FLORAL DIVERSITY ASSESSMENT REPORT

IN ANJAR, LEBANON

2022

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INTRODUCTION

Anjar and its natural features

The town of Anjar is located in the eastern part of the Bekaa valley in Lebanon, at an altitude of around 950m above sea level on the western slope of the Anti-Lebanon range, at the Lebanese Syrian border. This valley is a geological feature that supposedly originated from the African Rift some 30 million years ago (Addam et al., 2017). Its main feature lies in its central region, a substratum formed by lake deposits from the Quaternary. Other substrata bordering these deposits include conglomerates and lake deposits from the Miocene, chalks and limestones from the Upper Cretaceous, and sandstones from the Lower-Mid Cretaceous (Walley, 1998). Climatically, the valley hosts three bioclimatic levels from its North to its South: arid, semi-arid, and subhumid. It is also the only region hosting pre-steppic vegetation levels in its northern part, Mediterranean and Supra-Mediterranean, along with their two typical Mediterranean variants in the southern part.

The economy of Anjar, a small town of 3000 residents, is based on agriculture and tourism. In fact, the northern section of Anjar and the southern section of the neighboring village of Kfarzabad are part of what is known as “Hima Anjar-Kfarzabad”, a common conservation plan launched in 2005 (Kfarzabad) and 2007 (Anjar), and implemented by the municipalities of both villages and other stakeholders including the Society for the Protection of Nature in Lebanon (SPNL), local farmers and community members. The protected area created under the Hima concept extends on around 326 hectares of land, mostly wetlands, and aims to protect the Important Bird Area (IBA) in the area (Zorkot, 2016). It encompasses the wetlands of Anjar and Kfarzabad, which were once an extension of the Aammiq wetland before being separated by the emergence of agricultural fields in the Bekaa valley, and it also includes agricultural lands and the mountains adjacent to the wetlands, part of the Anti-Lebanon range.

The village of Anjar presents a multitude of natural features that promote its biodiversity:

- a fragment of the Anti-Lebanon range in the East, sometimes referred to as "Jabal Anjar" which translates to "Mountain of Anjar", where hiking and pastoral activities take place. The mountain is home to an oak woodland at elevations higher than 1000m and a reforested zone at lower elevations;
- a protected wetland, considered as an Important Bird Area (IBA) and habitat of the globally endangered Eurasian Otter (*Lutra lutra*) (Loy et al., 2016);
- the Chamsine Spring located at 2km North of the village, which supplies Anjar, Kfarzabad and the surrounding villages with water (Abou-Hamdan et al., 2014);
- the Ghouzaiel River, which has its source at the Chamsine Spring and drains into the Litani River some 18km westwards (Abou-Hamdan et al., 2014).

Opposed to the northern Bekaa where the arid climate has only enabled pre-steppic plant communities to grow, the sub-humid climate of the region has permitted an exceptional faunal and floral biodiversity to thrive in the Supra-Mediterranean plant community of the mountain, and a distinctive riparian community in the wetland.

Geologically, the area consists of Cenomanian-Turonian limestone, with Senonian marls and chalky marls (Zorkot, 2016).

This report will build a clear and updated database of the plant species found in Anjar, which would serve as a base material for future studies and as a decision-making reference for future conservation and rural planning projects in the region. This report will assess the floral diversity in the two different ecosystems in Anjar, describe the present species and their potential uses and identify the threats that these species are facing.

Conservation & Hima Concept

Conservation, in the scientific meaning, is the act of protecting and managing natural resources in order to ensure their persistence on the long term. The World Resources Institute (1992) defines conservation in the Guide to Global Environment as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations: thus, conservation is positive, embracing

preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment".

Though the terms conservation and preservation of nature are sometimes used in literature interchangeably, creating great confusion for the public, they differ in the way the natural resources are protected: the former aims to allow the sustainable use of nature by humans for activities such as responsible grazing or harvesting, whereas the latter works to completely protect nature from human influence (Redford & Richter, 1999).

A particular case of conservation is the concept of "Hima", a widely used traditional Community-Based Natural Resources Management System (CBNRM) originated in the Arabic Peninsula. Hima in Arabic means "protected area", but the concept hasn't always been the same and has much evolved over time, going from a simple personal protected land during the pre-Islamic era to a community-based conservation system in the Islamic era, till nowadays (Ibrahim et al., 2013).

The Hima system provides socio-economic benefits to the communities managing it, while also guaranteeing the sustainability of the ecosystem and its natural resources, and the protection of species.

In Lebanon, the Society for the Protection of Nature in Lebanon (SPNL) revived the application of the Hima concept as a way to promote the conservation of Important Bird Areas (IBA). In fact, out of the 15 identified IBA sites in the country, only five were in protected areas while the ten others lied on public lands without any legal protection status (SPNL, 2012). The Hima system ensured here that these sites get actively managed by the local communities while also contributing to the livelihood of these communities.

Today, Lebanon counts 25 Himas in total across the territory (Figure 1), one of them being the Hima of Anjar.

