From the Department for Farm Animals and Veterinary Public Health

University of Veterinary Medicine, Vienna

Institute of Animal Nutrition and Functional Plant Compounds

Head: Univ.-Prof. Dr.sc.agr. Qendrim Zebeli

The Toxic Plants on Syrian Pastures

DiplomaThesis

University of Veterinary Medicine, Vienna

Presented by:

Hussam Aryan

Vienna, April 2022

Scientific coordinator:

Ao. Univ.-Prof. Dr. phil. Remigius Chizzola

Institute of Animal Nutrition and Functional Plant Compounds

Department for Farm Animals and Veterinary Public Health

University of Veterinary Medicine, Vienna

Veterinärplatz 1, 1210Wien, Austria

Reviewer:

Ao. Univ.-Prof. Mag. Dr. Karin Zitterl-Eglseer

Institute of Animal Nutrition and Functional Plant Compounds

Department for Farm Animals and Veterinary Public Health

University of Veterinary Medicine, Vienna

Veterinärplatz 1, 1210 Wien, Austria

I would like to thank:

Mr. **Ao. Univ. Prof. Dr. phil. Remigius Chizzola** for his support and full confidence in all the decisions I have taken regarding the organization of the scientific activity as well as his competent guidance in order to carry out this thesis.

Thanks to my family, my wife Zeina and my daughter Helena who supported me and offered me love and understanding.

Content

1. Introduction

1.1.Characteristics of the natural environment and biological diversity in Syria

Syria has its rich plant and animal biodiversity, which is attributed to topographical and climatic diversity. The nature of its topography and its geographical location among the three continents Asia, Africa and Europe and its climate have led to the emergence of distinctive characteristics and marked differences in environments and factors that have an important role in biological diversity. Syria is located in the eastern side of the Mediterranean basin, with an area of 185,180 km^2 and its heights vary between high mountain peaks (Jabal Sheikh 2814 m) to areas that drop to 300 m below the surface of the sea (al-Himma in the Golan).The various landscapes include the beaches, coastal mountains, forests, hills, agricultural plains and desert. There are rivers, fresh water lakes and saline water lakes *(The National Country Study of Biodiversity in Syria 2000).*

Precipitation ranges from more than 1000 mm in the western and northwest to less than 120 mm in eastern Syria. The regions are characterized by diversity in soil and ecosystems that constitute a typical environment for plants and animals within a mild climate in summer and relatively cool in winter, while the interior plains and plateaus are areas where dry desert neighborhoods live in it. Five Mediterranean biological climates can be identified: wet, semi-wet, semi-dry, dry and very dry (*Nahal Ibrahim 2002).*The biological diversity in Syria, especially during the last two centuries, has been exposed to many risks and factors that led to its decline. Studies and effects indicated that this diversity was once more prosperous. It remained influenced from human activities and needs during the past few centuries. However, studies recorded by Arab researchers and foreign travelers in the eighteenth and nineteenth centuries until the beginning of the twentieth century indicated the presence of a large number of species of plants and animals that are now extinct at the national level.

Through a simple review of the Latin scientific names of wild species of plants and animals known in the region, we find that in the name of the species was previously or still often includeda reference to Syria, which confirms the important role of Syria as a natural habitat for many wild species, such as the Syrian brown bear (*Ursusarctos syriacus*), Hyaena (*Hyaena*

syriacus), *Serinus syriacus* and *Origanum syriacum (Reports of Biodiversity conservation and protected area management (SY-GE-57109) (2005)).*

1.2.The plants diversity in Syria

Syria is characterized by very diverse plant life due to its unique geographical location and diversified climate which form a rich environment with natural habitats suitable for the lives of many plants. Perhaps the most important studies of plant diversity in Syria are the Flora of Lebanon and Syria *(Mouterde, 1966, 1983, 1986).*Syria includes different areas of the botanical geographical regions: the Irano-Turanian, the Mediterranean, and the Arab desert in addition to the presence of the European Siberian component and other elements from other botanical geographic areas (Fig. 1). Table 1 gives an overview of the main plant families present in Syria.

Studies of phyto-geographic surveys recorded more than 2300 plant species (botanical encyclopedia, international references) these numbers form 75% of the flora in Syria. The major part of the Syrian natural plant is the Mediterranean or Irano-Turanian, where this section forms more than 50% of natural plant species. If we take the bi-regional (Mediterranean and Irano-Turanian) species, this percentage rises to 80% of the total Syrian species. The Syrian germ contains only a small vowel from the northern (Siberian European) species and the types of the south (tropical and African). Thus, the bulk of the Syrian plants belongs to the Mediterranean floras, or to the Asian continent originating from Turkey, Iraq and Iran *(Protected Areas, Categories, Objectives and Conditions 2003).*

The vegetation in the humid Mediterranean climate is an evergreen forest covering the coastal mountains and some peaks of the Eastern Chain. The main vegetation in the humid and semi-humid Mediterranean regions are degraded oak forests with *Quercus calliprinos*, *Quercus ithaburiensis* and *Pistacia palaestina* found in coastal plains, highlands of Golan, eastern mountains and high peaks of Jabal al-Arab (Arab Mountain) *(The National Strategy and National Action Plan of Biodiversity 2002).*In the semi-dry region are the eastern slopes of the eastern mountain range and the plains adjacent to Aleppo, Hama, Homs and the borders of the Fertile Crescent. The high peaks of the inner mountains and the Aljazeera region are degraded steppe

forest with *Pistacia atlantica* and *Crataegus*- and *Amygdalus* species, weeds and legumes. The dry region includes the western and northern borders of the eastern plateau and includes the plains of the Aljazeera where the weeds and shrubs of the genera *Astragalus*, *Salsola* and *Artemisia* are growing. The desert is located in the east and southeast, where there are perennial formations of stunted shrubs (comprising species of *Achillea* and *Anabasis) (ICARDA 2005)*.

Table.1. The main plant families of the Syrian Flora

Family (Scientific name)	**Number of Genera**	**Number of Species**
Fabaceae	50	402
Asteraceae	106	331
Poaceae	104	222
Brassicaceae	71	189
Lamiaceae	31	191
Apiaceae	74	164
Liliaceae	24	149
Scrophulariaceae	15	115
Boraginaceae	29	101
Ranunculaceae	12	77
Chenopodiaceae	30	71
Rubiaceae	11	55
Euphorbiaceae	5	51
Rosaceae	19	44
Iridaceae	5	41
Polygonaceae	8	36
Papaveraceae	8	34
Cyperaceae	10	33
Orchidaceae	11	32

Malvaceae	7	25
Crassulaceae	5	25
Campanulaceae	5	24
Convolvulaceae	4	21
Caryophyllaceae	11	21
Solanaceae	10	17
Cistaceae	5	16
Amaryllidaceae	5	9
Primulaceae	7	7
Oleaceae	5	7

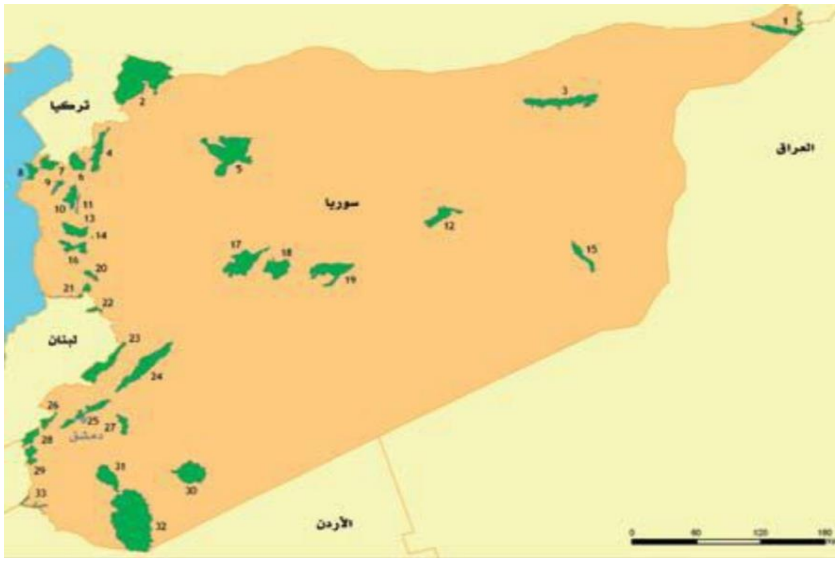

Fig.1. Important plant areas in Syria

Source: (The fifth national report on Biodiversity in the Syrian Arab Republic 2016)

1.3.The natural pasture condition in Syria

The total area of natural pastures and meadows in Syria is estimated at about 821.2 thousand hectares (year 2010; 44.35% of the total area), while the area was 8.33 million hectares (year 2003), However, despite the great potentials of Syria's pastures, there cannot be found a reflection of it on animal production or on the national economy *(The fifth national report on Biodiversity in the Syrian Arab Republic 2016)*.The most important manifestations of the weak reflections of the pastures:

-Syria imports meat, milk, and its derivatives, like many other Arab countries.
- The number of animals is not constant. According to the statistics of the Arab Organization for Agricultural Development in 2005, the number of sheep reached 14 million heads, cows 799 thousand heads, goats 10 million, camels 4000 and buffalo 1000. Most of these animals in Syria have adapted well to bear the harsh environmental conditions, but under these conditions an economic production is not possible because of the quality of the feed. Malnutrition leads to diseases and losses of animals, especially with the lack of veterinary care. The annual loss is estimated at 15%. This requires improving pastures and providing the necessary feed.

Statistics show that the average annual animal production is 15 thousand tons of meat, 155 thousand tons of milk, 5555 tons of wool, 25 tons of fish and 150 million eggs. The production is stable at its current level, but there is a human population increase of 1.2% annually. This will lead to malnutrition for the population and this requires serious consideration of solution. The production of fodder from natural pastures in Syria is estimated at about 4 million tons of dry fodder (the area is about 8.5 million hectares). That is, one hectare of natural pasture produces approximately 421 kg of dry fodder annually and this productivity is sufficient only for about 6-7 million head sheep (*Mudawer 2018)*. Therefore, the pastures of the Arab world and the pastures of Syria are unstable and do not fully meet the required needs, and this imposes and confirms the necessity of managing these rangelands to perform their role. The Syrian government issued the Legislative Decree No. 78/ 2011 to create the Public Authority for Management, Development and Protection of al-Badia (MDP). It is concerned with natural pastures and is linked to the

Ministry of Agriculture and Agrarian Reform, where it works to develop the Al-Badia, protect and develop its local community, human resources and infrastructure, manage and revitalize various activities. Pastoral planting and seeds and the establishment of a number of pastoral reserves distributed as follows *(Studies and reports of Biodiversity conservation and protected area management 2006-2009).*

In 2012: The total number of pastoral reserves currently included 68 protected areas (Fig. 2), with 59 pastoral reserves that are rehabilitated as part of annual plans by the two methods of planting pastoral planting and direct scattering of seeds, with a total area of 785,894 hectares.

• 9 environmental reserves to conserve biological diversity and wildlife with a total area of 121,957 hectares located in the Valley of the Governorates.

• 13 pastoral nurseries producing 10 million pastoral, seedlings of fruit and forest trees located in Damascus, Palmyra and Deir- Ezzor highways with a total area of 186 hectares.

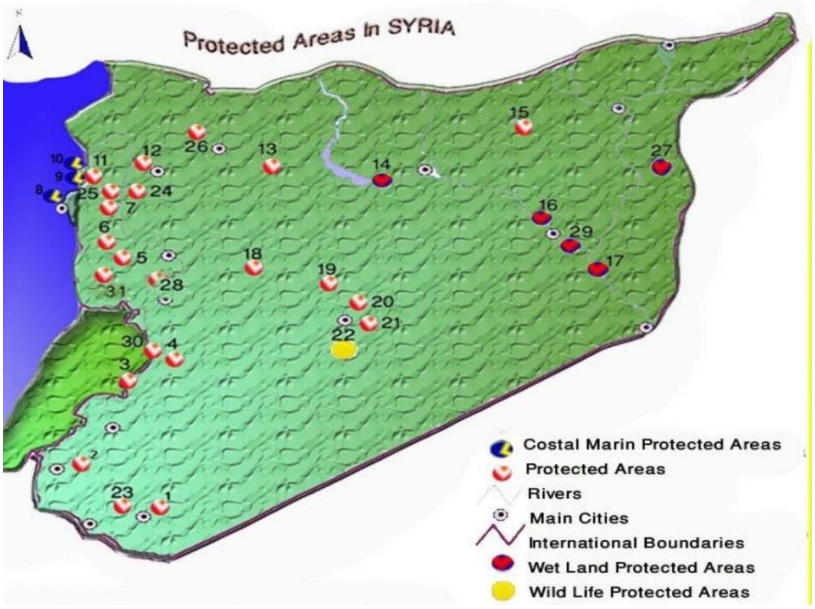

Fig.2.The protected Areas in Syria

1.4.Examples of some threatened species with extinction in Syria

International Union for the Conservation of Nature Red List (*IUCNRL 1997*) indicated that there is one specie that is highly threatened with extinction: *Isoetes olympica.* It is of limited spread, located in only two sites from Syria and Turkey, and registered in Jabal Al Arab by *Mouterde (1953*). Its numbers decreased dramatically, and it was believed to be extinct, and in 2000 a few numbers were seen in several locations from Jabal al-Arab (Arab mountains in south of Syria). Its small size makes it sensitive to any change or sabotage in its habitat, and therefore it is severely threatened. In fact, there are in addition to these threatened plant species of critical importance that require intensified efforts to protect them, including:

- Neglected marginal plants, such as wild iris (*Iris damascena*) is found in Qassioun Mountain and considered to be a semi-extinct species (known as Qassioun Iris). Some of the Iris is of medicinal importance, as the subsurface parts are used in the treatment of coughs, bronchitis, skin ulcers and headache.
- Wild medicinal plants as a result of unjust investment in order to trade in them (such as thyme) and a large number of plants that could benefit from their improvement as ornamental plants.
- Among the tree species are many types, including: *Ceratonia siliqua, Olea europaea, Cerasus mahaleb, Juniperus excels* of exceptional medicinal value, *Pistacia atlantica*, *Pistacia mutica*, Syrian elm (*Fraxinus syriaca*), wild apples (*Malus trilobata*) *(IUCN, IUCN Red List of threatened plants and animals1997) (Fig.3).*

Juniperus excelsa

Iris damascena

Isoetes olympica

Pistacia atlantica

Abies cilicica

Ceratonia siliqua

Fig. 3. Some plant species threatened with extinction in Syria

2. The toxic wild Plants in Syria

Botanic wealth has a great economic value which cannot be ignored or underestimated, but must be preserved, developed and evaluated, in its evaluation, there are many benefits to sustainable development, and rationally exploiting their environment. Some plants are useful, others are harmful, and some are classified as toxic so that a single dose of them can end the life of a human or animal. Therefore, a person must know everything about plants, some of which are not toxic in some seasons of the year, and toxic in other seasons, or it is toxic in some stages of growth and non-toxic in other stages. There are some plants, some parts of them are toxic and other parts can be eaten, and some plants become toxic after they wither,

so it becomes necessary to know the toxic plants and distinguishthemfrom other plants in the plants kingdom (*Al-Yemeni et al. 1999*).

Eating parts of toxic plants or their extracts may lead to poisoning when they contain the toxic component in a concentrated form. These extracts are also treated chemically to produce other compounds for use in therapeutic or non-therapeutic purposes. There are sufficient justifications for exploiting toxic plants as important sources of medicinal or nutritional materials necessary for human health and then protecting them from extinction. These justifications are manifested as follows: All plant species contain some unique biochemical properties, and no one knows which plant will be a future basis for important scientific and technological developments. Toxic plants should not be eliminated, as they may be concerned with this. Toxic plants have a long history in medicinal use, and there is no doubt that some chemicals in these plants are useful, and there are many studies in the field of biochemistry of toxic plants. This knowledge is useful as a basis for further research and development. There is a large number of industries and peoples that depend directly or indirectly on their income for exploiting, cultivating and producing poisonous plants *(Carmona et al. 2005).*

2.1. The toxic ornamental plants that are dangerous to the childrenlives

Many people may be ignorant of the danger of ornamental plants and their harm to human health and body, and it is possible to deal with them for their beautiful and attractive forms in order to decorate their homes. Often these plants are attractive to children, especially children under the age of six who are more likely to die as a result of exposure to these poisonous parts. Altogether, children represent about 85% of the total patients attending poison centers in the world *(Spoerke et al. 1990*). The toxic plant causes disease symptoms in humans and animals accompanied by irritation and allergic skin and many health consequences that may lead to death. These symptoms may appear immediately after exposure to them or after a period because of toxic substances present in these plants. These plants spread in all places, homes, gardens, fields, forests, and pastures. Some ornamental plants are characterized by the presence of very toxic chemicals and compounds, others are of very low toxicity, and most of

these toxins are not released from plants unless children messes with them such as cracking their stems, eating their leaves, or touching them *(Cheeke 1989)*.

Nerium oleander

Lantana camara

Dieffenbachia

Rhododendron

Euphorbia pulcherrima

Aconitum

Fig. 4. Examples of toxic ornamental plants

2.2.The plants and toxins in animal feed

The plants and fodder that the animals feed on contain organic or mineral materials that the animal body can benefit from and saturate if given in an appropriate amount and do not have an adverse impact on animal health. These include concentrated feed such as grains of all kinds, roots, tubers, fruits, foodstuff factories, and mill waste as well as materials of animal origin and fishmeal, as well as coarse feed materials such as cultivated green fodder or pasture and dry fodder materials such as straw and hay, crop residues and preserved green fodder (silage) materials. Often feed raw materials contain toxic substances or other materials harmful to the health of the animal that feed on them and have a negative effect in the animal and its production and may lead to its death *(Cheeke et al. 1985)*.

