

## **Multipurpose Plant Species in Bisha, Asir Region, Southwestern Saudi Arabia**

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(Received 5-12-1999 (27-8-1420H); accepted for publication 30-10-2000 (3-8-1421H))

**Abstract.** One hundred and forty-five species belonging to thirty-nine families were recorded in the study area. The most representative families are Compositae (20%), Gramineae (14.5%), Leguminosae and Chenopodiaceae together (6.8%). Sixty-six percent of the studied species are common and about 30 % are occasional, while 4% are rare. Fifty eight percent of the studied species are perennials, while 41 % are annuals. Most of the studied species have multipurpose in our daily lives. For example, 75 % of the studied species have medicinal value, 83 % are used as forage, 17 % are edible for human and birds and 40 % are used as fuel wood and energy source. Seventy two percent of the studied species recorded in this study have multi-ecological uses (e.g. sand accumulation, windbreak, reduction of erosion, soil fertility, shading, and microclimate effect.)

### **Introduction**

International Program for Arid Land Crops (IPALAC) was launched in 1994- 1995 under the aegis of UNESCO. The main objective was to contribute to the combating of desertification and the improvement of agricultural production in arid and semi-arid lands through the application of appropriate management techniques and the transfer of germplasm of multipurpose plant species [1]. Loss of species has many dimensions. There are ethical considerations regarding loss of life, and the prerogative of the human species to eliminate other species from this planet. There are esthetic concerns, regarding the loss of unique landscapes and species, and the corresponding impoverishment of the human experience if it is denied the opportunity to encounter the multifaceted products of natural selection. There are economic speculations about the potential use of species. Organisms whose properties have not yet been investigated, may be important as sources of drugs, as food, or as raw materials for the emerging field of biotechnology. There are also scientific arguments for the preservation of species. Many not yet described species may possess novel biological properties that may help us to understand how nature works. They may also play unique roles in the ecosystem.

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However, the strongest argument in favour of more knowledge is a very practical and selfish one. In order to ensure the maximum quantity and quality of renewable natural resources for ourselves and our descendants we must learn to use resources sustainably. This means we must learn to attach proper value to the benefits and the costs of using forests, savannas, grasslands, and all the other ecosystems that ultimately provide the oxygen, the food, the fiber, and the relational opportunities, for people worldwide [2].

Many substances that we use in our daily lives are plant products. Numerous medicines were first isolated from species of seed plants, and in extracts of these plants, many of the drugs and flavorings that are now synthesized in laboratories were originally discovered. Many industrial products such as rubber, paint bases, non-petroleum oils, gums and sizing starches are also derived from seed plants.

Most important of all, are the edible plant products that are the food base of human culture. The earliest civilizations are correlated with the domestication of one or other grasses, such as wheat, rice or maize. The food base for various tropical and alpine cultures are; roots, tubers, corns and bulbs produced by various unrelated kinds of flowering plants. Woody plants in particular can provide more than fuel calories. They can also be sources of :

- 1- vegetable oil, and fruits and nuts for food;
- 2- edible leaves and shoots for sauces, curries, salad, and beverages
- 3- honey;
- 4- forage for livestock and silk worms;
- 5- green manure for fertilizing soil;
- 6- tanbark for the tannin used in leather making;
- 7- medicines and pharmaceuticals;
- 8- extractives such as resins, rubber, gums, and dyes;
- 9- timber, lumber, posts, poles, and pulp for paper, cardboard, and construction boards; and
- 10- shade for pastures or plantation crops.

In the last decades, scientists and development specialists have become increasingly interested in the merger of crop, animal, and tree production commonly called "Agroforestry". Spurred by deforestation, soil erosion, and ever-growing need for both fuel wood and sustainable upland food production, agroforestry advocates have been exploring a wide variety of crop-tree, animal tree, and crop-animal tree combinations in both indigenous and newly designed farming systems [1].

Trees and shrubs play many roles in agroforestry. Besides providing such useful products as fuel-wood, fruit, edible seeds or beans, and fodder, they also minimize nutrient drain due to leaching and soil erosion, restore nutrients lost from the ecosystem, and perform other key environmental services. Plants that acts as "living fences"; trees and shrubs can keep grazing animals out of crop areas. They serve as windbreaks or as

shade trees in pastures and fields, thus helping to improve the microclimate so that animals and plants have better chances of survival. Trees with long tap roots for anchorage and wide-spreading lateral roots bind the soil and prevent erosion. Nitrogen-fixing trees also produce nitrates that can be recycled from decomposed leaves into the cropping system along with "pumped" nutrients. Ideal for many combined crops in the agroforestry systems are such leguminous trees as *Acacia*.

This work is a preliminary study whose aims are: 1) documenting the species in the study area; 2) recording and listing all of species present and their life forms; 3) collecting detailed information about the importance and role of the useful species in the region by field observation; 4) preparation of questionnaire form for inhabitants, and 5) address general questions about how knowledge of species role can contribute to local economy.

These issues are very important for future researches and to conserve the ecosystem in this raw area of Saudi Arabia. Generally this study would help to transfer or exchange ideas between this region and other areas in arid lands of germplasm of different life forms (trees, shrubs, forage, tubers, pulses, fruits and medicinal, salt and drought-tolerant plants), that could be introduced, or reintroduced to combat desertification and/or to provide a source of income. The following Table (1) highlights some examples of plant species in the southwestern region that considered sources for medicine and pharmacological purposes (after Khuth Hussain [3]; Mossa *et al.* [4]; Ayyad [1] and Boulos [5]).

