Pharmacological cativities of medicinal plants

Pharmacological activities is an approach for studying medicinal plants & their products.
Numerous plants although elicit a pharmacological respons used as drugs.
Major pharmacological groupings involve drugs which act on nervous system , heart &blood vessels , lung , GIT , kidney , liver , reproductive organs , skin & mucous membrane , hormons , vitamins & chemotheraputic drugs.
Some plants contain a range of compounds with differing pharmacological activities.

Drugs acting on the nervous system

Nervous system coordinates & regulates the various voluntary & involuntary activities of the body . It is devided into the Central Nervous System CNS & the Autonomic Nervous System ANS , whereby those two systems are inter-linked & some drugs which affect the CNS may also produce reaction on the ANS.

Drugs acting on the CNS :

CNS comprise the brain & spinal cord . It coordinates the voluntary activities of the body & exhibit numerous interactions within the system together with linkage to the autonomic nervous system .Drugs involved with CNS can be classified either generally stimulant or depressant action with further sub-division regarding specific actions , such as anti convulsant , narcotic analgesic , hallucinogenic etc. ex:
-cocaine from Erythroxylum coca leaves which causes mental stimulation & produce addiction .
-purine bases ex: caffeine , theophyllin which stimulate mental activities . It is found in coffee , tea , cacao & kola .
-Valerian passiflora which is sedative & hypnotic .
-Morphine from opium which used as analgesic .
-Picrotoxin from berries of Anamirta cocculus which is used as analeptic

Drugs acting on the ANS :

ANS supplies the smooth muscles tissues & gland . Its functions involve the ganglia situated out side the spinal cord . It is composed of two divisions , sympathetic (adrenergic) & parasympathetic (cholinergic) . The neuro-transmitor for the adrenergic system is nor adrenalin while the neuro-transmitor for the cholinergic devision is acetycetyl choline .

-Acetyl choline like drugs ex:
pilocarpine from leaves of Pilocarpus microphyllus .
muscarine from Ammanita species & other fungi.

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- Acetyl choline antagonist ex :

Tropane alkaloids (atropine & hyoscine) which are found in Datura & Atropa species .

- Adrenalin like drugs ex :

Ephidrine which are obtained from Ephedra species .

- Adrenalin antagonist drugs ex :

Ergot alkaloids like ergotamine which is obtained from Claviceps species.

Drugs acting on the cardiovascular system CVS

- Cardiovascular glycosides ex : Digitalis species , Nerium oleander .

Used for the treatment of failing heart . The chemical effect in cases of congestive heart failure is to increase the force of myocardial contraction resulting in a complete emptying of the ventricle , also used to control cardiac arhythmias & as diuretic .

- Anti arhythmic drugs ex : quinidine from Cinchona bark .

It is official in most pharmacopeais & its salt , used for prophylaxis of atrial fibrilation & sinus rhythm .

- Anti hypertensive drugs : hypertention is either mild or sever .

ex : reserpine alkaloid from Rauwolfia

also Veratrum alkaloids , and also Crataegus .

- Platelet activating factor (PAF) inhibitor :

PAF is involved in platelets aggregation , released from activated basophiles.

ex : drugs that inhibit PAF is cod liver oil , Tussilago , Piper futokodsura .

- Drugs acting on the blood vessels :

They are either vasoconstrictor or vasodilator . Their actions originates in different ways either direct , or central or periphral or reflux .

ex : ergotamine from Claviceps purpurea is a periphral vasoconstrictor.

- Picrotoxin is central vasoconstrictor .
- Papaverine is vasodilator .
- Xanthine derivatives ex : caffeine & theobromine.

- Oral anticoagulants :

It inhibits the clotting mechanism of the blood & are of value in arterial thrombosis but they have no effects on platelets aggregation .

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ex : coumarins which acts by antagonizing the effect of vitamin K in blood coagulation .They are found in Lavendula officinalis & Melilotus officinalis.

- Hypolipidimic drugs :

ex : Garlic (Allium sativum) it decrease serum total cholesterol & improve lipid prophile , it decreases low density lipoprotein LDL & increases high density lipoprotein HDL .

Drugs acting on urinary & reproductive system :

1- Diuretics : ex :-Xanthine derivatives found in beverages causes dilatation of renal blood vessels.
- Digitalis glycosides which increase glomerular filteration

2- Diuretics & urinary tract antiseptics ex : juniper .

3- Drugs acting on the uterus : ex :
- ergot alkoloids (ergometrine) which causes uterine contraction .
- Hydrastus for menstural disorder .

Drugs acting on the skin & mucous membrane :

Drugs are classified as follows :

1- Emolients & demulcents ex :

-fixed oils ex : olive oil , coconut oil .
- waxes ex : beeswax .
- gums ex : acacia .
- mucilages ex : Psyllium .

2- Absorbents & adsorbents ex : starch , charcoal .
3- Astringents ex : tannins which are found in galls , pomegranate rind .
4- Counter-irritant ex : comphor , Capsicum , mustard .
5- Antiseptics ex : Eucalyptus oil , thyme oil , eugenol
6- Wound covering ex : cotton .
7- Psorisis & eczema ex : Comfrey , Primrose oil .

