PLANT SCIENCE TODAY
ISSN 2348-1900 (online)
Vol 9(4): 1012–1020
https://doi.org/10.14719/pst.1901

HORIZON
e-Publishing Group
HePG

RESEARCH ARTICLE

A field study to restricted poisonous wild plants grown in Al-Kharj region, Saudi Arabia

Bushra Ahmed Alhammad

Biology Department, College of Science and Humanity Studies, Prince Sattam Bin Abdulaziz University, Al Kharj Box 292, Riyadh 11942, Saudi Arabia

*Email: b.alhammad@psau.edu.sa

OPEN ACCESS

ARTICLE HISTORY

Received: 18 May 2022
Accepted: 28 August 2022

Available online
Version 1.0 : 04 October 2022

Check for updates

Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://horizonepublishing.com/journals/index.php/PST/open_access_policy

Publisher's Note: Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS etc.
See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

Copyright: © The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited (https://creativecommons.org/licenses/by/4.0/)

CITE THIS ARTICLE

Alhammad B A. A field study to restricted poisonous wild plants grown in Al-Kharj region, Saudi Arabia. Plant Science Today. 2022; 9(4): 1012–1020. https://doi.org/10.14719/pst.1901

Abstract

This study was aimed to define and collect different poisonous plant species that grow in Al-Kharj region, Saudi Arabia and are detrimental to human and livestock. A total of 16 plant species belonging to 12 families were recorded in the current study. These plants were met through surveys conducted by herbalists and smart citizens with skills and experience in the field of toxic plants in the region. For each species reported, botanical and vernacular names, families, and toxic principles are recognized. The most dominant and widespread toxic flowering plants reported in the studied area were the clan of *Calotropis procera* and *Rhazya stricta*. Other less widespread poisonous plants such as *Citrullus colocynthis*, *Heliotropium bacciferum, Cassia italica, Alhagi maurorum, Capparis spinosa, Tribulus terrestris* and *Euphorbia helioscopia* as well as *Convolvulus arvensis*, *Zygophyllum coccineum* were also observed.

Keywords

Al-Kharj, poisonous, toxic principles, wild plants

Introduction

A strict definition of toxic plants is not easily created, since the margins between harmful and harmless plants are often indistinct. Poisonous plants result in enormous economic losses to livestock manufacturing worldwide. A poisonous plant is defined as a plant that when contacted through the skin, ingested, injected or absorbed in a certain amount can be detrimental or lethal to an organism or any plant capable of inducing a poisonous and/or lethal reaction (1, 2). These effects are mainly due to the presence of toxic chemicals within the plant, which may be touched or ingested. Some plants and flowers can give an attractive and deceptive appearance which can in fact lead to convulsions or occasionally death. The toxicity of plants can be attributed to the existence of toxic chemicals such as alkaloids, hormones and antibiotics, some metals such as molybdenum, cadmium and lead, mechanical structures such as hard hair, spine and sensitivity caused by pollens of plants such as *Prosopis spicigera*. Plants have developed an extensive range of defence mechanisms to protect themselves against natural enemies such as predators and parasite competitors. There are various categories of defences that have evolved in plants, for instance, mechanical and chemical defences (3). Mechanical (structural) defences involve tingling, thorns, hairs, trichomes and spines of certain parts of plants such as flowers and trees (hawthorn), which can invade the skin and cause irritation to the victim. Some plants have evolved secondary metabolites during their

development, which are not directly included in their distinctive growth, but rather a defensive role for the plant. These secondary metabolites make the plant slightly too highly toxic for livestock, thus serving as a warning to herbivores such as terpenoids, alkaloids, cyanogenic glycosides, anthocyanins, furocoumarins and quinones.

Many of the biologically active chemical principles in the plants have medicinal or therapeutic benefits and few have toxic physiological effects which are responsible for the toxicity of most poisonous plants (4). These toxic effects lead to livestock loss and deterioration of agricultural production in the region where these plants grow (5, 6, 7). There are many broad categories of toxicologically significant plant constituents including alkaloids, amino acids, peptides and proteins, glycosides, oxalates, terpenes, phenolics and tannins and essential oils.

The medical and governmental institutions in the Arab countries and the world have identified toxic and highly hazardous plants, which may cause diseases or death to humans and animals. In the Arab countries, the Ministry of the Environment of Iraq in a recent study on toxic plants reported that there are 81 kinds of poisonous plants, which requires work to remove them to avoid their risks and seek to invest in some of their active substances for the pharmaceutical industry (8). Furthermore, the ministry directed farmers and animal breeders to pay attention to natural pastures and agricultural fields because of the spread of poisonous weeds, which may cause enormous economic losses. In Jordan, a study by Al-Qura'n (9) recorded 125 toxic species belonging to 56 plant families, which necessitate certain environmental awareness to protect and preserve the wild and widespread species from threats to augment sustainable development. However, very few studies are available on poisonous plants in Saudi Arabia. In Saudi Arabia, in a recent study in the Qassim region, a total of 42 species belonging to 39 genera and 23 families were reported (10).

Therefore, this study aims to characterize a comprehensive list of poisonous plants growing in the Al-Kharj region and develop knowledge about the vegetation in the Al-Kharj region and its morphological description. Furthermore, documentation of the toxic plants grown in the Al-Kharj region and their active chemical principles are beneficial to be aware of their detrimental physiological effects and the possible use of these plants the in therapeutic industry. Al-Kharj area is located in the south-eastern of Riyadh, an area of 19790 km^2 and has a population of more than 750 thousand people.

Materials and Methods

Area of Study

The investigated area is located in Al-kharj region, which is located in the southeast of Riyadh, Saudi Arabia. Al-kharj region is located between a latitude of 24° 08' 43'' N and a longitude of 47° 18' 43'' E. It is a leading agricultural region and an important province in Saudi Arabia. The size of the area is about 19790 km^2.

Sources of the information of the current investigation

The materials of the current investigation were identified and obtained from two main sources. The first source of the information was obtained from questionnaire herbalists and owners of perfumery shops "Atarreen as the common name" positioned in Al-kharj region. In addition, the information of the first source was obtained from herders, nomads and citizens in close connection with wildlife and aware of the benefits and harms of plants to animals and human health. The second source of the information was obtained from the scientific published studies and other related references.

Field trips and plant identification

Different field trips from May 2018 to July 2019 were organized in Al-kharj region to collect the different reputed plant species (from questionnaires). Our aim was paid to the plants that induce poisonous physiological adverse effects in a challenge to demonstrate their identity and to document their scientific names. The collected plant specimens and samples were scientifically identified (10, 11, 13-19). The identified plants were checked through the comparison with authenticated specimens in local herbaria. Plant specimens were cleaned, pressed, and dried at room temperature via blotting papers. Finally, plant samples were carefully inserted in herbarium sheets and placed at the College of Science and Humanity Studies, Prince Sattam Bin Abdulaziz University. An intensive literature survey was done to cite the toxic principles with the toxic biological effects of each plant species.