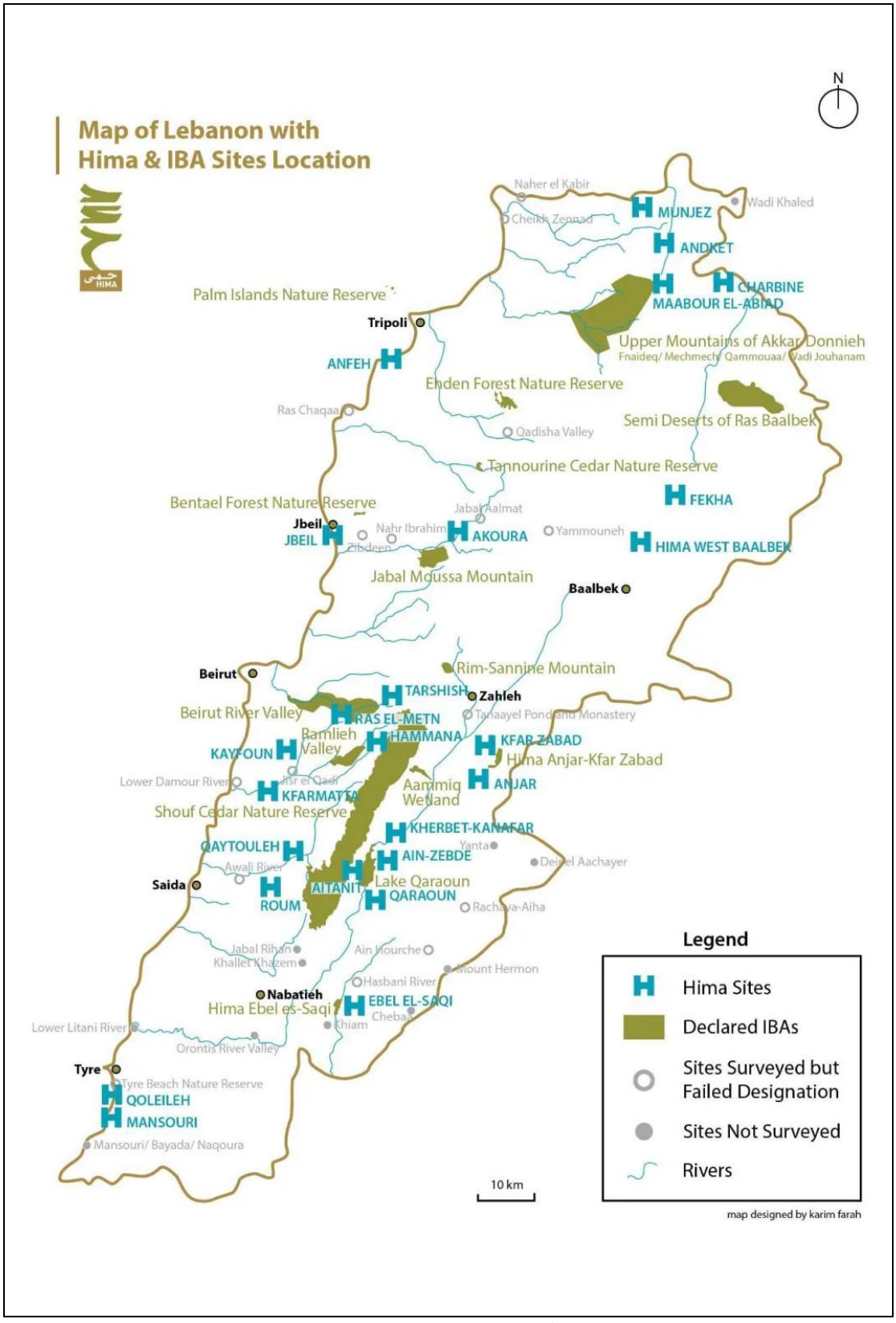


Figure 1 – Hima & IBA sites in Lebanon

Source: www.spnl.org

MATERIALS & METHODS

Study Area

The study area covered two different ecosystems in the eastern part of the village of Anjar, within the Hima Anjar zone:

- the fragment of the Anti-Lebanon mountain chain located within the administrative borders of the village: this includes a reforested area by the Lebanon Reforestation Initiative at lower altitudes, in addition to an oak forest at higher altitudes;
- the protected wetland, partially managed.

In order to have a better understanding of the vegetation diversity of the studied area, the plots were distributed in a way to be the most representative of the different physical environments in both ecosystems. A total of 15 plots were selected, 12 of them at different altitudes and landscapes on the mountain, and three others in the wetland (Figure 2).

