senna, Vasaka, Wool fat, Yellow bees wax, Zeodary.

Morphological Classification

In this system, the drugs are arranged according to the morphological or external characters of the plant parts or animal parts i.e. which part of the plant is used as a drug e. g. leaves, roots, stem etc. The drugs obtained from the direct parts of the plants and containing cellular tissues are called as *organized* drugs e. g. Rhizomes, barks, leaves, fruits, entire plants, hairs and fibres. The drugs which are prepared from plants by some intermediate physical processes such as incision, drying or extraction with a solvent and not containing any cellular plant tissues are called as *unorganized* drugs. Aloe juice, opium latex, agar, gambir, gelatin, tragacanth, benzoin, honey, beeswax, lemon grass oil etc. are examples of unorganized drugs.

Organised Drugs

Woods– Quassia, Sandalwood, Red Sandalwood.

Leaves– Digitalis, Eucalyptus, Gymnema, Mint, Senna, Spearmint, Squill, Tulsi, Vasaka, Coca, Buchu, Hamamelis, Hyoscyamus, Belladonna, Tea.

Barks– Arjuna, Ashoka, Cascara, Cassia, Cinchona, Cinnamon, Kurchi, Quillia, Wild cherry.

Flowering parts– Clove, Pyrethrum, Saffron, Santonica, Chamomile.

Fruits– Amla, Anise, Bael, Bahera, Bitter Orange peel, Capsicum, Caraway, Cardamom, Colocynth, Coriander, Cumin, Dill, Fennel, Gokhru, Hirda, Lemon peel, Senna pod, Star anise, Tamarind, Vidang.

Seeds– Bitter almond, Black Mustard, Cardamom, Colchicum, Ispaghula, Kaladana, Linseed, Nutmeg, Nux vomica, Physostigma, Psyllium, Strophanthus, White mustard.

Roots and Rhizomes– Aconite, Ashwagandha, Calamus, Calumba, Colchicum corm, Dioscorea, Galanga, Garlic, Gention, Ginger, Ginseng, Glycyrrhiza, Podophyllum, Ipecac, Ipomoea, Jalap, Jatamansi, Rauwolfia, Rhubarb, Sassurea, Senega, Shatavari, Turmeric, Valerian, Squill.

Plants and Herbs– Ergot, Ephedra, Bacopa, Andrographis, Kalmegh, Yeast, Vinca, Datura, Centella.

Hair and Fibres– Cotton, Hemp, Jute, Silk, Flax.

Unorganised Drugs.

Dried latex– Opium, Papain

Dried Juice– Aloe, Kino

Dried extracts– Agar, Alginate, Black catechu, Pale catechu, Pectin

Waxes - Beeswax, Spermaceti, Carnauba wax

Gums – Acacia, Guar Gum, Indian Gum, Sterculia, Tragacanth.

Resins– Asafoetida, Benzoin, Colophony, copaiba Guaiacum, Guggul, Mastic, Coal tar, Tar, Tolu balsam, Storax, Sandarac.

Volatile oil– Turpentine, Anise, Coriander, Peppermint, Rosemary, Sandalwood, Cinnamon, Lemon, Caraway, Dill, Clove, Eucalyptus, Nutmeg, Camphor.

Fixed oils and Fats– Arachis, Castor, Chalmooogra, Coconut, Cotton seed, Linseed, Olive, Sesame, Almond, Theobroma, Cod-liver, Halibut liver, Kokum butter.

Animal Products – Bees wax, Cantharides, Cod-liver oil, Gelatin, Halibut liver oil, Honey, Shark liver oil, shellac, Spermaceti wax, wool fat, musk, Lactose.

Fossil organism and Minerals– Bentonite, Kaolin, Kiesslgühr, Talc.

Difference between organized and unorganized drugs

Organized Drugs	Unorganized Drugs
These may be of plant or animal origin.	These may be of plant, animal or mineral origin.
These are direct part of plant or animal.	These are the product of plant or animals.
These have cellular structure.	These do not have well defined cellular structure.
Generally identified by morphological character.	Generally identified by organoleptic properties.
Examples: Digitalis leaf, cinchona bark and ephedra stem.	Examples: Agar, gelatin, honey.

Merits: :Morphological classification is more helpful to identify and detect adulteration. This system of classification is more convenient for practical study especially when the chemical nature of the drug is not clearly understood.

Demerits:

- The main drawback of morphological classification is that there is no co-relation of chemical constituents with the therapeutic actions.
- Repetition of drugs or plants occurs.

