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Review Article

Alkanna Species: A Promising Herbal Medicine and its Uses

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Abstract

The use of traditional medicine, nowadays, has extended globally and has gained popularity worldwide. The growing importance and value of traditional and complementary medicine in the provision of health care, on national and global levels, are no longer limited exclusively to any specific regions or communities. Traditional medication involves the use of herbal medicines, animal parts and minerals; however, herbal medicine is the most common in use on large scale. Concisely, the herb is a plant or plant part used for its scent, taste, flavour, and therapeutic properties. Herbal medicines are considered as one type of dietary supplement which they can be sold in different forms as tablets, capsules, powders, tea bags, syrup extracts as well as fresh or dried plant parts depend on their use. These types of plants are named "Medicinal plants" since ancient era. They are diverse group of the plants that distributed all over the world. The Food and Agriculture Organization estimated in 2002 that over than 50,000 medicinal plants are in use across the world in which 80 to 85% are recorded in Africa. However, in Egypt more than 384 different species of medicinal plants recorded in the Mediterranean coastal region, in the deserts and in the Sinai Peninsula. Among these medicinal plants is *Alkanna* sp. which reported as important value as a source of health promoting substances and can be used as alternative medicine.

Keywords: *Alkanna* species; Alternative medicine; Herbal medicine

1. Introduction

Throughout human history, natural products, from different and diverse groups of living organisms, have been used as a means of improving human health. Scientific investigation of these natural products found to be organic compounds produced as secondary metabolites that not directly involved in the normal growth, development, or reproduction of the produced-organisms. These compounds are known by their diverse structures depending on stress applied and considered as a signal for plant response. In sequence, plants produce a high diversity of natural products lasting to facilitate communication with other organism and environmental conditions. Therefore, the prominent function is considered as the protection against herbivores and/or microbial pathogens. Exploring the therapeutic potential of these natural products/secondary metabolites are proved to have the most promising source for drug leads [1, 2].

Nowadays, secondary metabolites produced by plants are predominantly verified their influence role for treating various diseases. Meanwhile, isolated compounds or individual plant parts, regulated in different forms, have been and are still in use to treat health disorder including infections, inflammation and many chronic diseases. Currently, exploring for anticancer drugs from different plant parts is the most pounced obligation which is in need to avoid toxicity of synthetic chemical drugs. Diverse group of the secondary metabolites were detected in which environmental conditions play a role for their density and potentiality. Secondary metabolites that contain ingredients like terpenoids, phenolic, flavonoids, alkaloids and glycosides are the most important to be considered for further investigation for single bioactive ingredient that can be used in nutraceuticals and modern medicines [3-5]. In the meantime, the side effect, curing target and efficiency of these metabolites became a key issue for manufacturing and drug lead developments.

Medicinal plants have been a part of our lives since our presence and have been involved for various medicinal purposes since ancient times where Folic medicine From ancient times to the present medicinal plants, as Ayurveda medicine, has been with great importance a system of medicine with historical roots in the Indian subcontinent and based on the belief that health and wellness depend on a delicate balance between the mind, body, and spirit [6]. Conversely, the ancient Egyptian Ebers Papyrus lists over 800 plant medicines such as aloe, cannabis, castor bean, garlic, juniper, and mandrake which were common in use as herbal medicine [7, 8]. From there on, natural remedy research makes the use of ethnobotany to explore the pharmacologically active substances that may occur and has in this way discovered hundreds of useful compounds.

Alkanna species are considered among the medicinal plants since they are known for their medicinal, pharmaceutical and other properties from ancient time and used for remedy of human health [9]. They are belonging to family Boraginaeae, which has more than hundred and fifty genera [10, 11]. They are herbaceous plants, including about 50 species that originally from Europe, the Mediterranean and Western Asia [12]. Although they are native to southern Europe, they also grown in and imported from Albania, India, Egypt, and Turkey [13, 14]. Their species are typical grassland vegetation that grown in light and loose sandy soil. They are extraordinary drought resistance with high ability to absorb water and transfer to all plant parts. Conversely to their species recorded, only two species, *A. tinctoria* and *A.* orientalis, are recorded in southern part of Saini, Saint Catherine area, Egypt [15].

