



Phytochemistry and medicinal properties of *Mandragora officinarum*: A review

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Abstract

Mandragora officinarum (MO) is thought to be one of the magical herbs since classical period. The plant belongs to Solanaceae family and popular in Greeks, the Romans, the Arabs and Hebrews. Earlier, it was believed that the plant has evil power. Different ethnic groups worked closely to establish its profound benefits in traditional medical field. After thorough research on this plant, it was found that the plant has several medicinal properties and has powerful intoxicating nature. Even it is familiar for its narcotic and anesthetic characteristics. Not only that the plant can be used in hallucination, mania, delirium and can relief certain joint pains and acts as a healing agent. It's diversified phytochemistry consisting of alkaloid, nonalkaloids and some sugars. The current article demonstrates its several pharmacological benefits such as narcosis, anesthetic, aphrodisiac, natural healer and hallucinating quality along with its different phytochemical constituent like apotropine, hyoscyamine, cuscohygrine, scopolamine, belladonine, some sugars.

Keywords: *Mandragora officinarum*, Phytoconstituents, aphrodisiac, surgical anesthetic

Introduction

Mandragora officinarum (MO) is one of the more mysterious and less explored plants from the ancient period [1]. Locally the plant is well known as mandrake [2]. Basically, the word *Mandragora* has been derived from the Greek word known as "hurtful to cattle". In arabic it is called "Satan's apple". There are many species available for the *Mandragora* genus, i.e. *M. acaulis*, *M. autumnalis*, *M. caulescens*, *M. officinarum*, *M. turcomanica*, and *M. vernalis* [3]. However, among all six species, only two (*M. officinarum* and *M. turcomanica*) were explored extensively in terms of their chemical constituents. Another two like (*M. vernalis* and *M. autumnalis*) were just evaluated superficially not in depth. Rest two were remained totally untouched. Thus, researcher might focus intensively to identify many of the pharmacological benefits of the *Mandragora* species. Some of the general properties of this include as hallucinogenic, healing, fertility enhancer. The plant has intoxicating nature as well as known to have aphrodisiac properties. It can be also utilized for having its narcotic characteristics⁴. Furthermore, it is well known as surgical anesthetic. The present study summarizes the history, phytochemical constituents, toxicological effect and pharmacological benefit of *Mandragora officinarum* with its enormous medical blessings/ advancement around the globe.

History

Mandrake is a medium sized plant with approximately 90 genera and 3000-4000 species [5]. It is a variable perennial herbal plant with an extended thick root, usually branched. It has almost no stem, and therefore the elliptical or simple leaves that modify long are borne during a basal rosette. The flowers seem from season to spring. They are light-green white to blue or violet. In diameter these are near about two inches. The fruit forms in late season to early summer. The berry is yellow or orange and resembles

atomato. The mandrake is toxic, particularly the roots and leaves which can be because of tropane alkaloids [6]. The young plants had a thick tapering root like as parsnip which may go down in the ground for a distance of two or more. Whenever it gets mature, the shape of the roots turns into more bulbous.

Distribution

The plant has for hundreds of years been native to several of the mediterranean countries, including Spain, Crete, Sicily, Asian country and North Africa, although apparently to not Egypt⁷. Mandrakes were found within the spot of King Tut-anh-amen, and should consequently are foreign into the country, little question from Asian country. within the fifth century B.C. it absolutely was mentioned by Hippocrates, and at the start of the epoch it absolutely was enclosed by dioscorides in his list of toxic herbs.



a) Plant



b) Root



c) Juice

Toxonomical class**Binomial Name:** *Mandragora officinarum* L.**Scientific class:**

Kingdom: Plantae
 Subkingdom: Viridiplantae
 Infrakingdom: Streptophyta
 Superdivision: Embryophyta
 Division: Tracheophyta
 Subdivision: Spermatophytina
 Class: Magnoliopsida
 Superorder: Asteranae
 Order: Solanales
 Family: Solanaceae
 Genus: *Mandragora* L.
 Species: *Mandragora officinarum* L

Synonyms

Atropa acaulis Stokes, *Atropa humilis* Salisb. *Atropa mandragora* L., nom. illeg., *Mandragora acaulis* Gaertn., *Mandragora autumnalis* Bertol., *Mandragora foemina* Garsault, *Mandragora haussknechtii* Heldr., *Mandragora hispanica* Vierh., *Mandragora mas* Garsault, *Mandragora microcarpa* Bertol., *Mandragora neglecta* G. Don ex Loudon, *Mandragora praecox* Sweet, *Mandragora vernalis* Bertol.

