

## **Floristic Analysis of Ajlun Mountains (Jordan)**

von

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### **Abstract**

The study of the flora of Ajlun Mountain showed that there are more than 650 different species of vascular plants.

The Mediterranean element is represented by 263 (40%) species which is the largest among the uniregional elements of the flora.

The percentage of phanerophytes is around 13% of the total number of species. The area under review comprises almost all the Mediterranean phanerophytes occurring in East Jordan. The study also showed that the number of species with diaspores without an kind of equipment for long distance dispersal (atelochores) is considerably higher than those furnished with appendages or other accessories. A description of the vegetation is also included.

### **INTRODUCTION**

The present paper is the result of a study on Ajlun mountain flora, extending over four years, and includes observations, field collections and floristic analysis of vascular plants growing in Ajlun mountain.

The area covered in the present study stretches between 32°10' to 32°40' latitude and 35°40' to 36°00' altitude and includes Um Queis, Ajlun and Jerash hilly areas. This area is bordered from the north by Yarmouk River, Zarqa River from the south, Jordan Rift valley from the west, and the eastern part merges gradually into the Syrian desert.

The Eu-Mediterranean climate dominates the area studied, which is characterized by rather mild rainy winters and moderately dry hot summers. The amount of annual rainfall ranges between 300-600 mm. The main annual temperature of the area ranges between 15-20°C. (maximum July 32°C., minimum January 3-5°C) (ABU KHADER et al., 1960).



The flora of Jordan comprises about 2078 species spread within 719 genera and 120 families (AL-EISAWI, 1982).

In a previous work by the present authors, they enumerated 69 families, 334 genera and 655 species of vascular plants from the studied area (EL-OQLAH and LAHHAM, 1985, in press). The vegetation types in forests and grazing lands in East Jordan were classified and studied by several authors (KASAPLIGIL, 1956; LONG, 1957, ZOHARY, 1962, 1973, 1982). Also the Jordanian government is studying the feasibility of making a national park at Birgish in Ajlun Mountain. In this floristic analysis the following has been studied and analyzed: vegetation, life forms, diaspore types, diversity at the class/division and subclass taxonomic levels and the distributional patterns exhibited by the different species.

## RESULTS

### I. Vegetation:

The local maquis and forests of Ajlun mountains can be grouped into the following types: (Map 1)

- (1) Pine forests: these forests of the Mediterranean region are dominated by *Pinus halepensis* and often accompanied by shrubs and trees of maquis and garigue such as *Quercus calliprinos*, *Pistacia palaestina*, *Arbutus andrachne*, *Cistus salviifolius*, and many other perennial and annual species. The occurrence and the density of which depends on the amount of light available beneath the canopy of the trees. These forests are restricted to light coloured, highly calcareous rendzina soils derived from soft rocks of various upper cretaceous and tertiary formations. The aleppo pine forests are mainly distributed in Dibbeen and Anjara (altitude 800-1200 m). Remnants of this forest type may be found scattered on different mountain summits especially near Al-Rabad fortrees, Sakhra and Ebbeen.
- (2) Deciduous tabor oak forests: these forests are dominated by *Quercus ithaburensis* and associated with *Pistacia atlantica*, *Pistacia palaestina*, *Styrax officinalis*, *Crataegus azarolus*, *Calycotome villosa*, *Cercis siliquastrum*, *Clematis cirrhosa*, *Rhamnus palaestina*, *Cyclamen persicum* and *Ruta chalepensis* and many other chamaephytes and annuals. These forests are found in the north-west, south-west and the eastern parts of Ajlun mountains.
- (3) The evergreen oak forests and maquis: these are the most typical and most common forest and maquis formation of the Mediterranean part of Palestine and



East Jordan (ZOHARY 1960, 1962). The forests and maquis are dominated by *Quercus calliprinos* which is usually found associated with *Pistacia palaestina*.

Apart from the dominating *Quercus* and *Pistacia*, a series of other Mediterranean evergreen trees and shrubs such as *Arbutus andrachne*, *Phillyrea media*, *Rhamnus alaternus*; furthermore the deciduous *Styrax officinalis*, *Cercis siliquastrum*, *Rhamnus palaestina*, *Crataegus azarolus* and others can be found.