Taxonomical Classification

Taxonomical classification is purely a botanical classification and is based on principles of natural relationship and evolutionary developments. They are grouped in Kingdom, phylum, order, family genus and species. As all the entire plants are not used as drugs, part of the plant is used as a drug, for example, cinnamon bark. Thus it is of no significance from identification

point of view to put plants in a taxonomic order. Table 1 give the account of main characters of various taxon that contribute crude drugs while as Table 2 gives the taxonomical classification of some drugs.

Table 1: Main Characters of Various Taxon that Contribute Crude Drugs

Plant Kingdom			
Thallophyta	Pteridophyta	Gymnosperm	Angiosperm
- Algae and fungi are considered together - They differ in mode of nutrition - Algae exhibit autotrophic and fungi exhibit heterotrophic nutrition. Example: Rhodophyta (Red algae) agar	- This group of plants derives its name from the fern, <i>Pteris</i> which also represents salient features of the group (Pteridophytes, Phyton-plant) - They occur in humid and tropical climates and usually grow on soil, rocks, in ponds etc. - These plants are also raised in pots as ornamentals Example: Male fern	- The gymnosperm (Gymnos-naked and spermatophyte i.e. plant with a naked seed) are comparatively more ancient than the angiosperm in evolutionary terms - The living gymnosperms are widely distributed in the cold climates - The plant body is sporophyte and differentiated into roots, stem and leaves. Example: Ephedra, Colophony	- The term angiosperm means enclosed seed because the ovules or potential seeds are enclosed within a hollow ovary. - The angiosperms constitute the most dominant and ubiquitous vascular plants of present-day flora - Dicots and monocots are its subdivisions.
			Dicot
			Monocot
			They have two cotyledons Example: Coriander, Capsicum
			They have one cotyledon Example: Vanilla, Colchicum

Table 2: Taxonomical Classification of Some Crude Drugs

Phylum	Order	Family	Drugs
Thallophyta (Bacteria, fungi, Lichens) Rhodophyta	Gelidiales	Gelidiaceae	Agar
Pteridophyta (Liverworts, Mosses and Ferns)	Filicales	Polypodiaceae	Male fern
Gymnosperms	Genetales Coniferae	Ephedraceae Pinaceae	Ephedra Colophony
Angiosperms (Monocotyledons)	Liliflorae Microspermae	Liliaceae Dioscoreaceae Orchidaceae	Colchicum Dioscorea Vanilla

Angiosperms (Dicotyledons)	Papaverales	Papaveraceae	Opium
	Rosales	Rosaceae	Almond, Rose oil
		Leguminosae	Balsam of Tolu
	Malvales	Malvaceae	Sida
	Umbelliflorae	Umbelliferae	Coriander, caraway
	Tubiflorae	Convolvulaceae Labiales Solanaceae Scrophulariaceae	Shankhpusphi Mentha Belladonna Digitalis
	Plantaginales	Plantaginaceae	Plantago
	Companulales	Lobeliaceae	Lobelia

Merits:- Taxonomical classification is helpful for studying evolutionary developments.

Drawback: This system also does not co-relate in between the chemical constituents and biological activity of the drugs.

Pharmacological Classification

Grouping of drug according to their pharmacological action or of most important constituent or their therapeutic use is termed as pharmacological or therapeutic classification of drug. This classification is more relevant and is mostly followed method. Drugs like digitalis, squill and strophanthus having cardiotoxic action are grouped together irrespective of their parts used or phylogenetic relationship or the nature of phytoconstituents they contain. Table 3 gives an outline of pharmacological classification of drugs .

Table 3: Classification of Drugs based on Pharmacological action.

Pharmacological Action	Drugs
Anticancer	Vinca, Podophyllum, Taxus
Anti-inflammatory	Colchicum, Turmeric
Antiamoebic	Ipecac root, Kurchi bark
Antiasthmatic	Ephedra, Lobelia
Anthelmintic	Male fern, Quassia wood
Antispasmodic	Datura, Hyoscyamus
Astringent	Catechu
Analgesic	Opium, poppy
Bitter tonic	Quassia wood, Nux-vomica, Gentian
Carminatives	Coriander, fennel, clove, peppermint
Purgatives	Senna, Rhubarb
Expectorant	Tulsi, Balsam of Tolu, Vasaka
Cardiotonic	Digitalis, Squill, Strophanthus
Tranquilizers	Rauwolfia Roots

Merits: This system of classification can be used for suggesting substitutes of drugs if they are not available at a particular place or point of time.

