

Medicinal Plants in Saudi Arabia: I. Sarrwat Mountains at Taif, KSA

^{1,2}Yassin M. Al-Sodany, ²Salih, A. Bazaid and ³Hosny A. Mosallam

¹Department of Botany, Faculty of Science, Kafr El-Sheikh University, Kafr El-Sheikh, Egypt

²Department of Biology, Faculty of Science, Taif University, KSA

³Department of Botany, Faculty of Science, Ain Shams University

Abstract: Today many medicinal plants face extinction or severe genetic loss, yet detailed information on these plants is lacking with just a fraction of this information being recorded in a systematic manner with more emphasis placed on the potential for discovering new wonder drugs. The ultimate aim of this study is assessing the list of medicinal plants in the study area. This may be useful in developing strategies for sustainable use of one of the threatened natural resources in Saudi Arabia. About 261 species were recorded, belonging to 55 families and 178 genera. The most dominate families were Asteraceae, Poaceae, Fabaceae, Lamiaceae, Chenopodiaceae, Boraginaceae, Brassicaceae, Asclepiadaceae and Zygophyllaceae. About 97% of the total recorded species have at least one aspect of potential or actual economic uses i.e., 165 species are having medicinal value. This means that this region has a large number of medicinal plants which needs to be discovered and surveyed.

Key words: Folk medicine • Grazing • Life form • Economic uses • Vegetation

INTRODUCTION

Plants not only provide man with food and fiber, but also cured him from several fatal diseases. Medication by herbs was the sole way against a lot of diseases. The early medicines of Pharaohs (3,000 B.C.), the Greek (400 B.C.; Hippocratis), the Roman (37 B.C.; Dioscorides) and those of Middle Ages exemplified by the Arab Physicians (Rhazes 865-925; Avicenna 980-1037) relied mainly on plants for therapy. In recent days attention is re-directed towards the drug plants for having less side-effect troubles. The preliminary results of a study on behalf of WHO has shown that the number of individuals using medicinal plants is large and on the increase, even among young people. It is not just in developing countries that medicinal plants are important. In USA, for example, 25% of all prescriptions from community pharmacies between 1959 and 1980 contained materials from higher plants [1]. The great surge of public interest in the use of plants as medicines has been based on the assumption that the plants will be available on a continual basis. However, no concerted efforts has been made to

insure this, in the face of the threats posed by increasing demand, a vastly increasing human population and extensive destruction of plant-rich habitats such as tropical forests, wetlands, Sahara-Arabian ecosystems and parts of the arid zone.

Today many medicinal plants face extinction or severe genetic loss, but detailed information is lacking. No conservation action has been taken for most of the endangered medicinal plant species. For most countries, there is not even a complete inventory of medicinal plants. Much of the knowledge on their use is held by traditional societies, whose very extinction is now under threat. Little of this information has been recorded in a systematic manner and too much emphasis has been put on the potential for discovering new wonder drugs and too little on the problems involved in the use of traditional medicines by local populations [2].

The disappearance of the medicinal plants from their natural habitats has an unseen consequence. Those traditional doctors; or herbalists usually have a long and inherited experience. The erosion of such important genetic resources and their deterioration are

accompanied with the disappearance of knowledge and traditional experience and consequently, a loss of valuable intellectual property rights. It has to be mentioned that while the activities of few research projects have been implemented in areas in the Kingdom. Little work has been done in Taif region. Consequently only little data is available about the medicinal plants and their status as natural resources for potential use by the local inhabitants of this region.

Agriculture has been the prime economic income of the Taif region. Even during pre-islamic times, farmers followed the advanced as well as traditional irrigation methods by diverting downward flowing rainwater to agriculture terraces or bringing rain water drawn from dams to irrigate parched wadis. Historically the tribes of Taif grew wheat and barley and fruits such as lime, apricot, orange, olive, fig, peaches, pomegranate, watermelons, grapes, almonds and dates. However, the natural vegetation of Taif region had to play a heavy price for agricultural development. Over the years, vast areas of virgin lands have turned into agriculture lands, which resulted in the disappearance of many wild species including medicinal plants. The following points summarize the major threats to plant diversity and medicinal plants in Saudi Arabia:

Overgrazing and/or Poor Management of Rangeland

Resources: Deterioration of rangelands, primarily due to over use. This has dramatically increased unpalatable species and the virtual disappearance of palatable species and increased desertification over vast areas. Most rangelands in the Kingdom are degraded and have impoverished species diversity. In most cases, the use of trees and shrubs as fuel wood is not for subsistence but rather for recreational camping use.

Agriculture: Many changes in agricultural practices and expansion of areas cultivated have been done in the last ten years, especially in the south-western region such as abandonment, dereliction due to neglect and enlarging of farm areas lead to loss of terraces. This in turn leads to loss of micro-habitats for plants and concomitantly, animals as well as increasing soil erosion and flash floods. However, changes in practices and use of “imported” varieties may results in loss of landraces of crops and hence loss of agro-biodiversity. This results in erosion of the genetic material in the country and the loss of a national resource. The reasons for agricultural threats are

absence of protected areas where natural stands of wild progenitors of domestic plants can survive; loss of traditional knowledge because of changes in practices; adoption of unsuitable agricultural practices, especially the excessive use of water, which results in increase of surface soil salinity with concomitant changes in plant species composition; and migration of people from rural areas to cities.

Recreational Activities: Off-road driving and excessive, unsustainable or poorly regulated recreational use of natural areas causes direct damage and general degradation to ecosystems in already harsh environments.

Population Growth and Expansion of Urban Areas: Urban development (especially rapid and extensive development in the sensitive and species-rich areas in the south-western mountains) and road building damage or reduce habitats as well as causing changes in ecosystem functioning.

Exotic Plants: They pose threats in isolated areas and habitats in Saudi Arabia, largely because of severity of the climate. However, in some ecosystems (notably aquatic systems), exotic species pose an added dimension of threat to a flora that is already under stress.

The present study was therefore mainly aims at collecting information on the medicinal plants in Sarrwat Mountains at Taif based on field observations, information collected from local inhabitants and literature review; surveying of the wild plants in general and medicinal plants precisely as distributed in Sarrwat Mountains at Taif; and developing strategies for sustainable use of one of the threatened natural resources in Saudi Arabia.

Study Area: Taif region is situated in the central foothills of the western mountains at an altitude of approximately 2500 m above sea level (21°16'N - 40°25'E) (Fig. 1). It is an important place for the people due to its scenic views and fertile valleys which support the growth of a number of fruits and vegetables. The geological units that outcrop in the Taif area from the oldest to youngest are: Precambrian rocks, Tertiary sediments, Tertiary to Quaternary basalt, flows and Quaternary deposits.