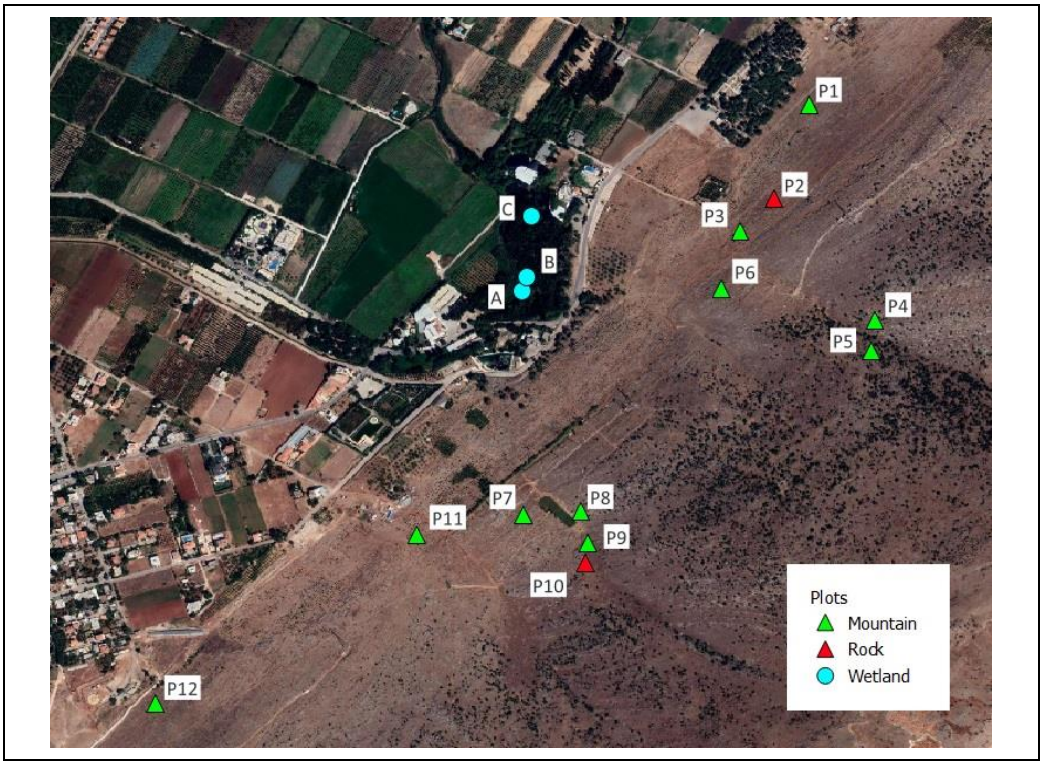


Figure 2 – Distribution of plots in the study area

Source: QGIS / Google Earth

Two plot sizes were considered for the mountain plots (Table 1): circular plots of 5m radius ($A = 78.539m^2$) for studying the vegetation on and around big rocks (P2 & P10), and circular plots of 12m radius ($A = 452.389m^2$) for regular plots. The total covered area on the mountain was 4680.968m^2 or 0.468ha.

Due to the inaccessibility of some areas in the wetlands (Table 2), the plots were limited to 20m × 3m bands ($A = 60m^2$) instead of circular plots, covering a total of 180m^2 or 0.18ha.

For each plot, we recorded the following characteristics:

- Geographic coordinates;
- Altitude;
- Slope;
- Slope aspect;
- Vegetation cover;
- Disturbances.

Plot details are summarized in the tables below:

Plot ID	Geographic coordinates	Altitude	Slope	Aspect	Vegetation cover	Plot type	Disturbances
P1	N33.73800/E035.95193	914m	30°	NW304°	25%	Mountain	Grazing (High)
P2	N33.73616/E035.95125	921m	37°	NW308°	70%	Rock	Grazing (Low)
P3	N33.73552/E035.95058	928m	33°	NW300°	50%	Mountain	Grazing (Moderate)
P4	N33.73378/E035.95322	1010m	40°	SW237°	90%	Mountain	Grazing (Low)
P5	N33.73320/E035.95316	1009m	44°	N1°	90%	Mountain	None
P6	N33.73441/E035.95023	933m	36°	NW314°	90%	Mountain	None
P7	N33.73000/E035.94636	950m	27°	NW325°	60%	Mountain	Grazing (Moderate)
P8	N33.73006/E035.94747	974m	33°	W249°	90%	Mountain	Grazing (Low)
P9	N33.72945/E035.94762	987m	30°	W288°	90%	Mountain	Grazing (Low)
P10	N33.72905/E035.94756	1001m	25°	N3°	40%	Rock	Nearby a human made water pond
P11	N33.72959/E035.94427	934m	26°	NW308°	10%	Mountain	Grazing (High)
P12	N33.72630/E035.93916	932m	27°	NW298°	60%	Mountain	Military camp

Table 1 – Mountain plot details

Plot ID	Geographic coordinates	Altitude	Vegetal cover	Plot type	Disturbances
A	N33.73436/E035.94633	872m	90%	Wetland	Ecotourism
B	N33.73464/E035.94643	872m	90%	Wetland	Ecotourism
C	N33.735815/E035.9465	872m	40%	Wetland	Anthropogenic activity

Table 2 – Wetland plot details

Sampling

The sampling period extended over three months, from April 2022 to August 2022, with regular field visits at one week interval.

During each field visit, the flowers and leaves of newly appearing plants were photographed and the abundance-dominance coefficient of Braun-Blanquet was recorded for each species in each plot. QField was used to take geo-localized photos and for the ease of data entry.

Later, the collected data were treated and visualized using QGIS v3.24.1 (Tisler), and then reported on an Excel sheet.

Plant identification

The identification of samples was based on *ex situ* visual comparison of photographed samples with reference photos. Two major references were used:

- "The Illustrated Flora of Lebanon – Second Edition"(Tohmé & Tohmé, 2014);
- "Nouvelle Flore du Liban et de la Syrie" (Mouterde, 1966).

Some of the identifications were done through personal communication with experts.

Furthermore, the taxonomy of the species and their up-to-date nomenclature were based on those used by Tohmé & Tohmé (2014).

Index of Biodiversity Potential

A quick field survey was performed on three zones (wetland, reforested area, and oak forest) on the 15, 16 and 17th of August 2022. Following a simple visual observation, each of the ten factors used to calculate the IBP was assigned a score of 0, 1, 2, or 5 based on the definitions of Larrieu & Gonin (2008) for these factors, calibrated for Mediterranean forests.

The Index of Biodiversity Potential for each zone was later calculated using an excel spreadsheet provided by the CNPF (Centre National de la Propriété Forestière). The generated graphic representations were used to visualize the results.

RESULTS

Floral Inventory

Taxonomic Diversity

During our study, we identified 107 species distributed into 36 families. The highest diversity was observed in the Asteraceae family with 14 species, which account for 13.08% of the assessed species, followed by the families Fabaceae (11 spp.) and Lamiaceae (9 spp.), covering respectively 10.28% and 8.41% of this inventory. The remaining 32 families account for 68.22% of the species, with some of them being represented by a single species.