Toxic plants cause chemical or functional disturbances of grazing animals or bred in pens, and their effect varies from mild to severe killer. Toxicity appears in some plants in some different stages of growth or in the flowering stage or in the ripening and drying state. One of the characteristics of camels is that in their nutrition they eat a few parts of the plant, and they move in their feeding from one place to another, not far from it, which reduces the amount of toxic plants eaten. By this way the state of poisoning does not appear on them, as well as their ability to bear some toxins. It is noted that some plant compounds are relatively non-toxic in the form present in the plants, but they become toxic by vital processes in the animal's body, such as nitrates in plants turn into nitrites in the animal body, and because nitrites are more toxic than nitrates, plant toxins sometimes become fatal at low levels, whereas that should be the case in greater quantities; some toxins are quickly destroyed and deactivated in the animal's body, while others are difficult to get rid of *(Cooper et al. 2003).*

2.3.The symptoms of poisoning with toxic plants

Symptoms of poisoning by toxic plants include sudden onset, chronic disease, general weakness, neurological symptoms, photosensitivity, miscarriage and birth defects. Some plants are characterized by toxicity as they produce or contain within their tissues one or more compounds that have harmful effects on the biological systems of the body, and severe digestive disturbance, bloody diarrhea, accompanied by poor appetite and lack of milk production. It is advised to feed animals only on mature or dry plants, and dry roasted seeds to make sure that they are free of toxic substances *(Kumar et al. 2006).*

2.4. The mechanism of poisoning and the animal's ability to avoid it

Eating the toxic plants could cause an irritating effect on the digestive system or could have an anesthetic effect or paralysis of the nervous system. The risk varies according to the type of poison present in the plant, and the animals have an instinctive ability to recognize the toxicity of some plants. It may be noted that some poisonous herbs in the pasture do not affect the resident animals which acclimatized to them, but they exhibit toxic effects in animals not

native in that region. In order to summarize the great variety of intoxications some of them are listed as follows:

1- Some plants induce congenital deformities, including lupine (Lupinus), Veratrum, Astragalus, pine trees and broom snake weed.
2- Some desert plants cause photosensitization. Symptoms include discomfort, swelling in the affected area, and ulceration of the camel udder. There are some types of *Trifolium* species (*Trifolium spp*) that may cause some kind of photosensitivity.
3- Chronic wasting due to liver deficiency that may lead to animal death because part of the plants contains a type of pyrrolyzidine alkaloid.

Poisoning may occur as a result of the accumulation of toxic substances in the environment such as nitrates, when eating a portion of contaminated plants, or from the plants theirselves producing toxins such as cyanides, oxalates and selenium, or prussic acid, such as: poison hemlock (*Conium macultum*), Johnson grass (*Sorghum halepense*) and Sudan grass (*Sorghum sudanese*). Intensive grazing or a narrow grazing area increases the possibility of intake of large quantities of poisonous plants for animals. Poisoning can also happen when preparing a diet contaminated with fungal toxins such as with myxotoxins infected peanuts (ground-nut) *(Gurudeeban et al. 2010).*

2.5. The chemical compounds in toxic plants

- **Hydrocyanicacid released from cyanogenic glycosides:** Some feed materials provided to the animal from some leguminous seeds, corn and Sudan grass contain these cyanogenic glycosides. They are concentrated in young plants and their percentage decrease with the age of the plant. Therefore, it is not recommended to provide these plants to the animal before 45 days of germination. Cyanogenic glycosides are complex organic compounds that contain non-carbohydrate components linked to a carbohydrate molecule. The carbohydrate part in glycosides is often over the taste, and thus the animal avoids the toxic effect of the

plant, and the hydrocyanic acid is released during enzymatic degradation or hydrolysis. It is absorbed through the stomach wall and is transferred to the blood and then to the liver. Symptoms of poisoning the animals are increased salivation, muscle twitching, heavy breathing and mortality. Hydrocyanic acid is also found in the flax *(Linumus itatissimum) (McKenzie 2001, Bothaet al. 2008)*.

- **Oxalic acid:** Occurs in some crops, such as leaves and heads of sugar beet, up to 5% of the dry matter. This acid is very toxic. It affects animals with a simple stomach, such as: horses, pigs and rabbits, very much, while its effect is reduced in ruminants, because oxalic acid is partially fermented in the rumen and loses its toxic effect. These toxic plants contain sodium and potassiumoxalate, as for example *Kochia prostrata* which contain 3-8% of both. The oxalates are combined with calcium and turn into an insoluble form which leads to urinary stones and problems with excretion by the urinary system *(Kellerman 2009)*.
- **Fluorine*:*** Animal feed additives such as phosphates contain impurities of fluorine, a toxic element that damages animal bones and teeth badly; especially when consuming phosphates in diets for a long time *(Kaspareket al. 2008).*
- **Gossypol:** A toxic substance that has phenolic properties is found in a free or bound form in cotton seeds. The free form is harmful and can be converted into bound form by addition of ferrous sulfate to the cotton seed powder in order to stop the toxic effect (*Willard et al. 1995*). The toxic effect can be reduced by exposing the seeds to hot steam for a minute. The poisonous gossypol turns into a form that is excreted in dung without affecting the animal. Therefore, it is recommended to use cotton seeds or its derivatives that are more exposed to steam. It is also advised to provide good hay to the bush and add a source of calcium and carotene. It is not preferable to provide cotton seed for small developing animals and pregnant animals because they do not tolerate gossypol. The substance gossypol may cause infertility in male animals (*Watkins et al. 2002).*
- **Alkaloids:** Alkaloids are defined as complex molecules that contain nitrogen, where the free base has alkaline reaction, and works to neutralize acids to form salts. Alkaloids are found in many plants. The most important are: *Atropa belladonna, Hyoscyamus smuticus,*

Delephinium ajacis, Lupinus varius, Heliotropium ramosissimum (Riet- Correaetet al. 2009b).

- **Toxic Glycosides:** Upon dissolution they give steroid-like compounds, such as Oleandrin glycosides in *Nerium oleander*, Colocynthin and Curcurbatacin in *Citrullus coloynthis*, Xanthin in *Xanthostemons*, and Cardiac glycosides in *Ornithogalum (Batanomy1999).*
- **Saponines*:*** Saponines are compounds that turn into colloidal solutions when they dissolve in water. Saponineare found in many plants, including many forage species that belong to the clover *Trifolium, Lotus, Medicago* species. The most important of these plants is the weed (*Solanum nigrum*) *(Al Gaby et al. 2000).*
- **Plants that accumulate selenium in their tissues:** Poisoning with these plants occurs when the concentration of selenium is as large as in *Astragalus* spp. Symptoms appear as poisoning, blindness and then death.
- **Plants that accumulate nitrate in their tissues*:*** These plants become toxic when the nitrate concentration reaches about 1.5% the dry weight of the plant.

3. The toxic plants in folk medicine

Folk medicine (alternative or complementary medicine) is a set of health practices that include the use of natural plants in treatment. These practices are classified within traditional medicine, and therefore they are not part of modern medicine, as it has not been proven that these practices are safe and effective enough.

Traditional Arabic medicine (TAM) is one of the famous traditional medical systems, which is occasionally called Unani medicine, Graeco-Arabic medicine, humoral medicine or Islamic medicine. The subject of Traditional Medicine in Syria has received little attention in the literature, and very little is known about the traditional medicinal substances used nowadays by the Syrian population to treat the most common diseases. Throughout ancient times in Syria, as part of the Levantine Nations (Bilad al-Sham), and other lands in the region, humans used various natural materials as sources of medicines. In the western countryside of Hama,

there is a natural reserve for medicinal plants, which is called the Abu Qubais Protected area in Al-Ghab region (which protect the biodiversity rights of indigenous people and is affiliated to the general commission for Al-Ghab administration and development), 509 plant species belonging to 72 families have been recorded (*Al-Mahmoud et al. 2010*). Many recent studies indicate that alternative medicine is widely practiced in the world, where the World Health Organization (WHO) indicated that more than half of the world's population used alternative medicine. According to the results of the National Health study in the United States of America, more than a third of adults use complementary and alternative medicine. The results of this research indicated that out of every ten individuals, four have used alternative medicine *(Dulger et al. 2004).*

It is a fact that people in some areas in Syria suffer from poverty, so they depend a lot on folk remedies, and folk healers provide their expertise at small costs, because the medicinal herbs are cheaper than chemical medicines, and most of the medicinal recipes are available around. However, a large quantity of medicinal plants are still under study. A total of 76 medicinal plant species (57.9% are wild and 42.1% are cultivated plants) belonging to 39 families are recorded; they are being used for a variety of purposes by native people.

In Syria, many studies were conducted on the usage of alternative and complementary medicine. The results of one of these studies showed that 46% of the individuals under study had previously used alternative and complementary medicine, while another study showed that 73% used alternative medicine and found that 42% consulted a medical therapist alternatively, and that 72% had at least one folk remedy in their homes *(Chaudhary et al.1999).*

Another study, included multiple regions of Syria, showed that not all practitioners of traditional medicine do hold a scientific qualification in this field.42% of them had a high school education, 58% had a lower secondary education qualification and 73% depended in their treatment on the transmission of information and reading some references and 27 % got experience from family medicine practitioners. 82% of them believe that alternative medicine has no harm even though 45% have no knowledge of poisonous plants. All of them also believed that the herbs can be preserved under any environmental conditions, while 54% of

them believed that the herbs could be given to all ages, pregnant and lactating women and 92% of them mixed several herbs in one composition *(Chan 2009).*Studies confirmed that most patients who use alternative medicine also use modern medicine, and most of these patients do not consult the attending physician about their use of complementary and alternative medicine.

The most commonly usedplant family is Asteraceae (11.84%), followed by Lamiaceae (10.52%), then Rosaceae (7.89%) and Apiaceae (6.57%), Poaceae (5.26%), Anacardiaceae and Fabaceae (3.94%), Fagaceae, Liliaceae, Myrtaceae and Oleaceae (2.63%), then all the other families (1.31%). The calculated results of use value (UV) showed that *Cichorium intybus* L., *Eucalyptus globulus* Labill. was ranked first, followed by *Fraxinus syriaca* Boiss., *Olea europaea* L., then *Allium sativum* L., *Lepidium sativum* L., *Coriandrum sativum* L., *Glycyrrhiza glabra* L., *Dittrichia viscosa* L., while the lowest value was found for *Plumbago europaea* L. *(Chadi K et al. 2021).*

The analysis of the ethnobotanical data showed that the recipes in the most cases were obtained from single herb, but some of recipes were prepared together, and there is a famous local mixture called Damask tisane (zhourate Shamieh). A mode of Traditional Medicine preparation reported was a decoction (30%), followed by infusion (23%), and then by other method such as fresh herbs, juice, cooked, powder, vinegar and oils (47%). Considering according to results, most of the plant preparations are used orally (Table 2). The results of questionnaires showed that 20% of the informants were diagnosed with their diseases by a doctor, and 45% were diagnosed with a conventional therapist, and 35% self-diagnosed their diseases, while the results of the questionnaires showed that the evaluation of the treatment by informants was as following (58% relied on the disappearance of symptoms, and 24% through the results of laboratory analysis, 18% adopted other methods such as chest radiography, adopting the attending physician’s opinion and clinical observation of the improvement of skin diseases, and some of them depended on psychological comfort during treatment as evidence of improvement).

Among these studied plants, 62 are used to treat digestive disorders, 41 for respiratory diseases, including asthma, bronchitis and coughs, 40 for skin diseases, 16 for diabetes, 36 for

kidney and urinary tract disorders, 22 for nervous system disorders, six for enhancement of the body's immunity, two for hemorrhoids, five for fever, eight for heart disorders, five for infertility and impotence, six for treating several types of cancer, two for increasing breast milk production, five for losing weight, four for lowering cholesterol, and two for increasing weight, and six for anaemia, 15 for blood disorder, two anti-toxicant, 19 for arthritis and pain, one for typhoid disorder, eight for infections, six for gynaecological diseases, one for eye inflammation, two anti-toxicant and four for mouth sores. Many of them are still used today, especially those plants recommended for internal uses such as traditional medicinal teas, which mainly consist of remedies for obesity, weight loss, colds, digestive disorders, abdominal pain, constipation and some skin diseases *(Amjad et al 2013).*

The ethnobotanical categories indicated that there is large use of medicinal herbs in Syria; most of them are wild. There is an increased exploitation of medicinal plants by the local population, collectors and dealers of herbal medicines, in line with the demand from the pharmaceutical industry. This caused a sharp decrease in the occurrence and products of medicinal plants. Grazing, deforestation by cutting down trees for heating, and fires were mainly responsible for the reduction of medicinal plants. That is why the government is working on developing strategies to conserve wild plant diversity. Some people collect the medicinal plants for an income. They uproot and collect each part of the medicinal plants in non-scientific way. Thus to date, a few articles are devoted to Traditional Medicine of Syria, such as a study of folk medicine in Aleppo Governorate (*Alachkar et al. 2011*), and a study about the use of 'Zahraa' (Syrian traditional tisane) (*Carmona et al. 2005*), and a third one on the medicinal plants in Golan (*Said et al. 2002*), which is an occupied Syrian territory. The perspectives in the questionnaire were compared with other ethnomedicine studies in the countries surrounding Syria such as Lebanon, Jordan, Palestine, Iraq and Turkey.

Similarities in various traditional uses in Syria, Lebanon, Palestine and Jordan were observed. This is mainly due to the mutual history of these areas that were previously called Levantine Nations (Bilad al-Sham) (*Lev 2002*), and there is some similarity with a smaller number of folk uses both in Syria and Iraq, but there is a difference in the folk uses described between Syria and Turkey (*Yerebasan et al. 2020*).

3.1.Advantages and disadvantages of herbalmedicine

Folk medicines are medicines that are prepared from herbal sources and depend on documenting the effectiveness of the preparation on the use of peoples and the transmission of information. It is important to know the effect of herbal preparations on public health especially when using poisonous plants. It is necessary to shed light on the advantages and disadvantages of herbalmedicine *(Kunkel 1984).*

Advantages:

- Cheap price;
- Plants are available everywhere, whether in residential or remote areas;
- It does not need an official qualification or academic degree and it is sufficient for the practitioner to collect information from old references or the experiences of others.

Disadvantages:

- Does not subject to the supervision of governmental organizations in some countries;
- Does not have valid data;
- It has no well documented storageconditions;
- It has no specific dosage or specific age for use;
- There are no reliable international specifications for the quality of the preparation;
- There are no official studies that guarantee the safety of the user;
- Does not subject to a treatment ethics system.

A study of the formulations that are formulated by practitioners of alternative medicine showed:

- 32% contain toxic agents that are higher than internationally permitted limits;
- 62% contain toxic aflatoxins;
- 3% contain deadly bacteria;
- 79% contain dust and insects.

This is due to a lack of consumer awareness and the absence of government oversight and greed by some practitioners.

3.2. The most important plants with toxic potency used in folk and herbalmedicine in Syria and the Middle East countries

- ***Alkannatinctoria*:** This plant is used to treat leg ulcers caused by varicose veins. An ointment called Histoplastin Red is made from the roots of the plant with olive oil and beeswax. The plant contains toxic pyrrolizidinealkaloids which are carcinogenic, therefore, there is a warning against taking this plant orally and its use is limited to topical application *(Baser2002).*
- ***Teucrium polium*:** This plant is used in the treatment of diabetes. The results of a study of the cytotoxicity of this plant on the liver showed that it could cause complete liver failure in experimental animals according to the suggested dose from alternative medicine practitioners *(Ambula et al.2003).*
- ***Calotropis procera*:** This plant is used as a laxative for the intestine, as a medicine for ulcers and as a treatment for asthma. Its lactating juices are used to treat pimples. This plant is considered to be a poisonous plant. In contact with eyes it may cause blindness. As for its ingestion, it affects the digestive system and causes stomach pain accompanied by nausea, vomiting, diarrhea and slow pulse. Increased exposure to the sap may lead to an arrhythmia which may cause cardiac arrest *(Basu1992).*
- ***Clematis recta*:**Itis used in the treatment of sexually transmitted diseases such as syphilis, and for the treatment of chronic skin diseases and varicose veins. It is one of the poisonous plants that lead to death when large doses are taken; it contains toxic lactones (Protoanemonin) which cause also irritations to the skin, mucous membranes and urinary tract *(Batanouny et al. 2007).*
- **Copaiferalangsdorffii:** It is used in the treatment of urinary tract infections, kidney and bladder stones and chronic infections in the respiratory tract. It contains antimicrobial sesquiterpenes.The daily therapeutic dose should not exceed four grams because of its toxicity.
- ***Convallaria majalis*:**It contains glycoside steroids that stimulate the heart, so it is used in the treatment of heart failure, as it is used in the treatment of epilepsy, paralysis and

conjunctivitis. It is believed that it is a toxic plant, but the possibility of poisoning when taken orally is relatively small due to the lack of the body's ability to absorb the existing glycoside *(Nima et al. 2012).*

- ***Chrysanthemumcinerariifolium*:** Its flowers are used in the treatment against lice and scabies as it is toxic to the nervous system of insects and parasites. Both plant compounds cinerine and pyrethrine work as insecticides. The toxic dose of the plant is more than 2 g, and in the case of poisoning the injured person is treated with stomach washing *(Adel et al. 1998).*
- ***Datura*** (*Datura stramonium, Datura metel*): They are all highly toxic because they contain alkaloid compounds (hyoscyamine and scopolamine). Atropine, norscopolamine and meteloiden are extracted from them in low quantities. Datura is used asa strong anesthetic and rheumatic analgesic and is used externally as an anti-ulcer and a pain reliever for burns and hemorrhoids. Symptoms of Datura poisoning are headache, dry mouth and skin, hallucinations, high temperature, difficulty of swallowing, dilated pupils and respiratory paralysis *(Ahmad et al. 1991).*
- ***Chenopodium ambrosioides***: It contains a toxic monoterpene compound (ascaridole) and is used as an anti-worm remedy. It is also used to treat asthma, joints, eczema and uterine bleeding. The lethal dose of ascaridoleis about 10 mg/kg for adults; the plant affects badly the nervous system and hearing, therefore, it can be considered as obsolete *(Bellakhdar 1997).*
- ***Conium maculatum*:** It has a very toxic alkaloid compound (coniin). The lethal dose of this compound is approximately 150 mg. It is equal to about 10 g of fruits or 30 g of dry leaves. The patient becomes vomiting, headache and vision difficulty *(Batanouny et al. 1999)*.
- ***Adonis vernalis*:** It is used as a cardiac stimulant and diuretic, but it should only be used with medical advice because it is toxic.
- ***Artemisia herba-alba*:** It is used to treat colic and as anthelmintic, but this plant has toxic effects if it is taken continuously orally or in high doses. This plant is used as a perfume by

burning its seeds in homes to purify them from bad smell or to repel snakes, especially in bird farms *(Acamovic et al. 2001)*.