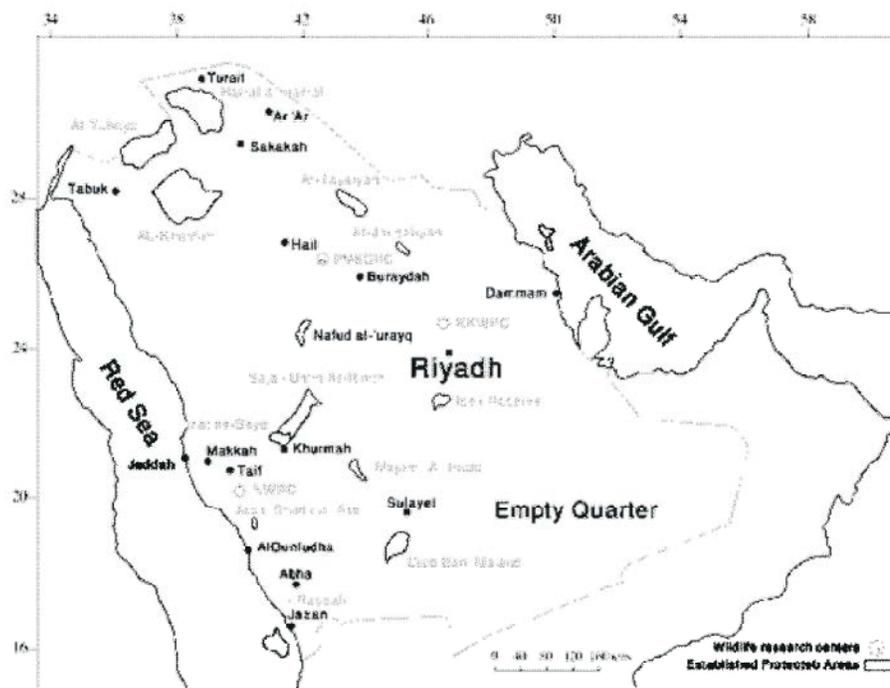


Fig. 1: Map showing the protected areas of Saudi Arabia including Taif region.

Table 1: Monthly variation in air temperature (°C), relative humidity (%), weed speed (km hr⁻¹) and rainfall (mm month⁻¹) as recorded at Taif meteorological station located in the study area. The data are long term averages (Climatological Normals for KSA, 1997 - 2007). The F-value for each variable are calculated (ANOVA), ***:P=0.001.

| Month | Temperature (°C) | | | RH (%) | WS (km hr ⁻¹) | RF (mm mo ⁻¹) |
|------------|------------------|----------|----------|-----------|---------------------------|---------------------------|
| | Max. | Min. | Mean | | | |
| Jan. | 22.9±1.1 | 7.9±1.2 | 15.4±1.0 | 58.7±5.6 | 5.5±0.5 | 12.1±12.0 |
| Feb. | 25.8±1.3 | 10.1±1.4 | 17.9±1.1 | 52.2±4.7 | 6.7±0.6 | 283.0±392.2 |
| Mar. | 27.5±0.9 | 12.0±1.2 | 19.8±0.7 | 46.5±7.1 | 7.2±0.9 | 22.5±23.7 |
| Apr. | 30.8±1.0 | 15.3±0.9 | 23.0±0.7 | 43.2±4.5 | 6.7±0.6 | 93.5±227.8 |
| May | 34.1±1.2 | 18.4±0.7 | 26.3±1.2 | 33.1±7.4 | 6.2±0.8 | 97.9±227.9 |
| Jun. | 36.3±0.8 | 22.2±0.9 | 29.4±0.6 | 19.6±4.2 | 8.3±0.6 | 141.8±314.4 |
| Jul. | 35.6±1.0 | 23.2±0.9 | 29.1±0.9 | 21.8±4.6 | 10.6±1.2 | 73.7±233.5 |
| Aug. | 36.3±0.5 | 23.4±0.8 | 29.5±0.4 | 27.5±4.4 | 9.7±0.9 | 92.8±229.2 |
| Sep. | 35.3±0.6 | 20.3±0.9 | 28.0±0.4 | 29.6±4.1 | 6.2±0.4 | 294.1±383.8 |
| Oct. | 31.2±0.7 | 15.3±0.6 | 23.5±0.6 | 39.7±7.9 | 5.0±0.4 | 88.0±231.8 |
| Nov. | 27.2±1.0 | 12.0±1.1 | 19.6±0.5 | 55.5±8.4 | 5.1±0.3 | 155.6±308.1 |
| Dec. | 24.4±1.4 | 9.3±1.0 | 16.7±1.1 | 60.0±6.0 | 5.1±0.7 | 4.3±5.7 |
| Total mean | 30.6±4.8 | 15.8±5.5 | 23.2±5.1 | 40.6±14.8 | 6.9±1.9 | 113.3±257.4 |
| F-value | 270.2*** | 348.3*** | 457.5*** | 63.8*** | 73.1*** | 1.5 |

The Precambrian rocks constitute the oldest rock units and consist of a group of sedimentary and volcanic rocks that was subjected to series of deformations [3, 4]. Consolidated and unconsolidated marine classic sediments of the tertiary age crop out along the western

edges. Nebert [3] considered these sediments to include horizontally stratified, vari-colored, alternating clay, sand and gravel. The thickness of these sediments were reported by Liddicoat [4] to reach up to 50 m, these tertiary sediments lies unconformable over the

Precambrian rocks, while they are overlain in many parts by the tertiary to Quaternary basalt flows. According to Karpoff [5], these basaltic flows started in the Pliocene and continued throughout the Quaternary until recent times.

The climate of the study area falls in a transitional zone between the Monsoon and Mediterranean climatic types, which are modified by the Red Sea and the elevated Harrat Rahat. In general Taif climate is a warm desert for most climatic classifications. Ahmed [6] recorded that, the primary classification of the Taif climate according to the basis of Blair [7] is considered as dry climate because the rainfall is less than 10 inch. Also Trewartha and Horn [8] show the same result because the humid is less than 40% for most months. It may be concluded that the Taif climate is dry and in the desert or semi- desert side. Also the middle temperature in Taif decreases the dryness in the angle of rain and evaporation, so it has effects on the vegetation.

The data obtained in Table 1 show the range of climatic conditions of the Taif area for last ten years from 1970 to 2007 [9]. It is clear that January is the coolest month (mean temperature $15.23 \pm 1.17^\circ\text{C}$) and air temperature rises in February and such rise continued till August (mean temperature $28.89 \pm 0.80^\circ\text{C}$). Thereafter, it decreases gradually and attained the lowest value in winter. Relative humidity exhibits considerable seasonal variations. June and July have the lowest humidity value (24.25 ± 6.42 and $26.19 \pm 6.70\%$, respectively); the most humid months are December ($61.53 \pm 5.60\%$) and January ($61.03 \pm 5.31\%$). The wind direction is mainly to the west side and the maximum wind speed recorded in July ($10.61 \pm 1.10 \text{ km h}^{-1}$). October, November and December have the lowest wind speed (5.64 ± 0.87 , 5.56 ± 0.73 and $5.58 \pm 0.94 \text{ km h}^{-1}$, respectively). The total amount of precipitation ranged from $29.09 \pm 128.74 \text{ mm month}^{-1}$ in December to $174.63 \pm 326.96 \text{ mm month}^{-1}$ in February. The number of precipitation days was 47.4 yr^{-1} , while the average number of mist days was 33.1 yr^{-1} and Hazy days about 41.6 yr^{-1} .