Results and Discussion

A total number of sixteen wild plant species were found and supposed to exhibit poisonousness to human beings and animals in the Al-Kharj region, Saudi Arabia. These wild plant species belong to twelve angiosperm families. Plant species that belong to the family of Apocynaceae (*Calotropis Procera* and *Rhazya stricta*) were reported as the utmost dominant toxic and hazardous flowering plant family in the Al-Kharj region, followed by plant species of the Boraginaceae and Euphorbiaceae families. A list of these wild plants, their families, vernacular names, toxic parts and toxic principles are presented in Table (1). The results of the study showed that the predominant growing plant species in this area were *Calotropis procera* and *Zygophyllum coccineum*.

The substances responsible for poisonings or toxic reactions are originated from many different pathways within plants. However, most poisonous principles are considered to be secondary metabolites or by-products of the essential functions of the plant. These are compounds aren't considered fundamental to the life of the plant. Although there are many theories as to why plants produce these nonessential compounds, one of the key theories maintains that plants have evolved to reduce these compounds in order to prohibit animals and insects away from them.

Table 1. The Poisonous plant species in AlKharj region, Saudi Arabia.

Scientific name	Family
Calotropis procera Rhazya stricta	Apocynaceae
Alhagi maurorum Cassia italica	Fabaceae
Zygophyllum coccineum Tribulus terrestris	Zygophyllaceae
Citrullus colocynthis	Cucurbitaceae
Heliotropium bacciferum	Boraginaceae
Anthemis cotula	Asteraceae
Capparis spinosa	Capparaceae
Herniaria hirsuta	Caryophyllaceae
Convolvulus arvensis	Convolvulaceae
Andrachne telephioides Euphorbia helioscopia	Euphorbiaceae
Malva parviflora	Malvaceae
Haplophyllum tuberculatum	Rutaceae

Calotropis procera L.

It is an evergreen shrub, 3-5 meters long, with brown juice, and covered with white flannel shells (Fig. 1A). The leaves of *Calotropis procera* L. are seated with a wide elliptical shape and a rectangular range. The leaf length is ranged from 10-20 cm, and it is wider than 15 cm (Fig. 1A). The leaves have a bottom and surface. The flowers are quintuple white with purple edges and flowers that gather in coronal or axillary flowers and fruits (Fig. 1A). Spherical globules with spongy texture, black seeds gathered in lightweight oval pairs. The plant grows in sandy soil and desert environments. *Calotropis procera* L. is characterized by tolerance to high salinity levels (20). The toxic ingredients of *Calotropis procera* are uscharin, calotoxin, calotropin, calactin and calotropage. Different parts of the plant are very dangerous and poisonous for the eyes causing cutaneous and ocular toxicity with *Calotropis*. The plant is non-palatable. Ingestion of *Calotropis* by animals is commonly accompanying by cardiotoxicity due to its capacity in hindering the Na^+ K^+ ATPase pump (21). The presence of the plant in an area indicates overgrazing. *Calotropis procera* grows copiously and survives well under water deficit stress (20, 22). *Calotropis procera* is extensively distributed in arid and semiarid areas and has been used as a ruminant feedstuff and in medicinal drug preparation (23). *Calotropis procera* has been conventionally used to treat diarrhea, stomatic, sinus fistula, skin disease and the leaf part is used for jaundice treatment (24).

Rhazya stricta L.

Rhazya stricta L. is an evergreen dwarf perennial shrub that is commonly distributed in Saudi Arabian rangelands, and its length ranges from 30-100 cm (25). The stem is dense, branching, and brownish (Fig. 1B). Leaves of *Rhazya stricta* L. are semi-seated or semi-fleshy (leather or thick) with a full rim and pointed tip (Fig. 1B). The leaf length is 5 cm, while its width is about 1 cm or more dripping from the tenderness. The fruit of this shrub is a little milky and the flowers are white-colored. The flower is consisted of five parts, with little odor, in groups up to 5 mm in diameter and appears in summer (Fig. 1B). The fruit is bony, up