Alkannatinctoria

Teucrium polium

Calotropis procera

Chrysanthemum cinerariifolium

Convallaria majalis

Clematis recta

Fig. 5. Some plant species used in folk medicine

Table. 2. The uses of plant species according to ethnomedicinal survey in Syria

Name of species	Family	Part used	Ethnobotanical uses
Achillea santolina L.	Asteraceae	L	Fever, absence of menstruation, dysentery, loss of appetite, gastrointestinal (GI) tract discomfort, and to induce sweating.
Allium cepa L.	Liliaceae	Bb	Cough, asthma, typhoid, and the roasted bulb is used for diabetes, a juice of the fresh bulb is used externally for whooping cough, back pain, neck pain and warts.
Allium sativum L.	Liliaceae	Bb	Fresh bulb is used internally for hypertension treatment, diseases of the gastrointestinal tract, and urinary tract infection, relieves atherosclerosis, diabetes; anti-inflammatory; the bulb oil is used externally for rheumatism, dandruff, scabies, fungi and treating insect bites.
Ammi visnaga L.	Apiaceae	Ps, Sd	Pedicles of this plant are used to clean the teeth, and seeds decoction are used internally as a diuretic, antispasmodic and for bladder stones. Also it is used as a smooth muscle relaxant for asthma, and whooping cough.
Artemisia herba-alba	Asteraceae	L	An infusion of leaves is used internally against cancer, nerve system disorders, heart diseases, diabetes, to increase appetite.
Asparagus officinalis L.	Asparagaceae	R, Sh	Cooked roots and shoots are used internally for urinary tract diseases, lowering blood pressure; analgesic and anti-inflammatory.
Avena sativa L.	Poaceae	Sd	The bran husk of seed is a mealy nutritive herb used internally for weight reduction, and constipation, the wholeground seeds are used internally for diabetes, hypercholesterolemia; diuretic and antispasmodic.
Borago officinalis L.	Boraginaceae	L	An infusion of leaves is used internally for treatments for infections, respiratory complaints, depression, arthritis, asthma and the fresh leaves are used as mealy nutritive herb and diuretic.

Arum maculatum L.	Araceae	L	Cooked leaves are used internally for digestion disorders treatment, asthma treatment, bacterial infection; anthelmintic and liver tonic.
Capparis spinosa L.	Capparaceae	Sh, R	Young shoots pickled either in vinegar or preserved in granular salt are used internally for diseases of the nervous system, back pain, liver diseases, the fresh roots are used externally for back pain and rheumatism.
Carissa edulis (Forssk.)	Apocynaceae	R	A decoction of root is used externally for lichen disease.
Carthamus tinctorius L.	Asteraceae	Sd	Seeds oil is used internally to prevent heart disease, dysmenorrhoea, amenorrhea, postpartum abdominal pain, pain of joints.
Celosia cristata L.	Amaranthaceae	L, Sd	The leaves decoction is used internally as an antidiarrheal; seed decoction is used internally as a laxative; in cases of cough, and dysarthria urination, and for pain.
Centaurea calcitrapa L.	Asteraceae	L	The fresh leaves are used internally as appetite enhancer, and for diarrhea, the cooked leaves are edible as special traditional Syrian recipe known as Syrian salad (saleeg).
Chrozophora tinctoria L.	Euphorbiaceae	L	The fresh leaves are used internally as diuretic, and for kidney stones.
Cichorium intybus L.	Asteraceae	L, R	An infusion of leaves is used internally for improving immunity, protecting the heart, and for cancer, and eye inflammation, the fresh leaves are used as diuretic, laxative and slimming, the roasted of roots for liver diseases, the leaves are edible as special salad.
Convolvulus althaeoides L.	Convolvulaceae	L	An infusion of leaves is used internally as diuretic, and for kidney stone.
Coriandrum sativum L.	Apiaceae	Sd, L	A decoction of seeds and leaves is used internally for intestinal inflammation, weight loss and intestinal gas, treating narrowed arteries, diabetes.
Crataegus azarolus L.	Rosaceae	F	A decoction of fruits is used internally for cardiovascular diseases, hypertension, sexual weakness, cancer and diabetes.

Cyperus rotundus L.	Cyperaceae	T, Sd	A decoction of tuber part is used internally for digestion, bedwetting, diarrhea, diabetes, inflammation and gastrointestinal disorder, the oil of seeds is used externally for permanent hair remove and for burns.
Dittrichiaviscosa (L.) Greuter	Asteraceae	L, Fl	A decoction of leaves is used externally for burns, wounds, cutaneous leishmaniasis and the oil of the flowers is prepared in olive oil to use topically, and it is used internally for anemia, respiratory problems, ulcers of the gums, diarrhea.
Ecballium elaterium L.	Cucurbitaceae	F	Fresh juice of fruits is used for liver diseases, jaundice and sinusitis by nasal administration (just one drop of juice is inhaled in each nostril), and it is used externally for eczema.
Eremostachys laciniata L.	Lamiaceae	R, Fl	Decoctions of root and flower areused internally for allergy, headache and liver diseases; sedative.
Eruca sativa Mill.	Brassicaceae	L	Fresh leaves are used internally for sexual weakness and blood purification, diabetes, anti-toxicant, oil from seeds is used ashair tonic, burns, skin lesions; the leaves are edible as special salad.
Eucalyptus globulus Labill.	Myrtaceae	L	An infusion of leaves is used externally as inhalation for respiratory diseases.
Ficus carica L.	Moraceae	F, Lx	The dried fruit externally for wounds, the latex is used externally for warts; the decoction is used internally forbronchitis, and for diabetes, hypertriglyceridaemia, and laxative.
Foeniculum vulgare Mill.	Apiaceae	Sd	An infusion of seeds is used internally as carminative, digestive, lactagogue and diuretic and in treating of respiratory and gastrointestinal disorders.
*Fraxinus syriaca*Boiss.	Oleaceae	L	An infusion of leaves is used internally to facilitate digestion, treat tracheitis, strengthening the immune system, the cooked leaves known as traditional Syrian food in Salamiyah.
Glycyrrhiza glabra L.	Fabaceae	R	Fever, ulcer, kidney diseases and asthma, rheumatism, its syrup famous as traditional Syrian drink during the holy

			month of Ramadan (fasting month) as anti-thirst.
Hypericum triquetrifolium Turra.	Hypericaceae	Fl	An infusion of flowers is used internally as anxiolytic, and antidepressant.
Juglans regia L.	Juglandaceae	Sd, L, F	A decoction of seeds and leaves is used internally for sexual impotency, blood purification, lymph gland enlargement and bleeding, and topically it is used for scrofula disease, sores, blisters, the fresh fruits are used for poor memory, strengthen immunity.
Juniperus communis L.	Cupressaceae	F, Co	A decoction of cones and fruits is used internally for rheumatism, paralysis, tuberculosis, anemia, diuretic and for urinary tract infection.
Lepidium sativum L.	Brassicaceae	L, Sd	A decoction of leaves is used internally for kidney disorders, kidney stone, to increase breast milk in female, andas tonic, it is used to regulate the menstrual cycle in women, and to reduce blood sugar for diabetics, and triglyceride and blood cholesterol levels, the oil of seed is used externally as hair tonic; diuretic.
Linumusitatissimum L.	Linaceae	S	Seeds oil is used internally as laxative and for obesity. The seeds are used in treatment of urinary tract infections and hypertriglyceridaemia.
Malus trilobata (Labill. ex Poir.)	Rosaceae	F	Apple cider vinegar is used internally for slimming and reducing blood lipids, externally, it is used to treat skin diseases, remove corns, and as an antiseptic, and to treat lichen.
Malva sylvestris L.	Malvaceae	L, Fl	Decoctions of leaves and flowers areused internally for cough as expectorant, sedative for sleep problems, digestion problems and mouth sores, and externally for skin diseases.
Matricariaaurea (Loefl.) Schultz Bip.	Asteraceae	Ca	The capitulum decoction or infusion is used internally for fever, coughing and heart diseases, chest pain, headache and kidney stone, and it's used externally to treat skin infections, burns, wounds, eczema.
Matricariachamomilla	Asteraceae	F	The flower decoction or infusion is used internally for

L.			chest diseases, treatment of stomach ache, diabetes.
Melissa officinalis L.	Lamiaceae	L	A decoction of leaves is used internally as carminative, antispasmodic, to treat depression, anxiety, cough, respiratory infection.
Mentha pulegium L.	Lamiaceae	L	A decoction of leaves is used internally as antiseptic, diaphoretic, sedative, itching, and to treatmenstrual complaints, common cold, and respiratory tract disorder.
Micromeriamyrtifolia Boiss. &Hohen.	Lamiaceae	L	A decoction of leaves is used externally for wounds, sores, skin diseases and it's used internally for colic and cold, heart diseases, digestive system and asthma.
Myrtus communis L.	Myrtaceae	L	A decoction of leaves is used internally for diarrhoea, respiratory tract diseases and externally for haemorrhoids.
Nigella sativa L.	Ranunculaceae	Sd	Seeds are ground finely and used internally as expectorant, carminative, against impotency in male, as antispasmodic, hypoglycemic; theoilis used externally for skin diseases, hair growth and orally to strengthen the body's immunity.
Olea europaea L.	Oleaceae	L, F	A decoction of leaves is used internally for diabetes, high blood pressure and slimming. A fruit's oil is used for coughing, as vasodilator, laxative, to treat hyperacidity and stones in kidney and it's used externally for skin diseases.
Opuntia ficus-indica L.	Cactaceae	F, L	Fresh fruits and leaves extract or juice are used internally as laxative, anti-inflammatory, carminative, and digestive and externally for sun burns, skincare, burn, and wounds.
Origanum syriacum L.	Lamiaceae	Ap	A decoction of aerial parts is used internallyagainstcatarrh, headache, rheumatism, neck stiffness, stomach cramps, stomach discomfort, and indigestion. It has cholesterol reductive, carminative, antiseptic, and diuretic properties.
Papaver rhoeas L.	Papaveraceae	Fl	A decoction of flowers is used internally for whooping cough, headache and has hypnotic and analgesic effects, relieves stress.
Paronychia argentea Lam.	Caryophyllacea e	Fl	An infusion of flowers is used internally as diuretic, and for kidney stone.
Petroselinum sativum	Apiaceae	Fl	An infusion of flowers is used internally for anaemia, and

			inflammation, as anti-toxic and liver tonic, calms nerves, and is used externally for treating bruises, insect bites and rough skin.
Pistacia atlantica Desf.	Anacardiaceae	F, G	The fruits of the mastic are called green ivory in the Syrian countryside, fresh green fruits are used internally for treating the liver diseases, tumors, joint diseases, colds and headaches, joint pain, gum of the tree is used externally in treating scabies, wounds and fungal diseases.
Pistacia vera L.	Anacardiaceae	F, Pe, G	The fruits are nutritious, and the peels of fruits and gum of the tree are used externally for cases of eczema, dermatitis and psoriasis.
Plumbago europaea L.	Plumbaginaceae	Fl	An infusion of flowers is used externally for treating alopecia and psoriasis.
Portulaca oleracea L.	Portulacaceae	Ap	An infusion of flowering herbs is used internally for kidney disorders and improvement of digestion, prevention of heart disease and cancer, and for weight reduction, stomach diseases and bone strengthening.
Prunus armeniaca L.	Rosaceae	F	Dried fruits are used internally to strengthen the body's immunity.
Punica granatum L.	Punicaceae	F	The fruit juice is used internally for mouth sores, cough, malabsorption syndrome, hypercholesterolemia; the bark is used as anthelmintic, and for diarrhoea, amoebic dysentery, and ulcer; has antibacterial effect.
Quercus calliprinos Webb.	Fagaceae	F, Bk	A decoction of fruits and bark is used internally as anti bleeding and pain reliever, and helps in digestion, purification, coughing, and it is used externally for eczema treatment.
Quercus ithaburensis Decne.	Fagaceae	S, Bk	Decoctions of stem, bark and fruit are used internally for cancer, fever, bed wetting, high blood pressure and ulcer.
Raphanus raphanistrum L.	Brassicaceae	R	A decoction of roots is used internally as diuretic, anticancer, and for rheumatism, and the dried roots are used for liver diseases.
Rhus tripartite (Ucria) Grande	Anacardiaceae	W	A decoction of whole plant is used internally as diuretic, and for kidney stone.

Rosadamascena Herrm	Rosaceae	Fl	Rose water is used externally for skin diseases, and skincare, the petals are used internally for cough, and as laxative, and to treat chest infection.
Rosmarinus officinalis L.	Lamiaceae	L	An infusion of leaves is used internally for respiratory diseases, heart disorders, to enhance memory, enhance the body's immunity, treating headache and as antidepressant.
Rubus fruticosus G.N.Jones	Rosaceae	F, R	Infusions of fruits and root are used internally for kidney stone and atherosclerosis; have glycaemic, hypotensive and anticoagulant effects.
Rumex obtusifolius L.	Polygonaceae	L	An infusion of leaves is used internally for mouth ulcers, for anemia, to adjust sugar, improve blood circulation; the cooked leaves are edible as special traditional Syrian recipe known as Syrian salad (saleeg).
Salvia fruticosa Mill.	Lamiaceae	L	An infusion of leaves is used internally for stomach and colon disorders, and diabetes, asregulator and sterilizer for uterine diseases in women, intestinal antiseptic and diuretic.
Sarcopoterium spinosum L.	Rosaceae	R	A decoction of roots is used topically for treating joints and spinal disc, a decoction of seeds is used internally for hemorrhoids, and diabetes.
Sorghum halepense L.	Poaceae	W	It has a toxic potency due to cyanogenic glycosides and can be a problematic weed, but it is used internally for the treatment of urinary tract disorders, and kidney stone; as diuretic.
Thymus syriacus Boiss.	Lamiaceae	L	An infusion of leaves is used internally as anti-cough, againstbronchitis, diabetes; has carminative, antispasmodic, anthelmintic properties.
Trigonella foenum-graecum L.	Fabaceae	Sd	A decoction of seeds is used internally as antitussive, galactagogue, against hypercholesterolemia, atherosclerosis, diabetes, high blood pressure, heartburn, cold, inflammations. It is used for topical massage for joint and bone pain, against kidney stone, and to gain weight; the oil of seed is used externally for breast enlargement.
Triticum aestivum L.	Poaceae	Sd	An infusion of seeds (bran husk) is used internally for

			constipation and obesity; it is used externally as compresses for skin itch.
Urtica dioica L.	Urticaceae	Ap, Sd	An infusion of flowering aerial part and seeds is used internally for rheumatism, joint and chest pain, anemia, digestive diseases, kidney disease, gall and diuretic disorders, cough and diseases of the respiratory system, and for cessation of nosebleeds; the oil is used externally for cases of hair loss and cases of burns.
Vicia faba L.	Fabaceae	Sd	Seeds are used internally as tonic, diuretic and to treat diabetes; are beneficial to the heart, and for the menopause stage.
Vitis vinifera L.	Vitaceae	F	The seeds are used as antihypertensive and to reduce blood sugar. The seeds are used for menstrual cramps and period regulation; dried fruits called (Zabeb) are used to strengthen the body's immunity, and as general tonic; the seed oil is used externally as tonic for hair, and for skin diseases.
Xanthium strumarium L.	Asteraceae	Sd	Decoctions of seeds and leaves are used internally for infertility and impotence in males; as galactagogue in females.
Zea mays L.	Poaceae	St	An infusion of corn stylus is used internally for regulating blood sugar, reducing cholesterol, as diuretic for kidney stone, weight loss, gout, bedwetting.
Ap: aerial parts; Bk: bark; Bb: bulb; Ca: capitulum; Co: cones; Fl: flower; F: fruit; G: gum; Lx: latex; L: leaves; Ps: pedicles; Pe: peel; R: root; S: stem; Sd: seeds;Sh: shoots; St: stylus; T: tubers.			

