The Coloured Atlas of Medicinal and Aromatic Plants of Jordan and Their Uses (Volume Two)

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By

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DEDICATION

- In the name of God, who created, invented and sustained all these wonderful, valuable, diverse plant species, His mercy and His blessing, and who said “We will show them our signs in the horizons and within themselves until it becomes clear to them that it is the truth. But is it not sufficient concerning your Lord that He is, over all things, a Witness?” (Sura Fussilat 041-053).
- To my homeland and to all who bless its soil.
- To the memory of my parents, who made sacrifices for my education and taught me that the land is faith and life.
- To all my grandchildren, to learn and to know the value of the source and the product.

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Volume II

PREFACE

Authoring a reference book on an important subject utilized daily by the public, traders, readers and researchers is not an easy task in the absence of well-planned and well-conducted academic research and real scientific information. A huge number of reference books and an overwhelming amount of articles on medicinal and aromatic plants are available in local markets, bookshops, libraries, and many herbal stores and shops specializing in folk medicine trades and preparing, formulating and selling these plants or their materials; some are of an acceptable history and accumulated experience while others are recently founded and have little or no experience but are rather invested in this field. All these sources mentioned, in addition to the public's inherited experience on the utilization of these plants in folk medicine, herbalism and traditional herb practices and their knowledge on plant-based medications that have been passed down from one family to another within communities, have created a great demand for knowledge on these species' use in medication. However, many of the available reference works have been gathered, compiled or prepared by non-specialists, which casts some doubt on their information, which may negatively add to our knowledge or even be confusing. In addition, many authors, researchers and project leaders in this field of science are either not specialists or are unfamiliar with medicinal and aromatic plants, and thus their results and reports may lead to random public use of these species in folk medicine, which could result in permanent illness or death.

Aromatic and medicinal plants are renewable resources for drugs, the medicinal industry, cosmetics, perfume and pesticides. Many species are toxic if used fresh or in crude forms, or may be so at a certain stage or under specific conditions. Others are extremely poisonous when internally taken, used in high doses, or when repeatedly applied or utilized for a long period. Some are also effective for curing local inhabitants but are not so for foreigners, hence the statement of Hippocrates that one should "treat or cure each patient by plants of his own land which are most appropriate to restore his health and recovery from illness". The active constituents of these plants are not produced or synthesized, but are only available under certain conditions or at a certain time of the day, season or year and only in certain plant parts.

As an author, agriculturalist, weed science specialist, lecturer on medicinal and aromatic plants, and researcher, I have reviewed the literature and gathered exact and correct information on these important species in drugs and in the industry, as reported and confirmed by different authors. However, many of the reported species in this book have not been fully researched or studied and their active constituents are still unknown. I should indicate that I am not the author who examined or proved species' effectiveness and their safe use against the illnesses and diseases reported in this book. Therefore, self-medication using these species or in folk medicine is the responsibility of the user, who should always seek medical advice from a specialized practitioner. The book is an important source of scientific information, but is certainly not a guide for self-medication. It emphasizes wild grown species, which hence are unfamiliar to the public; many cause health difficulties if misused but are important for investment and the ecosystem. However, with the world's increasing interest in natural products and herbalism, medicinal and aromatic species gain priority as renewable resources for such natural chemicals, and more research and development is needed.

Finally, I do not claim that the species reported are all that occur in Jordan's flora, especially in the absence of actual academic research or survey studies. I should indicate that many species occurring in local habitats lack basic information with regard to their biology, ecology and importance, and are only listed as wild species of an unknown value or as common weeds. However, this atlas introduces 769 plant species (209 are cultivated and 560 are wild grown) occurring in Jordan belonging to 119 plant families, and all are listed with necessary information. The atlas presents a full colour photo for each species for readers to become acquainted with the species presented and shows their values to the national economy and environment.