**Table 1. Examples of plant species considered sources for medicine**

Species	Used part	Effective constituent	Medicinal use
<i>Acacia tortilis</i>	Pods and Bark	Glycosides and tannins	Healing wound and antidiarrhotic
<i>Argemone mexicana</i>	Seeds	Alaloids berberine, protopine and coptisine	Diuretic alterative, hypnotic and purgative
<i>Balanites aegyptiaca</i>	Fruits	Saponins and sugars	Coughs, colic, liver & spleen disorder treatment of snake bite
<i>Capparis spinosa</i>	Fruits	Glycosides and vitamins	Diuretic, astringent and folk medicine
<i>Calotropis procera</i>	Whole plant	Trypsin, calotropin and uscharin	Purgative and rheumatism treatment
<i>Chenopodium sp.</i>	Whole plant	Santonin and ascaridol	Anthelmintic and expels worms
<i>Citrullus colocynthis</i>	Fruits	Colocynthin, colocynthitin, resins and saponins	Purgative and rheumatism treatment

Table 1. (Continued)

Species	Used part	Effective constituent	Medicinal use
<i>Datura stramonium</i>	Whole plant	Hyoscyamine, hyoscyne and meteloidine	Pain relief, hypnotic and narcotic
<i>Dodonaea angustifolia</i>	Roots and leaves	Glycosides, enzyme and resins	Stimulate milk production and diarrhea
<i>Fagonia bruguieri</i>	Leaves and twigs	Alkaloid harman, sugars and amino acids	Tonic, astringent, febrifuge and used against smallpox & poisoning
<i>Glycyrrhiza glabra</i>	Roots and rhizomes	Glycyrrhizic acid, asparagine, glucose and saponine	Expectorant, stomach-tonic and carminative
<i>Juniperus procera</i>	Fruits	Volatile oil (terpenes, sesquiterpenes) and resins	Diuretic and eczema treatment, diarrhea
<i>Lavandula sp.</i>	Flowers	Volatile oil, tinene and lemonene	Nerve stimulant and perfumes preparation
<i>Malva parviflora</i>	Seeds	Amino acids and fatty acids	As a demulcent in coughs, treatment of bladder ulcers and hot poultice for wounds
<i>Mentha sp.</i>	Leaves and inflorescence	Peppermint oil, tannins and resins	Carminative, local antiseptic, antispasmodic and perfumes preparation
<i>Papaver rhoeas</i>	Leaves and seeds	Alkaloids rhocadine, morphine and narcotine	Sedative, tonic and useful in low fevers
<i>Senna italica</i>	Pods and leaves	Senuoside A, B and koempferol	Purgative and ophthalmic disease
<i>Solanum incanum</i>	Leaves and fruits	Solasodine and saponins	Cortisone, abdominal pains and aphrodisiac
<i>Zilla spinosa</i>	Root	Glycosides and volatile oil	Expels kidney stone
<i>Ziziphus spina-christi</i>	Leaves and fruits	Glycosides, alkaloids and tannins	Astringent and antidiarrhoeic

It is clear from the above discussion that this study has the potential to provide guidance for developing appropriate management techniques for arid lands and for transferring, exchanging and propagating of multipurpose species to combat desertification in Arab countries.

The study area is Asir region, in the vicinity of Bisha in southwestern Saudi Arabia, ( $18^{\circ} 30'$ ,  $21^{\circ} 30'$  N and  $38^{\circ} 00'$  E) (Fig. 1) and altitude between  $> 354 <$  feet above sea level. It has different wadis, the largest one is wadi Bisha. Geologically, the study area belongs to the greater Afro-Arabian shield which is a part of Precambrian crustal plate, generally exposed and locally covered by tertiary volcanic rocks as described by Schmidt *et al.* [6].

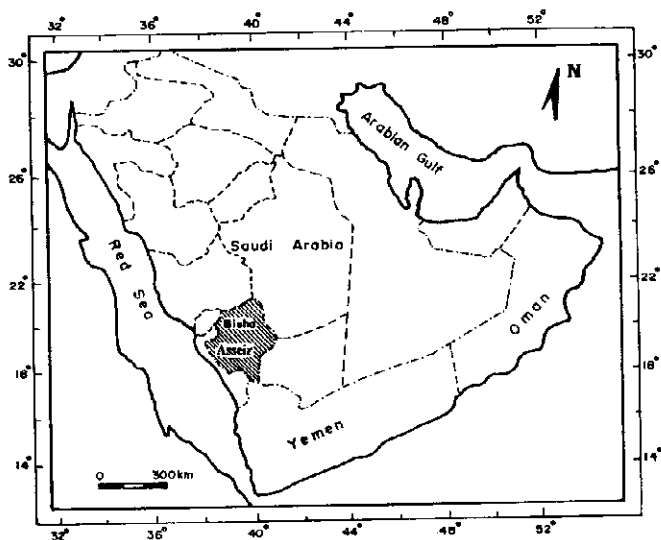


Fig. 1. Map of Saudi Arabia showing the location of the study area.

According to the climatic normals of southern region (average of 1964-1994), Bisha area is generally hot during summer and cold during winter. The monthly air temperature ranges between  $2^{\circ}\text{C}$  during January and  $40^{\circ}\text{C}$  during August with average  $24^{\circ}\text{C}$ . The annual mean relative humidity of the study area is about 31% and the rainfall ranges between  $100 - 123 \text{ mm y}^{-1}$ .

### Species Collection and Identification

The present work was initiated in September 1996 and continued until September 1998. Several locations in different habitats were taken to collect and identify the plant species. There were several visits to record most physiographic variations of the region and to represent all or most of species that occur in different sites. Most of the visits were carried out during the growing seasons to be sure that the survey covered all the plant species in the study area. Samples from the recorded species were collected and prepared as herbarium specimens for further studies. Floristic identification are according to T ckholm [7]; Mandaville [8]; Boulos [9], and Migahid [10]. Voucher specimens have been deposited in Botany Department Herbarium, Faculty of Education Bisha, Saudi Arabia.