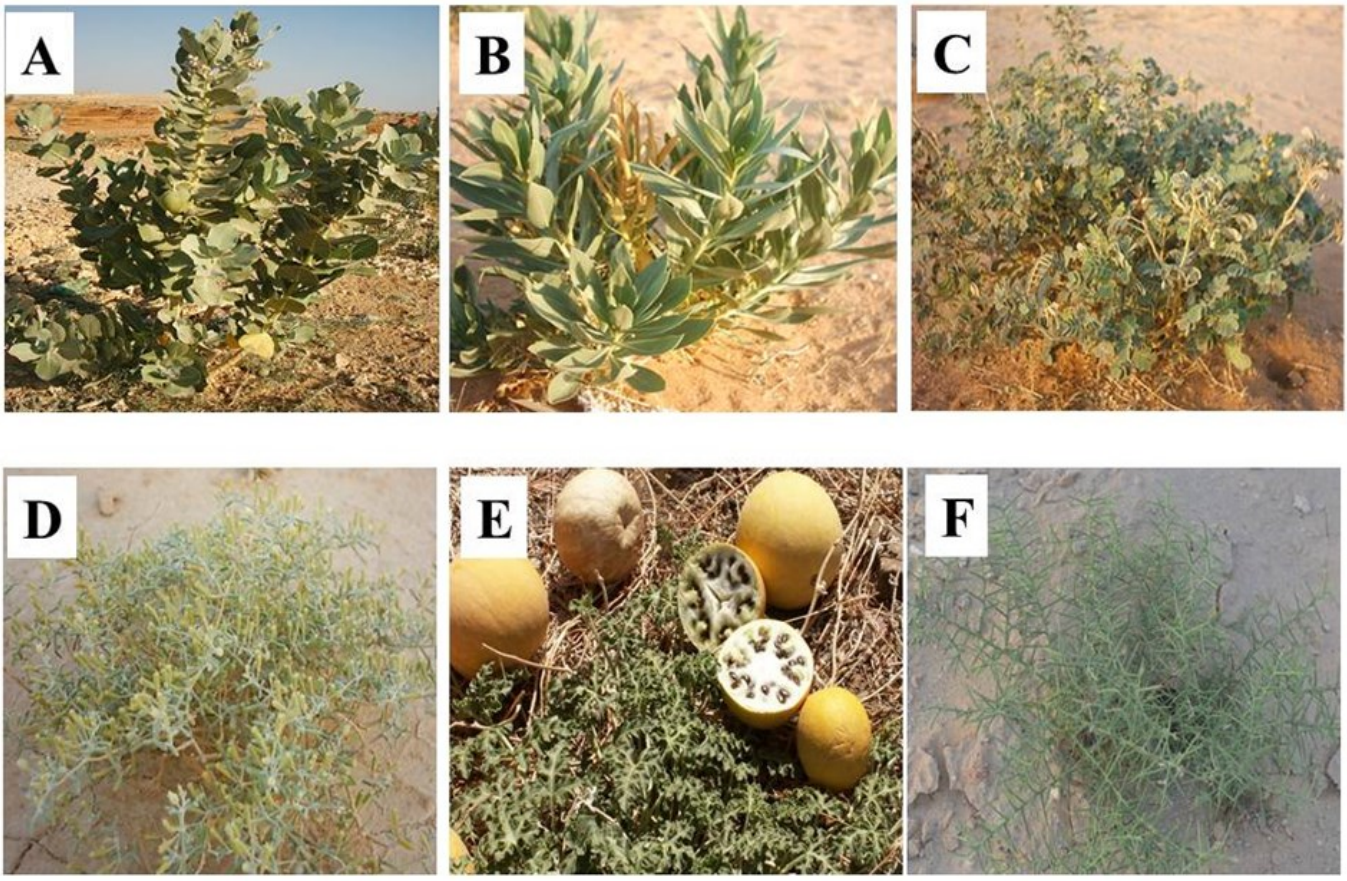

Fig. 1. The morphological characterization of *Calotropis procera* (**A**), *Rhazya stricta* (**B**), *Cassia italica* (**C**), *Zygophyllum coccineum* (**D**), *Citrullus colocynthis* (E) and *Alhagi maurorum* (F).

to 5 cm long, spiky and yellowish-colored. The seeds of this shrub are winged black in color, radiant and deep. The shrub is can grow in different environments and is characterized by drought, heat stress and salinity tolerance (24). All parts of the plant are poisons, especially the seeds. Various active constituents involving alkaloid, fatty acids, polyphenols, tannins, flavonoid and terpenoid compounds were detected in *Rhazya stricta*. Its extract has been demonstrated to have antimicrobial, antioxidant, anticancer and antidiabetic properties (26). The plant is used in the folk medicine to treat diabetes mellitus, inflammation and helminthiasis (26). The LD_{50} of the consumption of plant extract was observed to be 16.0 g/kg (27) and its toxicity was associated with elevated levels of blood AST, LDH, bilirubin and urea, reduced protein content and calcium concentrations, leukopenia and anaemia (28).

Cassia italica L.

It is an undershrub, and its roots are scattered and lateral (Fig. 1C). It is a perennial shrub that reaches up to 90 cm long and is dark green (Fig. 1C). The leaves are composed of feathers of 7-10 cm in three- 6 pairs and oval-shaped slabs seated up to one cm long (Fig. 1C). Flowers are yellow with a diameter of 2 cm, in the side cluster nuggets have five petals appear in summer. Fruits are 5 cm long, 2 cm wide and dark-colored. The seeds are small and similar in size and shape to raisins. Seeds are dark brown in color and their number is from 6 to 12 seeds per fruit. The leaves, plant juice and seeds of the plant, which is also called "senna", are poisonous. *Cassia italica* is found in most parts of Saudi Arabia. This is the plant of "the shark", which is heard by people and is spoken by the commoners. *Cassia italica* L. is classified in scientific sources as a poisonous plant .There are different types of Senna, however this type of Senna is called "Ashraq" (*Senna italica*). This type differs from the famous type of medical use ,which is known as the senamaki (*Cassia angustifolia*) or herd in the Najd and the Arabian Gulf. It can be used as a ground cover for soil protection and conservation. *Cassia* shows several pharmacological actions including antimicrobial, antioxidant, anticancer, antidiabetic and immunity stimulant. The phytochemical investigations of Cassia reveal the presence of chemical ingredients such as alkaloids, anthraquinones, flavonoids, pentacyclic, sterols, phenylpropanoids and γ-naphthopyrones (29). *Cassia italica* leaves are commonly used in traditional medicine for the treatment of Jaundice and diabetes (30). *Cassia italica* caused enterohepatonephrotoxicity (31) and its toxicity was associated with the presence of anthraquinones in the blood and urine samples (29).

Zygophyllum coccineum L.

It has a much-branched undershrub, up to 75 cm high and 100 cm wide (Fig. 1D). The stems are branched, woody at the base with ascending branches covered in spring with appressed, greyish hairs and later glabrous. Leaves of the plant are green, smooth, opposite, cylindrical, up to 14 mm long, 3-4.5 mm wide and oval or flattened smoothness about 1 cm long (Fig. 1D). The flowers are yellowish-green, hermaphrodite, rounded-obtuse at the apex, herbaceous, obovate, pubescent and aestivation imbricate. In the autumn, the fruit capsule polygon with 5 shutters 4 mm appears in winter and sometimes in spring. The shrub is widely spread in Saudi Arabia and bears drought and difficult desert conditions. The shrub grows in sandy and saline soils. The vegetative part of the shrub is poisonous. This plant is used to feed camels whereas its seeds are used as a pepper substitute. Extracts from this plant have been used in traditional medicine as anthelminthic and diuretics. Additionally, plant fruits are used in the treatment of various diseases such as diabetes, gout, asthma, rheumatic arthritis and hypertension (32, 33). Various compounds including triterpenes, flavonoids, saponins, sterols, phenolic, essential oils and esters have been demonstrated in *Zygophyllum* sp. (32, 33). It was showed acute poisoning in camels was characterized by diarrhea, polyuria and photosensitization owing to *Zygophyllum coccineum* ingestion which was linked to a high level of saponins (34).

Citrullus colocynthis L.

It is a perennial herbaceous vine, with angular and rough stems. Stems are 0.5-1.5 m, procumbent, branched, angular, hirsute, rough, having rough hairs and can grow to more than 100 cm long in the winter (Fig. 1E). The root is fleshy. The leaves are deep triangular oval, crisscrossing, monochromatic with pale yellow flowers and spherical fruits about 10 cm in diameter (Fig. 1E). Flowers are monoecious, solitary, peduncle, axillary, corollas 5-lobed; ovary villous. A green-striped tree turns yellow at a mature stage, blooming in summer and fall (35, 36). *Citrullus colocynthis* fruit is commonly called as bitter apple in English. The shape is plotted in green or yellowish colors. The fruits are globular with a smooth texture. The pulp of the internal fruits of the melon contains the material of a bitter taste, which is a glycoside material and is known as colossal. Seeds are numerous, ovoid, compressed, smooth, dark brown to light yellowish-orange borne on the parietal placenta. The plant produces 40-60 fruits every year. The soaked water of seed and pulp is used as a popular drink to remove chronic constipation and to stimulate gastrointestinal tract mobility, which helps to ease digestion and reduce gastric gases. Seeds contain fatty oil and alkaloids and oils (i.e. 15 - 20%). *Citrullus colocynthis* L. is an important cucurbit plant, widely available in the desert areas of the world, including Saudi Arabia, has medicinal and nutraceutical values (37, 38). Oil extracted from the seeds of melon is useful in the treatment of some skin diseases, including scabies and used in the expulsion of ticks skinned animals, farm animals and domestic birds. The poisonous part of the plant is the balls of *citrullus*.