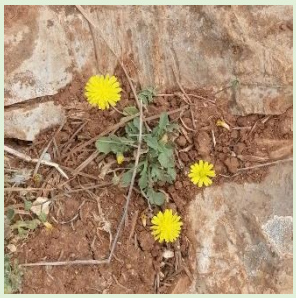
The identified species (scientific name) are presented in the Table 3 below, in alphabetical order of families, along with their respective photographs and potential uses. Also, when applicable, we marked the endemism status of the species under their names according to Tohmé & Tohmé (2014).

The abundance of these species and their distribution on the different plots are detailed in another table added as Annex 1.

ANACARDIACEAE		
Pistacia palaestina Boiss.		Culinary Medicinal
APIACEAE		

Conium maculatum L.		Medicinal
Eryngium sp.		-
Torilis chrysocarpa Boiss. & Bl.		-
ARACEAE		
Arum elongatum Stev.		Medicinal
Arum palaestinum Boiss. End (Leb+Syr+Pal)		Culinary Medicinal

ARALIACEAE		
Hedera helix L.		Medicinal
ASTERACEAE		
Anthemis sp.		-
Carthamus sp.		-
Centaurea solstitialis L.		Medicinal

Chondrilla juncea L.		Culinary Medicinal
Cirsium sp.		-
Crepis sp.		-
Crepis syriaca (Bornm.) End (Leb+Syr+Pal)		Culinary Medicinal
Echinops sp.		-

Echinops viscosus DC.		-
Lactuca serriola L.		Culinary Medicinal
Picnomon acarna (L.)		-
Scorzonera phaeopappa (Boiss.) Boiss. End (Leb+Syr+Tur)		Culinary Medicinal
Senecio vernalis Waldst. & Kit.		-

Silybum marianum (L.)		Medicinal
BORAGINACEAE		
Anchusa sp.		-
Cynoglossum creticum Mill.		Medicinal
BRASSICACEAE		
Arabis verna (L.) R. Br.		Ornamental

Fibigia clypeata (L.) Medic.		Culinary Medicinal
Fibigia eriocarpa (DC.) Boiss.		Medicinal
Sinapis arvensis leiocarpa Gaudin.		Culinary Medicinal
CARYOPHYLLACEAE		
Arenaria cassia Boiss. End (Leb+Syr+Tur)		-
Dianthus strictus polycladus (Boiss.) Mouterde		-

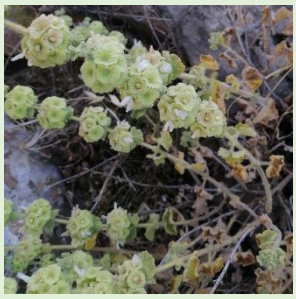
CONVOLVULACEAE		
Convolvulus sp.		-
CRASSULACEAE		
Sedum sp.		-
Umbilicus horizontalis (Guss.) DC.		-
CUCURBITACEAE		
Ecballium elaterium (L.) Rich.		Medicinal
EUPHORBIACEAE		

Euphorbia exigua L.		Medicinal
Euphorbia helioscopia L.		Medicinal
FABACEAE		
Lathyrus aphaca L.		Culinary Medicinal Dye
Lathyrus sp.		-
Ononis spinosa leiosperma (Boiss.) Sirj.		Culinary Medicinal

Robinia pseudoacacia L.		Medicinal
Trifolium campestre Schreb.		-
Trifolium sp.		-
Trifolium tomentosum L.		-
Vicia aintabensis Boiss. & Hausskn.		-

Vicia hirsuta (L.) Gray.		Culinary
Vicia lutea hirta (Balb.) Loisel.		Culinary
Vicia peregrina L.		-
FAGACEAE		
Quercus calliprinos Webb		Wood
GERANIACEAE		

Erodium gruinum (L.) L'Hér.		-
Erodium malacoides (L.) Willd.		Culinary
Geranium molle L.		Medicinal
Geranium robertianum L.		Medicinal
Geranium sp.		-
HYPERICACEAE		

Hypericum sp.		-
LAMIACEAE		
Ballota nigra uncinata (Beg.) Patzak		Medicinal
Ballota sp.		-
Ballota undulata (Fresen.) Benth.		Medicinal
Lamium purpureum L.		Medicinal

Lycopus europaeus L.		Medicinal
Mentha aquatica L.		Culinary Medicinal
Phlomis kurdica Rech.		Medicinal
Prunella sp.		-
Salvia multicaulis simplicifolia Boiss.		Culinary Medicinal
LAURACEAE		

Laurus nobilis L.		Culinary Medicinal
LILIACEAE		
Ornithogalum divergens Boreau.		-
Ornithogalum fucescens Boiss. & Gaill. End (Leb+Syr+Pal)		-
Ornithogalum sp.		-
MALVACEAE		

Alcea sp.		-
OLEACEAE		
Fraxinus syriaca Boiss.		-
Jasminum fruticans L.		Medicinal Ornamental
ONAGRACEAE		
Epilobium hirsutum L.		Culinary Medicinal
ORCHIDACEAE		

Ophrys attica orientalis (Renz.) Mouterde		-
PINACEAE		
Pinus pinea L.		Culinary
PLANTAGINACEAE		
Plantago sp.		-
Plantago lanceolata L.		Medicinal
POACEAE		

Avena sterilis L.		Culinary
Dactylis glomerata L.		Forage
Hordeum bulbosum L.		Culinary
POLYGONACEAE		
Rumex crispus		Medicinal
PRIMULACEAE		