3.3.Prevention of the toxic plants

Because of the negative effects of toxic plants on humans and animals, it is necessary to find appropriate solutions and put laws in place that help limiting and preventing their risks, as they may cause the loss of animals and the deterioration of agricultural production. Thesepoisonous plants may be in your home, in the garden or in fields and forests*(Monge et al. 2007).*Animals are an essential element in the food production as well as being an

important resource for the development of national income in countries. Therefore it is necessary to devote efforts to care for this wealth and prevent it from being destroyed as a result of bad management in natural pastures and fields where weeds spread. The rapid development that we witness in the agricultural and industrial fields often led to a violation of natural systems by changing the numbers of animals and plants and their types and changing the natural balances of the Earth. Typical problems are: Overgrazing, deforestation, monocropping, increased salt content in the soil, poor irrigation management, increasing only the nitrogen in the soil, which plants need to grow, increase of soil acidity due to acid rain, overuse of some fertilizers, increase of soil alkalinity, pollution, climatechange*(Soils united nation challenge badge, FAO 2015).*

In order to avoid the risks and toxic effects of the active substances of the plantssuch as alkaloids, glycosides, resinous substances, and other compounds, at varying concentrations in plant parts, experts are required. They are dealing with the knowledge of these plants, education of the general community, and encouragement of researchers as well as pay attention to the conservation of these natural resources. Plants contain a certain percentage of active or productive substances under normal conditions, which also may adversely affect humans and animals and their products. Therefore, knowledge of the type of compounds or toxic elements present in plants is a prerequisiteto facilitate diagnosis of symptoms and knowledge of treatment methods *(Gemeda et al. 2015).*The extent of animals being susceptible to poisoning depends on physiological and anatomical factors. The method of digestion in ruminants and the anatomical structure of the digestive system limit the effect of toxic substances. Also, hybrid animals are more sensitive to toxic substances in the plants. The effect of toxic substances in small animals is often greater than that of large animals. The young animals are more susceptible compared to older animals, and this is due to the ability of organs to resist toxins. The healthy animals are more resistant to toxins than the weak and lean animals react to toxins easily. On the other hand, animals are affected by toxins in hot and dry climates, where the heartbeat increases and the temperature rises in stressed animals making them more sensitive to toxic substances. It is also noted that the nervous system of

animals is less sensitive in winter compared to summer and is more sensitive to toxic substances in the spring.

One of the misconceptions during dealing with poisonous plants is the human consumptionof plants that animals feed on, as these plants can be toxic to humans but not toxic to animals. There is also a false assumptionthat toxic substances can be removed from plants when boiled with water, but the truth is, that boiling poisonous plants in water removes many toxins, but not all of them*(Sotelo et al. 2005).*

4. Avoiding the poisonous plants

One of the best ways to avoid poisonous plants is to have a firm knowledge of the plant in terms of their harmful uses. So, if personshave enough information about plants, they should exclude themand don´t feed animals on, andthey should not touch the plants except after making sure that they are free of toxic substances.

4.1. Avoiding contact

Simply, some types of plants cause allergies by contacting them, and this is considered one of the most important problems in the field. The effect may be critical, leading to irritation of the skin and a feeling of intense itching; if this itch occurs around the eyes, it will increase their risk. These toxic substances can contaminate the tools used in the field, and smoke from burning poisonous plants was also found to be toxic *(Krenzeloket al. 1996).*

The symptoms become more severe at high temperatures and if the person is in a condition of sweating, the injury can be localized or spread to the entire body. Symptoms can last a few hours to several days, and symptoms include redness, swelling and bubbles *(Bleasel et al. 2002).*

4.2. Avoiding food poisoning

Eating toxic plants leads to very negative and dangerous consequences, some of which cause death directly, so wild plants must be checked and identified before they are eaten. Common symptoms when eating poisonous plants are: nausea, vomiting, intestinal cramps, diarrhea, difficulty breathing, hallucinations, fainting, coma and death.

If poisoning due to eating poisonous plants occurs, the plant should be removed from the patient's mouth and stomach as soon as possible, either through vomiting or drinking a solution of (hot) water, when the person is fully conscious. The toxicity can be reduced by drinking water and milk in large quantities *(Chevallier 1996).*

4.3.Home protection against the dangers of toxic plants

One of the causes of unintended poisoning in children under the age of six is poisoning by plants, especially ornamental plants at home, so a special awarenessabout the dangers of toxic plants for childrenis necessary.

In order to avoid this at home, the following must be done:

- Resorting to the identification of plants that grow in the garden of the house and whether they are poisonous or not, by plant specialists or by referring to references for plants that grow naturally *(Flanagan et al. 1995).*

- Definition of ornamental plants present in the home by placing a poster on the plants clarifying the scientific and common name of the plant, and it should be easy to ensure that the plant does not belong to the poisonous plants;

- Keeping herbs and their seeds in places that are difficult for children to reach;
- Teaching children not to eat unknown plants;
- When preparing herbal tea, be sure not to use poisonous plants;
- Educating children about the potential danger when eating poisonous plants.

4.4. Protecting animals from the danger of toxic plants

Many losses in livestock are caused by grazing of toxic plants due to the wrong management of pastures, and these results from failure to study pastures before using them, because the growth of some plants varies from year to year, so failure to know poisonous plants in the animal grazing area can lead to big losses. It happens that animals feed on poisonous plants when the pastures are subjected to drought and the amount of feed decreases as these conditions occur in most years. In the autumn periods when most of the pastoral plants become scarce, the animals are forced to eat poisonous plants. Pastures exposed to early grazing and overgrazing are characterized by a decrease in the number of beneficial plants and an increase in the number of toxic plants *(Mazzas et al. 2000).*

Among the proposed solutions to get rid of poisonous plants in the pastures is plowing the pastures if poisonous plants are observed and afterwards growing agricultural crops. There are animals that do not have the ability to distinguish poisonous plants, so it is preferable not to leave them in the areas where poisonous plants grow, and to feed these animals in drought seasons, barley and corn, before bringing them to pastures to reduce the feeding on plants and facilitate their ability to distinguish toxic plants. The presence of starchy materials in the feed limits the formation of hydrocyanic acid in the animal's stomach, but in summer it is preferable to water the animals before leaving them in the fields which crops were harvested *(Nurhayt et al.1993).*

5. The aim of this research

1- Introducing some toxic plantsofSyria.
2- Definition of the toxic components and its effects.

Each plant is describedas follows:

a- The scientific name of the plant and its species as mentioned in the flora of Lebanon and Syria *(Mouterde 1966, 1983, 1986).*

b- The toxicity of plants, the toxic parts, and the affected animals, the main symptoms of poisoning.
c- The toxic components in the plants, the toxic effect resulting from feeding or contact with plant saps.
d- A photo of the plant.

3- Introducing some plants that are used in folk medicine in Syria and the Middle East countries.

6. Material and Methods

This study was carried out in Syria in the period between 2009-2011 with the aim of inventorying poisonous plants whichnumber seemed to increase due to the desertification and the degrading of the pasture area in Syria. It was scheduled to prepare a comprehensive research, the costs of which would be subsidized by the Syrian government through the Ministry of Agriculture and the Ministry of Environment, but the project was not completed as planned due to the conditions of the war in Syria in 2011, and support for most projects in this field was stopped. The study included an inventory of more than 200 plant species distributed among about 77 families spread in Syria, arranged within their families according to the Latin alphabet. The Latin scientific names of the plants are mentioned at the top of the page from the left, accompanied by the first letters of the name of its species, with the family to which it belongs. For the purpose of accurate identification of the plant, the botanical description was elaborated as it is in nature, which helps to distinguish it from other species. The morphological classification (height, leaf characteristics, fruits, flowers, seeds, and stem) and the manifestations of their growth in terms of being perennial or annual, pictures of each plant also were added, to identify visually the shape of the plant and to enable the people to distinguish them. The original habitat of each plant was also indicated, with mention of the areas of spread and distribution outside these habitats, whenever possible. And what was mentioned does not contradict the possibility of its presence in other places, whether these places are inside Syria or in similar natural climatic conditions outside Syria.

As for the active ingredients and their concentrations in the plant, which vary according to the plant part, the study tried to focus on the active parts (leaves, seeds, flowers), and mentioned their chemical compounds of carbohydrates, alkaloids, oils, tannins, and acids, depending on what has been obtained from reference studies in this field. In order to facilitate the research and deepen the interest, these plant species have been tabulated and classified into special lists according to nominal lists arranged according to the alphabet, and according to the poisonous parts of the plant and chemical components. The scientific references in this research varied, in Arabic, English and French languages, to obtain as much as possible the largest amount of information about the toxic and medicinal plants that exist in Syria and the neighboring countries, which are similar in climate to Syria and where these plants grow.

Presentation of selected highly toxic plants on pastures in Syria

7. Introduction

Poisonous plants are the plant species that cause to humans and animals - when eaten or feed with them - disease symptoms, which may result in various health problems, appearing directly or after a while, as a result of toxic substances in the tissues of the organism. The toxicity of poisonous plants varies widely, some of them are very toxic, such as *Conium maculatum*, and some other poisoning occurs when feeding with a large amount of the plant or for a long time, such as *Portulaca oleracea*, which is used in a small amount in the salads. But eating a large amount of it and for a long period may lead to poisoning that appears in the form of muscle twitching, tetany, depression, and inability to move, due to the plant containing a high concentration of oxalates that cause hypocalcemia*(Dowling et al.1993).*Some plants exhibit their toxicity when they are applied to the skin of humans or animals.

Poisonous plants spread in all places, as they are found in and around home gardens, on the sides of roads and the edges of fields, in pastures, forests, etc. Because of theirwide spread, poisoning incidents are not few. The most important factors that contribute to plant poisoning are:

7.1. Factors favoring poisoning of human:

A. Lack of knowledge: The lack of knowledge of many people of poisonous plants, especially children who desire to discover what is around them, causes many cases of poisoning, especially since the leaves and fruits of some plants are very similar to the leaves or fruits of that are edible. So, the fruit of *Melia azedarach* is very similar to the fruits of some varieties of cherries, even if their color differs. Not only children, but adults also can pluck the fruits or leaves of poisonous plants, and eatthem *(Facciola1998).*

B.Gardeners: Garden owners and workers are exposed to contact with many poisonous plants, many of which lead to skin irritation, especially during the picking or cultivation of plants, such as bulbous plants, or during the disposal of harmful plants, and the flowers of some plants can cause allergies.

C.Identification error and confusion: Many wild plants are used in food, and it often happens that they are mixed, during their collection, with similar plants that may be poisonous. This is common for fungi, some of which lead to poisoning incidents that may be fatal. The same applies for some species such as *Conium maculatum*, and bulbs such as *Narcissus corma* and others, which may be mistakenly mixed with onions which are eaten. The toxicity of medicinal plants, because many of them are toxic, has also to be considered and the increased dose may cause poisoning *(Kunkel 1984).*

7.2. Factors favoring poisoning of animals

A. Drought conditions: When the pastures are exposed to drought, and the amount of feed material decreases, the pastoral animals feed even with poisonous plants. Such conditions occur in many years, as well as in the autumn periods when most of the palatable pastoral plants finish their life cycle.

B.Degraded pastures: The degraded pastures and pastures that are used too early and overgrazed are characterized by a decrease in the number and production of palatable plants, an increase in the number of unpalatable plants, both toxic and thorny, and the pastoral animals, under the weight of hunger, are forced to feed them.

C.Feed mixing with some toxic plants: Fresh plants are collected in the spring, or dried and preserved and then fed to animals later. Toxic plants such as *Senecio sp*. are often combined with forage plants, especially since many poisonous plants become partially palatable after drying, and animals can be fed with large quantities.

D.The remains of the gardens: Uprooting harmful plants from gardens, some of which may be toxic, and throwing them in neighboring areas leads to feeding some animals with them. In many areas the phenomenon of animal grazing on landfills that contain a lot of plant remnants or crops planted on the sides of roads in the cities, and in public gardens also may induce intoxications.Many ofthese plantsare poisonous, for instance, feeding animals with 30-40 leaves

of *Nerium oleander* may be fatal, and the same is true for *Melia azedarach, Robiniapseudoacacia* leaves and fruit, and cypress leaves *(Hammiche et al. 2006).*

E.Animals move to new pastoral sites: Local animals avoid poisonous plants, through their smell or taste, which is a protective instinctual characteristic for animals. But domesticated animals, as well as pastoral animals when they move to new areas, often lose some of this instinctive qualities that enable them to recognize the poisonous plants and to avoid them. Especially since the local animals avoid these plants and do not eat them, thus their abundance increases in the area.

7.3. Toxicity of plants

Some plants exhibit high toxicity, such as *Nerium oleander, Conium maculatum, Apocynum venetum* and others. Eating a small amount of them is sufficient to cause serious poisoning. Poisoning may also occur when animals are fed with a large amount or for a long time with less toxic species. The toxicity of poisonous plants varies sometimes according to their parts, as the seeds of *Agrostemma githago*, as well as the seeds of *Lolium temulentum* are very toxic compared to other parts of the plant. Similarly, apple seeds and some apricots seeds (bitter apricots) are very toxic, while the fruits are a luxurious and useful food.

The toxic components are not distributed uniformly in all parts of the plant but may be concentrated in some parts of it. *Ricinus communis* seeds are highly toxic, so that feeding with several seeds is sufficient to cause serious poisoning, while other parts of the plant are low in toxicity compared to the seeds. The toxicity of plants may also vary according to the stage of growth. *Xanthium strumarium* seedlings are very toxic compared to the adult plant, and the same is valid for *Anabasis haussknechtii*, which toxic components are highly concentrated in its fresh parts formed in the spring, and then their concentration decreases to a minimum in the autumn. The toxicity of plants varies according to the region in which they grow. *Solanum nigrum*, which grows in temperate regions, is low in toxicity, and the one that grows in our country is very toxic. The toxicity of plants often depends on certain conditions. Potato tubers are not toxic, rather they

are a luxury food, but sprouted or injured tubers, and tubers that have been exposed to sunlight and become greenish, cause serious poisoning if animals are fed with them *(Polunin et al. 1987).*

Many plants cause sensitization, burns, eruption, and the eyes pain, when their juice gets in touch with the skin. The repeated contact may lead to hypersensitivity, and such effects can occur as soon as the skin or eyes come into contact with the plant's sap, such as the types of *Euphorbia sp.,* and *Urtica sp*. Some symptoms occur after contact with the plant and exposure to sunlight (photodermatitis) such as *Rutachalepensis,* or after feeding animals with some plants, such as *Hypericum sp.,* before exposure to sunlight (photosensitization) *(Lovell1993).*The effect of toxic plants varies greatly depending on the animal species. *Equisetum ramosissimum* and *Juglans regia* peel are more toxic to horses compared to other animals, and *Linumusitatissimum* has a more toxic effect on ruminant animals. The toxic effect on animals also varies within the individual species. The amount of the plant that causes poisoning depends, in many cases, on the size and weight of the animal, and the natureofits digestive system *(Goren1993).*

Due to the different toxicity of the variousparts of the plant, and the different susceptibility of different animals to poisonous plants, the degree of toxicity of plants is not precisely defined.

7.4. Toxic components

There are many toxic compounds that are responsible for the toxic effects that plants cause after feeding with them. Some of them have been known for a long time, and were given names derived, mostly, from the scientific name of the plant such as Hederin, which is derived from the scientific name of the plant *Hedera helix*, and some others are a mixture of several compounds. Some toxic components have not been identified precisely up to now. The most important toxic chemical compound groups in plants are: alkaloids, glycosides, oxalates, phenols, nitrates and nitrites, and tannins. Further more, chemical irritants, allergens and photosensitizing agents exhibit adverse effects. It is believed that the toxic components were formed during the evolution of plants as means of defense against insects and microorganisms, and that their toxic effect on animals, especially mammals, is a symptomatic effect *(Jeong et al. 2009).* It is difficult to estimate the damages caused by toxic plants in our country due to the lack of an accurate

inventory and distribution of them, and the lack of accurate data on cases of poisoning caused by these plants. More studies are needed to evaluate all the toxic plant species that spread in Syria, in order to familiarize people with them, especially those interested in animal husbandry, pastoralists, veterinarians, and to avoid the dangers that could be caused by them.

***Acermonspessulanumsubsp.microphyllum* (Boiss.) Bornm. =**

***Acer hermoneum* (Bornm.) Schwer. (= *A.microphyllum* (Boiss.) Dinsm.)**

Family: *Aceraceae*

Common name: *Maple tree*

Description: A tree, its height ranges 5-7 meters, the young branches may be covered with soft hairs, the three-lobed leaf has a long hook, a short cluster with more than five flowers, and the fruit has two wings. It blooms in April-May, and spreads in the coastal mountainous regions, in the eastern Lebanon chain and the Golan. Another type of maple found in Syria is the *Acer obtusifolium* ssp. Syriacum.

Toxicity: Highly toxic

Toxic parts: Leaves and tree bark.

Affected animals: All animals, especially horses.

Signs of poisoning: Respiratory disturbances jaundice, urine turns dark brown, and death may occur.

Toxic components: Leaves when wilted and dry leaves contain toxic substances with oxidant

properties. Other *Acer* species as the European *A.pseudoplatanus* contain the toxic amino acid hypoglycine A. Whether this compound occurs also in *A.hermoneum* has not yet been investigated.

Effect: Toxic substances affect pastoral animals, especially horses, and lead to oxidation of hemoglobin and the formation of Heinz bodies, methemoglobinemia, and consequently to hemolytic anemia, and dark brown blood coloration as a result of the formation of methemoglobin. Poisoning with maple leads to fatigue and increased breathing speed. Mares can abort without signs of hemolytic anemia *(Al-Awdat 2010).*

Adonis **L. (species)**

Family: *Ranunculaceae*

Common name: *False hellebore*

Adonis dentata

Description: Perennial or annual herbs, the leaves are close and divided, and seem pinnate, the leaves are elongated, the flowers are often terminally and single, 5-8 sepals, 5-20 petals, multiple stamens, multiple carpels, achene, blooming from April to May.