MATERIALS AND METHODS

The important sites in the Taif region (Hada, Shafa, Ghadeer El-Banat, El-Rodaf, Seised Wadi and Bani Saad) were visited and surveyed between 2008-2012. In each site, the following data were recorded:

- List of the annual and perennial species,
- First and second dominant species,

- A visual estimate of the total cover (%) and the cover of each species according to Braun-Blanquet scale and
- The physical changes that occurred in each stand (e.g., grazing, overcutting and firing, etc.). Nomenclature was according to [10-18]. The herbarium sheets of the recorded species were kept in the Herbarium of Biology Department, Faculty of Science, Taif University.

The potential and actual economic uses of the wild plants will be assessed on three bases; field observations, information collected from local inhabitants and literature review [19-39].

RESULTS

It is shown that the study area includes 261 plant species: 84 annuals (32.2%) and 174 perennials (66.7%). These species belong to 55 different plant families and 178 genera (Table 2). The most dominant families are: Asteraceae (13.4%; 35 plant species), Poaceae, (11.1%; 29 plant species), Fabaceae (7.7%; 20 plant species), Lamiaceae (5.8%; 15 plant species), Chenopodiaceae (5.4%; 14 plant species), Boraginaceae (4.6%; 12 plant species), Brassicaceae and Asclepiadaceae (4.2%; 11 plant species) and Zygophyllaceae (3.8%; 10 plant species). Twenty one families were represented only by one species; 10 families were represented by two species; and 4 families were represented by three species.

Regarding to life forms, the perennial herbs had the highest contribution of the recorded species (109 spp. = 41.8%), followed by annuals (84 spp. = 32.2%), shrubs (25 spp. = 9.6%), shrublets (22 spp. = 8.4%) and trees (19 spp. = 7.3%) (Fig. 2). On the other hand, the biennials and parasites had the lowest contribution (1 and 2 species, respectively).

Two hundred fifty three species of the recorded plants in this area (96.9% of the total species) have at least one aspect of potential or actual economic uses (Table 2). Fifty nine species have ≥ 4 (out of 5) economic aspects. On the other hand, 165 species (63.2% of total recorded species) are medicinal, 196 species (75.1% of total recorded species) are grazing, 104 species (39.8% of total recorded species) are edible to man, 93 species (35.6% of total recorded species) used as fuel and 57 species (21.8% of total recorded species) used for other economic purposes (Fig. 3). The economic uses of the recorded species could be arranged in descending order as follows grazing \rightarrow medicinal \rightarrow human food \rightarrow fuel \rightarrow other uses.

Table 2: Botanical survey of the plant species recorded in Taif region.

| Species | Family | Arabic name | Life form | Economic uses | | | | |
|---|----------------|---------------------------------|--------------|---------------|---|---|---|---|
| | | | | M | G | E | F | O |
| <i>Abutilon bidentatum</i> A.Rich. | Malvaceae | رن | Shrub | | | + | + | |
| <i>Abutilon fruticosum</i> Guill.& Perr. | Malvaceae | رن | Shrub | | + | | + | |
| <i>Acacia asak</i> (Forssk.) Willd | Fabaceae | سلم / طلح | Tree | + | + | | | |
| <i>Acacia ehrenbergiana</i> Hayne | Fabaceae | سلم | Tree | + | + | | + | |
| <i>Acacia gerrardii</i> Rech f. | Fabaceae | طلح | Tree | + | + | | | |
| <i>Acacia tortilis</i> (Forssk.) Hayne | Fabaceae | سمر / شوك الجمل | Tree | + | + | | + | |
| <i>Acacia tortilis</i> ssp. <i>raddiana</i> (Savi.) Brenan | Fabaceae | سيال / سمر / طلح | Tree | + | + | | + | |
| <i>Achillia fragrantissima</i> (Forssk.) Sch. Bip. | Asteraceae | قصبون جنات - قصبون جملان | Shrub | + | + | | + | |
| <i>Achyranthes aspera</i> L. | Amaranthaceae | مخوات | Per. | + | | + | | |
| <i>Aerva javanica</i> (Bunn.f.) Juss.ex Schult | Amaranthaceae | طرف باروا | Per. | + | | | + | |
| <i>Aerva lanata</i> (L.) Juss.ex Schult | Amaranthaceae | طرف | Per. | + | | | + | |
| <i>Aizoon canariense</i> L. | Aizoaceae | حديق - عذاء - كشاط الهلاد - عاع | Per. | | + | | | |
| <i>Ajuga arabica</i> P. Davis | Lamiaceae | شندفورة - جعدة | Per. | + | + | | | |
| <i>Allium alibile</i> A. Rich. | Liliaceae | | Per. | + | + | + | | |