Several different ways were used to get information about the economic or beneficial values of plant species during visits to the study area, including: 1- direct observation in the field; 2- preparing a questionnaire form to the inhabitants (especially the oldest). The questionnaire was prepared in order to obtain information about fuel wood, traditional uses of some plant species for treatments; 3- using the previous experience in the field of study; and some references.

### List of the Collected Species

Table 2 includes 145 species, their life-forms, abundance and their most common habitats. These species are related to 6 types of life forms e.g. 50 % of the species belonging to chemoephytes and phanerophytes (woody species). The most common habitats are sandy plain and flat plateau followed by sandy plains wadis. Some of the plant species occur in rocky hill. Sixty six percent of these species are common and about 30 % occasional, while 4 % rare. Fifty eight percent of the studied species are perennials and forty one percent are annuals. One hundred and forty five species belonging to thirty nine families and their economic, ecological values are represented in Table 3. This number of species represents a high percentage of the flora of southwestern of Saudi Arabia. Family Compositae has the highest contribution in the studied species (20 %) followed by Gramineae (14.5 %). The contribution of Leguminosae and Chenopodiaceae are 6.8 %. According to Al-Hubaishi and Hohenstein [11], the southern Arabian phytogeographical region (including Yemen) contains 2000 2500 species of the flowering plants. The most important tropical genera in Arabia are *Acacia*, *Juniperus*, *Olea*, *Indigofera*, *Euphorbia*, *Caralluma*, *Tephrosia*, *Pulicaria*, *Grewia*, *Cadaba* and *Commiphora*. About 20 % of the floristic elements of southern Arabia are endemic [12].

**Table 2. List of the most common plant species, life-forms, habitat, and their abundance in the study area. Sp = Sandy plains, W. = Wadi, Fl. Pl. = Flat plateau, R. Pl. = Rocky plateau, Rh. = Rocky hill, Sm. = Salt marshes, Mo. Sh. = Moist shady places, D = Deep soil, C = Cultivated area, and S = Shallow soil**

Species	Life-form	Habitat	Abundance
<i>Abutilon pannosum</i> (Forst.) Schtdl.	Ch.	Sp. W.	Common
<i>Acacia ehrenbergiana</i> Hayne	Ph.	Sp. Rh.	Common
<i>Acacia tortilis</i> (Forssk.) Hayne	Ph.	Sp. Rh.	Common
<i>Achillea arabica</i> Ky.	Ch.	Sp. W.	Common
<i>Adenium obesum</i> (Forssk.) R	Ph.	Rh.	Common
<i>Aerva javanica</i> (Burm. F) Spreng.	Ch.	Sp.	Common
<i>Amaranthus graecizans</i> L.	Th.	Sp. W.	Common
<i>Ammannia baccifera</i> L.	Th.	Sp. Fl. Pl.	Few
<i>Anabasis sp.</i>	Ch.	Sp. Rh.	Few
<i>Anabasis setifera</i> Moq.	Ch.	Sp. Rh.	Common
<i>Aristida adscensionis</i> L.	Th.	Sp. Rh.	Common
<i>Argemone mexicana</i> L.	Ch.	Fl. Pl.	Few
<i>Artemisia sieberi</i> Del.	Ch.	Sp. W.	Common
<i>Artemisia judaica</i> L.	Ch.	Sp. Rh.	Common
<i>Arnebia hispidissima</i> (Lehm.) DC.	Ch.	Sp. W.	Few
<i>Asparagus africana</i> Lam.	Ch.	Rh.	Few
<i>Asparagus stipularis</i> Forssk.	Ch.	Sp. Rh.	Common
<i>Asphodelus fistulosus</i> L.	Th.	Sp.	Common
<i>Astragalus corrugatus</i> Bert.	Th.	Sp. W.	Common
<i>Astragalus sieberi</i> DC.	Ch.	Fl. Pl.	Rare
<i>Atractylis carduus</i> (Forssk.) Christens	Ch.	Rh. Sp.	Common
<i>Avena fatua</i> L.	Th.	Sp.	Common
<i>Bassia eriophora</i> (Schrad.) Asch.	Th.	Sp.	Few
<i>Bassia muricata</i> (L.) Murr.	Th.	Sp. W.	Common
<i>Blepharis ciliaris</i> (L.) B. L. Burtt.	Ch.	Sp. Rh.	Common
<i>Bromus rubens</i> Jusl. ap. l.	Th.	Sp. W.	Common
<i>Balanites aegyptiaca</i> (L.) Del.	Ph.	Sp. Rh.	Few
<i>Calotropis procera</i> (Wild) R. Br.	Ph.	Sp. W.	Few
<i>Calendula micrantha</i> Tineo et Guss.	Th.	Sp. W.	Common
<i>Desmidorchis penicillatus</i> (Defl.) N.E. Br.	Ch.	Rh.	Rare
<i>Cayusea hexagyna</i> (Forssk.) M. L. Green.	Th.	Sp. Fl. Pl.	Few
<i>Capparis spinosa</i> L.	Ch.	Rh.	Few
<i>Cheilanthes catanensis</i> (Consent.) H. P. Fuchs	Ferns	Mo. Sh.	Common
<i>Cenchrus ciliaris</i> L.	Ch.	Sp. Fl. Pl.	Common
<i>Cenchrus setigerus</i> Vahl	Th.	Sp. W.	Few
<i>Centaurea aegyptiaca</i> L.	Th.	Sp. Fl. Pl.	Few
<i>Ceterach officinarum</i> Lan. et DC.	Ferns	Mo. Sh.	Common
<i>Chenopodium murale</i> L.	Th.	Sp. Mo.	Common
<i>Citrullus colocynthis</i> (L.) Schrad.	Th.	Sp. W.	Common
<i>Conyza bonariensis</i> (Willd.) T. ckh.	Th.	Sp. Mo.	Common
<i>Conyza dioscoridis</i> (L.) Desf.	Ch.	W. Rh.	Common
<i>Cucumis prophetarum</i> L.	Th.	Sp. Fl. Pl.	Common
<i>Cutandia memphitica</i> (Spreng.) K. Richt.	Ch.	Sp. W.	Common
<i>Cynodon dactylon</i> (L.) Pers.	Cr.	Sp. W.	Common
<i>Cyperus sp.</i>	Cr.	Sp.	Few
<i>Datura innoxia</i> Mill.	Th.	Sp. W.	Few
<i>Datura stramonium</i> L.	Th.	Sp. W.	Few
<i>Digitaria ciliaris</i> (Retz.) Koeler	Th.	Sp.	Common
<i>Dodonaea angustifolia</i> L. f.	Ch.	Sp. Fl. Pl.	Few
<i>Ducrosia anethifolia</i> (DC.) Boiss.	Ch.	Sp.	Common