Demerits: Drugs having different action on the body gets classified separately in more than one group that causes ambiguity and confusion. Cinchona is antimalarial drug because of presence of

quinine but can be put under the group of drug affecting heart because of antiarrhythmic action of quinidine.

Chemical Classification

The crude drugs are divided into different groups according to the chemical nature of their most important constituent. Since the pharmacological activity and therapeutic significance of crude drugs are based on the nature of their chemical constituents. The chemical classification of drugs is dependent upon the grouping of drugs with identical constituents. An out of this classification is as follows:

1. Carbohydrates– Carbohydrates are polyhydroxy aldehydes or ketones containing an unbroken chain of carbon atoms.

Gums	Acacia, Tragacanth, Guar gum
Mucilages	Plantago seed
Others	Starch, Honey, Agar, Pectin, Cotton

2. Glycosides – Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycone) and non-sugar (aglycone).

Anthraquinone Glycosides	Aloe, Cascara, Rhubarb, Senna
Saponins Glycosides	Quillaia, Arjuna, Glycyrrhiza
Cyanophore Glycosides	Wild cherry bark
Isothiocyanate Glycosides	Mustard
Cardiac Glycosides	Digitalis, Strophanthus
Bitter Glycosides	Gentian, Calumba, Quassia, Chirata, Kalmegh

3. Tannins– Tannins are complex organic, non-nitrogenous derivatives of polyhydroxy benzoic acids. Examples- Pale catechu, Black catechu, Ashoka bark, Galls, Myrobalan, Bahera, Amla

4. Volatile oils– Monoterpenes and sesquiterpenes obtained from plants

Examples- Cinnamon, Fennel, Dill, Caraway, Coriander, Cardamom, Orange peel, Mint, Clove, valerian

5. Lipids

Fixed oils – Castor, Olive, Almond, Shark liver oil

Fats – Theobroma, Lanolin

Waxes – Beeswax, Spermaceti

6. Resins– Complex mixture of compounds like resinols, resin acids, resinotannols, resenes. Examples Colophony, Podophyllum, Cannabis, Jalap, Capsicum, Turmeric, Balsam of Tolu and Peru, Asafoetida, Myrrh, Ginger

7. Alkaloids – Nitrogenous substance of plant origin

Pyridine and Piperidine – Lobelia, Nicotiana

Tropane - Coca, Belladonna, Datura, Stramonium, Hyoscyamus, Henbane

Quinoline – Cinchona

Isoquinoline – Opium, Ipecac, Calumba

Indole – Ergot, Rauwolfia

Amines – Ephedra

Purina – Tea, coffee

8. Protein – Gelatin, Ficin, Papain

9. Vitamins - Yeast

10. Triterpenes – Rasna, Colocynth

Merits : It is a popular approach for phytochemical studies

Demerits: Ambiguities arise when particular drugs possess a number of compounds belonging to different groups of compounds.

Chemotaxonomic Classification

This system of classification relies on the chemical similarity of a taxon i.e. it is based on the existence of relationship between constituents in various plants. There are certain types of chemical constituents that characterize certain classes of plants. This gives birth to entirely new concept of chemotaxonomy that utilizes chemical facts/characters for understanding the taxonomical status, relationships and the evolution of the plants. For example, tropane alkaloids generally occur among the members of Solanaceae thereby, serving as a chemotaxonomic marker. Similarly other secondary plant metabolites can serve as the basis of classification of crude drugs. The berberine alkaloid in Berberis and Argemone; Rutin in Rutaceae members, ranunculaceous alkaloids among its members etc are other examples.

It is the latest system of classification and gives more scope for understanding the relationship between chemical constituents, their biosynthesis and their possible action.

References

1. Said MH, Traditional greco-Arabic medicine and modern western medicine: conflict or symbiosis Hamdard National Foundation, Karachi, 1975.
2. Evans WC, Trease and Evans Pharmacognosy, Harcourt Brace & Company, Singapore, 14th Edition, 2001.
3. Nath N, Gupta S, The Ayurvedic system of medicine, Neeraj Publications, Delhi, 1984.
4. Kokate CK, Purohit AP, Gokhale SB, Pharmacognosy, Nirali Prakashan, Pune, 31st Edition, 2005.
5. Dahanukar SA, Thatte UM, Ayurveda revisited: Ayurveda in the light of contemporary medicine, Popular Prakashan, Bombay, 1994.
6. Ali M, Text book of pharmacognosy, C.B.S Publications, New Delhi 2nd Edition, 2002.