| <i>Aloe pseudorubroviolacea</i> J.J.Lavranos & I.S.Collenette | Aloaceae | | Per. | + | | | | |
| <i>Amaranthus graecizans</i> L. | Amaranthaceae | عرف الديك | Annual | | + | | + | + |
| <i>Amaranthus retroflexus</i> | Amaranthaceae | | Annual | + | + | + | + | |
| <i>Amaranthus viridis</i> L. | Amaranthaceae | سائقين | Annual | + | + | + | + | |
| <i>Anethum graveolens</i> L. | Apiaceae | مناب البر - الشيت منب بري - حرة | Annual | + | + | + | | |
| <i>Anvillea gracini</i> (Burm.f) DC. | Asteraceae | عين الثور العربي - نقد | Shrublet | + | | | | |
| <i>Argemone mexicana</i> L. | Papaveraceae | أرجيمون | Annual | + | + | + | + | |
| <i>Argemone ochroleuca</i> Sweet. | Papaveraceae | | Annual | + | + | + | + | |
| <i>Arnebia hispidissima</i> (Lehm.) DC. | Boraginaceae | قنون - عذرة - حمصط | Annual | + | + | | + | |
| <i>Asclepias fruticosus</i> | Asclepiadaceae | | | + | + | | | |
| <i>Asclepias sinaicus</i> (Boiss.) Muschl. | Asclepiadaceae | عقلة الذهب - دغول | Per. | | + | | + | |
| <i>Asparagus africanus</i> Lam. | Liliaceae | اسبرجس افريقي | Shrub | + | + | | + | |
| <i>Asparagus falcatus</i> L. | Liliaceae | | Shrub | + | + | | + | |
| <i>Asphodelus fistulosus</i> L. | Liliaceae | بصيل - عيصان | Ann. or Per. | + | + | + | | |
| <i>Asphodelus tenuifolium</i> | Liliaceae | | Per. | + | + | + | | + |
| <i>Astragalus abyssinicus</i> Steud. | Fabaceae | سيف | Annual | + | + | | | |
| <i>Astragalus eremophilus</i> Boiss. | Fabaceae | | Annual | + | + | | | |
| <i>Astragalus spinosus</i> (Forssk.) Muschl. | Fabaceae | قتاد كراد - كتاد | Shrublet | + | + | | + | |
| <i>Atractylis carduus</i> (Forssk.) C.Chr. | Asteraceae | جلوة بيبية - خرشف - شوك جمل | Shrublet | + | + | | | |
| <i>Atriplex glauca</i> | Chenopodiaceae | | Per. | + | + | | + | |
| <i>Atriplex halimus</i> L. | Chenopodiaceae | | Shrub | + | + | | + | |
| <i>Atriplex leucoclada</i> Boiss. | Chenopodiaceae | | Per. | + | + | | + | |
| <i>Avena barbata</i> Link. | Poaceae | شوفان | Annual | | + | + | | + |
| <i>Azadirachta indica</i> | Meliaceae | | Tree | | | | | |
| <i>Bassia muricata</i> (L.) Asch. | Chenopodiaceae | ذئبان - عوتم - خرميدان | Annual | + | + | | + | |
| <i>Blepharis ciliaris</i> (L.) Burt | Acanthaceae | أفيع - شوك المنب | Per. | + | + | | | |
| <i>Brassica rapa</i> L. | Brassicaceae | | Annual | + | + | + | | + |
| <i>Brassica tournifortii</i> Gouan. | Brassicaceae | فراص - جزيرة | Annual | + | + | + | | |
| <i>Calotropis procera</i> (Ait.) Aitfil. | Asclepiadaceae | عشور - عشور | Tree | + | + | | + | |
| <i>Capparis decidua</i> (Forssk.) Edgew. | Capparaceae | شطح - مساقط الاوراق | Shrub | + | | | | |
| <i>Capparis sinaica</i> Veill. | Capparaceae | شطح - نصف - مالت - مالت | Shrub | | + | + | | |
| <i>Capparis spinosa</i> L. | Capparaceae | شطح - نصف - مالت - قير | Per. | + | + | + | + | + |
| <i>Caralluma edulis</i> (Edgew) Booth. | Asclepiadaceae | | Per. | + | + | + | | |
| <i>Carduus pycnocephalus</i> L. | Asteraceae | نسان | Annual | + | | | | |
| <i>Caylusea hexagyna</i> (Forssk.) Green | Resedaceae | ذئبية | Annual | + | + | + | | |
| <i>Cenchrus ciliaris</i> L. | Poaceae | سيال - حنيط - حرز | Per. | | + | + | | |
| <i>Centaurea pseudosinaica</i> Czerep. | Asteraceae | بركمان - حرار | Annual | + | | | | |
| <i>Centaurea sinaica</i> DC. | Asteraceae | بركمان - حرار | Per. | + | + | | | |
| <i>Centaurea solstitialis</i> L. | Asteraceae | مرار - حرمان | Annual | + | | + | | |
| <i>Centropodia fragilis</i> | Poaceae | حنطفا - حصاد | Per. | | + | | | |
| <i>Chenopodium album</i> L. | Chenopodiaceae | الطيرة | Annual | + | + | + | + | |
| <i>Chenopodium murale</i> L. | Chenopodiaceae | خبيثة | Annual | + | + | + | + | |
| <i>Chenopodium opulifolium</i> Schrad.ex Koch&Ziz | Chenopodiaceae | | Annual | | + | + | + | |
| <i>Chenopodium vulvaria</i> L. | Chenopodiaceae | | Annual | + | + | | | |
| <i>Chloris gayana</i> Kunth. | Poaceae | | Per. | | + | | | |
| <i>Cirsium vulgare</i> L. | Asteraceae | شبرم - خشرف | Biennial | + | + | + | + | |
| <i>Cistanche phelypaea</i> (L.) Cout. | Orobanchaceae | ذائب | Per. | + | | | | |
| <i>Citrullus colocynthis</i> (L.) Schard. | Cucurbitaceae | حنطل - حنطل بري | Per. | + | + | | | |
| <i>Cleome amblyocarpa</i> Barranté & Murb. | Capparaceae | حنطلة - عقيمة | Annual | + | | | + | |