Jamal R. Qasem

ACKNOWLEDGEMENTS

First, thanks to God for completing this reference book and making it into a reality for the scientific community, students, researchers and interested public readers in this important branch of science. Creation, health, toxicity, wellness, sickness, recovery, drugs and cures all are from and by God, and must lead any who deeply think on creation to become a believer. The Holy Qur'an says, "Those who remember Allah while standing or sitting or [lying] on their sides and reflect on the creation of the heavens and the earth [and say] "Our Lord, You did not create this aimlessly; exalted are You [above such a thing]; protect us then from the punishment of the Fire"" (Ali-Imran 003-191). I would like to express my gratitude to the Deanship of Academic Research at the University of Jordan for approving and funding this project. I also thank Miss Hadeel Bdair and Mrs. Dina Al-Hattab for their part-time technical assistance during the early preparation phase of this project; thanks are also extended to Mr. Madi Al-Abbadi for joining me on field trips, Mr. Alex Monaghan for proof-reading the manuscript and the Cambridge Scholars Publishing family for printing and publishing the book. Thanks to my wife and sons who supported and encouraged me throughout the whole period. Finally, to all friends and colleagues who encouraged me to complete this project and highly valued its importance, I say thanks, and to others who thought its completion would not be an easy task, or even an impossible one, I say your feelings were behind my persistence and insistence to complete this work. Having realized the merits of its publication, I offer it to all who are homesick and in love with scientific research, who devote their lives to their homelands, and who believe in history and originality.

INTRODUCTION

The history of utilizing plants for their healing properties is as old as man himself. The first man on earth was searching for plants that would fulfil his needs of food, shelter, medicine and beauty then, later, as feed for his animals. He recognized useful plants, and protected and increased their number, productivity and/or the area they occupied, while other plants of unknown values or which were poisonous were ignored or severely controlled. However, in the absence of historical documentation on the exact date, the grave of a Neanderthal man buried 60,000 years ago reveals that the connection between plants and human health has existed for thousands of years. Such a link has also been confirmed through the drawings on graves of Ancient Egyptians and documented in medical hieratic papyri. Mesopotamian prescriptions and the medicinal substances of the Babylonians and Sumerians are available from the era of Hammurabi's laws on plants' uses in medication with full details on diseases, plants' doses, formulations and the time at which these were used. Some species, however, were also found to have grown in biblical gardens. The great historical documents on medicinal plants' uses in human medication have also been found in China, Greece, India and some European countries. However, many of the plant species used in history for healing certain ailments or against certain diseases have also proved effective against the same diseases in modern medicine; some formulations have been changed, while others are still used as they were when they were first prescribed.

Plants are a renewable resource for human drugs and veterinary medicine. Medicinal and aromatic plants represent a significant component of the natural ecosystem and agroecosystems, play an important role in industry and add significantly to a nation's economy. Many are used as drugs and drug additives in perfumes, cosmetics, food, flavouring agents and spices or as a source of natural pesticides. With the trend towards rapid urbanization, people became more concerned about their food, drinks, drugs and environment, and more interested in a safe habitat, a clean environment, a hazard-free life and their welfare. Although many countries have traditionally adopted a natural system for their food and drug production, and folk medicine is widely practised, others are more restricted and dependent on synthetic or manufactured materials as a main source of food and products. However, with better awareness of the problems that the second system created for human health and the environment, natural products became more attractive for health, industry, and investment in food and drugs, and thus more attention is given to protecting the natural ecosystem. In this context, using natural resources and organic food production in the drug industry is highly respected. Considering the above-mentioned reasons, and the possible risk in using synthetic drugs and other chemicals on human health and the environment, people worldwide have turned back to nature's chemicals. While 400,000 chemical compounds are estimated to occur in plants, only 10,000 have been isolated and identified as secondary metabolites of different uses. This huge number of plants' natural chemicals could greatly serve and fulfil humanitarian needs in all fields.