In addition, some undershrubs of the garigue and batha formations are often found. The most typical climbers of the maquis are *Clematis cirrhosa*, *Lonicera etrusca*, *Bryonia syriaca* and *Smilax aspera*. Apart from the arboreal vegetation, mention should be made of dwarf shrub formation forming succesional stages that lead to the restoration of the local maquis and forest climaxes, such as *Calycotome villosa*, *Cistus salviifolius*, *C. creticus* and *Phlomis viscosa*. The vegetation of the south west and eastern slopes of Ajlun mountains is mainly dominated by Irano-Turanian plants consisting of annual and perennial herbs with scattered dwarf shrubs and trees such as *Pistacia atlantica*, *Ziziphus spina-christi*, *Rhus coriaria*, *Retama raetam*, *Rhamnus palaestina*, *Crataegus azarolus*, *Salvia dominica*, *Salvia horminum*, *Euphorbia hierosolymitana*, *Ferula communis* and *Phlomis viscosa*. The predominant habitats of this territory are grey calcareous steppe soils, loess, soils and rocky hills, with an annual rainfall ranging between 200-350 m.

In the studied area also very few Sudanian species escaped from the rift valley to grow on the lower slopes or very deep valleys such as *Ziziphus spina-christi*, *Tamarix tetragyna* and *Calotropis procera*.

## II. Life Forms

In table 1 an analysis of the life forms as defined by RAUNKIAER is given. These are given as number of species and percentages.

Table 1

| <u>Life form</u> | <u>No.</u> | <u>%</u> |
|------------------|------------|----------|
| Therophytes      | 354        | 54.04    |
| Geophytes        | 71         | 10.83    |
| Hemicryptophytes | 13         | 1.98     |
| Chamaephytes     | 128        | 19.54    |
| Phanerophytes    | 83         | 12.67    |
| Succulents       | 3          | 0.45     |
| Parasites        | 3          | 0.45     |
|                  | 655        | 100.00%  |

The percentage of phanerophytes (trees and shrubs with their perennating buds more than 0,5 m above ground) in the



region is around 13% of the total number of species. Their number is about 2/3 of the number of chamaephytes (shrubs with buds less than 0,5 m above ground).

The remaining 68% of species are distributed between the categories of therophytes which represents the highest percentage (54%), geophytes, hemicryptophytes, and finally the succulents and parasites which are represented by the least percentages. The area under review comprises almost all the Mediterranean phanerophytes occurring in East Jordan. Although the maquis and forests in the area are evergreen in their appearance, its evergreen phanerophytes are somewhat less numerous than the deciduous ones. Of the evergreens the following may be mentioned: *Quercus calliprinos*, *Pistacia lentiscus*, *Arbutus andrachne*, *Phillyrea media*, *Ceratonia siliqua* and *Olea europaea*. The deciduous trees and shrubs are: *Quercus ithaburensis*, *Q. infectoria*, *Crataegus azarolus*, *Cercis siliquastrum*, *Pyrus syriaca*, *Amygdalus communis*, *Styrax officinalis* and *Calycotome villosa*.

### III. Diaspore:

The dispersal mechanisms of Ajlun mountain plant species are given in table 2. (The nomenclature and terminology used is that of VAN DER PIJL (1969) and RIDLEY (1930).

Table 2

| <u>Diaspore type<br/>or Disseminule</u> | <u>No.</u> | <u>%</u>     |
|---|------------|--------------|
| Sporochore                              | 95         | 14.52        |
| Pterochore                              | 45         | 6.88         |
| Pogonochore                             | 50         | 7.64         |
| Cyclochore                              | 10         | 1.52         |
| Epizoochore                             | 62         | 9.40         |
| Endozoochore                            | 20         | 3.05         |
| Ballochore                              | 1          | 0.15         |
| Barochore                               | 5          | 0.76         |
| Hydrochore                              | 3          | 0.45         |
| Anthropochore                           | 6          | 0.91         |
| Atelechore                              | 228        | 34.70        |
| Polychore                               | <u>130</u> | <u>19.87</u> |
|   | 655        | 100.00%      |

Plants were grouped into the above mentioned categories according to the nature of their diaspores, their structure and appendages, of their mechanisms of discharge from the parent plant. Table 2 shows that the number of species with diaspores without any kind of equipment for long distance dispersal (atelechore) is considerably higher than those furnishes with appendages or other accessories supposedly enabling long distance transportation.