Vernacular names

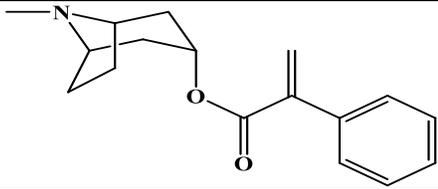
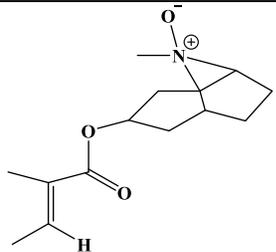
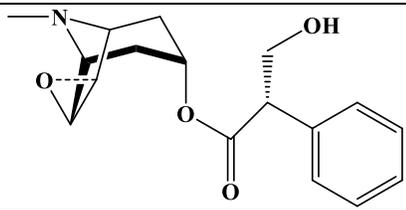
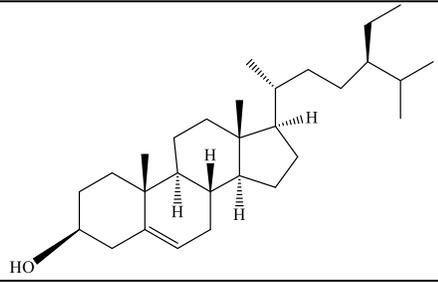
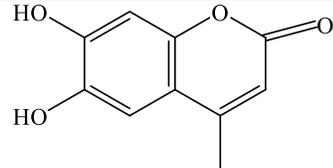
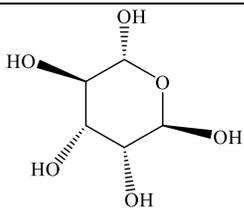
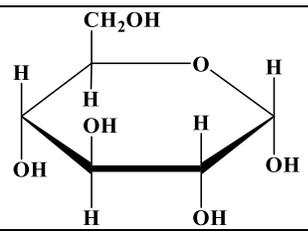
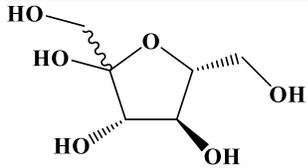
Soudi-Arab: Master of the life breath, Love Apple, Mad Apple;
 Sweden: Alrune; Egypt: Apemum; Rome: Ciceron; Russia: Trava

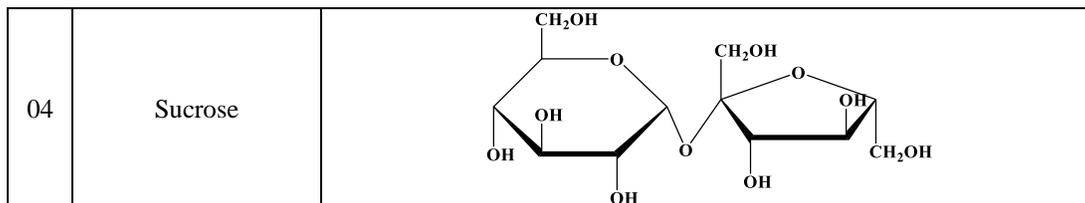
Phytochemical composition

Although Mandrake plant has profound medicinal benefits and the root of the plants is extensively utilized as traditional ailments, however its phytochemistry is still unexplored. Scientists are not confident to work on any particular compound that is responsible to show the pharmacological effects [8]. Even from time to time *Mandagora officinarum* was analyzed but there is some controversy always. Afterwards, scientist began to explore two species of Mandrake i.e. *M. autumnalis* and *M. officinarum* L. to distinguish the constituents. Primarily, the roots and rhizomes are the basic interest of the analysis [9]. From analysis it is evident that mostly alkaloid compounds like hyoscyamine, cuscohygine, apoatropine and 3a-tigloyloxytropine are present in both species. In root belladonine was also detected and reported. Some non-alkaloids are also identified such as sitosterol and beta-methylesculetin and have reported presence of four free sugars, namely rhamnase, glucose, fructose and sucrose [10]. Even though this work did not demonstrate any distinctions in the constituents between two *Mandragora* species roots, it yielded data of significant enthusiasm for the more extensive chemotaxonomic field inside the family Solanaceae. Among these genera, it is just a single other, in particular scopolia, in which the presence of both tropic and tiglic corrosive esters has been accounted. Moreover, Daturae and Salpiglossideae, are incorporated several other genera in which both types of esters found. Below table enlisted some of the important chemical constituents that exerts basically the medicinal benefits:

