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## Review Article

### A REVIEW ARTICLE ON: PLANT ALKALOIDS

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Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. The name derives from the word alkaline and was used to describe any nitrogen - containing base. An alkaloid may be defined as a naturally occurring organic base containing one or more heterocyclic nitrogen atoms in its molecule. Alkaloids possess pharmacological activity and have economic importance as clinical agent. They can be purified from crude extracts of these organisms by acid-base extraction, or solvent extractions followed by silica-gel column chromatography. Alkaloids have a wide range of pharmacological activities including antimalarial (e.g. quinine), antiasthma (e.g. ephedrine), anticancer (e.g. homoharringtonine). Alkaloids are the important secondary metabolites that are known to possess therapeutic properties. On the basis of their biosynthetic precursor and heterocyclizing system, the compounds have been classified into various categories which include indole, piperidine, tropane, purine, pyrrolizidine, imidazole, quinolizidine, isoquinoline and pyrrolidine alkaloids. Alkaloids are able to prevent the onset of various degenerative diseases by free radical scavenging or hindering with the oxidative reaction. Several studies have been done in evaluation of alkaloids from various plants for its wide range of pharmaceutical activities. This review provides an overview of alkaloid drugs that are derived from the various plants and potential against various diseases.

**Keywords:** - Alkaloids, Poppy, Antiasthma, Anticancer

#### INTRODUCTION

Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. The name derives from the word alkaline and was used to describe any nitrogen - containing base. Alkaloids are produced by a large variety of organisms, including bacteria, fungi, plants, and animals and are part of the group of natural products (also called secondary metabolites). The term "alkaloid" was proposed by the pharmacist W. Meissner in 1819 to cover a group of natural substances, which were "vegetable alkalis". An alkaloid may be defined as a naturally occurring organic base containing one or more heterocyclic nitrogen atoms in its molecule. Alkaloids are produced by a large variety of organisms including

bacteria, fungi, plants, and animals. Excellent reviews covering literature on thin-layer, gas, and liquid chromatography of alkaloids up to 1982-1983 have been completed by R. Verpoorte and A. Baerheim-Svensen ("Chromatography of Alkaloids"). Studies of alkaloids began in the 19th century. In 1804, the German chemist Friedrich Sertürner isolated from opium a "soporific principle" (Latin: principium somniferum), which he called "morphium" in honor of Morpheus, the Greek god of dreams; in German and some other Central-European languages, this is still the name of the drug. A significant contribution to the chemistry of alkaloids in the early years of its development was made by the French researchers Pierre Joseph



Pelletier and Joseph BienaiméCaventou, who discovered quinine (1820) and strychnine (1818). Several other alkaloids were discovered around that time, including xanthine (1817), atropine (1819), caffeine (1820), coniine (1827), nicotine (1828), colchicine (1833), sparteine (1851), and cocaine (1860).

### CLASSIFICATION

The classification of alkaloids is a difficult task even for specialists in the field; therefore, the alkaloids will be classified roughly according to the type of heterocyclic system which contains the nitrogen atom. These large groups are further divided into subgroups in accordance with botanical classification of plant species in which a certain type of alkaloid occurs, e.g. tobacco alkaloids, Amaryllidaceae alkaloids, Senecio alkaloids, and so on. Sometimes the name of the subgroup is derived from that of a well-knownalkaloid, e.g.,quinine,yohimbine, etc.

The Alkaloids are classified into following Categories :-

- 1 Pyridine Alkaloids
- 2 Pyrrolidine group
- 3 Tropane group
- 4 Indolizidine group
- 5 Quinoline group
- 6 Isoquinoline group
- 7 Phenanthrene alkaloids
- 8 Phenethylamine group
- 9 Indole group
- 10 Purine group
- 11 Terpenoid group

### Physico-Chemical Properties

An alkaloid is a naturally occurring nitrogenous organic molecule that has a pharmacological effect on humans and other animals. The name derives from the word alkaline; originally, the term was used to describe any nitrogen - containing base (an amine in modern terms).

Alkaloids are found in plants (e.g., in potatoes and tomatoes), animals (e.g., in shellfish) and fungi (e.g., in mushrooms), and can be extracted from their sources by treatment with acids ( usually hydrochloric acid or sulfuric acid, though organic acids such as maleic acid and citric acid are sometimes used )

### EXTRACTION

The conventional process involved in the alkaloids separation and isolation. Extraction is usually served by one of the following general methods;

1. The plants are defatted with petroleum ether, especially in case of seeds and leaves to remove the fat soluble constituents and then with polar solvents. The extract is concentrated under reduced pressure and treated with alkali so that the free bases convert in their salts and separated with organic solvents. This process is known as Stash-Otto process. This method is frequently used in the extraction of ergotamine (Kokate et al., 2005) from ergot.
2. The powdered material is moistened with water and mixed with lime, which combines with acids, tannins and other phenolic substances



and sets free the alkaloid salts. Extraction is then carried out with organic solvents such as ether or petroleum spirit. The concentrated organic liquid is then shaken with aqueous acid and allowed to separate. Alkaloid salts are now in aqueous liquid, while many impurities remain behind in the organic liquid.