Table 2: Continued

| Species | Family | Arabic name | Life form | Economic uses | | | | |
|---|-----------------|--------------------------------------|-----------|---------------|---|---|---|---|
| | | | | M | G | E | F | O |
| <i>Colchicum schimperi</i> Lanka ex Stefanov | Colchicaceae | | Per. | + | + | + | | |
| <i>Commicarpus sinuatus</i> Meikle | Nyctaginaceae | | Per. | - | | | | |
| <i>Convolvulus arvensis</i> L. | Convolvulaceae | عليق حديد نخ - عمالية | Per. | + | + | | + | |
| <i>Convolvulus asyrensis</i> Kotschy | Convolvulaceae | | Per. | + | + | | | |
| <i>Conyza bonariensis</i> (L.) Conquist | Asteraceae | | Per. | + | + | | | |
| <i>Cornulaca monacantha</i> Delile | Chenopodiaceae | | Shrublet | | | | | + |
| <i>Crataegus sinaica</i> Boiss. | Rosaceae | | Tree | + | + | | | + |
| <i>Crotalaria emarginella</i> Vatk. | Fabaceae | | Per. | + | + | + | | |
| <i>Crotalaria persica</i> (Burm.f.) Merr. | Fabaceae | | Per. | + | + | | | + |
| <i>Cryptollum edulis</i> (Edg.) Plowes. | Asclepiadaceae | | Per. | - | - | - | - | - |
| <i>Cynodon dactylon</i> (L.) Pers. | Poaceae | إبل خيل | Per. | + | + | | | + |
| <i>Cyperus rotundus</i> L. | Cyperaceae | | Per. | + | + | + | | + |
| <i>Cyperus rubicundus</i> Vahl. | Cyperaceae | | Per. | + | + | | | + |
| <i>Dactyloctenium scindicum</i> Boiss. | Poaceae | | Annual | | + | | | |
| <i>Datura innoxia</i> Mill. | Solanaceae | طامورة - داتورة | Per. | + | | + | + | |
| <i>Datura stramonium</i> L. | Solanaceae | داتورة - داتورة - بنج - بنج - طامورة | Per. | + | | | + | + |
| <i>Dianthus strictus</i> Banks & Sol. | Caryophyllaceae | قرنفل | Per. | + | | | + | + |
| <i>Digitaria ciliaris</i> (Retz.) Koel. | Poaceae | | Annual | | + | | | + |
| <i>Digitaria violescens</i> | Poaceae | | Annual | | + | | | |
| <i>Dipcadi viride</i> (L.) Moench | Hyacinthaceae | | Per. | + | | | | |
| <i>Ecbolium gymnostachyum</i> (Nees) Milne redh | Acanthaceae | | Per. | - | - | - | - | - |
| <i>Echinochloa colonum</i> (L.) Link | Poaceae | | Annual | | + | + | | |
| <i>Echinops spinosissimus</i> Tuna. | Asteraceae | كمر شديق الجبل - لصيق | Per. | + | + | + | + | |
| <i>Echinops spinosus</i> L. | Asteraceae | كمر | Per. | + | + | + | + | |
| <i>Echium brabicum</i> | Boraginaceae | | Per. | + | + | + | + | |
| <i>Echium vulgare</i> L. | Boraginaceae | | Per. | + | + | + | | + |
| <i>Ehretia obtusifolia</i> Hochst. ex DC. | Boraginaceae | | Shrub | + | + | + | + | + |
| <i>Emex spinosa</i> (L.) Campd. | Polygonaceae | حمير حمير ان - | Annual | + | + | + | | |
| <i>Ephedra foliata</i> Boiss. ex c.A. Mey | Ephedraceae | صلف | Shrub | + | + | + | + | |
| <i>Eragrostis minor</i> host. | Poaceae | | Annual | | + | + | | |
| <i>Eragrostis papposa</i> (Roem & Schult.) Steudel | Poaceae | | Annual | | + | | + | |
| <i>Eremobium aegyptiacum</i> (Spreng.) Asch.& Schweinf. ex Boiss. | Brassicaceae | اربية | Annual | | + | | | |
| <i>Erodium laciniatum</i> (Cav.) Willd. | Geraniaceae | قرنوة منشقة | Annual | | + | | | |
| <i>Erodium neuradifolium</i> Del. | Geraniaceae | | Annual | | + | | | + |
| <i>Eruca sativa</i> Mill. | Brassicaceae | جر جبر | Annual | + | + | + | | + |
| <i>Euphorbia glomerifera</i> | Euphorbiaceae | | Per. | + | | | | |
| <i>Euphorbia cuneata</i> Vahl. | Euphorbiaceae | ابولين | Tree | + | | | | + |
| <i>Euphorbia granulata</i> Forssk. | Euphorbiaceae | ملبنة - حطبية - ابولين - ملبان | Annual | + | | | | |
| <i>Euphorbia peplus</i> L. | Euphorbiaceae | خنيز | Annual | + | | | | |
| <i>Euryops arabicus</i> Steud. | Asteraceae | قايور - طباق - بير | Shrublet | + | + | | | |
| <i>Fagonia boveana</i> (Hadidi) Hadidi & Graf. | Zygophyllaceae | شكاعة | Per. | - | - | - | - | - |
| <i>Fagonia bruguieri</i> DC. | Zygophyllaceae | شكاعة شويكة - جذبية - شطاعة | Per. | + | | | | + |
| <i>Fagonia iudica</i> Bunn. | Zygophyllaceae | شكاعة | Per. | + | | | | + |
| <i>Fagonia schweinforthii</i> Hadidi | Zygophyllaceae | | Per. | + | | | | |
| <i>Faresetia longisiliqua</i> Decne. | Brassicaceae | | Per. | | + | | | |
| <i>Faresetia ramosissima</i> Hochst. ex Boiss. | Brassicaceae | | Per. | | + | | | |
| <i>Faresetia stylosa</i> R. Br. | Brassicaceae | جرية - حمصا | Annual | | + | | | |
| <i>Felicia abyssinica</i> A.Rich. | Asteraceae | | Per. | - | - | - | - | - |
| <i>Felicia dentata</i> (A.Rich) Dandy | Asteraceae | | Per. | - | - | - | - | - |
| <i>Ficus cairica</i> L. | Moraceae | تين | Tree | + | + | + | + | + |
| <i>Ficus cordata</i> Thunb ssp. <i>salicifolia</i> (Vaw.) Berg | Moraceae | | Tree | + | + | + | + | + |
| <i>Ficus palmata</i> Forssk. | Moraceae | حمص | Tree | + | + | + | + | + |
| <i>Filago desertorum</i> Pomel | Asteraceae | | Annual | | + | | | |
| <i>Flaveria trinervia</i> (Spreng.) Mohr. | Asteraceae | | Annual | + | | | | |
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | شمر - شمر - شمر - شومر - شومر | Per. | + | + | + | | + |
| <i>Forsskaolea tenacissima</i> L. | Urticaceae | لصيق - لصيق | Annual | + | + | | | |
| <i>Geranium arabicum</i> Forssk. | Geraniaceae | | Annual | + | + | + | | + |
| <i>Gisekia pharnaceoides</i> L. | Molluginaceae | | Annual | | + | + | | |
| <i>Glossonema boveanum</i> (Decne.) Decne. | Asclepiadaceae | نوز النبي | Per. | + | | | | |
| <i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss. | Chenopodiaceae | رمت | Shrublet | | + | | | + |
| <i>Helichrysum glumaceum</i> DC. | Asteraceae | | Shrublet | + | | | | |
| <i>Heliotropium arbainense</i> Fresen | Boraginaceae | اربية - قراق | Per | + | | | | + |