Citrullus colocynthis is widely used in different countries of the world to treat a variety of diseases involving diabetes, leprosy, gut disorders, common cough, asthma, bronchitis, wounds, jaundice, arthritis, cancer and mastitis (38, 39). Although, *Citrullus colocynthis* fruit has been used for a long time in traditional medicine, reports on systematic toxicity and safety evaluation are very limited. It was indicated that the median lethal dose (LD_{50}) of saponin extracted from the whole plant was 200 mg/kg, which sug-

gests that *Citrullus colocynthis* constituent is not toxic in comparison with the LD_{50} of most bioactive pharmaceuticals (40, 41).

Alhagi maurorum L.

It is deep-rootedoted, rhizomatous, old-aged wild thorny shrub, intricately branched, generally growing to 50-100 cm in height (Fig. 1F). Roots extend deep into the earth to more than 10 m depth. The greenish stems bear numerous axillaries spreading spines, 2-4 cm long with yellow tips. The leaves are alternately arranged, oval to lance-shaped (42). *Alhagi maurorum* L. is Leguminous (Fabaceae) and protects itself with thorns around the bush from each side (common name, Camel Thorn). In a striking phenomenon, flowers grow on the sides of trees and turn into the fruits of horny-bearing seeds. The leaves contain a number of thorns when the armpit of every fork. There is a small, simple rod that does not exceed 5 mm long and at the same time as the fork 30 mm. The redness of its flowers is a form of adaptation, where the color is converted into red-purple in presence of drought. The vegetative part of the plant is poisonous. The plant is adapted to the desert environment. The plant is native to North Africa, the Middle East and Southeast east East Europe. It was also found in wide areas including Asia, North America, Europe and Australia. *Alhagi maurorum* is grazed by livestock and used for haymaking for small livestock and camels. *Alhagi maurorum* is usually used in traditional medicine for the treatment of a variety of diseases, including arthritis, bilharziasis, liver disorders, gastrointestinal disorders, respiratory problems, wounds, uterine problems and jaundice. In addition, the plant has diuretic, anti-inflammatory, antipyretic and antimicrobial effects (42). Several chemical constituents such as flavonoids, alkaloids, steroids, coumarins, glycosides, sterols, resins, alkaloids, tannins and triterpenes were detected in *Alhagi maurorum*. The glycoside compounds of the shoot and seeds extracts from *Alhagi maurorum* indicated acute toxicity (The LD_{50}) in mice were 8333.33 and 7414.66 mg/kg body weight respectively (43).

Anthemis cotula L.

It is branched, usually subglabrous, and ill-smelling annual weed. The plant height is ranged between 15-60 cm and the leaves are lobed with short sharply pointed segments, mostly 2-6 cm long (Fig. 2A). The flowers are single at the tips of branching stems with white colors. The interior (tubular flowers) is yellow (Fig. 2A). The bulb is surrounded by several small, overlapping, dry membrane membranes. The poisonous parts of the plant are leaves, flowers and seeds. *Anthemis cotula* has been used for the treatment of psoriasis, gastrointestinal problems, dysentery, fever, gout and arthritis (44). A paste prepared by powdered *Anthemis cotula* flowers with olive oil has been used to treat psoriasis and the juice of *Anthemis cotula* is used as an insect repellent (44). The main components of *Anthemis cotula* are flavonoids, polyphenols, coumarins and volatile oils (44).

Heliotropium bacciferum L.

A leafy grass with a short gray hair length of 30-50 cm (Fig. 2B). The leaves are 3-6 cm long, triangular, oval, spruce, flat and non-spiky, covered with squeezed whiskers (Fig. 2B). Flowers consist of five corollas with a caustic crown, and thin petals with short coarse hair. The active biochemical components of *Heliotropium* sp. Are pyrrolizidine alkaloids, flavonoids and terpenoids (45). The vegetative part of this plant is poisonous. The toxic effects of *Heliotropium* were owned to the presence of pyrrolizidine alkaloids which are reported to be accountable to many liver diseases (45).

Capparis spinosa L.

It is erect, procumbent, or pendulous with branches being unramified or multi-ramified, green, red or yellow (Fig. 2C). It is a perennial shrub and the height of the shrub is ranged between 1-3 m long (Fig. 2C). Stems were thick and short and swollen near to the ground. The leaves are stock full rim and round. The flowers have an aromatic fragrance and bloom at night, white tends to color pink (Fig. 2C). The seeds are numerous black and red pulp colors. Fruit is ellipsoidal, obovate or oblong. *Capparis spinosa* have been reported to have nutritional and medicinal uses, phytochemistry, ethnopharmacology, biological activities and cultivation (46). *Capparis spinosa* is used in traditional medicine for rheumatoid arthritis, diabetes and liver and kidney diseases (47). *Capparis spinosa* has a variety of bioactive compounds such as alkaloids, steroids, tocopherols, flavonoids and terpenoids (47). The poisonous compounds are concentrated in the vegetable parts, floral buds, flowers, peel and seeds (47). The LD_{50} of *Capparis spinosa* fruit extract was reported to be greater than 4000 mg/kg in rats (48).

Herniaria hirsuta L.

It is a perennial herbaceous grass, much branched, and the plant length ranges from about 10 - 20 cm with smooth stem (Fig. 2D). Leaves are reciprocated, humorous, oval, sharp leaf tip, round blade base and yellow foliage tend to color (Fig. 2D). Green or white, and gather in alternating clusters with hair and fruit bar. The entire plant is poisonous. *Herniaria hirsuta* include some bioactive compounds such as phenols, coumarin, saponins, flavonoids and tannins (49). The plant is a popular medicinal herb used in the treatment of kidney diseases, including kidney stones, pyelonephritis and polycystic kidney disease (49).

Convolvulus arvensis L.

It is a perennial grass, creeping climber with a circumference, ranging from 40 cm to 3 m (Fig. 2E). The plant has long and easy-to-cut rhizomes. The roots are deep, persistent, and spreading. The smooth cylindrical stem is twisted in the opposite direction of the clock on the stalks and branches of other plants (Fig. 2E). The length of the stem ranges from 0.3-1.8 m (Fig. 2E). The leaves are flared, fully edge, dull green and with readily noticeable veins (Fig. 2E). The flowers are carried on long necks, and are of a repressive white color, single or bilateral (Fig. 2E). The fruit is a capsule containing four smooth and black seeds. *Convolvulus arvensis* contains toxic alkaloids in all of its plant parts, whereas the greatest contents are in the seeds. The plant was distributed in Africa, Asia and Europe (50).