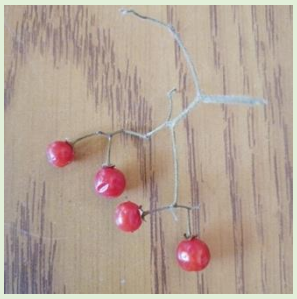
Anagallis arvensis caerulea (L.)		Medicinal
Anagallis arvensis phaenicea (L.) Gouan		Medicinal
RANUNCULACEAE		
Ranunculus asiaticus L.		Ornamental
Ranunculus constantinopolitanus d'Urv.		Culinary Medicinal
Ranunculus hierosolymitanus Boiss.		-

Ranunculus sp.		-
RHAMNACEAE		
Rhamnus lycioides L.		Ornamental Wood Erosion control
Rhamnus sp.		-
ROSACEAE		
Crataegus azarolus L.		Culinary Medicinal Ornamental Wood

Poterium spinosum L.		Medicinal
Prunus korschinskyi (Hand.-Mazz.) Bornm. End (Leb+Syr+Pal)		?
Prunus microcarpa C.A. Mey.		Culinary Medicinal Dye
Prunus orientalis Mill.		Culinary
Rosa canina L.		Medicinal

Rubus hedycarpus Focke.		Culinary
RUBIACEAE		
Galium sp.		-
Rubia tenuifolia d'Urv.		-
SALICACEAE		
Populus alba L.		Medicinal Ornamental Wood Papermaking

Salix alba micans And.		Medicinal
SCROPHULARIACEAE		
Scrophularia sp.		-
Verbascum sinaiticum Benth.		Medicinal
Verbascum sp.		-
Verbascum tiberiadis Boiss. End (Leb+Syr+Pal)		-

Veronica cymbalaria Bodard		Medicinal
Veronica persica Poiret.		Medicinal
Veronica syriaca Roem. & Sch.		Medicinal
SOLANACEAE		
Solanum dulcamara L.		Medicinal
Mandragora automnalis Bertol.		Medicinal

VALERIANACEAE		
Valerianella vesicaria (L.) Moench.		-

Table 3 – List of inventoried species

Endemic Species

A total of 7 species were classified as endemic: *Arum palaestinum*, *Crepis syriaca*, *Scorzonera phaeopappa*, *Arenaria cassia*, *Ornithogalum fucescens*, *Prunus korschinskyi*, *Verbascum tiberiadis*. This classification includes 5 species endemic to the Lebanon-Syria-Palestine region, and 2 species endemic to the Lebanon-Syria-Turkey region.

Dominant Species

Based on the abundance factor of the species, we can clearly indicate the dominant species in each of the three studied zones.

On the mountain and below 1000m, in the Eu-Mediterranean climatic zone, the dominant species was *Poterium spinosum* (Rosaceae) at the floor layer. The only present species which has a potential to dominate the canopy layer in the future was the planted young *Pinus pinea* (Pinaceae) trees, part of the reforestation program.

Above 1000m, in the Supra-Mediterranean climatic zone, the dominance at the canopy layer was for *Quercus calliprinos* (Fagaceae), which is the climax forest in this climatic zone according to Abi-Saleh (1982). No dominant species at floor layer was identified because all the herbaceous and shrubby species existed at scattered form and had low individual abundance.

In the wetland, the canopy layer was dominated by *Populus alba* (Salicaceae), while *Rubus hedycarpus* (Rosaceae) dominated the floor layer. Both of these species are associated with humid zones.

Disturbances

The most common disturbances that can be associated with the loss of biodiversity in the mountain ecosystem of Anjar are wildfires and overgrazing.

Wildfires

The last known wildfire in the region dates back to the summer of 2021, when a massive fire had damaged a large portion of the mountain. After a year of the disturbance, no signs of fire damage were found during the field visits, the vegetation appeared to have started recovering by the ecological succession process.

Overgrazing

Overgrazing was the most important factor observed to be impacting the flora on the mountain. A visual comparison revealed that the vegetation cover on the ground was significantly lower in the severely grazed plots, respectively 25% in plot 1, and 10% in plot 11. The plots showing limited or no grazing activity (plots 2-10) had a vegetation cover ranging from 40% to 90%. The grazing rate was exceptionally high in P1 and P11 due to their accessibility for local shepherds, as these plots were at low altitude, and each of them was within a 50m range of the nearest farm/house. During the study, we have encountered free ranging flocks in these plots.

Overgrazing also affects the taxonomic diversity, favoring the prevalence of some less palatable species over palatable/forage species (Perevolotsky et al., 2001). As the results of our study show, there was a clear dominance of *Poterium spinosum* in the reforested area, where the main grazing activity occurs. The species had greater abundance than any other species in most of the mountain plots.

P. spinosum is a species of prickly perennial shrub that is not consumed by sheep or goats. According to Perevolotsky et al. (2001), the high resilience of this species makes it a common invader of abandoned or overgrazed lands. Therefore, its presence is a possible indicator of past overgrazing patterns in the mountain of Anjar.

Furthermore, the continued grazing would cause the complete dominance of *P. spinosum* in the future, which would discourage the growth of other annual and perennial species, resulting in both the loss of taxonomic diversity and the unavailability of forage. Hence, it is crucial to manage this species, *e.g.*, by the

elimination of mature shrubs and the stimulation of the growth of competitive herbaceous species (Henkin et al., 1998).

Invasive species

An invasive species *Ailanthus altissimus* was encountered in the wetland, and actions should be taken to limit the dissemination of this tree such as continuous cutting.