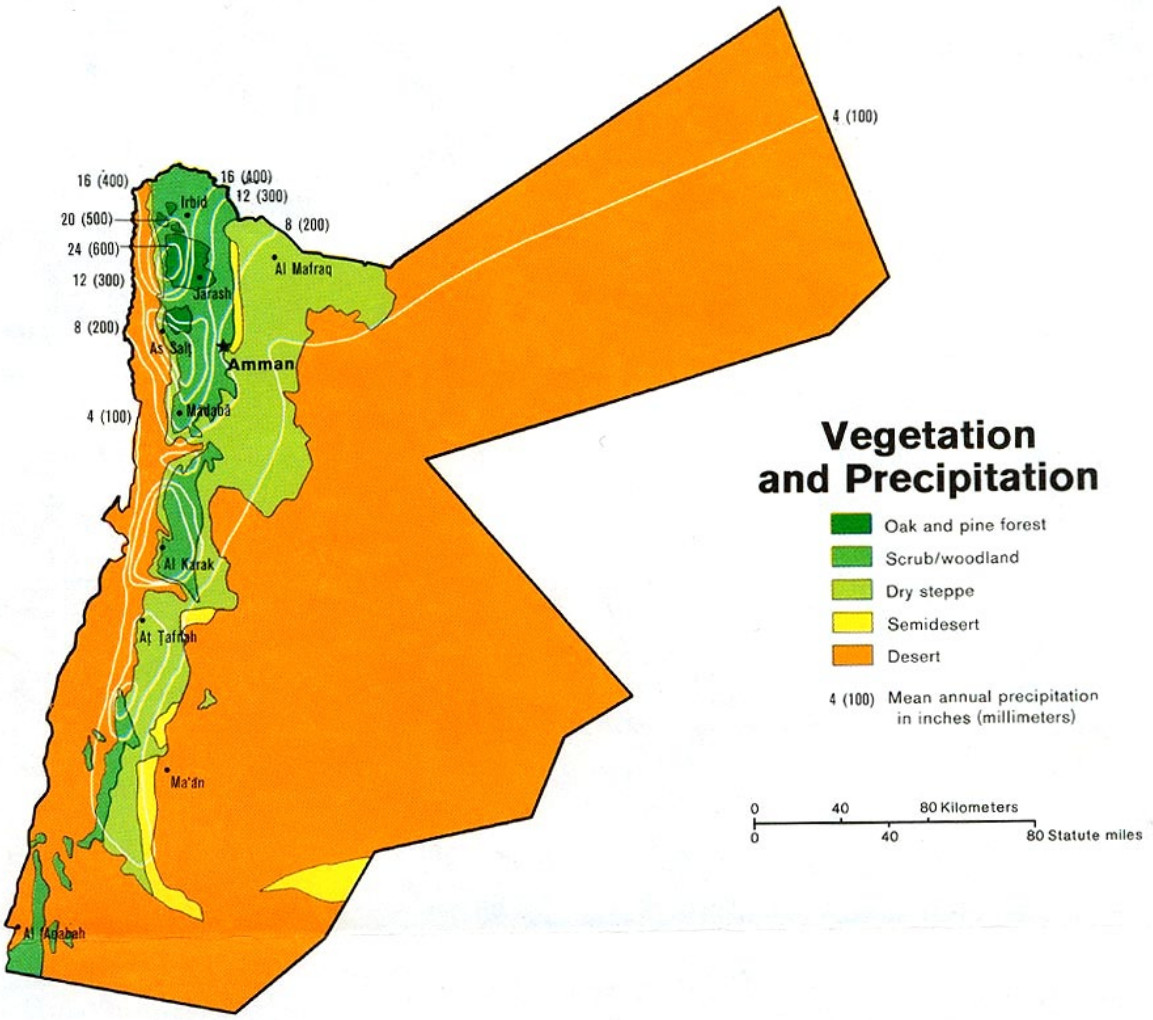
In Jordan, almost 2,500 plant species have been reported to occur in the country, accounting for about 1% of the total number of plant species known in the world. Among these, 350 to 500 are regarded as useful in medicine and cures, and many of these are also used in food and for other purposes. The main issue is the absence of a drug industry and the complete reliance on imported chemical drugs and pesticides. This declined levels of interest in these species and investment in their production. In addition, harvesting, heavy grazing, war, drought, salinity, low rainfall and housing construction have created unfavourable conditions for the plant population's expansion in natural habitats and/or their cultivation. All have contributed to placing many plants in endangered or threatened categories despite the diverse environmental conditions, extending from tropical and sub-tropical to the Sahara-Arabian, that create ideal environments for a wide diversity of such species or others in the country.