Drugs acting on sugar metabolism :

These drugs are used for oral treatment of diabetes ex : cumin fruit , ginsing , Teucrium oliverianum , onion , Aloe .

Drugs which act like steroids & anti inflammatory :

There are two types of corticosteroidal hormons :

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1- Glucocorticoids :which regulate carbohydrate & protein metabolism & has strong anti inflammatory action .
2- Mineralocorticoids : which influence the electrolytes & water balance in the body .

These hormons are synthesised using plant steroids as intermediates ex : diosgenin , hecogen .

Non steroidal anti inflammatory drugs : ex :

Matricaria flowers which contain flavonoids .
Calendula officinalis which contains terpenoids .
Glycyrrhiza glabra root which contains saponin & flavonoids .
Colchicum autumnale which contains colchicine alkaloid which is used in the treatment of gout .
Ananas comosus juice which contains five proteolytic enzymes which are able to dissolve fibrin in conditions of inflammatory oedema .

Drugs used in the treatment of infections :

These drugs are classified as follows :

1- Antibiotics which are obtained from moulds & streptomyces .
2- Antimalarial ex : Cinchona species which contains quinine alkaloid .
Artemisia which contains artemisin which is triterpene Lacton
3- Amoebicides ex : Ipecacuana root which contains emetine alkaloid .
4- Anthelmentics ex : Achilea santolina which contains santonin which act against round worm .

Drugs which act on the nasal & respiratory system :

- Aromatic inhalation ex : Eucalyptus oil , menthol , peppermint , thymol .
- Bronchodilators & nasal decongestant ex : ephedrine , theophyline .
- Expectorant ex : liquorice root , lobelia .
- Cough suppresant ex : codeine , wild cherry .
- Demulcent ex : Marshmallow , plantago , honey .

Drugs used for treatment of malignant deseases :

Ex : Catharanthus roseus which contains vincristine & vinblastine which act as anti cancer .

Drugs used in diagnosis of allergy :

Some plant exrtacts are used as allergens ex : grass , flowers , pollen , also dried plants are used as a diagnostic kits or for desensitization .

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Quality control

In the past reliance had ta be placed on the in-house standards of suppliers & manufacturers . At present the legislations ensure that product licences are not issued for proprietary medicine unless they meet tests for efficacy & safaty .

To meet these requirements , official reference monographs for individual drugs are required . These will give :

-macroscopical examination .
-microscopical description .
-test for identity .
-foreign & exhausted material .
-microbial contamination .
-pesticide residues &radioactivity .
-an assay method for the active constituents .

In cases where an assay is lacking it is therefore of importance that the crude drug is properely authenticated , its general quality verified , & all informations of it prepared in accordance with good maufacturing practice & also the shelf-life of the crude drug & its preparation should be taken in consideration .

Qualitative assays :

There are a number of standards which can be applied to the evaluation of crude drugs either in the whole or the powdered condition :

1- **Sampling** : when a sample must be drawn for analysis , considerable care must be exercised to ensure that this sample is truely representative . With large quantities of bulky drugs a different method of sampling is required from that involving broken or powdered drugs .
2- **Preliminary examination** : In the case of whole drugs the macroscopical & sensory charecters are usually sufficient to enable the drug to be identified ex : size , colour , odour , this is called organoleptic examination .
If the drug is in a powdered form then it should be examined microscopicaly .
3- **Foreign matter** : Pharmacopoeias contain statements as to the percentage of other parts of the plant or of other organic matter which may be permitted . Drugs containing appreciable quantities of potent foreign matter , animal excreta , insects or mould should be rejected .
4- **Moisture contents** : Drugs which contain excess water , with a suitable temperature will lead to the activation of enzymes , given suitable conditions to the proliferation of living organisms . A large

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number of methods are available for moisture determination , many of them being employed .

5- **Loss on drying** : This is employed in the EP , BP & USP . It means the loss in weight in the samples , principally is due to water ; small amounts of other volatile materials will also contribute to the weight loss .

6- **Extractive values** : The determination of water-soluble or ethanol-soluble extractive is used as a means of evaluating drugs the constituentsof which are not readily estimated by other means .

7- **Ash value** : When vegetable drugs are incinerated , they leave an inorganic ash which might indicate to some extent the amount of care taken in the preparation of the drug .

8- **Determination of volatile oils** : Minimum standards for the percentage of volatile oils present in a number of drugs are prescribed by many pharmacopoeias :

9- **Swelling index** : This is defined (in the BP) as the volume in milliliters occupied by 1 g of a drug after it has swalled in an aquous liquid for 4 hours .

10- **Rf values** : This will be discussed in chromatography .

11- **Microbial contamiation** : Generally , manufacturers should ensure that , for crude drugs to be taken internally , the limits for bacterial & mould contamination as applied to foodstuffs . Considerable quantities of drugs are sterilized in special equipments by treatment with ethylene oxide .

12- **Toxic residue** : These may arise in crude drugs as a result of pesticide application during cultivation of the drug & at a lator stage from fumigation of the srored product .

Quantitative assays :

A crude drug may be assayed for a particular group of constituents ex : the total alkaloids , total glycosides etc.

Many chemical & physical assays for standardization are found in pharmacopoeias ex : spectroscopic analysis , fluorescence analysis , immunoassays , quantitative microscopy etc.

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