Other possible disturbances

Hiking/ecotourism and the very localized agriculture, two other activities carried out on the mountain, don't seem to have a significant impact on the flora, as defined paths are accessible to the tourists.

Similarly, the biodiversity of the riparian forest doesn't seem to be affected by the ecotourism activities performed in the wetland. Despite the paving of a water trail during the study period, and the visits of several groups to the wetland, the vegetation stayed constant and new species continued to emerge.

On the other side, no specific instances of unauthorized woodcutting or plant harvesting by individuals are reported in the region. The reason behind this may be the inaccessibility of the forest by car, while for the wetland it's certainly the fence walls built all around the wetland.

Index of Biodiversity Potential

The scores given for each of the ten IBP (Index of Biodiversity Potential) factors during the field observation are presented in the Table 4 below.

Table 5 – Index of Biodiversity Potential in the studied zones summarizes the different IBP results in each of the three studied zones.

Factor	Wetland	Reforestation area	Oak forest
A	2	0	0
B	2	1	1
C	1	0	0
D	5	0	0
E	5	0	0
F	5	0	2
G	5	2	5
H	2	0	5

I	5	0	0
J	2	5	5

Table 4 – Scores of the IBP factors

	$IBP_{management}$	$IBP_{context}$	IBP_{total}
Wetland	71%	60%	68%
Reforestation Area	9%	33%	16%
Oak Forest	23%	67%	36%

Table 5 – Index of Biodiversity Potential in the studied zones

According to Zeller et al. (2022), the Index of Biodiversity Potential is positively correlated with the species richness of birds, fungi, true bugs, lichens, and moths. As a result, our survey reveals that there is a greater diversity in these taxa in the wetland than in the oak forest and the reforested area, the latter holding very low diversity.

Based on the $IBP_{context}$ results, the wetland and the oak forest appear to have a good advantage in their environmental context. If we set the $IBP_{management}$ performance of the wetland as normal, the oak forest is clearly underperforming.

As these results confirm it, effective forest management actions should be taken in these environments, mainly in the reforested area, to restore the environment and reach an optimal balance in these communities. The improvement of factors related to management, which have a result lower than 5 in the following graphics (Figure 3), needs to be considered in future conservation plans.

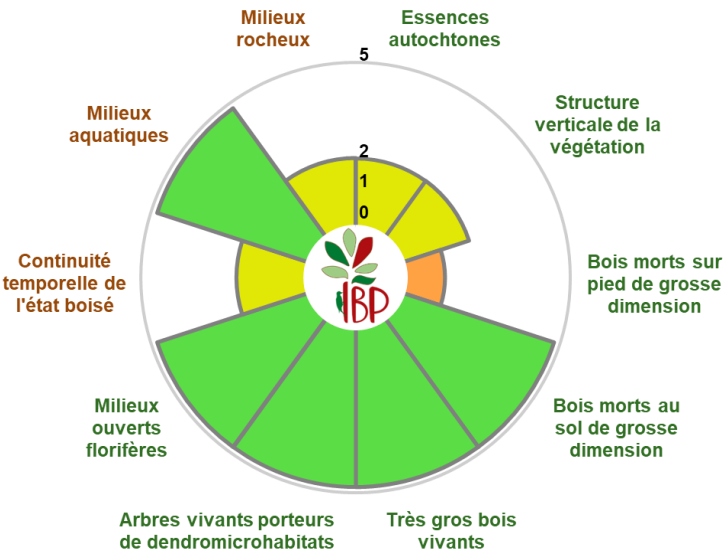
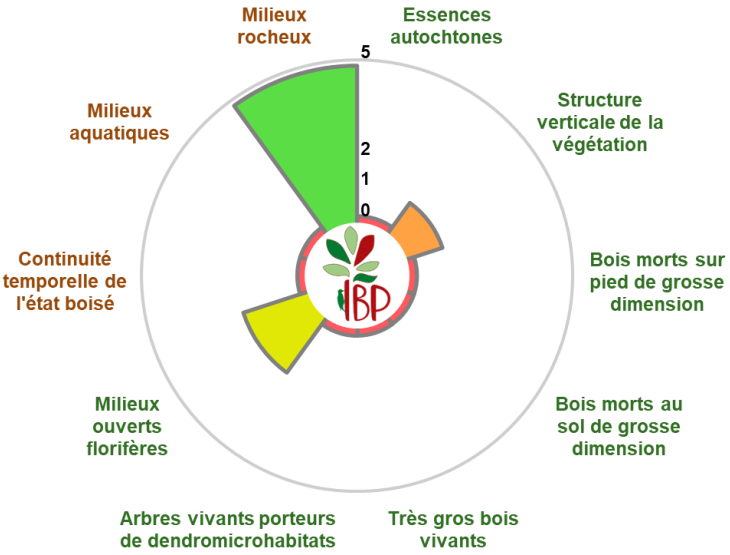
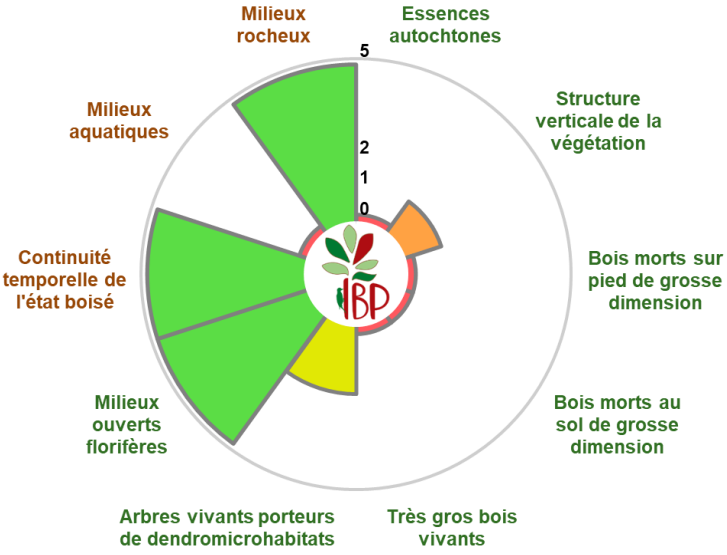
Wetland	
Reforestation area	
Oak forest	