The present book is divided into three volumes: the first is devoted to cultivated plant species while the second and the third cover wild grown species. Plants are arranged alphabetically based on their scientific names, regardless of other factors. It is a reference book that includes basic information on medicinal and aromatic species in Jordanian flora, emphasizing their importance in the drug industry and the natural ecosystem. It is of value for the general public, folk medicine practitioners and the drug and chemical industry. The scientific merit of this publication is clear for certain university departments, including medicine, pharmaceutical, scientific and agricultural faculties.

I have full faith in the work and hope that the book highlights a number of medicinal and aromatic plant species in Jordan and provides interested people with useful knowledge on each. Finally, thanks to the Lord who greatly helped me in finding, identifying, directing and finishing this work and, above all, who created these beautiful plants that maintain their secret curing recipes for many difficult human and veterinary diseases that specialists have no solution for and which are only stored in these peaceful, sensitive, and sometimes endangered or threatened plants. The book emphasizes wild species unfamiliar to the public that have been ignored or severely prevented from sowing their seeds or producing propagules to maintain their genetic lines and exist in nature. Thanks to the creature that organized and managed the life of all living organisms to exist and have strong ties to fulfil the needs of all. Man does not know all benefits of plants; many are still hidden and are only discovered through research, and therefore each species may be

regarded as a natural pharmacy that includes all drugs necessary for humans. Each species has some sort of beauty and it is our goal to search for and discover them. However, man, who we started with, is himself responsible for the eradication, killing and disappearance of these species in his habitat, which should have instead been protected, increased and developed.

The author



Map of Jordan showing the country's biogeographical regions and vegetation types (source: lib.utexas.edu)

With each sunrise, a new day starts that brings a huge amount of knowledge for those who want to learn.

VOLUME TWO

WILD MEDICINAL AND AROMATIC PLANTS OF JORDAN

- **Arabic name**: Babonij Saghir
- **Scientific name**: *Aaronsohnia factorovskyi* WarbEig.
- **Common name:** Faktorovsky's Aaronsonia, Yellow Chamomile
- **Family name**: Compositae / Asteraceae
- **Growth habit**: Herb
- **Life cycle**: Annual
- **Part/s used**: Flowers, and the whole herb
- **Chemical constituents**: Aromatic oil, tannic acid, and glycoside.
- **Pharmacological action**: The plant is a carminative, diuretic, and useful for enteritis and kidney colic.
- **Other uses**: A wild flower
- **Caution**: No reports.

Plant population

- **Arabic name**: Sallam
- **Scientific name**: *Acacia asak* L.
- **Common name**: Cassie
- **Family name**: Leguminosae / Fabaceae
- **Growth habit**: Tree
- **Life cycle**: Perennial
- **Part/s used**: The bark
- **Chemical constituents**: Psychoactive alkaloids, and tannin.
- **Pharmacological action**: Extracts of the bark are effective free radical scavengers. The stem cortex is used for gastric ulcers and skin diseases. It is an antiseptic and aromatic plant. A bark decoction is taken orally for dysentery and abdominal cramps.
- **Other uses**: It is an ornamental roadside plant.
- **Caution**: No reports.