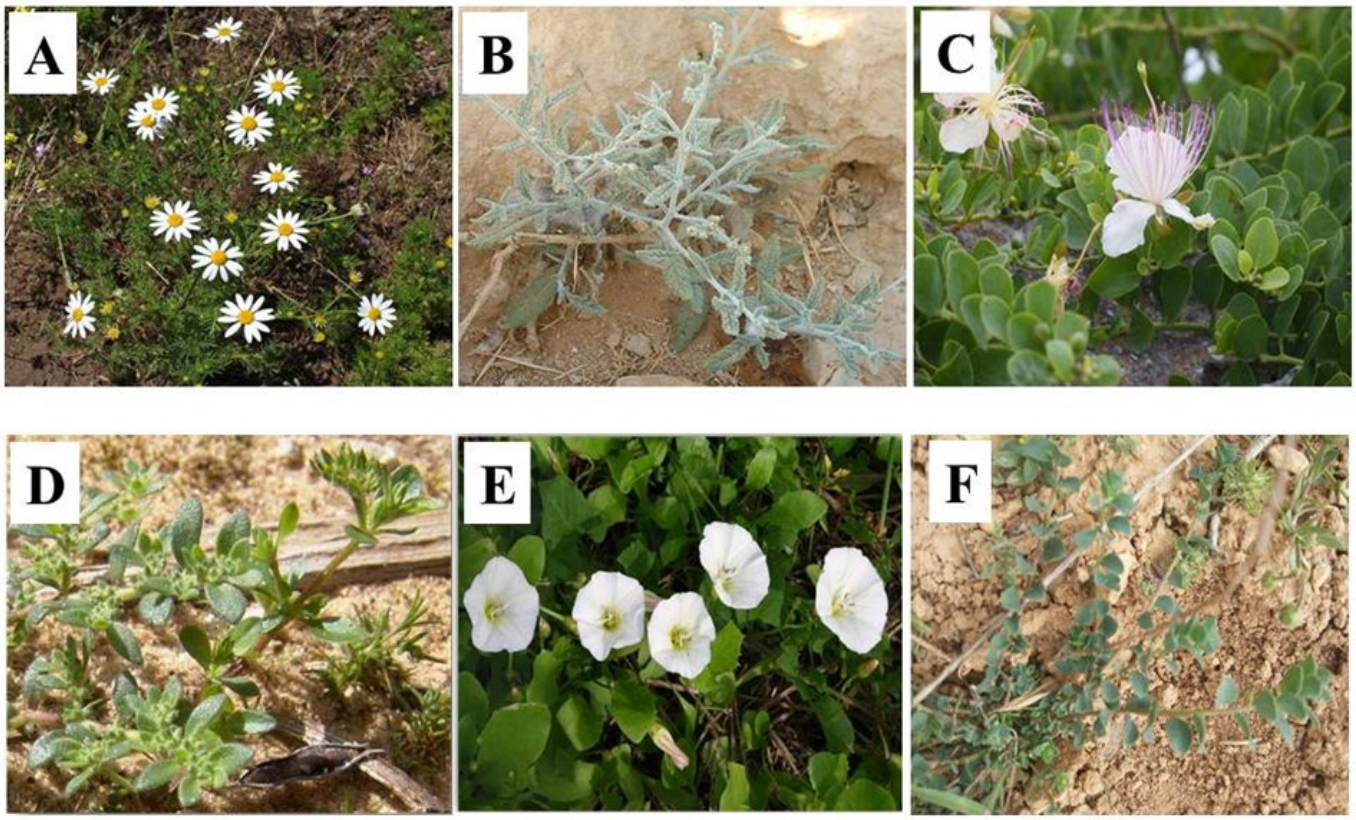

Fig. 2. The morphological characterization of *Anthemis cotula* (**A**), *Heliotropium bacciferum* (**B**), Capparis *spinosa* (**C**), *Herniaria hirsuta* (**D**), *Convolvulus arvensis* (**E**) and *Andrachne telephioides* (**F**).

The plant was determined to have been used in traditional medicine. *Convolvulus arvensis* L. has alkaloids, phenols, flavonoids, mucilage, sterols, tannins and sterols/triterpenes (50-52). The plant was used as an anti-spasmodic, anti-angiogenetic, diuretic, wound healing, laxative, anti-hemorrhagic and for treatment of parasites, jaundice, arthritis and flu (50-52). Consumption of large doses can induce acute gastrointestinal irritation and if absorbed, cause cystitis and nephritis (53), suggesting that the its toxicity occurring in animals may probably because alcoholic fraction.

Andrachne telephioides L.

It is a perennial and creepy grass with a plant length of 10-40 cm (Fig. 2F). The color of the plant is yellowish green and the stem is thin, branchy and covered with little whiskers. The leaves are a little bit fleshy (Fig. 2F). The vegetable part is poisonous. There is very little information in the literature about this plant to be discussed herein.

Euphorbia helioscopia L.

Euphorbia helioscopia L. is a smooth annual plant with an erect, stout stem, often branched from the base and light green color. Plant height can reach 4 m (Fig. 3A). The stem branches into 3 secondary branches, which in turn branch into 2 tertiary rays, each with a cone and covered with soft hairs (Fig. 3A). Each radial branch is branched into 3 secondary branches. The leaves are distributed along the stem (Fig. 3A). Leaves are broadened toward the apex with rounded, finely toothed or serrated ends, narrowed toward the petiole base, with the greatest width in the distal third (Fig. 3A). Flowers are included in a cup-shaped involucre approximating a calyx or corolla. Flowers are small, unisexual, greenish-yellow, inconspicuous and may be cumulative in complex inflorescences. The seed color structure with accurate perspiring plexiglass, reddish-brown and honeycombed. *Euphorbia helioscopia* is native to temperate regions but has adapted to subtropical conditions (45). *Euphorbia helioscopia* has different biological and therapeutic applications due to the presence of various classes of secondary metabolites isolated from the plant (54, 55). *Euphorbia helioscopia* was reported to have terpenoids, flavonoids, essential oil, tannins and steroids as main biochemical constituents (54, 55). The toxic parts of the plant are the latex and the seeds. This plant toxicity is characterized by digestive disturbance, difficulty breathing, heart failure. The contact with the latex caused skin irritation and redness (56). The LD_{50} of the active ingredient in *Euphorbia helioscopia* was documented to be 1211.7 mg/kg for rats (56).

Haplophyllum tuberculatum L.