Table 2: Continued

| Species | Family | Arabic name | Life form | Economic uses | | | | |
|--|------------------|----------------------------|-----------|---------------|---|---|---|---|
| | | | | M | G | E | F | O |
| <i>Heliotropium curossavicum</i> L. | Boraginaceae | | Per. | + | | | | |
| <i>Heliotropium digynum</i> (Forssk.) C.Chr. | Boraginaceae | حمة - حمة | Shrub | + | | | + | |
| <i>Heliotropium europaeum</i> L. | Boraginaceae | | Per. | + | | | + | |
| <i>Heliotropium lasiocarpum</i> Fisch. & C.A. Mey | Boraginaceae | | Per. | + | | | + | |
| <i>Heliotropium longiflorum</i> Hochst. & Steud. | Boraginaceae | | Per. | + | | | + | |
| <i>Heliotropium ramosissimum</i> DC. | Boraginaceae | زريقاء- رمرام- رمرام- زريع | Shrublet | + | | | + | |
| <i>Hippocrepis ciliata</i> Willd | Fabaceae | ام القرين | Annual | | + | | | |
| <i>Hippocrepis unisiliquosa</i> L. | Fabaceae | | Annual | + | + | | | |
| <i>Hordeum murinum</i> ssp. <i>glaucum</i> | Poaceae | | Annual | + | + | + | | |
| <i>Hyparrhenia hirta</i> (L.) Stapf. | Poaceae | | Per. | | + | | | + |
| <i>Hypoestes forsskalii</i> (Vahl) Roem. & Schult. | Acanthaceae | | Per. | + | + | | | + |
| <i>Ifloga spicata</i> (Forssk.) Sch. Bip. | Asteraceae | شجرة السعرة ذيل القط | Annual | | + | | | |
| <i>Imperata cylindrica</i> (L.) Rausch. | Poaceae | حلفا بر | Per. | + | + | | | |
| <i>Indigofera spinosa</i> Forssk. | Fabaceae | هيجاي قطف سنجد شبرق | Shrublet | + | + | | | + |
| <i>Juncus punctorius</i> L.f. | Juncaceae | | Per. | | + | | | |
| <i>Juniperus phoenicea</i> L. | Cupressaceae | عرعر | Tree | + | | | | + |
| <i>Juniperus procera</i> Hochst. ex Endl. | Cupressaceae | عرعر | Tree | + | | | | + |
| <i>Kichxia pseudoscoparia</i> D. Sutton. | Scrophulariaceae | | Per. | + | + | | | |
| <i>Launaea capitata</i> (Spring.) Dandy | Asteraceae | | Annual | | + | | | |
| <i>Launaea massauensis</i> (Fresen.) Sch.-Bip. ex Kuntze | Asteraceae | | Annual | | + | | | |
| <i>Launaea nudicaulis</i> (L.) Hook.f. | Asteraceae | حواء فتم صفارة | Per. | | + | | | |
| <i>Launaea sconchoides</i> (Jaub. & Spach) Kuntze | Asteraceae | | Annual | | + | | | |
| <i>Lavandula dentata</i> L. | Lamiaceae | ثنت حجات حجات | Per. | + | + | | | + |
| <i>Lavandula pubescens</i> Decne. | Lamiaceae | | Per. | + | + | | | + |
| <i>Leptadenia pyrotechnica</i> (Forssk.) Decne. | Asclepiadaceae | | Per. | + | + | | | |
| <i>Leucas neuflyzeana</i> Courbai | Lamiaceae | | Per. | + | + | | | |
| <i>Lolium multiflorum</i> Lam. | Poaceae | | Annual | | + | | | |
| <i>Lotononis platycarpa</i> (Viv.) Pic.-Serm. | Poaceae | | Per. | | + | | | |
| <i>Lotononis platycarpa</i> (Viv.) Pic. Serm. | Fabaceae | زرسة | Annual | | + | | | |
| <i>Lotus</i> sp. | Fabaceae | لوتس | Annual | | + | | | |
| <i>Lycium shawii</i> Roem. & Schult | Solanaceae | عوسج-عوش شوك الصحراء | Shrub | + | + | + | + | |
| <i>Maerua crassifolia</i> Forssk. | Capparaceae | مرح سرح | Shrub | + | + | + | + | + |
| <i>Malva parviflora</i> L. | Malvaceae | خبيزة | Annual | + | + | + | | + |
| <i>Malva verticillata</i> L. | Malvaceae | | Annual | + | + | + | | |
| <i>Marubium vulgare</i> L. | Lamiaceae | زقوم | Per. | + | + | + | + | + |
| <i>Melilotus albus</i> Medik | Fabaceae | | Annual | + | + | + | | + |
| <i>Mentha longifolia</i> (L.) Huds. | Lamiaceae | حبق نعناع بري | Per. | + | | + | | |
| <i>Mentha microphylla</i> C.Koch | Lamiaceae | حبق نعناع بري | Per. | + | | + | | |
| <i>Micromeria abyssinica</i> (Hochst.) Benth | Lamiaceae | | Per. | + | + | + | + | |
| <i>Micromeria biflora</i> Benth. | Lamiaceae | | Per. | + | + | + | + | |
| <i>Mollugo cerviana</i> (L.) Ser. | Molluginaceae | | Annual | + | + | + | + | |
| <i>Molkiopsis ciliate</i> (Forssk.) I.M. Johnst | Boraginaceae | | Per. | + | + | | + | |
| <i>Monolluma quadrangular</i> (Forssk.) Plowes | Asclepiadaceae | | Per. | + | | | | |
| <i>Monsonia nivea</i> (Decne.)Webb | Geraniaceae | خزام بيوق دهمة | Annual | | + | | | |
| <i>Morettia canescens</i> Boiss. | Brassicaceae | | Per. | | + | | | |
| <i>Moytenus parviflorus</i> (Vahl.) Sebsebe | Celestraceae | | Shrub | | | | + | |
| <i>Nerium oleander</i> L. | Apocynaceae | الذلة | Shrub | + | | | | |
| <i>Neurada procumbens</i> L. | Neuradaceae | سعدان | Annual | + | | | + | |
| <i>Nicotiana glauca</i> R. graham | Solanaceae | | Shrub | + | | | + | + |
| <i>Notoceras bicom</i> (Ait.) Amo. | Brassicaceae | هثارا | Per. | - | - | - | - | - |
| <i>Ochradenus baccatus</i> Del. | Resedaceae | قرضى جرتى-خلندرة كورد | Shrub | + | + | + | + | |
| <i>Ochradinus arabicus</i> Chaud., Hill. & A.G. Mill. | Resedaceae | | Shrub | + | + | + | + | |
| <i>Ocimum basilicum</i> L. | Lamiaceae | زعتر هندي-ريحان | Shrub | + | + | + | | + |
| <i>Olea europaea</i> L. ssp. <i>africana</i> (P. Mill.) P. Green | Oleaceae | زيتون بري | Tree | + | + | + | + | + |
| <i>Opuntia ficus indica</i> (L.) Miller | Cactaceae | تين شوكى - برشومى | Shrub | + | | + | | + |
| <i>Orobanche cernua</i> Loeffl | Orobanchaceae | | parasite | | | + | | |
| <i>Osteospermum vaillantii</i> (Decne.) Nor!. | Asteraceae | هشمة | Per. | + | + | | | + |
| <i>Otostegia fruticosa</i> Forssk. | Lamiaceae | شرم شكيب | Shrub | + | | | | + |
| <i>Oxalis corniculata</i> L. | Oxalidaceae | | Annual | + | + | + | | + |
| <i>Pancreatium maximum</i> Forssk. | Amaryllidaceae | | Per. | + | + | + | | + |
| <i>Pancreatium sickenbergeri</i> Asch. & schweinf. ex Boiss. | Amaryllidaceae | | Per. | + | + | + | | |
| <i>Panicum repens</i> L. | Poaceae | | Per. | + | + | + | + | |
| <i>Panicum turgidum</i> Forssk. | Poaceae | ثمام | Annual | + | + | + | + | |