#### IV. Diversity:

The number of species per class and subclass is shown in tables 3 and 4. (Nomenclature used is that of CRONQUIST 1978).

Table 3

| <u>Non flowering</u>     |            | <u>Flowering (Magnoliophyta)</u> |            |
|--------------------------|------------|----------------------------------|------------|
| <u>Division of class</u> | <u>No.</u> | <u>Division of class</u>         | <u>No.</u> |
| Pteridophyta             | 3          | Pinophyta                        | 1          |
|                          |            | Magnoliatae (dicots)             | 564        |
|                          |            | Liliatae (monocots)              | 87         |

Table 4: Number of species per subclass (of the Magnoliophyta).

Table 4

| <u>Subclass</u> | <u>No. of Species</u> | <u>%</u> |
|-----------------|-----------------------|----------|
| Magnoliidae     | 36                    | 5.52     |
| Hamamelidae     | 9                     | 1.38     |
| Caryophyllidae  | 28                    | 4.30     |
| Dilleniidae     | 69                    | 10.59    |
| Rosidae         | 219                   | 33.64    |
| Asteridae       | 203                   | 31.18    |
| Alismatidae     | 1                     | 0.15     |
| Arecidae        | 2                     | 0.30     |
| Commelinidae    | 48                    | 7.37     |
| Liliidae        | 36                    | 5.52     |
|                 | 651                   | 100.00%  |

The most dominant plant families are the Leguminosae with 29 genera and 112 species; Compositae 37 genera - 54 species; Gramineae 27 genera - 45 species; Labiatae 22 genera - 43 species; Umbelliferae 31 genera - 41 species; Cruciferae 24 genera - 27 species.

#### V. Distribution:

A phytogeographical analysis of Ajlun mountains revealed the existence of uni-, bi- and pluriregional groups. The numerical proportions of these groups are shown in Table 5.



Table 5

| (1) The uniregional groups                         | No. | %     |
|--|-----|-------|
| Mediterranean                                      | 263 | 39.84 |
| Irano-Turanian                                     | 58  | 8.85  |
| Saharo-Arabian                                     | 17  | 2.59  |
| Sudanian   | 16  | 2.44  |
| Euro-Siberian                                      | 1   | 0.15  |
| (2) Bi- and pluriregional                          |     |       |
| Mediterranean - Irano-Turanian                     | 151 | 23.05 |
| Mediterranean - Saharo-Arabian                     | 8   | 1.22  |
| Irano-Turanian - Saharo-Arabian                    | 15  | 2.28  |
| Saharo-Arabian - Sudanian                          | 2   | 0.33  |
| Mediterranean - Irano-Turanian -<br>Saharo-Arabian | 20  | 3.05  |
| Mediterranean - Irano-Turanian -<br>Euro-Siberian  | 59  | 9.0   |
| Cosmopolitan                                       | 45  | 6.87  |

Table 5 shows that the Mediterranean element is represented by 263 which is the largest number among the uniregional elements of the flora.

The number of species of the Irano-Turanian element in the flora of the studied area is 58, about 9% of the flora. Adding to this number of about 253 bi- and triregional species such as Mediterranean - Irano-Turanian, Irano-Turanian - Saharo-Arabian, and the Mediterranean - Irano-Turanian - Saharo-Arabian groups, the Irano-Turanian affinity of the local flora becomes strongly apparent.

#### DISCUSSION

This study shows that the flora of Ajlun mountain comprises 31% of the total plant species that grows in East Jordan, and about 27% of the total plant species that is recorded in Flora Palaestina.

The Mediterranean element in the flora of the studied area is represented by 263 species (40%). In the flora of Palestine, ZOHARY (1962, 1966-1978, 1973, 1982) indicated that the Mediterranean element is represented by some 800 species, which is the largest among the uniregional element of the flora. This illustrates that the area has a typical Mediterranean flora.

The percentage of phanerophytes in the region is higher than the percentage given by ZOHARY (6,6%) for the whole flora of Palestine. A comparison of the dispersal mechanisms of Ajlun mountain plant species with a similar association of *Quercus calliprinos* in upper Galilee



(ZOHARY, 1962) reveals that the two woodland communities are similar in the predominance of wide-range dispersal mechanisms.