Figure 3 – Graphic representation of the scores of IBP factors

CONCLUSION

This study provides an overview of the plant species present on the mountain and in the wetland of Anjar, to serve as a decision-making tool for future conservation and rural planning programs.

Field survey revealed that Hima Anjar is home for at least 107 species belonging to 36 families. Seven of these species were endemic. Furthermore, the estimation of the Index of Biodiversity Potential showed the important biodiversity in the wetland compared to the oak forest and the reforested area.

In an effort to protect the natural resources of the village, given their ecologic and economic importance, several measures must be implemented to guarantee the stability of the natural communities.

Therefore, it is recommended to:

- Manage grazing activities in the mountain in a more efficient and controlled way to avoid overgrazing. This can be accomplished by educating local shepherds on the risks associated with overgrazing and by training them on improved grazing practices. The mountain should be divided into 4 plots with rotational grazing in each plot. Which means that during each season, the shepherds have only access to one plot. The total number of sheep should not exceed the 50/flock with only 2 flocks in the mountain. A study about the carrying capacity of the mountain should be conducted in the future to confirm the suggested numbers. AEP team will have to ensure that the grazing is done in a rotational way. Grazing should still be prohibited from the riparian area as there is a lot of sensitive species
- Research the effects of *Poterium spinosum* on the other herbaceous annual and perennial plants and managing the propagation of this species in an attempt to restore the taxonomic diversity in the area and to guarantee forage availability for grazing. The roots and the aerial parts of this species has great glucose lowering properties that can be used as a medication for the diabetes. AEP team could get in contact with Lebanese pharmaceutical companies and

sell this species in a sustainable way. That way they can reduce the number of this species in the mountain and have economical benefits from it. A further study needs to be conducted to know the quantity of this species that can be sold without damaging the existence of the species.

- Eliminate invasive species in the region, *e.g.*, *Ailanthus altissima (tree of heaven)* in the riparian area. Due to its extensive root system and resprouting ability, tree-of-heaven is difficult to control. Treatment timing and following up the second year are critical to success. Mechanical methods, such as cutting or mowing, are ineffective, as the tree responds by producing large numbers of stump sprouts and root suckers. Hand pulling young seedlings is effective when the soil is moist, and the entire root system is removed. Small root fragments can generate new shoots. Seedlings can be easily confused with root suckers, which are nearly impossible to pull by hand. Persistence is the key to success. *Rubus hedycarpus* in the riparian area should also be eliminated every spring in the middle area and keep it on the area around the river to form a 3m wide river border.

Lastly, this work represents a baseline for more in depth studies. Further research is needed to confirm the findings and get a complete checklist of the local species and to assess the possible risks on the taxonomic diversity associated with overgrazing and the dominance of *Poterium spinosum*.

Annex

Annex 1

Family	Species	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	A	B	C
Anacardiaceae	*Pistacia palaestina*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Apiaceae	*Conium maculatum*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Apiaceae	*Eryngium sp.*	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-
Apiaceae	*Torilis chrysocarpa*	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-
Araceae	*Arum elongatum*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Araceae	*Arum palaestinum **	-	2	-	-	-	2	2	-	2	-	-	-	-	-	-
Araliaceae	*Hedera helix*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Asteraceae	*Anthemis sp.*	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Asteraceae	*Carthamus sp.*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Centaurea solstitialis*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Chondrilla juncea*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Asteraceae	*Cirsium sp.*	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Asteraceae	*Crepis sp.*	-	-	3	-	-	-	2	2	2	2	1	2	1	-	-

Asteraceae	*Crepis syriaca **	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Echinops sp.*	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Echinops viscosus*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Lactuca serriola*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Asteraceae	*Picnomon acarna*	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Asteraceae	*Scorzonera phaeopappa ***	2	1	1	3	-	1	2	3	1	2	-	-	-	-	-
Asteraceae	*Senecio vernalis*	3	2	2	2	2	2	3	-	3	2	-	2	2	2	-
Asteraceae	*Silybum marianum*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Boraginaceae	*Anchusa sp.*	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
Boraginaceae	*Cynoglossum creticum*	-	-	-	-	-	-	-	-	-	-	-	-	3	+	-
Brassicaceae	*Arabis verna*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Brassicaceae	*Fibigia clypeata*	2	1	-	-	-	-	-	-	-	2	-	-	-	-	-
Brassicaceae	*Fibigia eriocarpa*	2	-	-	-	-	3	-	2	2	2	-	-	-	-	-
Brassicaceae	*Sinapis arvensis leiocarpa*	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
Caryophyllaceae	*Arenaria cassia ***	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Caryophyllaceae	*Dianthus strictus polycladus*	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Convolvulaceae	*Convolvulus sp.*	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Crassulaceae	*Sedum sp.*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-