Table 2: Continued

| Species | Family | Arabic name | Life form | Economic uses | | | | |
|--|-----------------|---------------------------------|-----------|---------------|---|---|---|---|
| | | | | M | G | E | F | O |
| <i>Parietaria alsinifolia</i> Del. | Urticaceae | شرح | Annual | + | + | + | | + |
| <i>Paronychia arabica</i> (L.) DC. | Caryophyllaceae | بصايط العريض شندق الجمل | Per. | + | + | + | | |
| <i>Paronychia chlorothyrsa</i> Murb. | Caryophyllaceae | | Per. | | + | | | |
| <i>Paronychia sinaica</i> Fresen. | Caryophyllaceae | | Per. | + | + | + | | |
| <i>Peganum harmala</i> L. | Zygophyllaceae | حرم مل حرم ملان حنيزة | Per. | + | + | + | + | + |
| <i>Pennisetum setaceum</i> (Forssk.) Chiov. | Poaceae | | Per. | | + | + | | + |
| <i>Pennisetum villosum</i> R. Br. ex Fresen. | Poaceae | | Per. | | + | + | | |
| <i>Pergularia tomentosa</i> L. | Asclepiadaceae | غلقة عيرم بلين الحمارة-عتمة | Shrublet | + | + | | | + |
| <i>Periploca aphylla</i> Decne | Asclepiadaceae | سواس | Shrub | + | + | + | + | |
| <i>Pistiaca atlantica</i> | Anacardiaceae | فلقل ممستكة | Tree | + | | + | + | + |
| <i>Plantago ciliata</i> Desf. | Plantaginaceae | قربطة قرينة | Annual | + | + | + | | |
| <i>Plicosepalus curviflorus</i> (Benth. ex Oliv.) Tiegh. | Loranthaceae | | Parasite | + | | | | |
| <i>Polgonum aviculare</i> | Polygonaceae | ايوزلف-قرضلب | Per. | + | | | | |
| <i>Polycarpha repens</i> (Forssk.) Asch. & Schweinf. | Caryophyllaceae | رقيقة - مكر | Per. | | + | | | |
| <i>Polygala abyssinica</i> R.Br. ex Fresen | Polygalaceae | سواسي حسمل | Per. | + | | | | |
| <i>Polygogon monspeliensis</i> (L.) Desf. | Poaceae | ذيل القطشعر الفلر | Annual | + | + | + | | |
| <i>Portulaca oleracea</i> L. | Portulacaceae | رجلة بقلعة | Annual | + | + | + | | |
| <i>Psidium punctulata</i> DC. | Asteraceae | | Shrublet | + | | | | |
| <i>Pulicaria crispa</i> (Forssk.) Oliv. | Asteraceae | جتجلت | Shrublet | + | + | + | + | |
| <i>Pulicaria undulata</i> (Forssk.) Oliver. | Asteraceae | | Shrublet | + | + | + | + | |
| <i>Rhamnus lycioides</i> L. | Rhamnaceae | | Shrublet | + | + | + | | |
| <i>Ricinus communis</i> L. | Euphorbiaceae | خروع | Shrub | + | | + | + | + |
| <i>Rumex vesicarius</i> L. | Polygonaceae | حميض حامض-حميضاء | Annual | + | + | + | | + |
| <i>Salsola imbricata</i> Forssk. | Chenopodiaceae | خریطهرم | Shrublet | | + | | + | |
| <i>Salsola kali</i> L. | Chenopodiaceae | | Annual | + | + | + | + | + |
| <i>Salsola spinescens</i> Moq. | Chenopodiaceae | سلسولا | Shrublet | | + | | + | |
| <i>Salvia aegyptiaca</i> L. | Lamiaceae | عشبة رعة شجرة الغزال | Per. | + | + | | | + |
| <i>Salvia deserti</i> Decne | Lamiaceae | | Shrublet | + | + | | | |
| <i>Salvia multicaulis</i> | Lamiaceae | | Shrublet | + | + | + | + | |
| <i>Sarcostemma forskolianum</i> | Asclepiadaceae | | Per. | + | | | | |
| <i>Schismus arabicus</i> Nees. | Poaceae | | Annual | | + | | | |
| <i>Scorzonera schweinfurthii</i> Boiss. | Asteraceae | مشع | Per. | + | + | + | | |
| <i>Scorzonera tortuosissima</i> Boiss. | Asteraceae | تلوق (ذلوق) الجمل | Per. | + | + | + | | |
| <i>Seetzenia lanata</i> (Wild.) Bullock | Zygophyllaceae | | Per. | | + | + | | |
| <i>Senecio sumarae</i> Defl. | Asteraceae | | Annual | + | + | | | |
| <i>Senecio vulgaris</i> L. | Asteraceae | | Annual | + | + | | | |
| <i>Senna italica</i> Mill. | Fabaceae | عشرق | Per. | + | + | | | + |
| <i>Setaria viridis</i> (L.) P. Beauv. | Poaceae | | Annual | + | + | + | | |
| <i>Sisymbrium erysimoides</i> Desf. | Brassicaceae | | Annual | + | + | | | |
| <i>Sisymbrium irio</i> L. | Brassicaceae | ثلثيت | Annual | + | + | + | | |
| <i>Solanum forsskalii</i> Kotschy ex Dunal. | Solanaceae | نشبة | Shrublet | + | + | | | + |
| <i>Solanum incanum</i> L. | Solanaceae | حنق-عصرصم-عيون البقر شوكه الخرب | Shrublet | + | + | | | + |
| <i>Solanum schimperianum</i> Hochst ex A. Rich | Solanaceae | | Shrublet | + | + | | | + |
| <i>Solanum villosum</i> (L.) Lam | Solanaceae | | Per. | + | | | | |
| <i>Sonchus asper</i> (L.) Hill. | Asteraceae | | Annual | + | + | + | | + |
| <i>Sonchus oleraceus</i> L. | Asteraceae | | Annual | + | + | + | | + |
| <i>Sonchus tenerrimus</i> L. | Asteraceae | | Annual | + | + | + | | + |
| <i>Sorghum bicolor</i> (L.) Moench. | Poaceae | | Per. | + | + | + | | + |
| <i>Spergula fallax</i> (Lowe) Krause | Caryophyllaceae | | Annual | | | | | |
| <i>Spergularia diandra</i> (Guss.) Boiss. | Caryophyllaceae | | Per. | | | | | |
| <i>Sphenopus divaricatus</i> (Gouan) Reich. | Poaceae | | Annual | | + | | | |
| <i>Stipagrostis obtusa</i> (Del.) Nees | Poaceae | | Per. | | + | | | |
| <i>Stipagrostis plumosa</i> (L.) Munro ex T. Anders. | Poaceae | | Per. | | + | | | |
| <i>Tamarix aphylla</i> (L.) Karst. | Tamaricaceae | نصي أثل حطفاء | Tree | + | + | | | + |
| <i>Tephrosia pumila</i> (Lam.) Pers. | Fabaceae | | Annual | | + | | | |
| <i>Tetrapogon villosus</i> Desf. | Poaceae | | Per. | | + | | | |
| <i>Teucrium ploium</i> L. | Lamiaceae | | Shrublet | + | + | + | + | |
| <i>Themeda triandra</i> Forssk. | Poaceae | | Per. | | + | | | |
| <i>Tribulus arabicus</i> H. Hosni ined. | Zygophyllaceae | | Shrub | | + | | | |
| <i>Tribulus macropterus</i> Boiss. | Zygophyllaceae | | Per. | + | + | | | + |
| <i>Tribulus terrestris</i> L. | Zygophyllaceae | حمله- خرشوم النعجة- شرشير خريسة | Annual | + | + | + | | |
| <i>Typha elephantina</i> Roxb. | Typhaceae | حلفا | Per. | + | + | + | + | + |
| <i>Umbilicus horizontalis</i> (Guss.) DC | Crassulaceae | | Per. | + | + | + | | |

Table 2: Continued

| Species | Family | Arabic name | Life form | Economic uses | | | | |
|---|------------------|----------------------------------|-----------|---------------|-----|-----|----|----|
| | | | | M | G | E | F | O |
| <i>Umbilicus rupestris</i> (Salisb) Dandy | Crassulaceae | | Per. | + | + | | | |
| <i>Vaccaria pyramidata</i> Medik. | Caryophyllaceae | قل العرب | Annual | + | + | + | | |
| <i>Verbascum sinaiticum</i> benth. | Scrophulariaceae | ودن الحمر | Per. | + | | | | |
| <i>Verbesina encelioides</i> (Cav.) Booth.& Hookfil ex.A.Gray | Asteraceae | غرغر | Per. | + | + | | + | |
| <i>Vicia monantha</i> Retz. | Fabaceae | | Annual | + | + | + | | |
| <i>Vicia sativa</i> L. | Fabaceae | | Annual | + | + | + | | |
| <i>Withania somnifera</i> (L.) Dunal | Solanaceae | عيب حمير الغراب-سم الفرسخ الفراع | Shrublet | + | + | + | + | + |
| <i>Xanthium strumarium</i> L. | Asteraceae | شبيط | Per. | + | + | + | + | + |
| <i>Ziziphus spina- christi</i> (L.) Desf. | Rhamnaceae | نبيق مسند - صبرى - عرج | Tree | + | + | + | + | + |
| <i>Zygophyllum simplex</i> L. | Zygophyllaceae | حردام - ثؤيب حمضى | Annual | | + | | | |
| 261 | 55 | | | 165 | 196 | 104 | 93 | 57 |

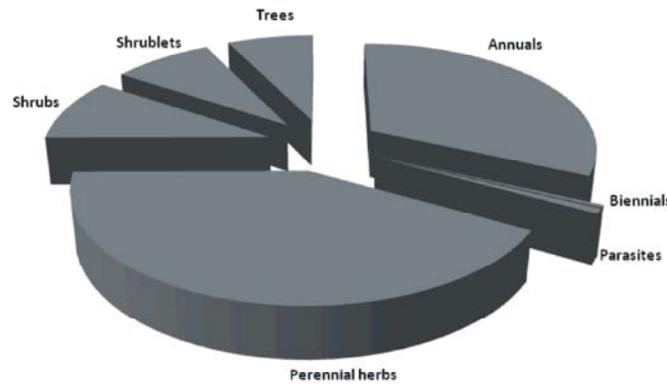


Fig. 2: Life form spectra of the recorded species in Taif region.

