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Some Medicinal Plants of Interest for their Content in Alkaloids I

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ABSTRACT

For many years, medicinal plants have been one of the most used remedies by different cultures, to combat all kinds of ailments and conditions. After various bibliographical studies, it is worth highlighting the important role of alkaloids, as the main component of many medicinal plants. These studies provide the description, composition, properties and ecological-agronomic aspects of some medicinal plants with alkaloids, highlighting which alkaloids are present in each plant, as well as their role in our body, and the appropriate doses, always under medical control. indicated for the improvement of our health.

Keywords: Alkaloids; Drugs; Medicine; Cultivation

Introduction

To know a civilization in depth, it is necessary to know what all the means used to promote health have been since ancient times. In this aspect, the use of medicinal plants has been, since many years before Christ and until our times, one of the most used means in the fight against diseases, so it should not be despised by today's societies, many of which are unaware of this great treasure [1]. Many of these medicinal plants are composed of alkaloids, which are those molecules resulting from cellular metabolism. Alkaloids have very diverse chemical structures, they generally act on the central nervous system, such as morphine in *Papaver somniferum*, which is anesthetic, or caffeine in *Coffea arabiga* and nicotine in tobacco, *Nicotiana tabacum*, which are CNS stimulants; other alkaloids have activity on the autonomic nervous system, such as pilocarpine from *Pilocarpus jaborandi* leaves, with parasympatholytic properties, atropine from *Atropa belladonna*, with anticholinergic activity, or scopolamine from *Hyosciamus albus*, which acts as a competitive antagonist of substances that stimulate the parasympathetic; alkaloids such as vincristine or vinblastine from *Vinca rosea* and *Vinca minor*, which are inhibitors of cell mitosis, used in medicine as antineoplastic (antitumor) agents, resulting in great efficacy in the treatment of certain types of cancer.

But the alkaloids also act in other systems as antispasmodics, antitussives, diuretics, sedatives, anti-inflammatories, with dermatological applications [1]. There are some plants with a high toxicity, not existing a great difference between the therapeutic dose and the fatal one. For this reason, it is vitally important to consume them under medical or pharmaceutical control, respecting the appropriate doses recommended by the specialist, and may suffer all kinds of injuries or even death, due to intoxication with certain plants. One of these plants is the hemlock *Conium maculatum* with alkaloids such as coniine, which inhibits the functioning of the central nervous system, causing death. Or the jimson weed *Datura estramonium* that has neurotoxic factors that can produce a state of irreversible madness, or death by poisoning [2-4]. Currently more than 5000 alkaloids are known, which are mainly distributed in Angiosperms, in families such as Papaveraceae, *Rubiaceae, Ranunculaceae, Solanaceae*. Being some species of these botanical families distributed in different parts of the world, among other species we mention the following:

Papaver *Somniferum*, also known as Opium Poppy or "Opium Plant", which belongs to the Genus Papaver and the Family *Papaveraceae*

It is an annual herbaceous plant, with tap root and deep. Plant height can range from 15-100cm. The stem is strong, hollow, fistulous, and with little or no branching. The leaves are opposite, oblong, large and hairless, lobed, glaucous green, covered with wax which gives them a shiny appearance and with an irregularly toothed or scalloped edge. The lower ones are short petiolate and the stem ones are sessile and amplexicaul. The flowers are large, with two hairless and early deciduous sepals, and four petals that vary in color from white to pink or purple, with a dark basal spot, and more or less divided on their edge. Stamens numerous, with claviform staminal filaments and yellowish anthers. The fruit is a subglobular capsule, glabrous and pruinose, with a persistent stigmatic disc and 5-12 lobes. The seeds are very numerous, dark brown in color and approximately 1mm in size, kidney-shaped and with a reticulated surface. Flowering takes place from May to July. Its vegetative cycle is very short, four or five months.