Table 2 (Contd.)

Species	Life-form	Habitat	Abundance
<i>Echium horridum</i> Batt	Ch.	Fl.PI	Common
<i>Echinops</i> sp	Ch.	Sp. W.	Few
<i>Echinops hussoni</i> Boiss.	Ch.	Sp. W.	Few
<i>Echinops spinosissimus</i> Turra.	Ch.	Sp. W.	Common
<i>Erodium hirtum</i> Willd.	Th.	Sp. W.	Common
<i>Eruca sativa</i> Mill.	Th.	Sp. D.	Common
<i>Euphorbia granulata</i> Forssk.	Th.	Sp. W.	Common
<i>Euphorbia peplis</i> L.	Th.	Sp. W.	Common
<i>Euphorbia prostrata</i> Aiton	Th.	Sp. W.	Common
<i>Euryops arabicus</i> Steud.	Ch.	Rh.	Common
<i>Fagonia indica</i> Burm. F.	Ch.	Fl.PI.Rh.	Common
<i>Fagonia bruguieri</i> DC.	Ch.	Fl.PI.	Common
<i>Filago desertorum</i> Pomel	Th.	Sp. W.	Common
<i>Forskalea tenacissima</i> L.	Th.	Fl. Pl.Rh	Common
<i>Forskalea viridis</i> Her. ex Webb ap. Hook.	Th.	Fl.PI.Rh.	Common
<i>Glycyrrhiza glabra</i> L.	Ch.	Sp. W.	Few
<i>Glossonema nubicum</i> Decne.	Ch.	Sp. Fl.PI.	Few
<i>Haloxylon salicornicum</i> (Moq.) Boiss.	Ch.	Sp.Fl. Pl.	Common
<i>Helianthemum sessiliflorum</i> (Desf.) Pers.	Ch.	Sp. Rh.	Common
<i>Heliotropium longiflorum</i> (A.DC.) Steud.	Ch.	Sp. Fl. Pl	Common
<i>Ifloga spicata</i> (Forssk.) Sch.	Th.	Sp. Mo.	Common
<i>Indigofera spinosa</i> Forssk.	Ch.	Sp.	Few
<i>Jasminum floribundum</i> R. Br.	Ch.	Sp.Fl.PI.	Rare
<i>Juniperus procera</i> Hochst. ex Endl.	Ph.	Rh.	Few
<i>Latipes senegalensis</i> Kunth.	Ch.	Sp.	Few
<i>Launaea nudicaulis</i> (L.) Hook.f.	Ch.	Sp. W.	Common
<i>Launaea resedifolia</i> (L. emend.Coss.) Kuntz	Ch.	Sp. W.	Common
<i>Launaea</i> sp.	Th.	Sp.W	Few
<i>Lavandula dentata</i> L.	Ch.	R. Pl	Rare
<i>Lavandula pubescens</i> Decne	Ch.	Rh.	Rare
<i>Lycium shawii</i> Roem. & Schult.	Ch.	Sp. Rh.	Common
<i>Malva parviflora</i> L.	Th.	Sp. Fl.PI.	Common
<i>Marrubium vulgare</i> L.	Ch.	Sp.Fl.PI.	Common
<i>Medicago orbicularis</i> (L.) Bartal.	Th.	Sp. W.	Common
<i>Melilotus indicus</i> (L.) All.	Th.	Sp. W.	Common
<i>Mentha</i> sp.	Th.	Fl. Pl.	Few
<i>Ochradenus baccatus</i> Delile	Ch.	Sp.Fl. Pl	Common
<i>Olea chrysophylla</i> Lam.	Ph.	Sp.Fl. Pl	Common
<i>Otostegia fruticosa</i> (Forssk.) Penz.	Ch.	Sp.Fl. Pl.	Rare
<i>Panicum repens</i> L.	Cr.	Sp.	Common
<i>Panicum turgidum</i> Forssk	Cr.	Sp.	Common
<i>Papaver rhoeas</i> L.	Th.	Sp.C.	Common
<i>Paronychia desertorum</i> Boiss.	Th.	Sp.Fl. Pl.	Few
<i>Phalaris minor</i> Retz.	Th.	Sp. W.	Common
<i>Pennisetum divisum</i> (J.F.Gmel.) Henrard.	Ch.	D.Sp.	Common
<i>Pennisetum</i> sp.	Ch.	Sp.Fl.PI	Common
<i>Pergularia daemia</i> (Forssk.) Chiov.	Ch.	Fl.PI.Rh.	Few
<i>Plantago boissieri</i> Haussk & Bornm.	Cr.	Sp.Fl.PI	Few
<i>Plantago lanceolata</i> L.	Cr.	Sp.Fl.PI	Common
<i>Plantago major</i> L.	Cr.	Sp. Mo.	Common
<i>Plantago albicans</i> L.	Cr.	D.Sp. Fl. Pl	Few
<i>Phagnalon stenolepis</i> Chiov	Ch.	Sp. Rh.	Few