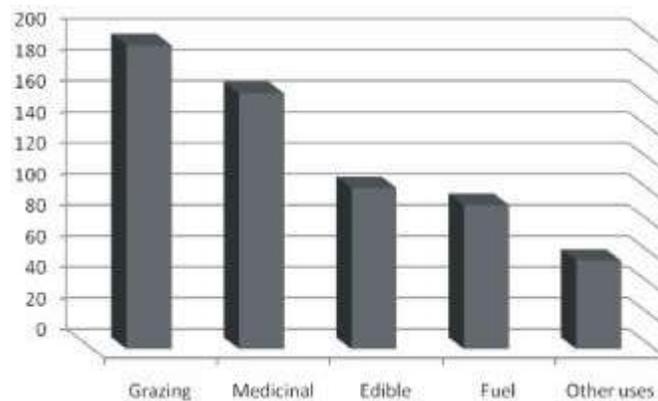


Fig. 3: Descending arrangement of the economic uses of the recorded species in Taif region.

DISCUSSION

One of the main characteristics of the vegetation cover of Saudi Arabia is its low floristic diversity. The number of plant species that were recorded in the country was 2172 species, many of which are in the wetter areas of its south-western part. These species belong to 840 genera and 149 families [40]. The number of species might be increased to 2250 by adding subspecies, extinct and species that have not been identified yet [12]. Numbers of families, genera and species are very low

compared to Saudi Arabia's vast land area, which is probably, the result of the harsh environmental conditions that prevail in the Saharo-Arabian region which covers the vast area of the country [41]. The recorded species in the present study (261 species) represent about 12% of the whole flora of Saudi Arabia; their genera represent 21.2%; and their families represent 37.9%. From the biodiversity viewpoint, the present study can conclude that this area seems to be the richest area of the kingdom taking into account its relatively small area compared with the area of kingdom (it represent about 0.05% of the total

area of kingdom). The greatest plant diversity, approximately 74% of the total plant species of Saudi Arabia, is found in the mountainous western area which includes the study area due mainly due to a greater rainfall [41].

It is evident that the Asteraceae family has the highest contribution, followed by the Poaceae and Fabaceae. These results are similar to the whole flora of Saudi Arabia where the highest families in the Whole flora are Poaceae (262 species= 12.1%), Asteraceae (233 species= 10.7%) and Fabaceae (210 species= 9.7%) which represent 705 species or 32.5% of the total plant species in the Kingdom. As in most tropical and subtropical deserts, most plant species of Saudi Arabia belong to a limited number of plant families. For example, 1586 species belong to 23 families or 15.4% of the total families. These plant species represent 73% of the total species in the Kingdom [41]. 46 families or 30% of the families in the country such as *Aloaceae*, *Celastraceae*, *Commelinaceae* and *Burseraceae* are found only in the Sarrawat mountains [40].

The life form spectrum indicated that the perennial herbs had the highest contribution of the recorded species, followed by annuals, shrubs, shrublets and trees, while the biennials and parasites had the lowest contribution. These results agree with that of Mosallam [42] in the National Wildlife Research Center (NWRRC) at Taif, Heneidy and Bidak [38] on Bisha, Asir region in southwestern of Saudi Arabia and El-Demerdash *et al.* [43] in the southern region. The high percentage of therophytes indicates that there is no opportunity to flush and set phanerophytes (trees and shrubs) and to a lesser extent chaemophyte (shrublets) due to overgrazing and also, the dominance of therophytes over other life forms in those that regions would be as a result of the hot dry climate, topography variations and biotic influence [38].

Consequently little data is available about the medicinal plants and their status as natural resources for potential use by local inhabitants in this region. Ninety seven percent of the total recorded species by the present study have at least one aspect of the potential or actual economic uses. One hundred sixty five species (63.2% of total recorded species) are medicinal, 196 species (75.1% of total recorded species) are grazing, 104 species (39.8% of total recorded species) are edible by man, 93 species (35.6% of total recorded species) used as fuel and 57 species (21.8% of total recorded species) used as other economic uses. The economic uses of the recorded species could be arranged in descending order as follows: grazing → medicinal → human food → fuel → other uses. This means that the Taif region has a large number of medicinal plants that needs to discover and survey.

On the other hand, this trend is similar to that recorded by Heneidy and Bidak [38] in Bisha, Asir region who recorded 75% as medicinal, 83% as grazing, 17% as edible to human and animals, 40% as fuel wood and 72% of them as other uses; and Mossa *et al.* [33] who recorded 149 plant species as a medicinal plants in the Saudi Arabia. However, there is a shortage of information about the multipurpose uses of natural species. Many substances that we use in our daily lives are plant products, although there are a lot of uses of plant species still unknown. Numerous medicines, many industrial products are derived from plant products. Most are edible plant products that form the food base of human culture [39]. Evaluation of the effects of the environmental factors threatening the wild life should be taken in consideration. On the other hand, the increase of fodder grazed plants in this area indicated the good selection of this area as a protected area for breeding the endangered mammals in the Saudi Arabia.

However, the total number of species in the flora of Saudi Arabia is 2172 species of flowering plants. About 450 species (18%) of flowering plants have direct benefit to man and 45 species (1.8%) are poisonous. About 334 species (13.4%) are used in folk medicine or known to have medicinal value. Thirty-eight species are important palatable fodder plants, 6 are important as fuel-wood, 25 species are human food plants and 47 species are used as ornamentals or for other purposes.

Due to the high diversity of the medicinal plants in this region, the present study recommended the following points:

- Continuing of the surveying of the plants and identification of their exact locations.
- Drawing distribution maps for the important medicinal plants using GPS coordinates.
- Collecting herbal and seed samples from the medicinal plants that were not recorded in the previous trips.
- Data analysis of the medicinal plants based on their phytochemical and pharmacognestical characteristics.
- Obtaining full information covering the active constituents of medicinal plants in this region and/or documented medicinal uses needs to be subjected to further search as well as phytochemical screening.
- Determining the actual status of medicinal plants in this region.
- The management plane has to be suggested to sustain the medicinal plants in the region.
- Monographs on some pharmacopoeial medicinal plants need to be done.

CONCLUSIONS

A total of 261 plant species recorded in the study area, ninety seven percent of them have at least one aspect of the potential or actual economic uses. One hundred sixty five species are medicinal which means that the Taif region has a large number of medicinal plants that needs to discover and survey. The lacking to full information covering the active constituents of medicinal plants in this region and/or documented medicinal uses, the present study recommended for further search and phytochemical screening as well as determining the actual status of medicinal plants in this region.

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