Crassulaceae	*Umbilicus horizontalis*	-	-	1	-	2	-	1	-	-	3	-	-	-	-	-
Cucurbitaceae	*Ecballium elaterium*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Euphorbiaceae	*Euphorbia exigua*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Euphorbiaceae	*Euphorbia helioscopia*	-	-	-	-	-	-	-	-	-	-	-	-	2	+	-
Fabaceae	*Lathyrus aphaca*	1	-	-	-	3	-	-	-	-	-	-	-	2	-	-
Fabaceae	*Lathyrus sp.*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Fabaceae	*Ononis spinosa leiosperma*	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Fabaceae	*Robinia pseudoacacia*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Fabaceae	*Trifolium campestre*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Fabaceae	*Trifolium sp.*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Fabaceae	*Trifolium tomentosum*	2	-	-	-	-	-	-	-	-	2	1	1	-	-	-
Fabaceae	*Vicia aintabensis*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Fabaceae	*Vicia hirsuta*	-	-	-	-	-	-	-	+	-	1	-	-	-	-	-
Fabaceae	*Vicia lutea hirta*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Fabaceae	*Vicia peregrina*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Fabaceae	*Robinia pseudoacacia*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Fagaceae	*Quercus calliprinos*	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-
Geraniaceae	*Erodium gruinum*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-

Geraniaceae	*Erodium malacoides*	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-
Geraniaceae	*Geranium molle*	-	1	2	-	2	-	+	-	-	-	-	-	1	-	-
Geraniaceae	*Geranium robertianum*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Geraniaceae	*Geranium sp.*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Hypericacea	*Hypericum sp.*	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Lamiaceae	*Ballota nigra uncinata*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Lamiaceae	*Ballota sp.*	-	-	2	-	-	2	-	-	-	-	-	-	-	-	-
Lamiaceae	*Ballota undulata*	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Lamiaceae	*Lamium purpureum*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Lamiaceae	*Lycopus europaeus*	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Lamiaceae	*Mentha aquatica*	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-
Lamiaceae	*Phlomis kurdica*	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Lamiaceae	*Prunella sp.*	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Lamiaceae	*Salvia multicaulis simplicifolia*	-	-	-	+	-	2	-	-	2	-	-	-	-	-	-
Lauraceae	*Laurus nobilis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Liliaceae	*Ornithogalum divergens*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Liliaceae	*Ornithogalum fucescens **	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Liliaceae	*Ornithogalum sp.*	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-

Malvaceae	*Alcea sp.*	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Oleaceae	*Fraxinus syriacum*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Oleaceae	*Jasminum fruticans*	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-
Onagraceae	*Epilobium hirsutum*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Orchidaceae	*Ophrys attica orientalis*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Pinaceae	*Pinus pinea*	1	-	1	-	-	2	2	-	-	-	2	1	-	-	-
Plantaginaceae	*Plantago sp.*	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
Plantaginaceae	*Plantago lanceolata*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Poaceae	*Avena sterilis*	3	+	1	+	+	3	4	3	4	+	2	2	-	-	-
Poaceae	*Dactylis glomerata*	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Poaceae	*Hordeum bulbosum*	2	+	+	+	+	3	3	2	3	2	2	2	-	-	-
Polygonaceae	*Rumex crispus*	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Primulaceae	*Anagallis arvensis caerulea*	-	-	-	+	-	-	-	-	-	-	-	-	2	-	-
Primulaceae	*Anagallis arvensis phaenicea*	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-
Ranunculaceae	*Ranunculus asiaticus*	-	-	-	2	+	+	2	-	1	1	-	-	-	-	-
Ranunculaceae	*Ranunculus constantinopolitanus*	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Ranunculaceae	*Ranunculus hierosolymitanus*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ranunculaceae	*Ranunculus sp.*	-	-	-	-	1	1	1	1	1	2	1	1	-	-	-

Rhamnaceae	*Rhamnus lycioides*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Rhamnaceae	*Rhamnus sp.*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Rosaceae	*Crataegus azarolus*	-	-	-	-	-	-	-	2	-	-	+	-	-	2	-
Rosaceae	*Poterium spinosum*	3	3	4	4	2	2	3	3	5	1	2	-	-	-	-
Rosaceae	*Prunus korschinskyi **	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Rosaceae	*Prunus microcarpa*	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-
Rosaceae	*Prunus orientalis*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Rosaceae	*Rosa canina*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rosaceae	*Rubus hedycarpus*	-	-	-	-	-	-	-	-	-	-	-	-	3	3	2
Rubiaceae	*Galium sp.*	-	-	-	-	-	-	-	-	-	1	-	+	-	-	-
Rubiaceae	*Rubia tenuifolia*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Salicaceae	*Populus alba*	-	-	-	-	-	-	-	-	-	-	-	-	-	5	4
Salicaceae	*Salix alba micans*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Scrophulariaceae	*Scrophularia sp.*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Scrophulariaceae	*Verbascum sinaiticum*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Scrophulariaceae	*Verbascum sp.*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Scrophulariaceae	*Verbascum tiberiadis **	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Scrophulariaceae	*Veronica cymbalaria*	-	-	-	-	1	-	-	+	-	-	-	-	1	+	-

Scrophulariaceae	*Veronica persica*	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-
Scrophulariaceae	*Veronica syriaca*	-	-	1	-	2	-	-	-	-	-	1	-	-	-	-
Solanaceae	*Solanum dulcamara*	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Solanaceae	*Mandragora automnalis*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Valerianaceae	*Valerianella vesicaria*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-

* Endemic to Lebanon, Syria and Palestine

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