Flowering plant

Plant population

- **Arabic name**: Acacia, Talh
- **Scientific name**: *Acacia gerrardii* Benth (*Vachellia gerrardii* (Benth.) P.J.H.Hurter)
- **Common name**: Acacia Negev, Talh
- **Family name**: Leguminosae / Fabaceae
- **Growth habit**: Tree
- **Life cycle**: Perennial
- **Part/s used**: Bark, roots, gum, and the whole plant.
- **Chemical constituents**: Gum, protein, tannin, volatile organic materials, cellulose, and fibres.
- **Pharmacological action**: The plant is used for burns, fevers, sore gums, to loosen teeth and toothache. A bark decoction is useful for dysentery and abdominal cramps. The bark can be chewed or used as a tea to treat coughs and throat ulcerations. Bark and root teas are useful for diarrhoea and to alleviate stomach ailments. The bark is also used as a component in ailment reliefs and pulmonary troubles. Gum is used as an active drug ingredient carrier.
- **Other uses**: An industrial species, ropes and threads can be made from its fibres and especially from the phloem tissues. Its wood is used for stoves, coal, carvings, furniture, poles and tools. It is a forage plant, and its leaves and pods can be eaten by goats. It is an excellent plant for honeybees.
- **Caution**: No reports.

The pods

- **Arabic name**: Anbar Al-Neel
- **Scientific name**: *Acacia nilotica* (L.) Willd. ex Del. (Synonym: *Acacia arabica* Willd.)
- **Common name**: Nile Acacia, Babul, Gum Arabic Tree, Egyptian Thorn, Prickly Acacia
- **Family name**: Leguminosae / Fabaceae
- **Growth habit**: Tree
- **Life cycle**: Perennial
- **Part/s used**: Leaves, bark, stem, pods, and gum.
- **Chemical constituents**: Amines, alkaloids, cyanogenic glycosides, cyclitols, fatty acids, seed oils, fluoroacetate, gums, non-protein amino acids, terpenes (including essential oils, diterpenes, phytosterol and triterpene genins and saponins), hydrolysable tannins and flavonoids. The plant is also rich in cystine, methionine, threonine, lysine and tryptophan amino acids, and minerals including potassium, phosphorus, magnesium, iron and manganese. It contains diester, pentacosane dioic acid, dihexadecyl ester and, heptacosane 1, 2, 3-triol.
  Seeds contain phenolics of m-digallic acid, gallic acid, protocatechuic and ellagic acids, leucocyanidin, m-digallic dimer 3,4,5,7-tetrahydroxy flavan-3-ol, oligomer 3,4,7-trihydroxy flavan 3,4-diol and 3,4,5,7-tetrahydroxy flavan-3-ol and (-) epicatechol. Mature seeds also contain crude protein, fibre, fat, carbohydrates, potassium, phosphorus, magnesium, iron and manganese at high concentrations. Fruit contains mucilage and saponins. In the pods are gallic acid, Me-ester-n-digallic acid and tannins. Leaves contain apigenin, glycoside, rutin, and protein. The bark includes tannins, saponins and glycosides, phlobetannin, gallic acid, protocatechuic acid pyrocatechol, catechin and epigallocatechin-5,7-digallate. Roots contain octaconsanol, betulin, B-amyrin and B-sitosterol. The gum is composed of galactoarabinan.

A leaf and flower extract showed the presence of pentadecane, phthalic acid, neophytadiene and benzyl alcohol.