In Syria there are number of species, all of which are toxic, the most important are: *Adonis*

aestivalis L.*, Adonis aleppica* Boiss. *A. autumnalis* Bieb.*, A. dentata*.The plant spreads in the countries of the Mediterranean basin.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant.

Affected animals: All animals.

Signs of poisoning: Neurological disorders, rapid breathing, arrhythmia

Toxic components: Steroidal glycosides include: adonitoxin, cymarin, adonidoside, strophanthoside. It is also believed to contain protoanemonin. Flavonoids include: adonivernith, vitexin.

Effect: The plant is toxic, it is preferred to use it under close medical supervision, as it is forbidden to use while treatment with cardiac digitalis glycoside, it is not given in cases of hypokalemia, and it is forbidden to use it with diuretics *(Chaiaet al. 1989).*

***Agrostemma githago* L.**

Family: *Caryophyllaceae*

Common name: *Bastard nigella*

Description: Annual herb which has thick hairs, a standing stem, with few branches, and a height of 50-100 cm. The narrow, opposite leaves are elongated with sharp ends, their length ranges between 5 and 12 cm. The flowers are individual at the end of the stem; they have a long pedicel (3-5 cm). The calyx of the flower has a five-pointed tube shape, the corolla purple petals, and the fruit is a capsule containing a large number of seeds. The seeds are small and black, and are covered with hairs. The plant spreads in the fields, especially those grown with wheat.

Toxicity: Highly toxic.

Toxic parts: Seeds, leaves.

Affected animals: All animals

Signs of poisoning: Acute gastrointestinal disturbance associated with pain, vomiting and diarrhea.

Toxic components: The seeds contain toxic saponins (githagenin), which forms 5 - 7% of the weight of dry seeds.

Effect: Feeding animals with grains and fodder that contain the seeds of the plant, even in small quantities leads to poisoning, as they develop intestinal disturbances, acute gastric inflammation accompanied by severe pain, diarrhea, and difficulty swallowing, followed by vertigo, general weakness, low breathing speed, and kidney irritation. Most animals die if they feed anamount of seed (was estimated) at 0.2% of its weight (about 60 g for sheep and 2 g for chicken). Death usually occurs on the third day after feeding with seeds *(Larkcom1991).*

Amanita sp.

Family: *Amanitaceae (Agaricaceae)*

Common name: *Amanita, Mushroom*

Amanita muscaria

Description: The *Amanita* genus includes various shapes, colors, and nutritional properties. Some are luxurious food, some are toxic, and are difficult to differentiate. The most important poisonous species: *Amanita muscaria, A. pantherina,* and *A. phalloides*.

Toxicity: Highly toxic

Toxic parts: All parts.

Affected animals: All animals and humans.

Signs of poisoning: Severe abdominal pain, bloody vomiting and diarrhea.

Toxic components: Choline, muscarine, and muscaridine, as well as amanitineand phalloidine, which are complex polypeptides. Some of these substances work to destroy the cytoplasmic reticulum of liver cells, others affect the nucleus, and some affect the central nervous system. The lethal dose for humans of toxic amanita fungi ranges between 30 and 50 g of fresh mushrooms, depending on the health status and age.

Effect: The toxic effect begins 6-15 hours after feeding with them. Signs of intoxication appear

suddenly as severe abdominal pain, bloody vomiting and diarrhea, increased secretion of salivary and lacrimal glands, excessive sweating, and may be accompanied by visual hallucinations and confinement in the urine. Death is possible because of respiratory failure. There are some types that are characterized by severe toxicity, and often lead to death within two days, and these types lead to bloody urine, tachycardia and hypotension *(Patockaet al. 2017).*

Artemisia herba-alba **Asso**

Family: *Asteraceae*

Common name: *Arabian wormwood*

Description: Small shrub ranging in length from 20 - 40 cm, fragrant smell, gray in color, multi stems, its roots are shallow, blooms from September to December, it spreads in dry areas in Syria (al-Badia).

Toxicity: Highly toxic.

Toxic parts: All parts of the plant.

Affected animals: All animals.

Signs of poisoning: Anorexia, general weakness, abortion.

Toxic components: Toxic santonin compound.

Effect: Anorexia, general weakness, abortion, and has many medical uses *(Charchari et al. 1996).*

***Anthemis cotula* L.**

Family: *Asteraceae (Compositae)*

Common name: *Dog Fennel, Stinking weed*

Description: Annual herb, standing stem up to a height of 40 - 60 cm, the stem is branched in its lower part, the leaves alternate double lobed, and elongated leaf lobes in the flower heads. The external flowers are of a white sway, while the internal flowers are yellow tubular. It blooms from May to July, and it is widely spread in Syria. There are other species of *Anthemis* in Syria, including *A.aaronsohnii* Eig, which spreads in the dry areas of Syria (al-Badia), *A.kotschyana, A. hyaline, A. bornmuelleri, A. brachycentra, A.emasenis, A. hebronica.*

Toxicity: Highly toxic.

Toxic parts: All parts of the plant.

Affected animals: All animals and humans.

Signs of poisoning: Irritation and allergy

Toxic components: All parts of the plant contain thujone, and bitter volatile oil, and sesquiterpenlactoneanthecotulide. It is believed to contain anthemidinealkaloid.

Effect: The plant is characterized by its sharp aroma, and its burning taste, which makes it unpalatable. The skin contact with the sap of the plant leads to irritation and inflammation of the skin, redness and swelling of the skin. Feeding with large quantities leads to death. Milk gains a bitter and unpalatable taste. The plant and its preparations are used as a repellent of insects and mice *(Mazzas et al. 2000).*

***Bryoniacretica* L. subsp. *dioica* (Jacq.) Tutin**

Family: *Cucurbitaceae*

Common name: *Red bryony*

Description: Perennial herb, tuberous fleshy root, weighting up to 3 kg. The long cylindrical stem (up to 4 m) climbs with tendrils. The leaves have 5-7 deep lobes. The male flowers are clustered and show yellow petals bearing green veins, the female flowers are single. The fruits

are red berries. The plant blooms in March and spreads to the coastal mountains, the eastern Lebanon chain and the Golan.

Toxicity: Highly toxic.

Toxic parts: All parts, especially the seeds.

Affected animals: All animals and humans.

Signs of poisoning: Gastrointestinal and respiratory disturbances, milk interruption

Toxic components: All plant parts contain bryoninglycoside, bryonicinealkaloid and cucurbitacines.

Effect: Fruits are attractive to children, and eating a small number of fruits leads to vomiting. A large amount causes gastric pain, bloody diarrhea and respiratory difficulties. When the plant comes into contact with the skin, it causes irritation, redness and blister. Animals often feed on the plant, especially when its roots appear above the surface of the soil after cultivation. This leads to severe poisoning, such as severe digestive disorders accompanied by bloody diarrhea, respiratory disturbances, interruption of milk and possibly death. Feeding the poultry with fruits leads to their death. The contact of the plant sap causes irritation *(Jeffrey 1969).*

Calotropis procera (Aiton) Dryand.

Family: *Apocynaceae (Asclepiadoideae)*

Common name: *Calotropis, Apple of Sodom*

Description: A bush that produces a white milky latex, its length ranges 2-6 m, young white branches, and the leaves are simple and opposite 10-30 x 5-15 cm. Thefruits are semi-spherical, green, length 8-15 cm, smooth, and the multiple seeds are compressed. It blooms from May to November, and it spreads in desert and dry areas.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant, especially the latex.

Affected animals: All animals.

Signs of poisoning: Vomiting, severe diarrhea, muscle cramps, arrhythmia.

Toxic components: Calotropin, a cardenolide glycoside

Effect: The plant is very toxic, small doses cause excessive sweating, while large doses cause vomiting, severe diarrhea, muscle cramps, arrhythmiaand death *(Basu1992, Akhtar 1992).*

Ceratocephalusfalcatus (L.) Pers

Family: *Ranunculaceae*

Common name: *Falcatceratocephalus*

Description: A small annual herb, a little more than 10 cm in height, the stems have different lengths, the leaves are small (0.5-2 cm), divided into elongated parts. The flowers are small, single and terminal, yellowish white in color, the fruit is thorny. It blooms in February-April, and spreads widely in dry and semi-dry regions, especially in degraded pastures, and is considered as an indicator of overgrazing and degraded rangelands.

Toxicity: Highly toxic.

Toxic parts: Leaves and stem (and plant sap).

Affected animals: All animals.

Signs of poisoning: Anorexia, dyspnea, severe diarrhea, tachycardia.

Toxic components: The plant parts contain ranunculin, which, when chewed, turns under the influence of enzymes to protoanemonin. The plant loses much of its toxicity after its drying.

Effect: Feeding with the plant, especially during blooming and fruit ripening, leads to poisoning that may be fatal if the amount consumed is large. It initially leads to irritation of the oral

mucosa, then to anorexia, dyspnea, digestion, diarrhea, trachycardia, general weakness. It may lead to death within 24 hours due to heart failure. Autopsy of poisoned animals has shown congestion in the heart, kidneys, liver, and lungs. On contact with the skin, the sap of the plant causes irritation and blister of the skin *(Hamdan et al. 2004).*

***Chenopodium ambrosioides* L.**

Family: *Chenopodiaceae*

Common name: *Mexican tea*

Description: Annual or bi-annual herbs, height ranges between 25 and 60 (90) cm. The stem is ribbed, its leaves are short-stranded, have an oval shape, and their edges are wavy – toothed. On the underside of the leaf there are yellow glands. The inflorescences are dense clusters of small green flowers. The small spherical fruits are surrounded by floral wrapping. It blooms from March to October, and spreads on the roads and neglected places in the regions of Homs, Tal Kalakh and Hama.

Toxicity: Highly toxic.

Toxic parts: Leaves and seeds.

Affected animals: All animals and humans.

Signs of poisoning: Nausea, hallucinations, vomiting, convulsions and possibly coma, dyspnea, coloration of the oral mucosa in a bluish-brown color.

Toxic components: The plant is characterized by the accumulation of high levels of nitrates in its tissues, especially if it grows on rich soil with organic materials, and it contains a high concentration of oxalates and sulfates, in addition to ascaridole and other terpenes.

Effect: Feeding animals with a large amount of the plant leads to sudden death, due to dyspnea, which results from the formation of methemoglobin. Feeding lead to abortion and the coloration of the oral mucosa in a bluish-brown color *(Tampion1977).*

Citrullus colocynthis **(L.) Schrad**

Family: *Cucurbitaceae*

Common name: *Colocynth, Bitter apple*

Description: Perennial herb, its stems lying on the ground and covering a large area. The leaves are deeply lobed, the flowers are yellow and large, the fruits are reminiscent of watermelon

fruits, but they are smaller, with a diameter ranging between 5 and 8 cm, yellowed when ripe. The fruit contains a large number of seeds. It blooms from May to August, it spreads in the dry areas especially al-Badia.

Toxicity: Highly toxic.

Toxic parts: All plant especially fruits.

Affected animals: All animals and humans.

Signs of poisoning: Digestive disturbance and severe diarrhea.

Toxic components: The plant especially the fruits, contain laxative alkaloids, citrullolresin and highly bitter glycosides, colocynthin and cucurbitacin.

Effect: Feeding with about 4 g of fruit causes gastrointestinal disturbance, irritation and dangerous diarrhea *(Wasfi1994).*

Cleome droserifolia (Forssk.) Del.

Family: *Cleomaceae*

Common name: *Cleome herb.*

Description: A small bush resembling the pillow in its general form, greenish yellowish and abundant leaves, and the height ranges 25-50 cm.

The leaves are simple, rounded or cordate with long petiole, triple-vein, covered with simple pubescent.

The seeds compressed and rounded, it blooms March – May, and spreads in deserts and dry areas.

Toxicity: Highly toxic.

Toxic parts: Leaves and seeds.

Affected animals: All pastoral animals.

Signs of poisoning: Tremors, extreme sweating, dyspnea.

Toxic components: Benzylisothiocyanate, carotol, naphthyl-n-propyl ether, caryophyllene,

glucocapparin, artemitin, rhamnoside, isorhamnetin, kaempferol, stigmasterol, β – sitosterol, docosanoic acid.

Effect: The plant is very toxic, and symptoms are manifested by tremors, extreme sweating, dyspnea, loss of consciousness and death *(Hesham IA2005).*

Colchicum **L. (Species)**

Family: *Liliaceae s. l.*

Common name: *Colchicum*

Colchicum persicum

Description: Perennial herb, which has a bulb, oval in shape. The bulbis covered with brown scales. The clusters of bright, 2-5 flowers with 6 lobes are beautiful. The color of the flower is pink, purple or white and rarely yellow. The fruit is a three-chamber capsule. The 2-9 leaves form in the spring, while the fruits ripen at the beginning of Summer. There are a number of *Colchium* species in Syria, the most important are: *Colchicum persicum* Baker =*haussknechtii* Boiss (northwestern Syria), *C. decaisnei* Boiss. (Northern Syria and As-Suwayda), *C. tunicatum* Feinbr. (Qatana, Damascus, the desert plain), *C. serpentinum* Woronowec Miscz = *C.tauri* Siehe ex Stef. (Jabal Al Sheikh, Houran, Damascus region), *C.*

hierosolymitanum Feinbr. (Mountainous areas), *C.tuviae* Feinbr. (Damascus, Jabal Al-Hoss), *C.stevenii* Kunth (Safita, Houran, Damascus), *C. schimperi* Janka ex Stef = *C. deserti* syriaca Feinbr. (Badia, Raqqa, Hasaka, Deir Ezzor).

Toxicity: Highly toxic.

Toxic parts: All parts.

Affected animals: All animals and humans.

Signs of poisoning: Severe colic, vomiting, diarrhea, hypertension, dyspnea.

Toxic components: The plant parts contain colchicine alkaloid, which is highly toxic, and colchicine is present in a high concentration in flowers and seeds (0.2%), while the stem has less (0.05%) content compared to flowers and seeds. Colchicine is a very toxic substance, the lethal dose for an adult is estimated at 50 mg, and it is sufficient to feed sheep on 40-50 g of leaves to cause severe poisoning.

Effect: Poisoning leads to increased salivation, vomiting, severe abdominal pain and bloody diarrhea, oral mucosa damage, muscle weakness, slow pulse and kidney failure, and then death. Toxic effects appear within 3-6 hours of feeding with it *(Perssonet al. 2011).*

***Cupressus sempervirens* L.**

Family: *Cupressaceae*

Common name: *Cypress*

Description: An evergreen tree, between 10 and 30 meters high, its branches are dense, upright or semi-horizontal. Its leaves are alternate and applied as scales over each other, have a triangle shape with a rounded end. Male cones are formed on short branches, single female cones are semi-spherical, with a diameter of 2 to 3 cm. Cypress blooms in March-May, is widely cultivated in Syria, and is used as a windbreak around fields and farms.

Toxicity: Highly toxic.

Toxic parts: Leaves.

Affected animals: All animals especially livestock.

Signs of poisoning: General weakness, lightheadedness

Toxic components: The leaves contain terpenes and different phenols, to which the plant's toxic effect is attributed.

Effect: Feeding with the leaves of cypress trees leads to poisoning of all animals, especially livestock. Signs of poisoning appear within one to two weeks of starting feeding on them, in the form of general weakness, the eyes become cloudy, the animals become dizzy and exhausted, often followed by death. Cypress is very dangerous for pregnant animals, especially in the last months of pregnancy, as it often leads to abortion, and also leads to a significant reduction in the quantities of milk given by dairy animals *(Al-Awdat 2010).*

***Datura stramonium* L.**

Family: *Solanaceae*

Common name: *Stramonium, Thorn apple*

Description: Annual herb of undesirable odor, up to a meter in height. The stems are upright, strong, branched, with large alternate leaves (5-10 cm), oval, long-hanging, and edges with large and irregular teeth. The flowers are large, up to 8 cm long, funnel-tubular, the cup has five teeth, the corolla is white and the flowers have an undesirable smell. The fruit is an egg shaped capsule (about 5 cm) with coarse teeth, which opens with four shutters, and the seeds are dark brown. The plant blooms from July to October, and spreads on the outskirts of fields, roads and

waterways, and in abandoned places, in all regions of Syria. There is another toxic species in Syria, *Datura metel* L. which height ranges between 60 and 150 cm. It has a strong ribbed stem, long-stranded leaves, full-edge (oval), white and large flowers; it spreads in the coastal region and Damascus.

Toxicity: Highly toxic.

Toxic parts: All plant parts, especially seeds.

Affected animals: All animals, especially poultry and humans.

Signs of poisoning: Salivation, vision disturbance, pupil's dilation, and tachycardia.

Toxic components: All parts of the plant, especially seeds, contain many tropane alkaloids; the most important are hyoscyamine, hyoscine (scopolamine) and atropine. The percentage of alkaloids in fresh leaves reaches about 0.7%, while in seeds it is much more than that, and the nectar also contains toxic alkaloids.

Effect: A very toxic plant, as 4-5 g of leaves or seeds orally lead to children's intoxication. Poisoning signs appear minutes to several hours after ingestion. The toxic alkaloids affect the central nervous system, leading to severe salivation, which is associated with dilated pupils, irritation and disorder, tachycardia, tremors, and delirium associated with hysterical seizures, followed by lethargy and possibly death. Feeding with small amounts of the plant leads to abortion or distortions *(Bhakta PG et al 2013).*

Digitalis ferruginea L.

Family: *Plantaginaceae* (formerly *Scrophulariaceae)*

Common name: *Rusty foxglove*

Description: Perennial plant, the height of the flower stalk reaches 80-100 cm. The leaves are large, elongated (15-25 cm), the inflorescences are 15-25 cm long, carrying a number of representative, crimson and large flowers, blooming in summer in June – July. The fruit is a capsule. The plant spreads in the high coastal mountains.