It is an aromatic and viscous plant. The lower part of the stem is undergrowth. The plant height ranges from 10-90 cm, and the stem is branched into different secondary branches (Fig. 3B). The leaves are reciprocated narrow, rounded and vertices. Small, narrow, yellowish-colored flowers (Fig. 3B). The fruit consists of five lobes and contains two-seeds with gray-colored, textured groove. The plant is totally poisonous. *Haplophyllum tuberculatum* is widely distributed in the Kingdom of Saudi Arabia (57). The plant is a perennial herb that grows all over the country, particularly on uncultivated land and sandy soil. *Haplophyllum tuberculatum* is recognized for its unpleasant odor, which makes it unattractive to grazing animals. The whole plant is used in traditional medicine to treat a variety

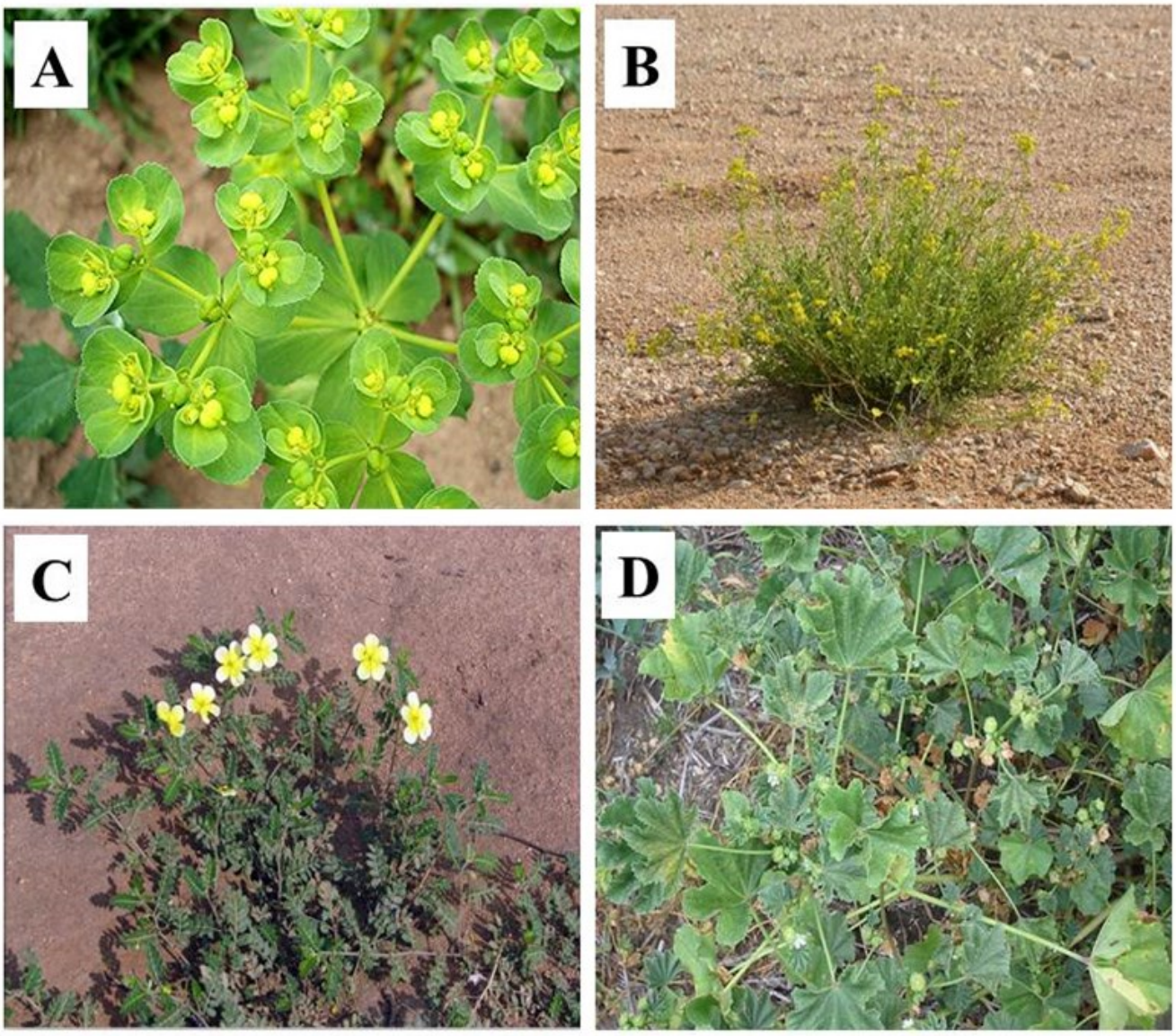

Fig. 3. The morphological characterization of *Euphorbia helioscopia* (**A**), *Haplophyllum tuberculatum* (**B**), *Tribulus terrestris* (**C**) and *Malva parviflora* (**D**).

of diseases, involving malaria, rheumatoid arthritis and gynecological troubles (58). Numerous classes of chemical compounds, including alkaloids, lignans, coumarins and flavonoids have been isolated from this plant (59).

Tribulus terrestris L.

It is on growing grass, creeping grass, with a length of 50-120 cm, covered with short, soft hairs, taped on the surface of the plant or silky hairs, stem detached and leaves are opposite double feathers and composed of 3-7 pairs of the oval leaf (Fig. 3C). The flowers are yellow and spiny (Fig. 3C). The spines are sharp and the petals are long. Different parts of the plant are considered as poisonous.

Malva parviflora L.

Malva parviflora L. is an annual glabrous or pubescent, herbaceous, creeping, or standing grass. The plant height is ranging from 10-45 cm (Fig. 3D). Stems are prostrate-ascending or erect and are occasionally covered with capillaries (60). Leaves are alternately round or renal, shallow in articulation 7-undisturbed lobes and round lobes, uneducated and tufted. The flowers are small, pink and the fruit is composed of a group of nymphs (Fig. 3D). Seeds are reniform, non-hairy with a seed coat composed of 6 zones and are black. The oil of the plant seed is identified to contain glycerides of cyclopropene fatty acids, cyclopropane, epoxy and conjugated dienoyl acids (61). The vegetative part of the plant is poisonous. The plant is adaptable to wide-ranging of climatic conditions. Consumption of this plant can be detrimental to livestock and ingestion of large quantities from 1.4 to 5.5 kg/day can induce 'staggers' in animals such as sheep, cattle and horses (62).

Conclusion

According to the current research, where the results showed in the studied area (Al-Kharj), the region is widely dominated by the clan of Apocynaceae (*Calotropis procera* and *Rhazya stricta*). Other less widespread wild plants such as *Citrullus colocynthis*, *Heliotropium bacciferum, Cassia italica, Alhagi maurorum, Capparis spinosa, Tribulus terrestris* and *Euphorbia helioscopia* as well as *Convolvulus arvensis*, *Zygophyllum coccineum* were also observed. Future attention should be paid to the determined wild species in the investigated region for its phytochemical composition.

Acknowledgements

The author wish to express their appreciation to Prince Sattam Bin Abdulaziz University, Saudi Arabia for its support.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None.