- **Pharmacological action**: *Acacia nilotica* is rich in bioactive secondary compounds. The plant is used for scabies and skin diseases, inhibits hepatitis C virus (HCV) protease, and is astringent, antiseptic, demulcent, purgative and tonic. A decoction of gum is used for diarrhoea, dysentery and constipation. The bark is important for eczema and leucorrhoea while the leaves are useful in epiphora treatment. The gum is a useful adjunct to medicines used for pulmonary and catarrhal affections. The plant is used for boils, cataracts, intestinal pains, diarrhoea, colds, diabetes, swellings and toothache. It is also important as an anticancer, antitumour, antiscorbutic, astringent, anti-oxidant, natriuretic, antispasmodic and diuretic. It is used as a nerve stimulant, and against congestion, coughs, dysentery fever, haemorrhages, leucorrhoea, ophthalmia and sclerosis. The seeds have anti-malarial, anti-diabetic, anti-hypertensive and antispasmodic activities. The leaves and pods are anti-inflammatory, the pods have molluscicidal and algicidal properties and the bark is used for haemorrhages, colds, diarrhoea, tuberculosis and leprosy. The root is an aphrodisiac and the flowers treat syphilis lesions. The gum is a suspending and emulsifying agent and is used in the preparation of many formulations. The plant has antimicrobial, anti-malarial, and antioxidant activity since it is rich in polyphenolic compounds and helps with the prevention and cure of various oxidative stress-related diseases including cardiovascular and neurodegenerative diseases. Kaempferol is the main chemical responsible for the plant's antioxidant activity. The plant also has anti-platelet aggregation, anti-quorum sensing, vasoconstriction, anti-mutagenic, cytotoxic, and anti-hepatocarcinogenic activities. A bark extract prevented hepatic malondialdehyde formation and reduced glutathione in rats, reduced liver injury and restored liver cancer markers. Traditionally, *Acacia nilotica* ssp. *adansonii* can stimulate milk production in lactating women.
- **Other uses**: The plant is used for miswak, timber, fuelwood, fodder and in the tanning industry. Acacia resins repel insects.
- **Caution**: No reports.

- **Arabic name**: Acacia, Samar, Sial, Sant Lawlabi
- **Scientific name**: *Acacia raddiana* Savi (Synonym: *Acacia tortilis* (Forskal) Hayne)
- **Common name**: Acacia, Shittim
- **Family name**: Leguminosae / Fabaceae
- **Growth habit**: Tree
- **Life cycle**: Perennial
- **Part/s used**: Leaves, pods, gum exudates, bark, and roots.
- **Chemical constituents**: Tannins, gum, polysaccharide, and alkaloids.
- **Pharmacological action**: It is a vermifuge, anti-diabetic, hypotensive, anti-tussive and anti-diarrhoeal; the plant also cures leucoderma, oedema and allergic dermatoses, skin infections and inflammations. *Acacia raddiana* is also useful for the treatment of various diseases like coughs, and it is a well-used plant by locals. Commercially, tannins derived from the bark are used as a dyestuff, pods and gum are used as food, and the leaves are diuretic and useful for the treatment of various diseases like skin allergies, diabetes, and hypertension. Plants' bark powder heals wounds and showed strong activity against *Candida albicans,* moderate activity against *Aspergillus niger* and may be used as an effective antifungal agent. Bark tannins prove useful in cattle suffering from diarrhoea. Extract of the pounded stem bark is gargled to treat mouth infections and dental problems, and is useful for infectious diseases. In dry coughs the plant is applied on burning charcoal and smoke is inhaled nasally. The root is used for coughs and diphtheria by burning charcoal for its smoke or by soaking crushed roots in water, which is taken orally. For wounds, the heated leaves or roots or their paste are applied topically. Root bark possesses antimalarial activity but would not be considered for follow up as an antimalarial candidate. An aqueous extract is used in cases of hyper-cholesterol and inflammation, decreased serum total cholesterol and LDL levels and increased serum HDL-cholesterol and decreased body weight. *A. raddiana* inhibits prostaglandin biosynthesis and PAF-induced exocytosis, and is effective for inflammatory reactions and febrifuge. The plant's methanol extract is used for leishmaniasis and parasitic disease, and showed moderate activity against *Plasmodium falciparum*. Pods and seeds of *Acacia raddiana* were recorded as a serious pesticide. Spines act as an effective form of antiherbivore protection, and they might be expected to increase their production of physical defences (long spines) under such circumstances**.** It is a disinfectant used for dermatitis, asthma and as an emollient. It is also effective against sore throats, ophthalmia, jaundice and bone pain. The gum is used like Arabic gum in folk remedies. The bark is used as a vermifuge and dusted onto skin ailments.
- **Other uses**: The leaves of young trees are browsed by goats and sheep, but the main value of this species is in its pods, which can be very numerous and eaten by livestock. The plant is also used for the production of

firewood. Soil under *Acacia* trees has more organic matter, including nitrogen, phosphorus, calcium, magnesium, sodium and potassium. It is a multipurpose tree of economic and environmental importance. Its fruit is edible, its flowers are used for beekeeping, and its wood is good for coal and construction. The yellow and brown dyes are used for leather tanning.