Table 2 (Contd)

Species	Life-form	Habitat	Abundance
<i>Picris radicata</i> (Forssk.) Less.	Th.	Sp.W.C	Few
<i>Poa annua</i> L.	Th.	Sp. W.	Common
<i>Polypogon monspeliensis</i> (L.) Desf.	Th.	Sp.W.C	Common
<i>Portulaca oleracea</i> L.	Th.	R.F.Pl.	Common
<i>Psadia arabica</i> Jaub.et Sp.	Ch.	Sp. W.	Few
<i>Pulicaria crispa</i> (Forssk.) Oliv.	Ch	Sp.Fl.Pl	Few
<i>Pulicaria orientalis</i> Jaub.& Sp.	Ch	Sp.Fl.Pl	Common
<i>Rhanterium epupposum</i> Oliv.	Ch.	D.Sp.	Common
<i>Rhazya stricta</i> Decne	Ch.	Sp. W.	Common
<i>Reichardia tingitana</i> (L.) Roth.	Th.	Sp.	Few
<i>Reseda muricata</i> Presl.	Th.	Sp. W.	Common
<i>Rumex vesicarius</i> L.	Th.	Sp. W.	Few
<i>Ruta chalepensis</i> L.	Th.	Sp.Fl.Pl.	Common
<i>Salsola kali</i> L.	Th.	S.Sm.	Few
<i>Salsola vermiculata</i> L.	Ch.	Sp.Fl.Pl	Common
<i>Salvia aegyptiaca</i> L.	Ch.	D.Sp.	Common
<i>Salvadora persica</i> L.	Ph.	Fl.Pl	Common
<i>Savignya parviflora</i> (Delile.) Webb.	Th.	Sp.	Common
<i>Senna italica</i> Mill.	Ch.	Sp.	Common
<i>Senna</i> sp.	Ph.	Sp.C.	Common
<i>Setaria verticillata</i> (L.) P. Beauv.	Th.	Sp.Fl.Pl	Common
<i>Senecio flavus</i> (Decne) Sch.	Th.	Sp.Fl.Pl	Few
<i>Senecio vulgaris</i> L.	Th.	R.F.Pl.	Few
<i>Silybium marianum</i> (L.) Goert	Th.	Sp. W.	Few
<i>Sisymbrium irio</i> L.	Th.	Rh.	Common
<i>Solanum albicaule</i> Dunal	Ch.	Rh.	Few
<i>Solanum incanum</i> L.	Ch.	Sp.Mo	Common
<i>Solanum nigrum</i> L.	Th.	Sp.	Common
<i>Sorghum bicolor</i> (L.) Moench.	Th.	Sp.	Few
<i>Stipagrostis ciliata</i> (Desf.) de Winter.	Hr.	Sp.	Common
<i>Stipagrostis plumosa</i> (L.) Munro ex T.	Hr.	Sm.Fl.Pl	Common
<i>Suaeda monoica</i> Frossk.	Ch.	Sp.Fl.Pl.	Common
<i>Tamarix aphylla</i> (L.) H. Karst.	Ph.	Rh.	Common
<i>Thymus capitatus</i> (L.) Link.	Ch.	Sp.Fl.Pl.	Few
<i>Traganum nudatum</i> Del.	Ch.	Sp.Fl.Pl.	Common
<i>Tribulus macropterus</i> Viv.	Th.	Sp.Fl.Pl.	Common
<i>Trigonella foenum-graceum</i> L.	Th.	Sp.W.	Common
<i>Verbesina encelioides</i> (Cav.) Benth & Hook.	Th.	Sp.Fl.Pl.	Common
<i>Withania somnifera</i> (L.) Dum.	Ch.	Sp.Fl.Pl.	Common
<i>Xanthium spinosum</i> L.	Th.	Sp.Fl.Pl.	Few
<i>Ziziphus spina-christi</i> (L.) Desf.	Ph.	S. Sp.	Few
<i>Zygophyllum album</i> L.f	Ch.	S.Sp.	Common
<i>Zygophyllum simplex</i> L.	Th.		Common

Ph. = Phanerophytes, Ch. = Chamaephytes, Th. = Therophytes, Cr. = Cryptophytes, Hr. = Hemicyrptophytes.

The composition of life-forms reflects the response of vegetation to variation in certain environmental factors. The life-form spectrum is thought to be either hereditary adjustment to environment [13], or representing the residual effects of some historical, climatic or biotic condition on the population of the plant [14]. In this study, chamaephytes are the most frequent life-form in the study area (43 %), followed by therophytes (41 %), phanerophytes (8 %), cryptophytes (6%), then ferns and

hemicryptophytes. The dominance of both chamaephytes and therophytes over other life-forms in the southwestern region of Saudi Arabia would seem to be a response to the hot dry climate, topographic variations and biotic influence. This agrees with the results obtained by El-Demerdash *et al.* [15] in the southern region of Saudi Arabia. Also this is supported by the results obtained by Abufatih [16] where, he reported that the southwestern region of Saudi Arabia is a unique with regard to its nature, landform, climate and water availability.

### Economic and Ecological Values

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 of all are the edible plant products that form the food base of human culture.

This work is a preliminary study and it deals with the economic values of natural resources, especially plant species. Economic values are classified as medicinal, aromatic (e.g. used in perfumery), forage, edible or as fuel, while the ecological value especially in the desert ecosystem includes sand accumulation, shading, esthetic concerns, soil fertility, aromatic source, windbreak and water storage. This information about the multi-uses of plant species in this study mainly depends on the actual observation and from other sources (e.g. herders, house hold managers, farmers and marketing men). Most of the plant species have a medicinal or grazing value. For details about the grazing value of plant species of Asir region see [17]. Seventy five percent of the species in the present study have a medicinal value either as extracts or as direct herb (e.g. folk medicine for skin diseases, gastro-intestinal troubles, sedative for cough, fever, diuretic, dysentery, and purgative effects) and 83 % of them have grazing value (see Table 3).