References

1. Lewis WH, Elvin-Lewis MPF. Medical Botany: Plants affecting man's health. John Wiley and sons, New York, USA. 1977; pp. 11-62.
2. Cooper MR, Johnson AW. Poisonous plants in Britain and their effects on animal and man. Pp. 130-305. Her Majesty's Stationery Office, London, UK.1984.
3. Patrick JB, Mcclintock JB, Hopkins TS. Structural and chemical defenses of echinoderms from the northern Gulf of Mexico. J Exp Mar Biol Ecol. 1997;210(2):173-86. https://doi.org/10.1016/S0022-0981(96)02677-9
4. Foster S, Caras RA. A Field Guide to Venomous Animals and Poisonous Plants. Houghton Mifflin Company, Boston. 1994.
5. Torrell LA, Owen LP, Mcdaniel KC, Graham D. Perception and economic losses from locoweeds in northern New Mexico. J Range Manag. 2000;53:376-83. https://doi.org/10.2307/4003747
6. Panter KE, James LF, Gar Dner DR, Ralphs MH, Pfister JA, Steglmeier BL, Lee ST. Reproductive losses to poisonous plants: influence of management strategies. J Range Manag Arch. 2022;55(3):301-08. https://doi.org/10.2307/4003138
7. Aganga M, Nsinamwa M, Oteng K, Maule B. Poisonous plants in Gardens and grazing lands. Online J Anim Feed Res. 2011;1(2):52-59.
8. Al-Rawi A, Bunni F. Poisonous Plants of Iraq. Ministry [sic] of Agriculture of the Republic of Iraq- Baghdad. 1966.
9. Al-Qura'n S. Ethnobotanical survey of folk toxic plants in southern part of Jordan. Toxicon. 2005;46(2):119-29. https://doi.org/10.1016/j.toxicon.2005.04.010
10. El Ghazali GEB, Mousa HM. A Checklist to the poisonous plants of Qassim Region, Saudi Arabia. J Agric Vet Sci. 2014;7:21-34. https://doi.org/10.12816/0009459
11. Chaudhary SA. Grasses of Saudi Arabia. Ministry of Agriculture and Water, Riyadh; 1989.
12. Chaudhary SA. Flora of the Kingdom of Saudi Arabia (Illustrated). Vol. two (part 3). Ministry of Agriculture and Water, Riyadh. 2000.
13. Chaudhary SA. Flora of the Kingdom of Saudi Arabia (Illustrated). Vol. two (part 2). Ministry of Agriculture and Water, Riyadh. 2001.
14. Chaudhary SA, AL Jowaid AA. Vegetation of the Kingdom of Saudi Arabia. Ministry of Agriculture and Water, Riyadh. 1999.
15. Collenette S. An illustrated guide to the flowers of Saudi Arabia. Scorpion Publishing Ltd., London. 1985.
16. Migahid AM. Flora of Flora of Saudi Arabia. Vol. 2 (Monocotyledons), 2nd edition, revised and illustrated. Riyadh University Publication, Riyadh. 1978.
17. Migahid AM. Flora of Saudi Arabia. Vol. 1, 3rd Edition. King Saud University Libraries, Riyadh. 1988.
18. Migahid AM. Flora of Saudi Arabia. Vol. 2, 3rd Edition. King Saud University Libraries, Riyadh. 1989.
19. Migahid AM. Flora of Saudi Arabia. Volume 3, 3rd Edition. King Saud University Libraries, Riyadh. 1990.
20. Ibrahim AH. Tolerance and avoidance responses to salinity and water stresses in *Calotropis procera* and *Suaeda aegyptiaca*. Turk J Agric For. 2013;37:352-60. https://doi.org/10.13140/RG.2.1.1908.9127
21. Rahnama-Moghadam S, Hillis LD, Lange RA. Heart and Toxins. Elsevier Inc. 2015; pp. 75-132. https://doi.org/10.1016/B978-0-12-416595-3.00003-7
22. Boutraa T. Effects of water stress on root growth, water use efficiency, leaf area and chlorophyll content in the desert shrub *Calotropis procera*. J Int Environ Appl Sci. 2010;5: 124-32.
23. Erdman MD, Erdman BA. *Calotropis procera* as a source of plant hydrocarbons. Econom Bot. 1981;35:467-72. https://doi.org/10.1007/BF02858597
24. Alikhan I, Khanum A. Medicinal and aromatic plants of India. Ukaaz Publication. 2005;133-34.
25. Bukhari NA, Al-Otaibi RA, Ibhrahim MM. Phytochemical and taxonomic evaluation of *Rhazya stricta* in Saudi Arabia. Saudi J Biol Sci. 2017;24:1513-21. https://doi.org/10.1016/j.sjbs.2015.10.017
26. Bashir A K, Abdalla AA, Hassan ES, Wnsfi IA, Amiri MA, Crabb TA. Alkaloids with antimicrobial activity from the root of *Rhazya stricta* Decne. growing in the United Arab Emirates. Arab Gulf J Sci Res. 1994;12:119-31.
27. Ali BH, Bashir AK, Bannat NR, Tanira MOM. Central nervous system activity of *Rhazya stricta* (decne) in mice. Clin Exp Pharmacol Physiol. 1985;22:248-53. https://doi.org/10.1111/j.1440-1681.1995.tb01989.x
28. Albeshri A, Baeshen NA, Bouback TA, Aljaddawi AA. A Review of *Rhazya stricta* decne phytochemistry, bioactivities, pharmacological activities, toxicity and folkloric medicinal uses. Plants. 2021;10(11):2508. https://doi.org/10.3390/plants10112508
29. Khurm M, Wang X, Zhang H, Hussain SN, Qaisar MN, Hayat K *et al*. The genus *Cassia* L.: Ethnopharmacological and phytochemical overview. Phytotherapy Research. 2020; ptr.6954. https://doi.org/10.1002/ptr.6954
30. Nadro MS, Onoagbe IO. Effects of the aqueous and ethanolic extracts of *Cassia italica* leaf in normal rats. Amer J Res Commun. 2014;2(8):72-80.
31. Bakhiet AO, Adam SEI. Toxicity to Bovans Chicks of Cassia italica Seeds. Phytother Res. 1996;10:156-60. https://doi.org/10.1002/(SICI)1099-1573(199603)10:2<156::AID-PTR795>3.0.CO;2-M
32. Middleditch BS, Amer MA. Studies in Plant Science 2: Kuwaiti Plants. Elsevier Science Publishers BV: Amerstdam. 1991.
33. Gibbons S, Oriowo MA. Antihypertensive effect of an aqueous extract of *Zygophyllum coccineum* L. in rats. Phytother Res. 2001;15:452-55. https://doi.org/10.1002/ptr.836
34. Al-Salihi KA, Al-Rammahi HM. Diarrhea associated with ingestion of *Zygophyllum coccineum* (Tartir) in camels in the Al-Najaf desert in Iraq. Int J Poisonous Plant Res. 2014;3(1):1-6.
35. Savithramma N, Sulochana C, Rao KN. Ethnobotanical survey of plants used to treat asthma in Andhra Pradesh, India. J Ethnopharmacol. 2007;113:54-61. https://doi.org/10.1016/j.jep.2007.04.004
36. Amamou F, Bouafia M, Chabane-Sari D, Meziane RK, Nani A. *Citrullus colocynthis*: a desert plant native in Algeria, effects of fixed oil on blood homeostasis in Wistar rat. J Nat Product Plant Res. 2011;1:1-7.

37. Sawaya WN, Daghir NJ, Khalil JK. *Citrullus colocynthis* seeds as a potential source of protein for food and feed. J Agric Food Chem. 1986;34:285-88. https://doi.org/10.1021/jf00068a035

38. Asyaz S, Khan FU, Hussain I, Khan MA, Khan IU. Evaluation of chemical analysis profile of *Citrullus colocynthis* growing in Southern area of Khyber Pukhtunkhwa, Pakistan. World Appl Sci J. 2010;10:402-05.

39. Abo KA, Fred-Jaiyesimi AA, Jaiyesimi AEA. Ethnobotanical studies of medicinal plants used in the management of diabetes mellitus in South Western Nigeria. J Ethnopharmacol. 2008;115:67-71. https://doi.org/10.1016/j.jep.2007.09.005

40. Diwan FH, Abdel-Hassan IA, Mohammed ST. Effect of saponin on mortality and histopathological changes in mice. East Medit Health J. 2000;6:345-51. https://doi.org/10.26719/2000.6.2-3.345

41. Sharma SK. Medicinal Plants Used in Ayurveda. National Academy of Ayurveda, Ministry of Health and Family Welfare Govt. of India, New Delhi, India.1998.

42. Al-Snafi AE . *Alhagi maurorum* as a potential medicinal herb: An overview. Int J Pharm Rev Res. 2015;5:130-36.

43. Al-Jubory SY. Determination the lethal dose50 (LD50) and study of acute toxicity and histopathological effects of glycosides extract of *Alhagi maurorum* (Aqual) in mice. J Thi-Qar Sci. 2013;3 (4):26-33.

44. Shawahna R, Jaradat NA. Ethnopharmacological survey of medicinal plants used by patients with psoriasis in the West Bank of Palestine, BMC Complement. Altern Med. 2017;17(1):4. https://doi.org/10.1186/s12906-016-1503-4

45. Fayed MAA. *Heliotropium*; a genus rich in pyrrolizidine alkaloids: A systematic review following its phytochemistry and pharmacology. Phytomedicine Plus. 2021;1(2):100036. https://doi.org/10.1016/j.phyplu.2021.100036

46. Chedraoui S, Abi-Rizk A, El-Beyrouthy M, Chalak L, Ouaini N, Rajjou L. *Capparis spinosa* L. in a systematic review: A xerophilous species of multi values and promising potentialities for agrosystems under the threat of global warming. Front Plant Sci. 2017;8:1845. https://doi.org/10.3389/fpls.2017.01845

47. Zhang H, Ma ZF. Phytochemical and pharmacological properties of *Capparis spinosa* as a medicinal plant. Nutrients. 2018;10 (2):116. https://doi.org/10.3390/nu10020116

48. El-Hawary SS, Taha KF, Kirillos FN, Dahab AA, El-Mahis AA, El-Sayed SH. Complementary effect of *Capparis spinosa* L. and silymarin with/without praziquantel on mice experimentally infected with *Schistosoma mansoni*. Helminthologia. 2018;55 (1):21-32. https://doi.org/10.1515/helm-2017-0055

49. Bencheikh N, Elbouzidi A, Kharchoufa L, Ouassou H, Alami Merrouni I, Mechchate H *et al*. Inventory of medicinal plants used traditionally to manage kidney diseases in North-Eastern Morocco: Ethnobotanical fieldwork and pharmacological evidence. Plants. 2021;10(9):1966. https://doi.org/10.3390/plants10091966

50. Al-Snafi AE. The chemical constituents and pharmacological effects of *Convolvulus arvensis* and *Convolvulus scammonia*-A review. OSR J Pharm. 2016;6:64-75.

51. Austin DF. Bindweed (*Convolvulus arvensis*, Convolvulaceae) in North America from medicine to menace. Bull Torr Bot Club. 2000;127(2):172 -77. https://doi.org/10.2307/3088694

52. Leporatti ML, Ivancheva S. Preliminary comparative analysis of medicinal plants used in the traditional medicine of Bulgaria and Italy. J Ethnopharmacol. 2003;87:123-42. https://doi.org/10.1016/s0378-8741(03)00047-3

53. Khare CP. Indian Medicinal Plants, An Illustrated Dictionary. Springer Science and Business Media, LLC. 2007; pp. 170. https://doi.org/10.1007/978-0-387-70638-2

54. Mohamed AH, Hegazy MF, Moustafa MFM, El-Sayed MA, Abdel-Farid IB, Esmail AM *et al*. *Euphorbia helioscopia*: chemical constituents and biological activities. Int J Phytopharmacol. 20123; .90-78:(1)

55. Zhang W, Guo YW. Chemical studies on the constituents of the Chinese medicinal herb *Euphorbia helioscopia* L. Chem Pharm Bull. 2006;54(7):1037-39. https://doi.org/10.1248/cpb.54.1037

56. AL-Sultan SI, Hussein YA. Acute toxicity of *Euphorbia helioscopia* in rats. Pak J Nutr. 2006;5(2):135-40. https://doi.org/10.3923/pjn.2006.135.140

57. Al-Rehaily AJ. Novel alkaloids from *Haplophyllum tuberculatum*, MSc, Department of Pharmacognosy. College of Pharmacy. King Saud University. 1992.

58. Ageel AM, Mosa JS, Tariq M, Al-Yahya MA, Al-Said MS. Saudi plants used in folk medicine, Riyadh: Department of Scientific Research, King Abdel-Aziz City for Science and Technology (KACST).1987; pp 211.

59. Al-Rehaily AJ, AL-Howiriny TA, Ahmad MS, Al-Yahya MA, Elferaly FS, Hufford CD, Mcphail AT. Alkaloids from *Haplophyllum tuberculatum*. Phytochemistry. 2001;57:597-602. https://doi.org/10.1016/s0031-9422(01)00041-3

60. Lamp C, Collet F. A field guide to weeds in Australia. 2nd edition. Inkata Press, Melbourne. 1984.

61. Ahmad MU, Sinha S, Husain SK, Osman SM. The nature of the oxygenated fatty acids present in *Malva parviflora* seed oil. J Sci Food and Agric. 1984;35:408-14. https://doi.org/10.1002/jsfa.2740350408

62. Main DC, Butler AR. Probable *Malva parviflora* (small flowered mallow) intoxication in sheep in Western Australia. Austr Vet J. 2006;84:134-35. https://doi.org/10.1111/j.1751-0813.2006.tb13396

§§§