Toxicity: Highly toxic.

Toxic parts: All parts especially the leaves.

Affected animals: All animals and humans.

Signs of poisoning: Gastrointestinal disturbance, diarrhea, tachycardia.

Toxic components: Cardiac glycosides: digitoxin, digoxin, and gitoxin.

Effect: Ingestion of any parts of the plant leads to severe poisoning that appears in the form of

diarrhea, bloody urination and diuresis, as well as rapid breathing, ventricular tachycardia, vision aberration, and possibly death. Digitalis is an important medicinal plant, and is used in small doses to stimulate the cardiac muscle, improve the heartbeat, increase diuresis, and rid the body of excess salts, but increasing the dose leads to poisoning *(Appel et al. 2006).*

***Dryopteris libanotica* (ROS.) A. Christ**

Family: *Aspidiaceae*

Common name: *Fern*

Description: Perennial herb has thick rhizomes covered with dense scales, large leaves between 20 and 80 cm long, feathered, leafy spears and divided into parts; the petiole is short, covered with yellowish brown scales. The leaves carry two rows of sporophytic bags called sori pimples. The plant spreads in coastal mountainous areas.

Toxicity: Highly toxic.

Toxic parts: Leaves and roots.

Affected animals: All animals.

Signs of poisoning: Vertigo, dilated pupils, and low vision.

Toxic components: The plant parts contain a mixture of substances called filicin which are

responsible for animal poisoning.

Effect: References indicate that the most poisoned animals are cows and that animals feed on plants even if pastoral plants are available. The consumption of the plant leads to dizziness, but the most important toxic effect is loss of vision accompanied by a severe dilatation of the pupil, and the lack of eye response to light. Some animals can restore the ability to see after a while but others may lose vision completely *(Akrout2001).*

***Ecballium elaterium* (L.) Rich**

Family: *Cucurbitaceae*

Common name: *Squirting cucumber*

Description: A perennial plant, soft and covered with harsh hairs, stems reclining, length 30 - 100 cm, branching from the base. The leaves are 6-10 cm large, triangular, rough and covered with dense and hard poppies. The small yellow single flowers are formed in armpit leaves. Large egg-shaped succulent fruits (3-5 cm). Touching ripe the fruits detaches them from the fruit stand, ejecting seeds and juice vigorously and for a long distance. The plant blooms from April to November, and spreads in all regions of Syria.

Toxicity: Highly toxic.

Toxic parts: All parts.

Affected animals: All animals and humans.

Signs of poisoning: Irritation, inflammation of the digestive system, severe diarrhea, and eye inflammation

Toxic components: All plant parts, especially fruits, contain latrine and elaterid, and also contain cucurbitaceous, ecbaline, and ecbalicacid.

Effect: Feeding animals with plants, especially fruits, leads to digestive disorders, severe diarrhea, and irritation of the mucous membrane of the digestive system *(Alhakim1992).*

***Equisetum ramosissimum* Desf.**

Family: *Equisetaceae*

Common name: *Horsetail*

Description: A perennial herb, the height ranges between 30 - 100 cm, its rhizome crawling, and dark brown. From the rhizome emerge two types of stems: a short fertile, unbranched stem forms

in early spring, bearing at the top the sporangial sacs, and a sterile, green stem consisting of phalanges, which has small nodes.

Horsetail plant grows in wet and swampy areas, especially in the Barada basin. In Syria there is another species, *Equisetum maximum* Lam. It spreads in Lattakia, especially on the banks of the northern Great River.

Toxicity: Highly toxic.

Toxic parts: All parts.

Affected animals: Horses are severely affected, while other animals are less affected.

Signs of poisoning: Anorexia, general weakness, and tachycardia.

Toxic components: Thiaminase is responsible for the poisoning, and other components contained in the plant such as silica, aconitic acid, nicotine, methoxypridine, equisitine, and palustrine, and others, may contribute to the toxic effects of the plant. It has been shown that they do not lead to signs of poisoning, but rather increases its toxic effect.

Effect: Thiaminase, especially in horses, leads to vitamin B deficiency, metabolism deficiency, and marrow degeneration in peripheral nerves. The important signs of non-ruminant poisoning are gait inconsistency and general weakness. Tremor, pulse acceleration, cornea opacity, hibernation and possibly death *(Ranđelović et al. 2019).*

Hyoscyamus sp.

Family: *Solanaceae*

Common name: *Henbane*

Description: Annual, bi-annual, or perennial herbs often covered with hair and stickiness that have a cluster of flowers or spike-like inflorescences. The flower crowns are often tubular-jersey, and the capsule contains a large number of black-brown seeds. There are a number of species in Syria that spread in the archaeological sites, the abandoned places and the edges of the roads, the most important of which are: *Hyoscyamus reticulatus* L., *Hyoscyamus albus* L., *Hyoscyamus aureus* L.*, Hyoscyamus desertorum* (Asch. &Boiss.) Täckh.

Toxicity: Highly toxic.

Toxic parts: All parts especially seeds and flowers.

Affected animals: All animals and humans.

Signs of poisoning: Violence, epileptic-like seizures, and shivering limbs.

Toxic components: The plant contains many tropane alkaloids, the most important are: hyoscyamine, scopolamine (hyoscine), atropine and others. The dryness of plants does not reduce their toxic effects.

Effect: The plant is characterized by its undesirable smell, so poisoning incidents are rare, but children often eat the seeds. A small amount of seeds is sufficient to cause poisoning, which is hallucinogenic, and a feeling of euphoria such as flying and dancing. It also leads to dilated pupils and visual hallucinations, a rapid pulse and dry skin. The signs of animal poisoning are severe thirst, intestinal stagnation, flatulence, muscle weakness *(El-Shazly et al. 1997).*

***Nerium oleander* L.**

Family: *Apocynaceae*

Common name: *Oleander*

Description: A well-known shrub with a height of 3 meters, its leaves are spear-shaped leathery. Its aromatic flowers are of different colors, and cylindrical fruits are grooved 10-16 cm in length. They open by means of three shutters, and their multiple seeds are covered with dense hairs. The oleander blooms from April to November, grows in multiple places, and is widely cultivated as ornamental plants in gardens, streets and parks.

Toxicity: Highly toxic.

Toxic parts: All parts.

Affected animals: All animals and humans.

Signs of poisoning: Digestive irritation, nausea, vomiting, tachycardia and cardiac arrest

Toxic components: All parts of the plant contain cardiac glycosides that are similar to those of *Digitalis* and *Adonis*. The most important are: oleandrin, oleandroside, nerioside, and nerinine. Red flowers are much more toxic than flowers of other colors.

Effect: Oleander is high toxic, whether fresh or dry, dry leaves may be more toxic compared to fresh leaves, 30-40 leaves are sufficient to kill an adult horse. Death occurs as a result of feeding with plant quickly, to the point that the animal may not show signs of poisoning. The signs of poisoning are vomiting, bloody diarrhea, cardiac disturbances, tremors, paleness of the mucous membranes, and respiratory and visual disorders. Coma and death occur within several hours *(Tasleemet al. 2104).*

Peganum harmala L.

Family: *Nitrariaceae*

Common name: *Hermala*

Description: Perennial plant, woody base, branching stem, its length 30-50 cm, the fruits spherical (0.8- 1 cm), compact and multiform seed, triangular seeds in black brown color (2 mm). Blooming from March to May, it spreads in desert-Arab, and extends to the Mediterranean region in North Africa and the Middle East.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant.

Affected animals: All animals except birds.

Signs of poisoning: Digestive disorder such as vomiting, nausea and sweating. Arrhythmia, neurological disorders (visual disturbances, fibrillation and convulsions), paralysis in the extremities accompanied by dizziness and hypothermia.

Toxic components: Alkaloids: harmaline, harmine, harman, harmol

Effect: The seeds have a toxic effect, with higher doses causing digestive disturbances such as vomiting, nausea and sweating *(Berrougui et al. 2002, 2006).*

Prunus prostrate **Labill**

Family: *Rosaceae*

Common name: *Tartuous cherry*

Description: Small creeping shrub with intertwined twigs, reaching a meter in length. The leaves are short, agglomerated, elongated ends, semi-rounded edge, and serrated edge. Single, armpit, pink or reddish flowers and small cherry fruits (chickpea size) egg-shaped or spherical, red cochineal. The plant blooms in March-April, and grows on the rocky slopes of the eastern Lebanon chain, al-Badia Mountains, Abdul Aziz and Al-Hoss mountains.

Toxicity: Highly toxic.

Toxic parts: All parts especially seeds.

Affected animals: All animals and humans.

Signs of poisoning: Anxiety, turmoil, severe dizziness, seizures, tongue out of mouth.

Toxic components: The plant contains cyanogenic glycosides; the most important are prunasinthatis formed in leaves and branches, and amygdalin that is formed in the seeds. These glycosides release hydrocyanic acid (HCN).

It is believed that withering plants increase the concentration of toxic substances, so wilted or dry leaves are more toxic than fresh leaves.

Effect: Feeding with a small amount of the plant leads to severe poisoning that appears in the form of anxiety and disturbance, severe dizziness, the fall of the animal on the ground and convulsions, dyspnea and rolling eyes, tongue exit from the mouth, loss of sensation and dilated pupils, congestion of the internal organs, after which the animal calms. It may die within several hours *(Al-Awdat2010).*

***Ranunculus asiaticus* L.**

Family: *Ranunculaceae*

Common name: *Turban buttercup*

Ranunculus damascenus

Description: Perennial herb, reaching a height of 30 cm. Its lower leaves are long, broad or semi-circular, serrated and lobed to elongated or triple-lobed parts; the upper leaves are divided into elongated or striped parts. The stem bearing the flowers is simple or slightly branched, and it holds 1-4 flowers.

The flowers are large (3-6 cm), ruby red and rarely orange or yellow. It blooms in February-May and is spread widely in all Syrian regions. There are many types of buttercup in Syria, all are toxic: *Ranunculus damascenes* Boiss. & Gali*, Ranunculus arvensis* L., *Ranunculus muricatus* L.

Toxicity: Highly toxic.

Toxic parts: All parts, dry plant less toxic.

Affected animals: All animals and humans.

Signs of poisoning: Digestive disorders, salivation, colic, and bloody diarrhea.

Toxic components: The different parts of the plant contain ranunculin, a glycoside which gives the toxic protoanemonin. The toxicity of plants is highest in the flowering period, while dry plants decrease their toxicity significantly and may be considered safe.

Effect: Feeding animals with plants leads to gastrointestinal disturbances, severe irritation of the digestive system associated with drooling, decreased appetite, abdominal pain, diarrhea, ulcers and redness of the mucous tissues of the mouth and throat, bloody urine, eyesight, temporary or permanent blindness. The toxic substances are transferred to the milk that takes a bitter taste and pink color. The skin's contact with the saps of the plant causes irritation and possibly inflammation *(Bown1995).*

Retama raetam **(Forssk.) Webb**

Family: *Fabaceae*

Common name: *White broom*

Description: A shrub (1-3 m) with few leaves, the roots are thick. The leaves are simple and live for a short period. The fruit is a small oval or oblong horn (7-20 x 5-9 mm); the seeds are yellow

or brown. The period of blooming is February to April, and the plant spread in the desert and dry areas in Syria.

Toxicity: Highly toxic

Toxic parts: All parts of the plant.

Affected animals: All pastoral animals and humans.

Signs of poisoning: The fruits of the plant are toxic and are believed to cause distraction.

Toxic components: Alkaloids: Cytisine, genistein, anagyrine.

Effect: The fruits of the plant are toxic and are believed to cause distraction, flowers cause urinary tract disorder, causes abortion *(ElBahriet al. 2003).*

***Ricinus communis* L.**

Family: *Euphorbiaceae*

Common name: *Castor bean*

Description: A shrub up to 5 meters and more in height that grows in cold areas in the form of a plant around a height of two meters. The leaves are alternate, long and widely lobed. Single-sex

flowers. The fruit is atripartite capsule covered with protrusions, containing three seeds. The seed cover is decorated with brown spots of forms that are not regular. It is wide spread in coastal areas of Syria and cultivated as ornamental plant.

Toxicity: Highly toxic.

Toxic parts: Seeds and leaves.

Affected animals: All animals and humans.

Signs of poisoning: Digestive disorders, irritation of mouth and throat, nausea and vomiting, stomach cramps.

Toxic components: Ricin is responsible for poisoning. Ricin is a simple protein that dissolves in water, its concentration is high in seeds, and it is one of the most toxic substances. The plant may contain other toxic substances that cause allergies and respiratory disorders. The medicinal castor oil as a laxative does not contain ricin (de-ricin).

Effect: Castor seeds are highly toxic, three seeds are enough to kill a child and about four are enough to kill an adult. Especially if seeds are chewed, because chewing leads to the release of the toxic substance. Signs of poisoning with the plant appear after a period of chewing seeds, the most important are digestive disorders, irritation in the mouth and throat, nausea and vomiting, diarrhea, dehydration and fatigue, vision disorders and muscle spasms, and death may follow. Poisoning also causes severe damage to the lungs, liver and kidneys. The seeds and leaves often lead to skin irritation *(Joanne et al. 2007).*

Salsola kali L.

Family: *Chenopodiaceae*

Common name: *Russian thistle, Tumble*

Description: Annual herb, succulent, with a height ranging between 20 and 60 cm. Its stem is tilted or lying flat and far apart. The leaves are small and succulent, the lower ones are opposite and the upper is rotating, the leaf ends with a fork. The flowers are small; the fruit is small and has wings. The plant blooms from June to August, and spreads widely in all regions of Syria.

Toxicity: Highly toxic.

Toxic parts: All parts.

Affected animals: All animals.

Signs of poisoning: Respiratory difficulties, tachycardia, and discoloration of the mucous membranes in brown.

Toxic components: All parts of the plant have a high concentration of nitrates, which in the stomach convert to nitrites.

Effect: Nitrates in the stomach (rumen) of the animals quickly transform into nitrites that interact with blood hemoglobin and convert it to methemoglobin, which cannot transport oxygen. This leads to a lack of oxygen in the body, respiratory disorders and increased respiratory and heart

rate. The mucous membranes of the mouth are browned; ataxia in the gait and then lying down may lead to death. Pregnant animals abort and the fetus dies *(Skalicka-Woźniak et al. 2009).*

***Solanum dulcamara* L.**

Family: *Solanaceae*

Common name: *Bittersweet nightshade*

Description: A bush with a length ranging (50-100 cm), semi-barren, semi-logged base, herbaceous and hanging branches. The leaves are oval, fruits are oval or spheric with diameter 6 mm. It blooms in summer; it spreads in coastal mountains in Syria (Kassab and Sulunfa).

Toxicity: Highly toxic.

Toxic parts: Leaves and stem.

Affected animals: All pastoral animals, humans.

Signs of poisoning: Nervous disorders, tremor and imbalance of movements, abdominal pain and diarrhea, salivation.

Toxic components: Steroid alkaloid glycosides, tomatidenol, α, ß-solamarine, soladulicidin, solasonine, solamargine.

Effect: Toxic plant, especially its green fruits. Feeding with the plant causes nervous disorders, tremor and imbalance of movements, abdominal pain and diarrhea, salivation, heart failure, hypotension, and renal failure. Not to be used during pregnancy and lactation *(Braun et al. 1994).*

***Dioscorea communis* (L.) Caddik& Wilkin = *Tamus communis* L.**

Family: *Dioscoreaceae*

Common name: *Black bryony*

Description: Climbing perennial plant, reaching a length of 4 m, that has a medium-sized tuber, and a stem branched with few branches. The leaves are ovate, cordate and sharp-ended, reach a length of 8 cm.

The female cluster is short and has 1-7 flowers. The fruit is an elongated smooth berry, about 8 mm in diameter.

It blooms in March-May and spreads in the coastal mountainous regions. There is another species in Syria, *Discorea orientalis* (Thieb.) Caddick & Wilkin = *Tamus orientalis*, which spreads in the coastal mountains, especially in the Marmarita region, and has the same toxic properties as *Discorea communis*.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant especially berry fruits.

Affected animals: All animals and humans.

Signs of poisoning: Severe abdominal pain, spotting and burns in the mouth, vomiting and diarrhea.

Toxic components: The plant, especially its berry fruits, contains histamine-like compound and bryonin saponins, in addition to the calcium oxalate that is abundant in all parts of the plant, especially the roots and fruits.

Effect: Fruits frequently lead to children's poisoning due to their attractiveness. They cause burns, blistered mouth and digestive system, which is accompanied by acute abdominal pain, vomiting and diarrhea. Feeding animals with any part of the plant, especially the roots and fruits, leads to poisoning, which is often deadly. The skin's contact with the sap of the plant, especially the fruit juices, causes irritation *(Sincich2002).*

***Drimia maritima* (L.) Stearn = *Urginea maritima* (L.) Baker**

Family: *Asparagaceae*

Common name: *Squill, Sea –onion*

Description: A perennial herb has a large bulb with a diameter ranging between 5 and 18 cm, and sometimes weights up to 2 kg, covered with bleached brown or reddish brown scales. The leaves are large, smooth, up to 30-60 cm long and 3 to 8 cm wide. The stem is long (60-100 cm) and carries about 50 small white flowers. The squill has a green or purple vein in the center, and the fruit is a capsule. It spreads widely in Syria, especially in the southern and coastal regions.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant, especially the bulb.

Affected animals: All animals and humans.

Signs of poisoning: Abdominal pain, diarrhea, and vomiting.

Toxic components: All parts of the plant contain cardiac glycosides such asscillarine and scilla-dienolides, the effect of which is similar to the effect of Digitalis glycosides.