Mature pods are often the main source of food for cattle, sheep and goats. The plant is used for timber, poles, posts, fuel and charcoal. The pods, bark and roots are used in tanning. The plant's particular value in arid zones lies in its extreme resistance to heat, drought, salinity, alkalinity, drifting sand, grazing and repeated cutting. Some of the Acacia species are of considerable value for re-forestation and the reclamation of wasteland. The gum is used in food.

❖ **Caution**: No reports.

Fruits' (pods)

Spiny branches

A very spiny plant

- **Arabic name**: Ghamloul Alsharkyia, Ghamloul Al-Silsilah Al-Sharqia Ghamloul Libnani
- **Scientific name**: *Acantholimon libanoticum* Mouterde
- **Common name**: Lebanese Prickly Thrift
- **Family name**: Plumbaginaceae
- **Growth habit**: Shrub
- **Life cycle**: Perennial
- **Part/s used**: Roots
- **Chemical constituents**: Essential oil.
- **Pharmacological action**: The root is used for wounds and skin injuries and its decoction is used for skin infections and wounds.
- **Other uses**: A wild flower.
- **Caution**: No reports.

- **Arabic name**: Kaf Al-Hir, Kafn Al-Dob, Shook Aljamal, Shooka Yahoodia, Shook Aljimal, Qadam Al-Dob, Difda'a
- **Scientific name**: *Acanthus syriacus* Boiss.
- **Common name**: Bear's-Breech, Syrian Bear's-Breech
- **Family name**: Acanthaceae
- **Growth habit**: Herb
- **Life cycle**: Perennial
- **Part/s used**: Leaves, flowers, roots, seeds, and fruits.
- **Chemical constituents**: Tannins, mucilage, mineral elements, gum, sugars, bitter element, glycosides, fatty acids, alkaloids, flavone acyl glycosides, and pectin.
- **Pharmacological action**: The plant is a laxative, digestive, astringent and appetitic. It is used for burns, diarrhoea, insect bites, and intestinal ailments and as a wound remedy. The seeds are palliative, analgesic, and effective in the treatment of bleeding, and relieve ailments, inflammation and inflammation-associated disorders. Fruits infusions and leaves extracts are anti-inflammatories.
- **Other uses**: A wild flower.
- **Caution**: No reports.

A population of plants in the field

- **Arabic name**: Qaisoum, Thafra
- **Scientific name**: *Achillea biebersteinii* Afan
- **Common name**: Yellow Milfoil
- **Family name**: Compositae / Asteraceae
- **Growth habit**: Herb
- **Life cycle**: Perennial
- **Part/s used**: The whole plant.
- **Chemical constituents**: Essential oil contains cis-ascaridole, p-cymene, carvenone oxide, camphor, and sesquiterpene lactone. The plant also contains alkaloids, achillin, inulin, bitter materials, vitamin K, resin, tannin and cenoil.
- **Pharmacological action**: The plant is antispasmodic, diaphoretic, carminative, stimulant and tonic. It is used as an eyewash for conjunctivitis, as an insect repellent, and for itching, toothache, intestinal colic, enteritis, dysentery, kidney stones, colds, cramps, fevers, dermatitis and haemorrhages. It stimulates bile flow and purifies the blood.
- **Other uses**: The plant is a wild flower and an insect repellent.
- **Caution**: Plant ingestion may cause some minor symptoms such as rashes, vomiting or diarrhoea. Small amounts may not cause any symptoms. Exposure to plant juice or sap may produce a skin rash or irritation. Skin wounds from these plants can be extremely painful, causing large blisters and skin burning.