2. Pharmacology and phytochemical aspect of Alkanna species

The genus *Alkanna* is widely known for its medicinal and pharmaceutical properties, since the ancient time, depending on the chemical constituents of its plant parts. The most important part of the plant is the bark of the root which is containing dying substances. The chemical analysis of these substances revealed the presence of most abundant compounds naphthoquinones which are aromatic diketones that belong to commonly known Alkannins and Shikonins. These compounds are containing double ring structure that conveys the intense red pigments. They are lipophilichydroxynaphthoquinone red pigments that used intensively in many purposes [16]. Derivatives of Alkannin were also detected, including Acetylalkannin, Propionylalkannin, Isobutylalkannin, Angelylalkannin, β,β-Dimethylacryl-alkannin, Isovalerylalkannin, α-Methyl-n-butylalkannin, and β-Hydroxy-isovalerylalkannin. These derivatives and their proportion detected were different among species and within the same species grown in different regions and altitudes [16].

Alkanna root tissues also contain resins, alkaloid, tannins and wax. Meanwhile, the roots can be toxic when pyrrolizidine-alkaloid accumulates in their tissues. This compound is a group of ester substances that have liver damaging effect. Some other compounds were isolated from *Alkanna cappadocica* that proven their cytotoxic effect including 11-deoxyalkannin and its derivitives (5-O-methyl-11-deoxyalkannin, 8-O-methyl-11-deoxyalkannin, 5-O-methyl-11-O-acetylalkannin, and 5-O-methyl-β,β-dimethylacrylalkannin. They are showed cytotoxicity on different type of cell cancer in which 5-O-methyl-11-O-acetylalkannin was most potent compound that has remarkable toxicity with 6 cancers types [17]. Therefore, these types of compounds can be used to diminish cancer in specific organs.

3. Medical importance of Alkanna species

Alkanna species, as mentioned before, have long history in ancient time as herbal medicine, the first recorded use of *Alkanna* roots was initiated by the works of the Greek doctor and philosopher Hippocrates (4th and 5th centuries BC) who used the plant roots in the ulcer treatment (http://webatomics.com/Classics/Hippocrates /ulcers.10.10.html). The most effective part of the *Alkanna* is the root which it is widely used for cosmetic and beauty purposes, lipstick in particular, for its sharp red colour. Beyond that eagerly uses, *Alkanna* species proved their capability for treatment of skin injuries; however, when it is topically apply it may show some allergy and itchy responses. *Alkanna* root has been extensively used for diarrhea, anticancer [18] and gastric ulcer treatments, in such case oral administration is recommended. *Alkanna* root has also demonstrated radical scavenging activity, suggesting potential antiaging effects; however, diminutive clinical information is available [19].

According to USDA National Nutrient, *Alkanna* root has proven to be very important part of medicinal plant to treat and remedy several diseases. Nowadays, health benefits of *Alkanna* plant are more pronounced and take attention to many scientists and pharmaceutical industries for its multi-biological properties. Depending on the part of the plant used we can summaries the beneficial health cure that be driven from the root and leaves.

4. Remedy from root part

4.1 The anti-inflammation effect found

Alkanna root can diminish the tight and slow mode of blood circulation which is the trigger of migraine and headache. By improving blood circulation, the headache will relieve. Alkanet root with its benefit as anti-inflammation also can be used for cure the inflammation of bones and muscles. By applying alkanet root essence

oil on the inflammation area, this will reduce the symptom and painful caused by the inflammation [20].

4.2 Scare recovering

Alkanna root extract can be used for scare recovering. One of the most crucial and influencing of health benefits of *alkanna* root is its capability to protect the skin from any microbial infection and improve the inflammation. *Alkanna* root is now widely used to heal burn scars since it has the natural ability of anti-inflammation and cooling to absorb the heat out of the skin. This also makes *alkanna* root is useful as sunblock and sunburn remover.

4.3 Fever treatment

The natural cooling character of alkanet root is used to cool down the fever and will fasten the healing process of fever pain due to its ability to induce the sweat.

4.4 Hair and nail treatment

Alkanet root is very effective in increasing hair strength, and prevent hair fall. They also used in preventing the damage of nail by healing of cracking and reduce the inflammation that may developed.

4.5 Rheumatic recovery

Alkanna root has been proven to be very effective in treatment of rheumatic disease and reduce uncomfortable sore and pain resulted from it. Rheumatic can be overcome by continuously applying the essential oil of *Alkanna* along the hurting area or routinely consuming the powder to reduce the pain.

4.6 Maintaining skin health

Alkanna root has Anti-viral and anti-bacterial effect which is useful for protecting our body, particularly skin from infection. Antiaging and anti-wrinkle property of *Alkanna* root also gives the opportunity for using the root oil to maintain the skin health and beauty by reducing aging and wrinkle.

4.7 Supports and promotes high performance cardiovascular health

Alkanna root contributes considerably to maintain the health of heart. This can be done by soaking alkanet root into the water and extract the essence to be drunk. Frequent use of the alkanet root can help to release the poison out of the body and optimize the function of heart to circulate the blood. *Alkanna* roots also have hypo-tense impact to control stress on cardiovascular system and are very effective to reduce higher blood pressure. This also may help to prevent and prohibit heart attack to be occurred and reduce the risk of stroke disease. This may be related to antioxidant activity that plays an important role for scavenging the free radical which normally is by-products of metabolism, and they are introduced into the body from external sources of harmful chemicals in the environment or during day life. Alkanna roots able to neutralize the free radicals and protect the body from cell damage [12, 21, 22].

4.8 Antifungal and skin healing

Alkanna root has anti-fungi activity and able to heal any diseases related to skin fungi such as phlegm, ringworm, and eczema on your skin disorder [23, 24].

4.9 Herpes treatment

Anti-viral property of *Alkanna* roots gives this plant the ability to cure viral diseases like herpes. Herpes is such immunity and skin disorder which lead to a very serious illness of skin scare or skin bleeding. Herpes is caused by virus which can be improved by using *Alkanna* root due to its antiviral activity.

4.10 Anti-aging activity

As the most forward body protector, skin is very risky of getting suffered by any foreign materials which can

create problems such as aging or wrinkle. Applying alkanet root oil or consuming alkanet root powder may help you to maintain the skin health and beauty by reducing aging and wrinkle.

4.11 Anticancer activity

Akanna species have different promising potential to treat diverse types of human cancer. Root bark of A. *tinctoria* (L.) contains alkannin and angelylalkannin compounds which have the capability to inhibit the proliferation of the human colon cancer cells by arresting the cancer cell cycle at the G1 phase resulted in apoptotic induction activity [18]. Meanwhile, another *Alkanna* sp., *A. cappadocica*, showed significant potent -ial against six-cancer types out of twelve using cancer cell lines. This high potentiality due to the presence of 5-O-methyl-11-O-acetylalkannin compound, mono-O-methylated alkannin derivatives, in the root extract of this plant [17].

5. Remedy from leaf part

Activity of leaves extract of *Alkanna* species is not fully studies and needed to be explored. However, few studies showed the ability of *Alkanna* leaves to inhibit the growth of infectious human pathogens. *Alkanna tinctoria* leaves extracts proved to be a forward-looking remedy against multidrug resistant human pathogenic bacteria [25].

6. Conclusion

Medicinal plants are regarded as rich resources of natural chemical products that be used as traditional medicines and from these plants many of the modern medicines are produced. Secondary metabolites produced by the plants are usually responsible for the biological characteristics of plant species used throughout the world. *Alkanna* plant is one of medicinal plants which is riched with medical important secondary metabolites. The major component of *Alkanna* sp. is *Alkanna* and its derivatives, besides alkaloids, flavonoids and other secondary compounds. These secondary metabolities are with great medical importance. They can be used as antimicrobial, antitumor, antioxidant and anti-inflammatory agents. Therefore, *Alkanna* species can be a promising source for drug discovery.

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Authors' Contributions

Om hashem, she shared in collecting the information and prepared drafting manuscript, Abed El-raouf, he involved in writing and revising the manuscript, Samira R. Mansour, she was the corresponding authors for writing the manuscript.

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