3. The powdered material is extracted with polar solvents such as water or aqueous alcohol containing dilute acid. Pigments and other unwanted materials are removed by shaking with chloroform or other organic solvents. The free alkaloids are then precipitated by the addition of excess sodium

bicarbonate or ammonia and then separated by Filtration or extraction with organic solvents.

4. The extract is treated with ammonia so as to convert the alkaloid salts into their free bases. Such liberated alkaloids in free base form are conveniently extracted with organic solvents like ether, benzene, chloroform etc. This method is not useful for the isolation of alkaloids of quaternary nitrogen.

5. The alkaloids present in the extract are converted into their reineckates by treating with (Reinecke's solution). The product is then dissolves in acetone and then passed this solution through an ion exchange column which

**Table 1: Common Reagents used for the detection of alkaloids**

S.NO	Name of Reagent	Chemical Composition	Colour Obtained	Example
1	Mayer's reagent	Potassium mercuric iodide Solution	Cream	Common
2	Wagner's reagent	Solution of iodine in potassium iodide	Reddish-Brown	Common
3	Dragendorff's Reagent	Potassium bismuth iodide Solution	Reddish-Brown	Common
4	Hager's reagent	Saturated solution of picric acid	Yellow	Common
5	Picrolonic acid	Solution of picrolonic acid	Yellow	Common
6	Tannic acid	Solution of tannic acid		Common
7	Murexide test	*Potassium chlorate+HCl+NH <sub>3</sub>	Purple	Caffeine
8	Mineral acids	Phosphotungstic acid, phosphomolybdic acid	Yellow	Colchicine
9	Acidic p-methyl Aminobenzaldehyde	p-Methyl-aminobenzaldehyde and sulphuric acid	Bluish-violet to Red	Indole
10	Nitric acid	Dilute nitric acid	Orange-red	Morphine



### Chemical & Identification Tests

The chemical tests used for detection of alkaloids depend on their character to precipitate with organic acids in the form of their salts. These are also precipitated by the reaction of compounds of heavy metals like mercury, gold, platinum etc. Caffeine and some other alkaloids which are highly water soluble, do not give the tests with usual reagents. Some common reagents, used to the detection of alkaloids are summarized in Table.1.

### Summary & Conclusion

Those are use for the help of mankind and found beneficial for certain life-threatening disease. Certain alkaloids have shown reverse effects such as asphyxia, paralysis or in some extreme condition patient death. Large number of alkaloid extraction and estimation methods has been formulated and these make ease to the researchers to improve the pervious methods. In the present review, it has been concluded that alkaloids from plant source can be utilized for pharmaceutical purpose .There are several drugs, which have been used for NDDs till date , but they do not possess the efficacy to amend the disease progression , rather they exert copious side effects. Frequently disease amending strategies have been discovered in the recent years and numerous compounds are being explored under these strategies but none of them have successfully grasped the market. In this perspective plant grounded drugs have also

developed as an innovative acumen.

### CONCLUSION

Alkaloids are one of the important classes of secondary metabolites which are found to possess important biological properties like analgesic, muscle relaxant, antioxidant, etc. These are used for the help of mankind and found beneficial for certain life-threatening disease. Certain alkaloids have shown reverse effects such as asphyxia, paralysis or in some extreme condition patient death. Frequently disease amending strategies have been discovered in the recent years and numerous compounds are being explored under these strategies but none of them have successfully grasped the market. In this perspective , plant grounded drugs have also developed as an innovative acumen. Numerous natural alkaloids retain mounting effects in the treatment of several NDDs . Along with modulating neuro transmitter system , natural alkaloids also possess anti inflammatory and anti oxidant properties as well as anti depressive and anti convulsing efficacy

### REFERENCE

1. Ahmad VU, Kamal A, Ali MS. Aspertins AD: "Further Piperidine Alkaloids from *Andrachneaspera* (Euphorbiaceae)". Turkish Journal of Chemistry. 2002, 26(2), 245-50.
2. Al-Shamma A., Drake S. D., Guagliardi L. E., Mitscher L. A. and Swayze J. K., "Phytochemistry" 1982 21 (2), 485-487,



3. Aotani Y, Nagata H, YOSHIDA M. Lymphostin (LK6-A), "a Novel Immunosuppressant from Streptomyces sp. KYI 1783: Structural Elucidation". The Journal of antibiotics. 1997 Jul 25;50(7):543-5. 5. Bartley J. P., Baker L. T. and Carvalho C. F., "Phytochemistry" 1994, 36 (5), 1327-1331