The useful parts of the opium poppy are the capsules from which the latex is extracted, the upper part of the stem (straw) and the seeds (food). The seeds contain 20% proteins, 15% carbohydrates, 45 to 53% lipids, oil with glycerides of unsaturated fatty acids, with 30% oleic acid, 60% linoleic acid and 5% fatty acid. linolenic. The latex (opium) and the capsules contain about 25 alkaloids, they are the same and with the same hierarchy, but the proportions vary in terms of the global content, varying from 5 to 20% in opium and from 0.5 to 0.8% in capsules and stem. These alkaloids are: Phenanthrene derivatives (Morphine, Codeine or methylmorphine, Thebaine) and Benzylisoquinoline derivatives (Papaverine, Noscapine, Narceine). Morphine is the main alkaloid of opium poppy and was also the first known alkaloid, discovered by FWSertürner (pharmacist) in 1801. Together with narcotine they make up about 16% by weight of opium, while all other alkaloids of it barely reach 1%.

Opium is a very complex product, which in addition to its numerous alkaloids, is composed of various acids, the main one being meconic acid (up to 5.5 %); and other components such as albuminoids, wax, pectins. Morphine is used to relieve acute pain, and causes drowsiness. The baine and codeine or methylmorphine also relieves pain and whooping cough. Papaverine exerts a vasodilator, antiarrhythmic and especially antispasmodic action on muscle spasms (arterial, digestive, bladder, and uterine) [5-7]. Opium preparations, which is the dry latex obtained from the capsules through incisions, are also used as antidiarrheals, thanks to their moderating action on the peristaltic movements of the intestine. But due to the analgesic-narcotic nature of opium, and because it is a highly toxic product, its use is reserved for medicine. The molecules of this plant have a similar structure to endorphins, which are captured by brain receptors and whose function, among others, is to free us from pain. The first effects that are noticeable are tiredness and drowsiness, as the effect grows, tingling and itching is felt throughout the body, and pain is no longer felt, increasing the tactile sensation.

But as the narcotic effects wear off, sleepy dreams begin to occur, along with hallucinations, nausea, and vomiting. Opium can be administered by inhalation, oral ingestion, which is usually accompanied by nausea, vomiting and stomach upset, or by preparing an infusion (infusion), among others. The seeds are used in food, thanks to their antioxidant properties, their content in vitamin B, lipids, carbohydrates and proteins. The oil obtained from the seeds is used as dietary food, since it is a good cholesterol lowering agent. Arriving in some countries to replace olive, walnut, sweet almond and flax oils, in terms of its medicinal uses. Some of the other applications it has are as drying oil, in the paint industry, and for the manufacture of soaps or as fuel. Cultivated and naturalized plant, found on roadsides and ruderal areas, forming part of the subnitrophilous-nitrophilous annual grasslands. Present up to 1,500m, sometimes found at higher altitudes. It inhabits any type of soil, except those that are flooded and those that are excessively light and poor in organic matter. It multiplies by seeds, with a germination power of 95% in the laboratory, at an average temperature of 20ºC in twelve days.

Planting will be done when the land is in good conditions of temperature and surface preparation, from November to the end of March, as a limit. We can find it relatively frequently as a naturalized plant in the Guadalquivir valley, in the province of Jaen [8]. In most of the countries of the world, this drug is classified in group I, so its trade and possession for profit is strictly prohibited. The legal cultivation of opium is legislated by the United Nations Single Convention on Narcotics and other treaties and under the individual supervision of each country [9]. Very few are the countries in which legal cultivation is authorized for the subsequent extraction of its active ingredients, including India, France, Turkey and Spain, where most of the crops are found in the south of the Iberian Peninsula.

Atropa Belladona, also known as Belladona, is a Herbaceous Plant of the Genus *Atropa*, belonging to the *Solanaceae* Family

It is a perennial herb, which gives off a characteristic bad smell, from the root a rhizome that can reach 1m in length. Branched stem, generally glandular-pubescent, which can reach a height of 1.60 m. Leaves large and entire, ovate-lanceolate, acute, petiolate. The flowers are axillary, solitary, sometimes in pairs, petiolate and with bracts similar to the leaves. The calyx, reaching 30 mm at fruiting, is pubescent, campanulate and deeply divided into 5 acute, ovate-lanceolate sepals. The corolla is tubular- campanulate, in one

piece, with 5 shallow lobes at its upper end and has two shades, greenish-yellow at the bottom and blue-violet at the top. Stamens 5 with unequal filaments and ovate or rounded anthers, which are inserted at the base of the corolla. The fruit is a spherical berry, 13 to 18 mm in diameter, black in color with purple juice. Inside, numerous small, kidney-shaped seeds are housed. Belladonna begins to bloom in May, continuing well into summer, and blooms again in the fall.

The entire plant contains a large amount of alkaloids, mainly l-hyoscyamine and atropine, which make it a potentially toxic plant, but it can also be used medicinally. In the root, stem, leaves and fruits, the alkaloid that we find in greater quantity is l- hyoscyamine, followed by atropine (discovered by Mein, in 1831). In the leaves, the amount of these two alkaloids mentioned, reaches 99% of the total alkaloids. The fruit contains 0.1% atropine and the root has higher concentrations, ranging from 0.4 to 0.6%. Other alkaloids present in belladonna, although in smaller amounts, are atropamine, beladonine, scopolamine, N-methylpyrroline, N-methylpyrrolidine, and scopolamine [9]. But this concentration of alkaloids can vary from one plant to another depending on various conditions such as the harvest season, geographical area, climatic conditions, soil type.

Belladonna alkaloids act mainly by paralyzing the activity of the central nervous system, used in ophthalmology as a mydriatic. They also act on the reflex action of swallowing, paralyzing the nerves of the pharynx. Thanks to its virtues as a paralytic, it is widely used to combat nocturnal urinary incontinence, dropsy, excessive secretion of hydrochloric acid in the stomach, duodenal ulcer.

Other uses of belladonna is as an antispasmodic (in gallstones and renal colic), antiasthmatic and anticholinergic. In pulmonology it is used for problems of bronchial spasms, whooping cough. Belladonna extracts have traditionally been used in the treatment of Parkinson's disease, using atropine in conjunction with levadopa. It is also used as an intestinal neuroregulator in cases of irritable colon, ulcerative colitis, etc., in gastric ulcers because it is antisecretory. Associated with certain laxatives, it is used to prevent colic, and as an antidote against poisoning by mushrooms, which contain muscarinic alkaloids such as *Amanita muscaria*. Belladonna can be applied externally as an ointment or oil, to relieve pain, but with great care because its alkaloids penetrate the body through the skin. Scopolamine from belladonna, at very small doses and quickly, causes, like atropine, a generalized paralysis of the central nervous system, but unlike the latter, the symptoms of its ingestion, such as reduced salivation and sweating, dilation of pupils, do not persist long [9]. In Moroccan culture, its fruits are used as aphrodisiacs and euphoria, and by students to increase memory [10].

In case of intoxication by belladonna, at slight doses they produce dryness in the mouth and throat, intense thirst; at higher doses, dizziness and lightheadedness are felt, pulse and respiratory rates increase, involuntary muscle action decreases, heart rate increases, pupils dilate markedly, and ocular accommodation is inhibited; and if the intoxication is severe, hallucinations occur, falling into a state of unconsciousness and delirium, and can finally go into a coma and die of respiratory paralysis. Belladonna is native to Europe, N Africa, and W Asia. It can also be found in North America where it has been naturalized. This species is usually found in undergrowth, hedgerows, grasslands, quarries and slopes, etc. It prefers limestone, nitrified, somewhat shady and humid soils, between 400 and 2000 m altitude [11-14].

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