Table 1: Different chemical constituents of *Mandragora officinarum*

SL. No.	Name of the Constituents	Chemical Structure
Alkaloids		
01	Hyoscyamine	
02	Cuscohygine	

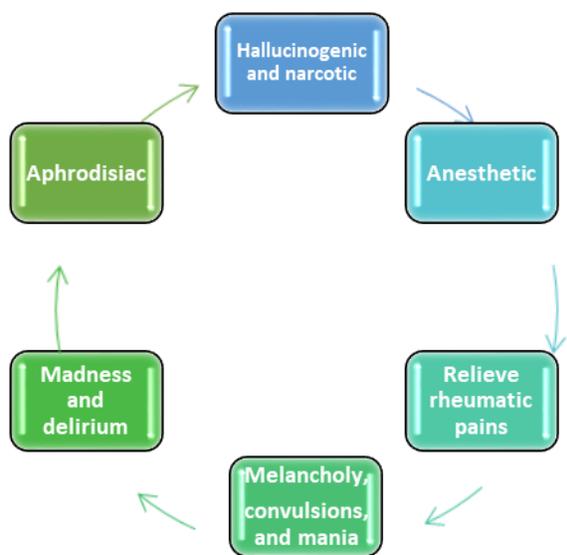
03	Apoatropine	
04	3a-tigloyloxytropane	
05	Belladonine	
Non-Alkaloids		
01	Sitosterol	
02	Beta-methylesculetin	
Sugars		
01	Rhamnose	
02	Glucose	
03	Fructose	



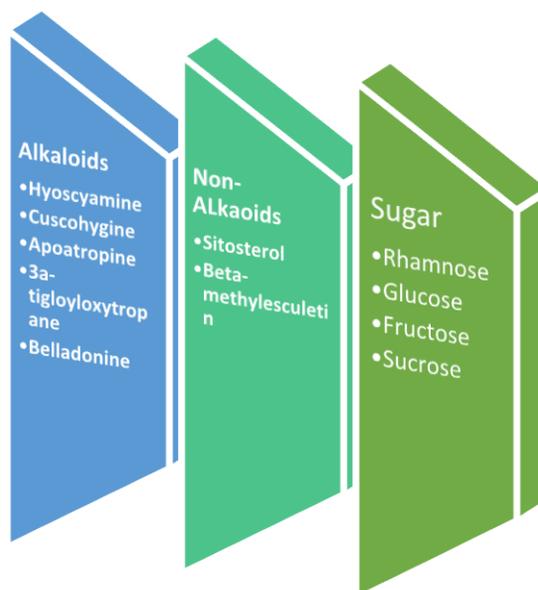
Pharmacological properties

From ancient time, the medicinal quality of Mandrake plant has drawn the attention of many researchers to treat many of the symptoms even in remote place. However, this sector was thought to be untouched and suspicious, thus little work has been conducted^[11]. Although the amount of research performed to demonstrate its medicinal properties, still some of the worthy evidence has been established showing the blessing of different parts of mandrake plant. Mandrake is well known to exert its narcotic properties throughout its usage period since ancient Greece and Rome period. Additionally, it has intoxicating properties^[12]. However, it is not shown to engage as a purgative or an emetic at all. Actually, the narcotic properties of the plant are rendered through its fruit which can be considered to have a love-charm. Even its narcotic constituents were such that when consume excessively, it may lead to some of the adverse effects like nausea, rigor and general malaise. Alternatively, its root has vigorous potency to exhibit narcosis^[13]. Another important property of the plant is that it can be considered as potent stimulant for venery by barren women. The root of mandrake was

found to enhance the fertility in women and placed on the body or in clothing as a talisman. The plant can be used to facilitate pregnancy in sterile women and there is a thinking likewise it may balance hormone constituency of the blood. The mandrake plant is also familiar and known for its magic, aphrodisiac properties and its fruit is called love apples^[14]. Moreover, the crushed root of mandrake plant was possessed hallucinations which may cause death like trance and sleep. The root may also cause insanity as well as can be used in flying potion. Another worthy blessing of mandrake is that it can be employed as a surgical anesthetic. Over many years this anesthetic and soporific properties of mandrake has been discussed. Some of the other medicinal properties of mandrake was noted and found that little amount of mandrake infusion can potentially change the numbness of the tongue, dryness of mouth, confusion vision, restlessness and exaggerated sensitivity to sounds. Considering these findings, it was claimed that if alkaloid constituents can be isolated from the plant it can be potentially used as anesthetic and thus can be superseded atropine as a mydriatic^[15].



a) Medicinal Properties



b) Phytochemical composition

Toxicological evaluation

Mandragora officinarum is very poisonous. Its toxicity is extreme in cases of plant ingestion. Some of the toxicological side effects include vomiting, diarrhea, slowing of heartbeat and death. Mandragora species contains extremely biologically active alkaloids, tropane alkaloids particularly. Approximately eighty

substances are identified among which 37 are explored in. Alkaloids are found within the contemporary plant or the dried root enclosed antispasmodic, poisonous substance, hyosine (hyosine), scopine, cuscohygrine, apoatropine, 3-alpha-tigloyloxytropane, 3-alpha,6-beta-ditigloyloxytropane and belladonnines. Non-alkaloid constituents included sitosterol and beta-methylesculetin (scopoletin)^[10, 16].

The alkaloids create the plant, particularly the foundation and leaves, poisonous, via anticholinergic, psychoactive, and hypnotic effects. Anticholinergic properties will result in asphyxiation. Ingesting root is probably going to own different adverse effects like innate reflex and diarrhoea. The organic compound concentration varies between plant samples, and accidental poisoning is probably going to occur. Clinical reports of the results of consumption of herb (as asterid dicot genus *autumnalis*) embrace severe symptoms like those of antispasmodic poisoning, together with blurred vision, dilation of the pupils (mydriasis), waterlessness of the mouth, issue in urinating, dizziness, headache, vomiting, bluish and a fast pulse (tachycardia). upset and hallucinations conjointly occurred within the majority of patients.

Conclusion

The present article revealed numerous medicinal properties of *Mandragora officinarum* that could help in several medical ailments. In addition to that the focus of the study is to enlist several chemical constituents which actually exerts diversified pharmacological effects to different diseases. Although different compounds have been isolated from the Mandrake plant, it is difficult to confirm the medicinal properties according to its constituents. However, it seems like the alkaloid compounds can exhibit many of the pharmacological effects. Hence, scientists have still open field to explore the blessing of the plants more extensively.

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Conflict of interest: Authors declare no conflict of interest.

References

1. Vidal F. An anesthetic 19 centuries old: mandragora. *Journal of Le Chirurgien-dentiste de France*. 2013; 52:21-26.
2. Carter AJ. Myths and mandrakes. *Journal of the Royal Society of Medicine*. 2003; 96:144-147.
3. Schultes RE. The botanical and chemical distribution of hallucinogens. *Annual Review of Plant Physiology*. 1970; 21:571-598.
4. Peduto VA. The mandrake root and the Viennese dioscorides. *Minerva anesthesiologica*. 2001; 67:751-766.
5. Olmstead RG, Sweere JA, Spangler RE, Bohs L, Palmer J. Phylogeny and provisional classification of the Solanaceae based on chloroplast DNA. In: Nee M, Symon DE, Lester RN, Jessop JP (Eds.), *Solanaceae IV*, Royal Botanic Gardens Kew, Richmond, Surrey, 1999, 111-117.
6. Crowfoot and Baldensperger GML. *From Cedar to Hyssop*. The Sheldon Press, 1932, 115.
7. Harrison RK. The Mandrake and The Ancient World. *The Evangelical Quarterly*, 1956, 87-92.
8. Ahrens FB. Ober das Mandragorin. *Berichte der Deutschen Chemischen Gesellschaft*. 1988; 22:2159.
9. Hesse O. Uber die Alkaloidie der Mandragora wurzel. *Journal fur Praktische Chemie*. 1901; 172:274-286.
10. Hanus LO, Rezanka T, Spížek J, Dembitsky VM. Substances Isolated from Mandragora Species. *Phytochemistry*. 2005; 66(20):2408-17.
11. Staub H. Non-alkaloid constituents of Mandrake root. *Helvetica Chimica Acta*. 1942; 25:649-683.
12. Wettstein R. In A. Engler and Prantl (Eds), *Die Natürlichen Pflanzenfamiliell, Part IV*, 1897; 3b:4.
13. Baker H. *The Natural History of the Bible*. Wentworth Press. 2016; 1868:467.
14. Zohary M. *Plants of the Bible*. Press Syndicate of the University of Cambridge, 1982; 188-189.
15. Lee MR. The Solanaceae II: The mandrake (*Mandragora officinarum*); in league with Devil. *J R. College of Physicians of Edinburgh*. 2006; 36:278-285.
16. Hanuš, Lumír O. Řezanka, Tomáš; Spížek, Jaroslav and Dembitsky, Valery M. Substances isolated from Mandragora specie. *Journal of Phytochemistry*. 2005; 66(20):2408-2417.