**Table 3.** List of most common species, family, economic and ecological values in the study area. 1= Sand accumulation, 2= Shading, 3= Windbreak, 4= Esthetic concerns, 5= Soil fertility, 6= Aromatic source, 7= Water storage, M= Medicinal, G= Grazing, E= Edible and F= Fuel

Species	Family	Ecological value				Economic value
		M.	G.	E.	F.	
<i>Abutilon pinnosum</i>	Malvaceae	+	+	-	+	1,3,4
<i>Acacia ehrenbergiana</i>	Leguminosae	+	+	-	+	1,2,3,4,5
<i>Acacia tortilis</i>	Leguminosae	+	+	-	+	1,2,3,4,5
<i>Achillea arabica</i>	Compositae	+	+	-	-	1,4,6
<i>Adenium obesum</i>	Apocynaceae	+	-	-	-	1,3,7
<i>Aerva javanica</i>	Amaranthaceae	+	+	-	+	1,3,4,6
<i>Amaranthus graecizans</i>	Amaranthaceae	+	+	-	+	1,3,4,6
<i>Ammannia buccifera</i>	Lythraceae	+	+	-	-	1,3,6
<i>Anabasis sp.</i>	Chenopodiaceae	-	+	-	+	1,3,7
<i>Anabasis setifera</i>	Chenopodiaceae	-	+	-	+	1,3,7
<i>Aristida adscensionis</i>	Gramineae	-	+	-	-	1,3,7

Table 3. (Contd.)

Species	Family	Ecological value				Economic value
		M.	G.	F.	F.	
<i>Argemone mexicana</i>	Papaveraceae	+	+	-	-	1,3,4
<i>Artemisia sieberi</i>	Compositae	+	+	-	+	1,3,4,6
<i>Artemisia judaica</i>	Compositae	+	+	-	+	1,3,4,6
<i>Arnebia hispidissima</i>	Boraginaceae	+	+	-	+	1,3,4,6
<i>Asparagus africana</i>	Liliaceae	+	+	-	+	1,3,4
<i>Asparagus stipularis</i>	Liliaceae	+	+	-	+	1,3,4
<i>Asphodelus fistulosus</i>	Liliaceae	-	+	-	-	1,7
<i>Astragalus corrugatus</i>	Leguminosae	+	+	-	-	1,4,5
<i>Astragalus sieberi</i>	Leguminosae	+	+	-	+	1,3,4,5
<i>Atractylis carduus</i>	Compositae	-	+	-	-	1
<i>Avena fatua</i>	Gramineae	+	+	-	-	1
<i>Bassia eriophora</i>	Chenopodiaceae	+	+	-	+	1
<i>Bassia muricata</i>	Chenopodiaceae	+	+	-	+	1
<i>Blepharis ciliaris</i>	Acanthaceae	-	+	-	-	1,3
<i>Bromus rubens</i>	Gramineae	-	+	-	-	1
<i>Balanites aegyptiaca</i>	Balanitaceae	+	+	+	+	1,2,3,7
<i>Calotropis procera</i>	Asclepiadaceae	+	+	-	+	1
<i>Calendula micrantha</i>	Compositae	-	+	-	-	1,4
<i>Desmidorchis penicillatus</i>	Asclepiadaceae	+	+	-	-	1,7
<i>Cayusea hexagyna</i>	Resedaceae	+	+	+	-	7
<i>Capparis spinosa</i>	Capparaceae	+	-	-	+	1,3,7
<i>Cheilanthes catanensis</i>	Adiantaceae	+	-	-	-	-
<i>Cenchrus ciliaris</i>	Gramineae	-	+	+	-	1
<i>Cenchrus setigerus</i>	Gramineae	-	+	+	-	1
<i>Centauria aegyptiaca</i>	Compositae	+	+	-	-	1,4
<i>Ceterach officinarum</i>	Aspleniaceae	+	+	-	-	-
<i>Chenopodium murale</i>	Chenopodiaceae	+	+	-	-	1
<i>Citrullus colocynthis</i>	Cucurbitaceae	+	+	-	-	1
<i>Conyza bonariensis</i>	Compositae	+	+	-	-	1
<i>Conyza dioscoridis</i>	Compositae	+	+	-	+	1,3
<i>Cucumis prophetarum</i>	Cucurbitaceae	+	+	-	-	1
<i>Cutandia memphitica</i>	Gramineae	-	+	-	-	1
<i>Cynodon dactylon</i>	Gramineae	+	+	-	+	1,3
<i>Cyperus sp.</i>	Cyperaceae	+	+	-	-	1
<i>Datura innoxia</i>	Solanaceae	+	-	-	+	1,6
<i>Datura stramonium</i>	Solanaceae	+	-	-	+	1,6
<i>Digitaria ciliaris</i>	Gramineae	-	+	+	-	1
<i>Dodonaea angustifolia</i>	Sapindaceae	-	-	-	-	1,6
<i>Ducrosia umethifolia</i>	Umbelliferae	+	+	-	-	-
<i>Echium horridum</i>	Boraginaceae	-	+	-	+	1,4,6
<i>Echinops sp</i>	Compositae	+	+	-	+	1,7
<i>Echinops hussoni</i>	Compositae	+	+	+	+	1,7

Table 3. (Contd.)

Species	Family	Ecological value				Economic value
		M.	G.	E.	F.	
<i>Echinops spinosissimus</i>	Compositae	+	+	+	+	1,7
<i>Erodium hirtum</i>	Geraniaceae	-	+	-	-	--
<i>Eruca sativa</i>	Cruciferae	+	+	-	-	6
<i>Euphorbia granulata</i>	Euphorbiaceae	+	-	-	-	6,7
<i>Euphorbia peplis</i>	Euphorbiaceae	+	-	-	-	6,7
<i>Euphorbia prostrata</i>	Euphorbiaceae	+	-	-	-	6,7
<i>Euryops arabicus</i>	Compositae	+	+	-	-	1,4
<i>Fagonia indica</i>	Zygophyllaceae	+	-	-	+	1,4
<i>Fagonia bruguieri</i>	Zygophyllaceae	+	-	-	+	1,4
<i>Filago desertorum</i>	Compositae	-	+	-	-	--
<i>Forsskalea tenacissima</i>	Urticaceae	-	+	-	-	1
<i>Forsskalea viridis</i>	Urticaceae	-	+	-	-	1
<i>Francoeuria crispa</i>	Compositae	+	+	-	-	1,6
<i>Glycyrrhiza glabra</i>	Leguminosae	+	+	-	-	1,4,6
<i>Glossonema nubicum</i>	Asclepiadaceae	+	-	-	-	1,4
<i>Hammada elegans</i>	Chenopodiaceae	-	+	-	+	1,3,7
<i>Helianthemum sessiliflorum</i>	Cistaceae	+	+	-	+	1,3,7
<i>Heliotropium longiflorum</i>	Boraginaceae	+	-	-	+	1,6
<i>Iflora spicata</i>	Compositae	-	+	-	-	--
<i>Indigofera spinosa</i>	Leguminosae	+	+	-	+	1,3,4,6
<i>Jasminum floribundum</i>	Oleaceae	+	-	-	+	1,3,4,6
<i>Juniperus procera</i>	Cupressaceae	+	-	-	+	1,2,3,4
<i>Latipes senegalensis</i>	Gramineae	-	-	-	-	1
<i>Launaea nudicaulis</i>	Compositae	-	+	-	-	1
<i>Launaea resedifolia</i>	Compositae	-	+	-	-	1
<i>Launaea sp.</i>	Compositae	-	+	-	-	1
<i>Lavandula dentata</i>	Labiatae	+	+	-	-	1,6
<i>Lavandula pubescens</i>	Labiatae	+	+	-	-	3,6
<i>Lycium shawii</i>	Solanaceae	+	+	-	+	1,2,3,7
<i>Malva parviflora</i>	Malvaceae	+	+	+	-	--
<i>Marrubium vulgare</i>	Labiatae	+	+	-	-	1,3,4,6
<i>Medicago orbicularis</i>	Leguminosae	-	+	-	-	1,5
<i>Melilotus indicus</i>	Leguminosae	-	+	-	-	5
<i>Mentha sp.</i>	Labiatae	+	-	-	-	6
<i>Ochradenus baccatus</i>	Resedaceae	+	+	-	+	1,3,4,6
<i>Olea chrysophylla</i>	Oleaceae	+	+	+	+	1,3,4,6
<i>Ostegia fruticosa</i>	Labiatae	+	-	-	+	1,3,6
<i>Panicum repens</i>	Gramineae	+	+	+	+	1,4
<i>Panicum turgidum</i>	Gramineae	+	+	+	+	1,4
<i>Papaver rhoeas</i>	Papaveraceae	+	-	-	-	4
<i>Paronychia drsertorum</i>	Caryophyllaceae	+	+	-	-	1,4
<i>Phalaris minor</i>	Gramineae	-	+	+	-	4

Table 3. (Contd)

Species	Family	Ecological value				Economic value
		M.	G.	E.	F.	
<i>Pennisetum divisum</i>	Gramineae	-	+	+	-	1
<i>Pennisetum sp.</i>	Gramineae	-	+	+	-	1
<i>Pergularia daemia</i>	Asclepiadaceae	+	+	-	+	1,2,4
<i>Plantago boissieri</i>	Plantaginaceae	+	+	+	-	1
<i>Plantago lanceolata</i>	Plantaginaceae	+	+	-	-	1
<i>Plantago major</i>	Plantaginaceae	+	+	-	-	1
<i>Plantago albicans</i>	Plantaginaceae	+	+	+	-	1
<i>Phagnalon stenolepis</i>	Compositae	+	+	-	-	1,4
<i>Picris radicata</i>	Compositae	+	+	-	-	4
<i>Poa annua</i>	Gramineae	-	+	+	-	1,4
<i>Polypogon monspeliensis</i>	Gramineae	+	+	+	-	1
<i>Portulaca oleracea</i>	Portulacaceae	+	+	+	-	-
<i>Psidium arabica</i>	Compositae	+	+	-	-	1,4
<i>Pulicaria orientalis</i>	Compositae	+	+	+	+	1,4,6
<i>Rhanterium epapposum</i>	Compositae	+	+	-	-	1
<i>Rhazya stricta</i>	Apocynaceae	+	-	-	+	1,4,6
<i>Reichardia tingitana</i>	Compositae	+	+	-	-	4
<i>Reseda muricata</i>	Resedaceae	+	+	-	+	4,6
<i>Ruta chalepensis</i>	Rutaceae	+	+	-	-	4
<i>Rumex vesicarius</i>	Polygonaceae	+	+	+	-	4,7
<i>Salsola kali</i>	Chenopodiaceae	-	+	-	-	1,4,7
<i>Salsola vermiculata</i>	Chenopodiaceae	-	+	-	+	1,4,7
<i>Salvia aegyptiaca</i>	Labiatae	+	+	-	+	1,3,4
<i>Salvadora persica</i>	Salvadoraceae	+	-	-	+	1,2,3,4,6
<i>Savignya parviflora</i>	Cruciferae	+	+	-	+	1,3,4,6
<i>Senna italica</i>	Leguminosae	+	+	-	+	1,2,3,4,5
<i>Senna sp.</i>	Leguminosae	+	+	-	-	1,2,3,4,5
<i>Setaria verticillata</i>	Gramineae	+	+	-	-	1,4
<i>Senecio flavus</i>	Compositae	+	+	-	-	1,4
<i>Senecio vulgaris.</i>	Compositae	+	+	-	-	1,4
<i>Silybium maritimum</i>	Compositae	+	+	+	-	1,4
<i>Sisymbrium irio</i>	Cruciferae	+	+	-	-	1,6
<i>Solanum albicaule</i>	Solanaceae	+	+	-	+	1,4
<i>Solanum incanum</i>	Solanaceae	+	+	-	+	1,4
<i>Solanum nigrum</i>	Solanaceae	+	-	+	-	1,4,5
<i>Sorghum bicolor</i>	Gramineae	+	+	+	-	1,4,5
<i>Stipagrostis ciliata</i>	Gramineae	-	+	-	-	1,3
<i>Stipagrostis plumosa</i>	Gramineae	-	+	-	-	1,3,4
<i>Suaeda monoica</i>	Chenopodiaceae	-	+	-	+	1,2,3,7
<i>Tamarix aphylla</i>	Tamaricaceae	+	+	-	+	1,2,3
<i>Thymus capitatus</i>	Labiatae	+	+	+	+	1,3,4
<i>Tragacanthum nudatum</i>	Chenopodiaceae	+	-	-	-	1,3,7

Table 3. (Contd.)

Species	Family	Ecological value				Economic value
		M.	G.	E.	F.	
<i>Tribulus macropterus</i>	Zygophyllaceae	+	+	-	+	1,3,4
<i>Trigonella foenum-graceum</i>	Leguminosae	+	+	-	-	1,3,5
<i>Verbesina encelioides</i>	Compositae	+	+	-	+	1,3,4
<i>Withania somnifera</i>	Solanaceae	+	+	-	+	1,3,4
<i>Xanthium spinosum</i>	Compositae	+	+	-	-	1
<i>Ziziphus spina-christi</i>	Rhamnaceae	+	+	-	+	1,7
<i>Zygophyllum album</i>	Zygophyllaceae	+	+	-	-	1,7
<i>Zygophyllum simplex</i>	Zygophyllaceae	-	-	-	-	1,7

Mossa *et al.* [4] recorded 149 plant species in the Saudi Arabia of which 49 species of the species under this study are mentioned in his book as a medicinal plants. Seventeen percent of the species represented in Table 3 are eaten by human and birds, while more than 40% are used as fuel-wood. About twenty of the studied species are edible (Al-Areid and Al-Farraj [18]; Abulfatih [16] and Al-Farhan *et al.* [19]). More than 72 % of the studied species have multi-ecological uses, as well as other uses such as nitrogen fixation, purification of the air and microclimate effects. So it is important to construct a representative reserve (natural protected areas) for conservation of the natural vegetation particularly where, Abulfatih *et al.* [20] recorded that the protection in the southwestern region leads to an initial increase in density of species and their standing phytomass.

**Acknowledgement.** The authors wish to thank Mr. Abdel-Rahman M. Awaied El-Salooly, the manager of the general library of Bisha for his guidance during the field work.

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## النباتات الطبيعية متعددة الأغراض في منطقة بيشة - عسير بالجنوب الغربي للمملكة العربية السعودية

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(قدم للنشر في ١٤٢٠/٨/٢٧ هـ؛ وقبل للنشر في ١٤٢١/٨/٣ هـ)

ملخص البحث. تهتم هذه الدراسة بإظهار الأنواع النباتية ذات الفوائد المتعددة في الجنوب الغربي للمملكة العربية السعودية حتى تكون دافعا لتقليل الضغط عليها وصون هذه المواد الطبيعية من التدهور وتوضيح أهميتها الاقتصادية والبيئية. سجلت الدراسة ١٤٥ نوعاً من النباتات تنتمي إلى ٣٩ فصيلة. وأن ٥٨٪ من هذه النباتات نوع معمر وذلك يزيد من أهميتها، لما تلعبه النباتات المعمرة من دور مهم في بناء النظم البيئية الصحراوية وتدعيمها، و٤١٪ منها حولي. وتم دراسة وفرة هذه الأنواع فكان منها ٦٦٪ نباتات شائعة، ٣٠٪ قليل، و٤٪ فقط نادر. وكانت الفصائل الأكثر شيوعاً هي الفصيلة المركبة ٢٠٪، النجيلية ١٤،٥٪، والزوربيحية و القرنية ٦،٨٪.

أوضحت الدراسة الفوائد المتعددة للنباتات ودورها في حياتنا اليومية وقيمتها البيئية والاقتصادية ووجد أن ٧٥٪ منها يدخل في الاستخدامات الطبية سواء في التركيبات أو كأعشاب (الطب الشعبي في علاج أمراض البرد والحصى وإدرار البول وكمسهلات وخلافة... ) و٨٣٪ لها قيمة رعوية ويمكن أن تستخدم كمراعي طبيعية وخصوصاً في النظم الصحراوية الجافة وشبه الجافة وهناك ١٧٪ من نباتات الدراسة يؤكل بواسطة الإنسان والطيور وكذلك ٤٠٪ منها يستخدم كوقود (مصدر للطاقة). وأوضحت الدراسة كذلك أن ٧٢٪ من هذه الأنواع لها فوائد بيئية عديدة مثل: تثبيت التربة، مصدات للرياح، تقليل عملية التعرية، مصدر للظل، تنقية الهواء، زيادة خصوبة التربة، التأثير على المناخ وغيرها.