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(KONKAY, 1965) reveals that the low woodland communities are similar in the predominance of wide-range dispersal mechanisms.

On the other hand, the low woodland communities are

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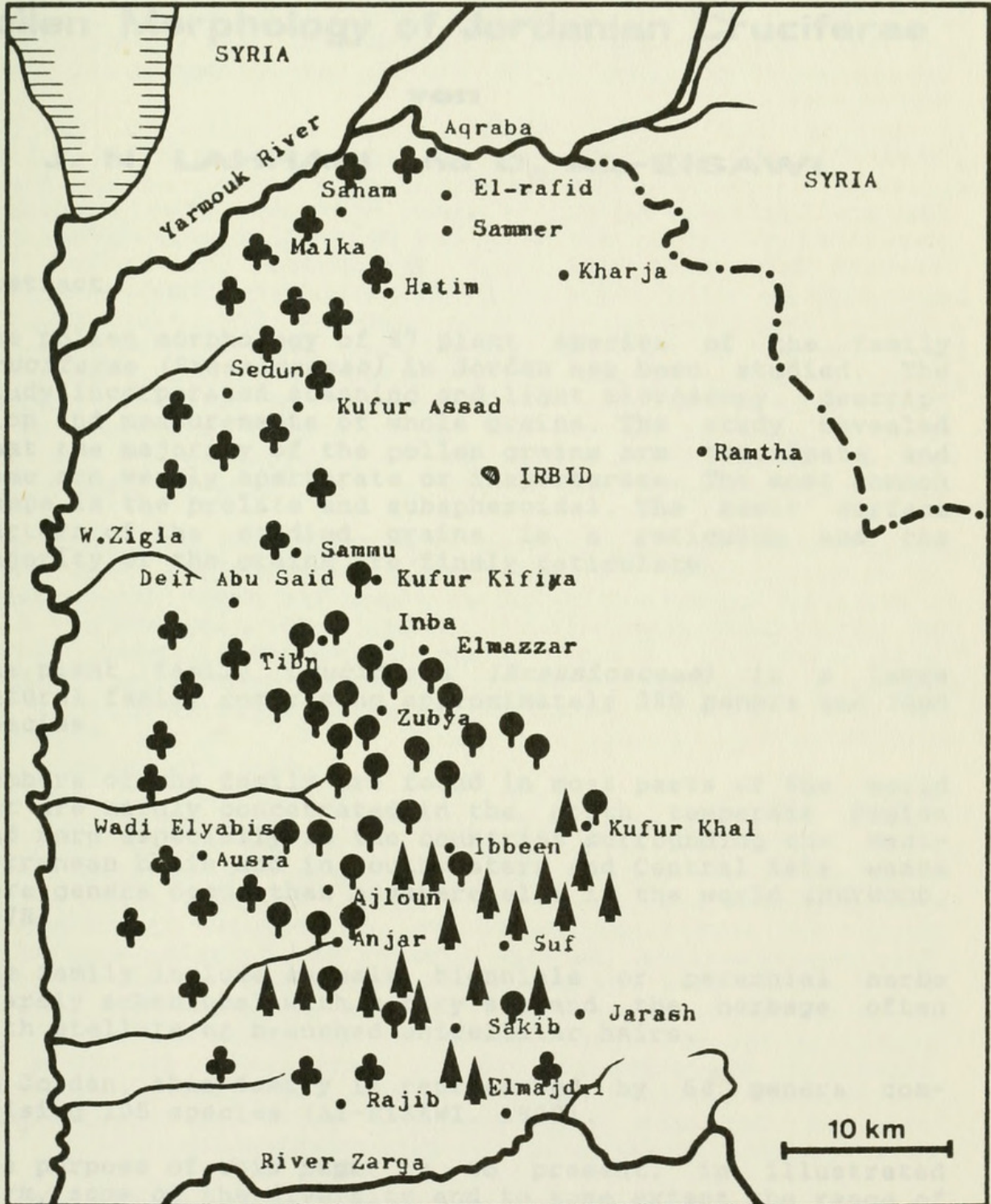
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Map 1: Vegetation Map of Ajlun Mountain.

- ▲ Pine Forests.
- ♣ Deciduous Tabor Oak Forests.
- Evergreen Oak Forests and Maquis.









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