Effect: Feeding animals with plant leads to poisoning, manifested by abdominal pain, digestive disorders and diarrhea, and arrhythmia. A skin contact with the plant sap leads to severe pain that

lasts for several hours and irritation of the skin *(Baba Aissa1999).*

***Urtica dioica* L.**

Family: *Urticaceae*

Common name: *Stinging nettle*

Description: Perennial plant, bisexual covered by incendiary bristles, long stem up to 1 meter and more, simple or branched, standing, opposite leaves of 4-10 cm in length, elongated spear, sharp end and serrated edge, semi-cordate base, and small oval seed length 1 mm. The plant blooms in April-September.

Toxicity: Highly toxic.

Toxic parts: All plant especially bristles.

Affected animals: All animals and humans.

Signs of poisoning: Erythema.

Toxic components: The bristles contain incendiary compounds such as acetylcholine, histamine and hydroxytryptamine.

Effect: Burning bristles are characterized by being easily inserted into the skin and emptying their contents into it, leading to pain followed by redness and swelling of the skin. A slight contact with the plant leads to short-term pain, but frequent contact leads to severe pain that lasts long, and repeated contact may lead to severe pain and dyspnea, twitching, and possibly vomiting *(Turkdogan2003).*

***Viscum album* L.**

Family: *Loranthaceae*

Common name: *Mistletoe*

Description: Perennial evergreen plant, lives intrusively on trees, spherical in shape, the diameter ranges between 20 and 100 cm, many branches, and has suckers that penetrate the veneer of trees that intrude on it. The leaves are opposite and thick, oval and tend to color yellowish, greenish yellowish. The fruits are single-seeded, spherical cherry-like and white. It blooms in March-April, its fruits ripe in autumn, and it intrudes especially on olive trees.

Toxicity: Highly toxic.

Toxic parts: Leaves and stems, while the fruits have low toxicity.

Affected animals: All animals and humans.

Signs of poisoning: Digestive disorders, severe cramps, bloody diarrhea, and dizziness.

Toxic components: The plant parts contain a mixture of toxic proteins; the most important are viscotoxins and viscumin. It is believed that the leaves and the stem are more toxic than the fruits, and there are indications that the toxicity of the plant varies with the trees that parasitize on.

Effect: Feeding animals with plants, especially their leaves, leads to severe poisoning, the symptoms are gastrointestinal disturbances (colic and bloody diarrhea), dilated pupils, lightheadedness, in addition to severe pain when touching the abdomen *(Zuber2003, 2004).*

***Xanthium strumarium* L.**

Family: *Asteraceae (Compositae)*

Common name: *Burdock, Cocklebur*

Description: Annual plant that has an undesirable smell, a strong stem with many branches, often covered with red or black spots, and up to 100 cm in height. The alternate leaves are cordate with shallow lobes and large and uneven teeth. The male capitules bear small white tubular flowers. The female capitules develop into a spiny fruit of about 2 cm in length, covered with dense hooks. It blooms from May to September, and it spreads in the abandoned places, sides of roads and fields, in all Syrian regions.

Toxicity: Highly toxic.

Toxic parts: All parts of the plant, especially seeds.

Affected animals: All pastoral animals and poultry.

Signs of poisoning: Digestive irritation, respiratory and behavioral disorders, and general weakness.

Toxic components: The plant, especially the seeds and the (young plant), contains various toxic substances such as glycosides and carboxy-atractyloside, which causes hypoglycemia, and it also contains a group of sesquiterpenes.

Effect: It is a high toxic plant, especially the seeds and young plant, which contain a high concentration of toxic components. The animals often feed on them, as its fruits may mix with fodder. The plant causes hypoglycemia, vomiting and tremor, liver damage, and death may occur within 48 hours. Fruits with hooky thorns cause wounds on the skin of animals, often causing dermatitis and infection, when mixed with fodder; they ulcerate the mucous membranes of the mouth *(Kim et al. 2003, 2005).*

8. Recommendations:

There are many reasons leading to the extinction of species or making them threatened with extinction, the most important of them is the destruction of habitats (Habitat Destruction) due to human activities, pollution, drying of wetlands, converting forest lands to pastoral areas, building roads, dams and building cities or residential areas. There is a reason no less important than the destruction of habitats, which is the fragmentation of these habitats into small areas and isolation from each other, which leads to the abolition of the contact between the plant and animal species remaining on these environments and reduces their genetic diversity and makes them less able to adapt to the environment and the climate change and thus vulnerable to extinction significantly. Taha (2013) mentioned two groups of plant species indicative of the Jabal Abdul Aziz reserve: Species indicative of habitat degradation and overgrazing: most of them are spiny or poisonous, such as *Noaea mucronata, Peganum harmala, Thymus syriacus, Teucrium polium*, and *Poa sinaica;* species indicative of the health of the habitat and plant formation such as*Pistacia atlantica, Pistacia khinjuk, Crataegus aronia, Amygdalus orientalis*.They are slow-growing and exposureto grazing or fire will not enable them to recover until a long time.Thelarge extent of their spread in one place is evidence of its health. Inaddition, *Salsola vermiculata* is highly palatable pasture shrubs, and its wide spreadindicates good pasture management. Al-Mahmoud (2010) also recorded two indicative species in Abu Qubais reserve: Species indicative of habitat degradation such as *Cistus creticus, Calycotome villosa*, and *Spartium junceum,* Species indicative of habitat health such as *Orchidaceae* species.

8.1. Create a modern database of Syrian species:

- Update the documentation of plant (and animal) species in Syria: by collecting all available information about them. The studies that have been carried out in the recent period as the existing database is old and needs revision.
- Provide data on the state of the species to assess its abundance and distribution.
- Provide data related to habitats, reserves, important plant areas and important areas for birds.

- Store data electronically, so that it can be downloaded and updated on the electronic network based on the database about toxic plants for animals in Switzerland (www.clinitox.ch).

8.2. Environmental information collection and analysis:

- Conduct an accurate inventory and field survey of wild species through national projects.
- Monitor biodiversity and the state of the environment through indicator species to study the distribution of species and their natural habitats.
- Update the study of the factors threatening wildlife, including environmental pollution factors in their various forms.
- Establish networks to manage information related to biodiversity.

8.3. In the field of protecting natural pastures:

- Activate the sustainable management of pastures and waters, which form the basis for the protection and development of the Badia
- Expand the implementation of water harvesting techniques.
- Use renewable energy sources such as wind and solar energy to produce electrical energy in pasture areas.
- Encourage the establishment of small and medium handicrafts and traditional rural food industries in the Badia to increase job opportunities, combat poverty, and protect natural resources from depletion.
- Allocate the marginal area adjacent to the Badia to be an industrial area for sheep products and encourage investment in sheep breeding and dairy production projects.
- Provide veterinary services for livestock, secure mobile veterinary units to carry out health programs for sheep, and assist in the marketing of products and the provision of fodder.

9. Summary

This study was carried out in Syria in the period between 2009-2011 with the aim of inventorying poisonous plants whichnumber seemed to increase due to the desertification and the degrading of the pasture area in Syria. It was scheduled to prepare a comprehensive research, the costs of which would be subsidized by the Syrian government through the Ministry of Agriculture and the Ministry of Environment, but the project was not completed as planned due to the conditions of the war in Syria in 2011, and support for most projects in this field was stopped.

The study included an inventory of more than 200 plant species distributed among about 77 families spread in Syria, arranged within their families according to the Latin alphabet. The Latin scientific names of the plants are mentioned at the top of the page from the left, accompanied by the first letters of the name of its species, with the family to which it belongs. For the purpose of accurate identification of the plant, the botanical description was elaborated as it is in nature, which helps to distinguish it from other species. The morphological classification (height, leaf characteristics, fruits, flowers, seeds, and stem); the manifestations of their growth in terms of being perennial or annual, images of each plant also were added to identify visually the shape of the plant and to enable the people to distinguish them.

33 plant species were classified as high toxic plants which spread on the Syrian pastures and cause different disturbances to humans and animals such as (cardiac and respiratory disturbances, coma, vomiting, and abortion….etc). The original habitat of each plant was also indicated, with mention of the areas of spread and distribution outside these habitats, whenever possible. As a part of this study about 70 plants species were mentioned as medical plants which are used widely in Syrian traditional medicine (TM), the species names, the family, the used parts for treatment and their ethnobotanical uses were described in details.

As for the active ingredients and their concentrations in the plant, which vary according to the plant part, the study tried to focus on the active parts (leaves, seeds, flowers, fruit and roots), and mentioned their chemical compounds of carbohydrates, alkaloids, oils, tannins, and acids

depending on what has been obtained from reference studies in this field. In order to facilitate the research and deepen the interest, these plant species have been tabulated and classified into special lists according to nominal lists arranged according to the alphabet, and according to the poisonous parts of the plant and chemical components.

The scientific references in this research varied, in Arabic, English and French languages, to obtain as much as possible the largest amount of information about the toxic and medicinal plants that exist in Syria and the neighboring countries (Turkey, Iraq, Lebanon, Jordan, Palestine, Israel), which are similar in climate to Syria and where these plants grow.

The study included too the factors favoring poisoning of human such as: The lack of knowledge of many people of poisonous plants, garden owners and workers are exposed to contact with many poisonous plants, many of which lead to skin irritation, and many wild plants are used in food, and it often happens that they are mixed, during their collection, with similar plants that may be poisonous.

As well as the factors favoring poisoning of animals such as: Drought conditions, degraded pastures, feed mixing with some toxic plants in the fields and the remains of the gardens, animals move to new pastoral sites. Because of the negative effects of toxic plants on humans and animals, it is necessary to find appropriate solutions and put laws that help limiting and preventing their risks, as they may cause the loss of animals and the deterioration of agricultural production. These poisonous plants may be in our home, in the garden or in fields and forests. Therefore many measures were suggested as solutions to minimize the negative effects of toxic plants or to eliminate it:

-Among the proposed solutions is to get rid of poisonous plants in the pastures and plow the pastures if poisonous plants are observed in them and then grow them with agricultural crops,

- Provide comprehensive and up-to-date data and information about species including endemic, economic, and medically important species, endangered species, and invasive species (introduced), traded species, toxic species).

- Establish a unit specialized in controlling the introduced invasive species and regulating their introduction.

- Improve and develop pastoral farming activities, produce pastoral seedlings and seeds, emphasize the method of direct dispersal of pastoral seeds, and secure the requirements for its uses.
- Research the economic and social impacts of environmental hazards (pollution, deterioration of natural resources, climatic changes, dust storms, and others).

10. Zusammenfassung

Diese Studie wurde zwischen 2009 und 2011 in Syrien durchgeführt, um eine Bestandsaufnahme der Giftpflanzen vorzunehmen, deren Anzahl aufgrund der Wüstenbildung und der Verschlechterung der Weideflächen in Syrien zuzunehmen scheint. Es war geplant, eine umfassende Studie zu erstellen, deren Kosten von der syrischen Regierung über das Landwirtschafts- und das Umweltministerium bezuschusst werden sollten, aber das Projekt wurde aufgrund der Kriegsbedingungen in Syrien im Jahr 2011 nicht wie geplant abgeschlossen, und die Unterstützung für die meisten Projekte in diesem Bereich wurde eingestellt.

Die Studie umfasste eine Bestandsaufnahme von mehr als 200 Pflanzenarten, die sich auf etwa 77 in Syrien verbreitete Familien verteilen und innerhalb ihrer Familien nach dem lateinischen Alphabet geordnet sind. Die lateinischen wissenschaftlichen Namen der Pflanzen sind oben auf der Seite von links aufgeführt, zusammen mit den Anfangsbuchstaben des Namens ihrer Art und der Familie, zu der sie gehören. Zur genauen Identifizierung der Pflanze wurde die botanische Beschreibung so ausgearbeitet, wie sie in der Natur vorkommt, was die Unterscheidung von anderen Arten erleichtert. Es folgt einemorphologische Klassifizierung (Höhe, Blattmerkmale, Früchte, Blüten, Samen und Stängel), eine Beschreibung der Erscheinungsformen ihres Wachstums als mehrjährig oder einjährig, und Bilder jeder Pflanze, um sie visuell zu identifizieren und den Menschen zu ermöglichen, sie zu unterscheiden.

33 Pflanzenarten wurden als hochgiftige Pflanzen eingestuft, die sich auf den syrischen Weiden ausbreiten und bei Mensch und Tier verschiedene Symptome hervorrufen (Herz- und Atemstörungen, Koma, Erbrechen und Abort, usw.). Der ursprüngliche Lebensraum jeder Pflanze

wurde ebenfalls angegeben, wobei, wenn möglich, auch die Ausbreitungs- und Verbreitungsgebiete außerhalb dieser Lebensräume erwähnt wurden. Im Rahmen dieser Studie wurden etwa 70 Pflanzenarten als Heilpflanzen aufgeführt, die in der traditionellen syrischen Medizin (TM) weit verbreitet sind, die Artnamen, die Pflanzenfamilie, die zur Behandlung verwendeten Teile und ihre ethnobotanischen Verwendungen wurden ausführlich beschrieben.

Was die Wirkstoffe und ihre Konzentrationen in der Pflanze anbelangt, die je nach Pflanzenteil variieren, so wurde in der Studie versucht, sich auf die aktiven Teile (Blätter, Samen, Blüten, Früchte und Wurzeln) zu konzentrieren und ihre chemischen Verbindungen aus der Gruppe von Kohlenhydraten, Alkaloiden, Ölen, Gerbstoffen und Säuren zu erwähnen, je nachdem was aus Referenzstudien in diesem Bereich gewonnen wurde. Zur Erleichterung der Forschung und zur Vertiefung des Interesses wurden diese Pflanzenarten tabellarisch erfasst und in speziellen Listen nach alphabetisch geordneten Namenslisten sowie nach den giftigen Pflanzenteilen und chemischen Bestandteilen geordnet.

Die wissenschaftlichen Referenzen in dieser Untersuchung waren vielfältig, in arabischer, englischer und französischer Sprache, um so viele Informationen wie möglich über die giftigen und medizinischen Pflanzen zu erhalten, die in Syrien und den Nachbarländern (Türkei, Irak, Libanon, Jordanien, Palästina, Israel) vorkommen, die ein ähnliches Klima wie Syrien haben und wo diese Pflanzen wachsen.

Die Studie umfasste auch die Faktoren, die die Vergiftung von Menschen begünstigen, wie z.B.die Unkenntnis vieler Menschen über giftige Pflanzen. Gartenbesitzer und -arbeiter kommen mit vielen giftigen Pflanzen in Kontakt, von denen viele zu Hautreizungen führen und viele Wildpflanzen werden in Lebensmitteln verwendet, wodurch es beim Sammeln zu Verwechslungen mit ähnlichen, aber giftigen Pflanzen kommen kann.

Hinzu kommen weitere Faktoren, die eine Vergiftung von Tieren begünstigen wie z. B.: Trockenheit, degradierte Weiden, Vermischung des Futters mit einigen giftigen Pflanzen auf den Feldern und den Resten der Gärten, Wechsel zu neuen Weideplätzen. Aufgrund der negativen Auswirkungen von Giftpflanzen auf Mensch und Tier ist es notwendig, geeignete Lösungen zu

finden und Gesetze zu erlassen, die dazu beitragen die Risiken zu begrenzen und zu verhindern, da sie zum Verlust von Tieren und zur Verschlechterung der landwirtschaftlichen Produktion führen können. Diese giftigen Pflanzen können sich in unserem Haus, im Garten oder auf Feldern und in Wäldern befinden. Daher wurden viele Maßnahmen vorgeschlagen, um die negativen Auswirkungen giftiger Pflanzen zu minimieren oder sie zu beseitigen:

- Bereitstellung umfassender und aktueller Daten und Informationen über Pflanzenarten, einschließlich endemischer, wirtschaftlich und medizinisch wichtiger Arten, gefährdeter Arten und invasiver (eingeschleppter) Arten, gehandelter Arten und giftiger Arten.
- Einrichtung einer Einheit, die auf die Kontrolle der eingeschleppten invasiven Arten und die Regulierung ihrer Einführung spezialisiert ist.
- Verbesserung und Entwicklung der Weidewirtschaft, Produktion von Setzlingen und Saatgut für die Weidewirtschaft, Hervorhebung der Methode der direkten Verbreitung von Saatgut für die Weidewirtschaft und Sicherstellung der Voraussetzungen für dessen Verwendung.
- Erforschung der wirtschaftlichen und sozialen Auswirkungen von Umweltgefahren (Verschmutzung, Verschlechterung der natürlichen Ressourcen, klimatische Veränderungen, Staubstürme usw.).

11. References

Acamovic T, C Stewart, T Pennycott. 2001. Poisonous plants and related toxins. CABI publishing, Wallingford, UK.

Adel MJ, A El-Oqlah. 1998. Antimicrobial Activity of Extracts of Herbal Plants used in the Traditional Medicine of Bahrain. J. Phytotherapy Research, 10(3): 251- 253.

Ahmad HA, SA Ghazanfar. 1991. Conservation of medicinal plants on the Arabian Peninsula. Two case studies (*Salvadora persica* and *Glycyrrhiza glabra* var. *landulifera*). Med. Plant Conserv, 3: 15-16.

Akhtar N. 1992. Proceragenin, an antibacterial cardenolide from *Calotropis procera*. Phytochemistry, 31(8):2821- 2824.

Akrout A. 2001. Etude des huilesessentielles de quelques plantes pastorales de la région Matmata (Tunisie). Institut des régions arides. 4119 Medenine, Tunisie.

Al Gaby A M, R F Allam. 2000. Chemical analysis, antimicrobial activity, and the essential oils from some wild herbs in Egypt. J. of Herbs Spices and Medicinal Plants, 7(1): 15-23.

Alachkar A, Jaddouh A, Elsheikh MS, Bilia AR, Vincieri FF. 2011. Traditional medicine in Syria: folk medicine in Aleppo governorate. Nat Prod Commun, 6(1):79–84.

Al-Awdat M. 2010. Poisonous plants in Syria (distribution and effects on humans and animals). Syrian Atomic Energy Authority, Syria, Damascus.

Alhakim W.1992. Medicinal and Aromatic Plants, Syria, Damascus University Press, 288 p.

Al-Mahmoud F, Al-Shater Z. 2010. Study of plant diversity in Abu Qubies protected area. AAE Arab Center Stud Arid Zones Dry Lands, 6:19–26.

Al-Yemeni MN, KM Zayed. 1999. Ecology of some plant communities along Riyadh Al- Thumamah Road, Saudi Arabia. Saudi J. Biol. Sci, 6(1): 9-26.

Ambula M K, Oduho G W, Tuitoek J K. 2003. Effect of high tannin and bentonite on the performance of laying hens. Trop. Anim. Health and Prod, 35(3):285-92.

Amjad MS, Arshad M, Hussain MZ. 2013. An overview of human–plant interaction in Nikyal rangeland district Kotli Azad Jammu and Kashmir. Afr J Plant Sci. 7:571–576.

Appel R M, Gisvold O. 2006. A Preliminary Phytochemical Investigation of *Digitalis ferruginea*, Journal of the American Pharmaceutical Association, 43(4):215-219.

Atlas Biodiversity in Syria. 2001 part1. Ministry of State for Environment Affairs- Biodiversity unit.

B S Gemeda, A Hassen. 2015. Effect of Tannin and species variation on vitro digestibility, gas, and methane production of tropical browse plants. Asian Australas. J. AnimScie, 28(2): 188–199.

Baba Aissa F. 1999. Encyclopédie des plantesutiles (Flore d´Algérie et du Maghreb). Substances végétalesd´Afrique, d'Orient et d'Occident. Ed. Edas. Alger, 368p.

Başer KHC. 2002. Aromatic biodiversity among the flowering plant taxa of Turkey. Pure Appl. Chem, 74 (4): 527- 545.

Basu A.1992. Hepatoprotective effects of *Calotropis procera* root extract on experimental liver damage inanimals. J. Fitoterapia, 63(6): 507 - 514.

Basu A, Chaudhuri AKN. 1991. Preliminary studies on the anti-inflammatory and analgesic activities of *Calotropis procera* root extract. Journal of Ethnopharmacology, 31(3): 319 - 324.

Batanouny K H, S AbouTabl, M Shabana, F Soliman. 2007. Wild Medicinal Plants in Egypt. An Inventoryto Support Conservation and Sustainable Use. With Support of the Swiss Development Co-operation (SDC) Academy of Scientific Research and Technology, Egypt International Union for Conservation (IUCN).

Batanouny K H, 1999. Wild Medicinal Plants in Egypt. Academy of Scientific Research and Technology, Egypt. The World Conservation Union (IUCN):120 -122.

Bellakhdar J. 1997. La pharmacopéemarocainetraditionnelle. Médecinearabeancienne et saviors populaires. Ibis Press; Casablanca: Editions Le Fennec, 764 p.

Berrougui H, R Soulimani, C Younos, A Ettaib, K Lalaoui, M Hmamouchi. 2002. Study of toxicity and psychotropic effects of methanolic extract from seeds of *Peganum harmala* L. in the mouse. International Symposium on Medicinal and Aromatic Plants - posters, Rabat, Morocco: 07 - 08.

Berrougui H, C Martin-corder, A Khalil, M Hmamouchi, A Ettaib, E Marhuenada, MD Herrera. 2006. Vasorelaxant effects of harmine and harmaline extracted from *Peganum harmala* L. Seeds in isolated rat aorta. Journal Pharmacological Research, 54 (2):150 - 157.

Bhakta Prasad Gaire, Lalita Subedi. 2013. A review on the pharmacological and toxicological aspects of *Datura stramonium* L, Journal of Integrative Medicine, 11(2):73-79.

Bleasel N, B Tate, M Rademaker. 2002. Allergic contact dermatitis following exposure to essential oils.Australas. J. Dermatol, 43(3): 211- 213.

Botha C J, Penrith ML. 2008. Poisonous plants of veterinary and human importance in southern Africa, J Ethnopharmacol, 119(3):549-58.doi: 10.1016/j.jep.2008.07.022.

Bown D. 1995. Encyclopaedia of Herbs and their Uses. Dorling Kindersley, London.

Braun M, Tóth A. 1994. Morphology of bitter sweet (*Solanum dulcamara* L.) in contrasting marsh habitats, Flora, 189 (4):307-313

Carmona MD, Llorach R, Obon C, Rivera D. 2005. "Zahraa", a Unani multicomponent herbal tea widely consumed in Syria: components of drug mixtures and alleged medicinal properties. J Ethnopharmacol, 102(3): 344–350.

Chadi K, Abdulhakim N, Mohamad IHA. 2021. Traditional medicines and their common uses in central region of Syria: Hama and Homs – an ethnomedicinal survey. Pharmaceutical Biology**,** 59(1): 778-788.

Chaia C H, Batia P. 1989. The annual species of Adonis (Ranunculaceae) a polyploid complex, Plant Systematics and Evolution Vol. 168, No. 3/4, pp. 181-193.

Chan T. 2009. Aconite poisonin. Clin Toxicol (Phila), 47 (4): 279–285.

Charchari S, A Dahoun, F Bachi, A Benslimani. 1996. In vitro antimicrobial of essential oils of *Artemisia herba-alba* and *Artemisia judacia* from Algeria. RivistaItaliana, 18: 3- 6.

Chaudhary SA, Al-Jowaid AA. 1999. Vegetation of the Kingdom of Saudi Arabia, National Agriculture and Water Research Center, Ministry of Agriculture and Water, Kingdom of Saudi Arabia.

Cheeke PR. 1989. Toxicants of plant origin. CRC Press, Inc. Boca Raton.USA, ISBN 9780367451035.

Cheeke PR, Shull LR. 1985. Natural toxicants in feeds and poisonous plants. AVI Publishing Company. Westport, Conn. USA, ISBN-0-87055-482-4.

Chevallier A. 1996. The Encyclopedia of Medicinal Plants. Dorling Kindersley, London.

Cooper MR, Johnson AW, Dauncey EA. 2003. Poisonous plants and fungi. TSO. London.

Dowling PM, Mc Kenzie, PA. 1993. Poisonous Plants: A Field Guide. Brisbane, Queensland, Australia, ISBN 9780724239825.

Dulger B, A Gonuz. 2004. Antimicrobial activity of certain plants used in Turkish traditional medicine. Asian J. Plants Sci, 3(1): 104 - 107.

El Bahri L, M Djegham, H Bellil. 2003. *Retamaraetam*: A poisonous plant of North Africa. Veterinary & Human Toxicology, 41(1): 33 - 35.

El-Shazly A, A Tei, L Witte, M El-Domiaty, M Wink. 1997. Tropane alkaloids of *Hyoscyamus boveanus*, *H. desertorum*, *H. muticus* and *H. albus* from Egypt. Journal of Biosciences, 52 (11- 12): 729 - 739.

Facciola S. 1998. Cornucopia II- A source book of edible plants. Kampong Publication, University of Michigan, USA, ISBN: 0962808725, 9780962808722.

FAO. 2015. Soils United nations challenge badge, ISBN 978-92-5-608434-

Flanagan RJ, Braithwaite RA, Brown SS, Widdop B, De Wolff FA. 1995. Basic analytical toxicology. Geneva, World Health Organization, ISBN 92-4- 154498 9

Goren N, A. Ulubelen, C Bozok-Johansson, E Tahtasakal. 1993. Sesquiterpene lactones from *Tanacetumdensum* subsp. amani. J. Phytochemistry, 33: 1157- 1159.

Gurudeeban S, Satyavani K, Ramanathan T. 2010. Bitter Apple (*Citrullus colocynthis*): An overview of chemical composition and biomedical potentials. Asian J. Plant Sci, 9 (7):394-401.

Hamdan H, F Afifi. 2004. Studies on the in vitro and in vivo hypoglycemic activities of some medicinal plants used in treatment of diabetes in Jordanian traditional medicine. J. Ethnopharmacol, 93(1): 117- 121.

Hammiche H, K Maiza. 2006. Traditional medicine in Central Sahara: Pharmacopoeia of TassiliNajjer, J. of Ethnopharmacology, 105: 358 -367.

Hesham I El-Askary. 2005. Terpenoids from *Cleome droserifolia* (Forssk.) Del., Molecules, 10(8):971-977.

ICARDA. 2005. Major Native Plant Species in Khanasser Area, 147 p.

IUCN (1997). 1997. IUCN Red List of threatened plants and animals, the World Conservation Union.

J Patocka, B Kocandrlova. 2017. Pharmacologically and Toxicologically relevant Components of *Amanita muscaria*, Mil. Med. Sci. Lett. (Voj. Zdrav. Listy), 86(3): 122-134, ISSN 0372-702

Jeffrey C. 1969. A Review of the Genus *Bryonia* L. (Cucurbitaceae), Kew Bulletin, 23(3): 441-461.

Jeong SM, Lee SH, Lim JS, Yoon SY, Ryu S, Lee JW, Kim SW, Yoo IS, You Y.H. 2009. A case of Systemic Toxicity that Occurred in an Adult Who Intentionally Ingested *Rhododendron sclippenbashii*. J Korean Soc Clin Toxicol, 7(2):180-182.

Joanne B, A Linda, J Anderson, D Phillipson. 2007. Herbal Medicines, RPS Publishing is the publishing organisation of the Royal Pharmaceutical Society of Great Britain, Third edition, ISBN 978 0 85369 623 0.

Karin Persson, Gitte Petersen, Alberto del Hoyo, Ole Seberg, Tina Jørgensen. 2011. A phylogenetic analysis of the genus *Colchicum* L. (Colchicaceae) based on sequences from six plastid regions, Taxon, 60 (5):1349-1365.

Kasparek M, S Al-Janabi. 2008. Plantes médicinales, la diversité biologique au service de la santé, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).

Keller-Didier C. 2004. Les plantesmédicinales. Académie Lorraine des Sciences.

Kellerman TS. 2009. Poisonous plants. Onderstepoort. J. Vet. Res, 76: 19–23.

Kim IT, YM Park, JH Won, HJ Jung, JW Choi, KT Lee. 2005. Methanol extract of *Xanthium strumarium* L. Possesses anti-inflammatory and anti-nociceptive activities. Biol Pharma. Bull, 28 (1): 94 - 100.

Kim YS, JS Kim, SH Park, SY Ryu. 2003. Two cytotoxic sesquiterpene lactones from the leaves of *Xanthium strumarium* and their in vitro inhibitory activity on farnesyl - transferase. J. Planta Med.Vol. 69(4):375 - 377.

Krenzelok EP, Jacobsen T D, Aronis JM. 1996. Poinsettia exposures have good outcomes.just as we though. Am J. Emerg Med, 14 (7): 671–674.

Kumar VL, S Arya. 2006. Medicinal uses and pharmacological properties of *Calotropis procera*. Recent Progress in Medicinal Plants, 373-388.

Kunkel G. 1984. Plants for Human consumption: An Annotated Checklist of the Edible Phanerogams and Ferns. Koeltz Scientific Books, University of Minnesota, USA, ISBN 3874292169, 9783874292160.

Larkcom J. 1991. Oriental Vegetables John Murray, New York, USA. ISBN 0 -7195 - 4781- 4.
Lev E, Amar Z. 2002. Ethnopharmacological survey of traditional drugs sold in the Kingdom of Jordan. J Ethnopharmacol, 82(2–3):131–145.

Lovell CR. 1993. Plants and skin. Blackwell Scientific Publications, Oxford, UK.

Mazzas G, Oomah BD. 2000. Herbs, Botanical and Teas. Technomic Publishing Co. Inc. Lanchaster, USA.

McKenzie R. 2012. Australia's Poisonous Plants, Fungi and Cyanobacteria: A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Collingwood, Australia. ISBN: 978 0 64309 267 9.

Monge CR, JD Hancock, C Feoli, S Bean, S Beyer. 2007. Effects of tannin concentration on nutritional alue of sorghum grain in broiler chicks. J. Anim. Sci, 85(Suppl.1):589.

Mouterde P. (1966, 1983, 1986). Nouvelle Flore du Libanet de la Syrie. Vol. 1, 2, 3, Text and Atlas. Dar el-Machreq. Beyrouth.

Mouterde P. 1953. La flore du Djebel Druze, Beyrouth (Lebanon) Université Saint Joseph.

Mudawer O. 2018. The pastures in dry areas, Hama University, faculty of agriculture, Syria.

Nahal I. 2002. Forest ecology science, university publications Directorate–Aleppo University. Agriculture Faculty.

Nima M, Diane P C, Richard D S. 2012. Cardiac Steroids and Glycoside Toxicity, Springer, Berlin, Heidelberg, ISBN 978-3-642-00417-9.

Nurhayat S, Afifi M, Yurdagül S. 1993. Poisoning by toxic honey in Turkey. Archives of Toxicology, 67 (2): 148–150.

Polunin O, A Huxley. 1987. Flowers of the Mediterranean. Hogarth Press, ISBN 0-7012-0784-1.
Protected Areas, Categories, Objectives and Conditions. 2003. Ministry of State for Environment Affairs, Damascus, Syria.

Ranđelović D, Mihailović N, Jovanović S. 2019. Potential of *Equisetum ramosissimum*Desf. For remediation of antimony flotation tailings: a case study. International Journal of Phytoremediation, 21(7): 207-213.

Report on national requirements for monitoring and classification of Biodiversity. 2002. The workshop held in the Veterinary Medicine Faculty, Al-Baath University- Homs.

Reports of Biodiversity conservation and protected area management (SY-GE-57109). 2005. Fir and Cedar PA project, Damascus, Syria
.
Riet-Correa F, R Medeiros, J Pfister, A Schild, A Dantas. 2009. Poisoning by Plants, Mycotoxins and Related Toxins. CABI Publishing, Wallingsford, UK, ISBN 978-1-84593-833-8.

S E Watkins, EA Saleh, PW Waldroup. 2002. Reduction in Dietary Nutrient Density Aids in Utilization of High Protein Cottonseed Meal in Broiler Diets. International Journal of Poultry Science, 1(4): 53-58.

Said O, Khalil K, Fulder S, Azaizeh H. 2002. Ethnopharmacological survey of medicinal herbs in Israel, the Golan Heights and the West Bank region. J. Ethnopharmacol, 83(3):251–265.

Sincich, F. 2002. Bedouin Traditional Medicine in the Syrian Steppe. FAO. Rome.

Skalicka-Woźniak K, Sokołowska-Krzaczek A, Czubkowska K. 2009. Variation of phenolic acids from herb and roots of *Salsola kali* L., Acta Societatis Botanicorum Poloniae, 78(3):197-201.

Sotelo A, Villavicencio H, Irene Montalvo. 2004. Gossypol content on leaves and seeds from some wild Malvaceae species. African journal of Traditional, complementary, alternative Medicine, 2(1).

Spoerke DG, Smolinske SC. 1990. Toxicity of houseplants. CRC Press, Inc. Boca Raton.USA.

Studies and reports of Biodiversity conservation and protected area management (2006-2009). 2009. Ministry of State for Environment Affairs, Damascus, Syria.

Taha D, Knio, Zabta K, Zabta S, Kreydiyyeh , Elias S, Elias B. 2013. Survey of medicinal plants currently used by herbalists in Lebanon. Pak J. Bot, 45: 543–555.

Tampion J. 1977. Dangerous plants, David & Charles; Illustrated edition, London.

Tasleem Akhtar, Nadeem Sheikh, Muddasir Hassan Abbasi. 2014. Clinical and pathological features of *Nerium oleander* extract toxicosis in wistarrats. BMC Research Notes, 7, Article number: 947.

The fifth national report on Biodiversity in the Syrian Arab Republic. 2016. Ministry of State for Environmental Affairs, Damascus, Syria.

The National Country Study of Biodiversity in Syria. 2000. Ministry of State for Environmental Affairs- Biodiversity Unit, Damascus, Syria.

The National Strategy and National Action Plan of Biodiversity. 2002. Ministry of State for Environmental Affairs - Biodiversity Unit, Damascus, Syria.

Turkdogan M. 2003. The role of *Urtica dioica* and *Nigella sativa* in the prevention of carbon tetrachloride induced hepatotoxicity in rats. Phytother Res, 17(8): 942 - 946.

Wasfi IA. 1994. Some pharmacological studies on *Citrullus colocynthis*. J. of Herbs, Spices and Medicinal plants, 2(2): 65 – 79.

Willard ST, Neuendorff DA, Lewis AW, Randel RD. 1995. Effects of gossypol in the diet of pregnant and postpartum brahman cows on calf development and cow performance. J. Anim. Sci, 73:496-507.

Yerebasan N, KırclE, Yılmaz MS, Cakılcıoglu A, Deniz V, Demirkıran D. 2020. A review of the traditional plant use culture in Elazıg (Turkey). Int J Nat Life Sci, 5:1–10.

Zuber D. 2003. Notes on the Cretan mistletoe, *Viscum album* subsp. *creticum*, (Loranthaceae/Viscaceae). J. Pl. Sci, 50 (Suppl.): 77 - 84.

Zuber D. 2004. Biological flora of Central Europe: *Viscum album* L. Flora, 199: 181 - 203.

12. List of tables:

13. List of figures: