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## Highlights from "The Bryophyte Flora of Israel" by C. C. Heyn & I. Herrnstadt, eds.

### Abstract

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The preparation of the Bryophyte part of the Flora Palaestina series has been completed and "The Bryophyte Flora of Israel" is *in press* (published by The Israel Academy of Sciences and Humanities, Series editor F. D. Por, Scientific editor N. L. Gil-ad.). The flora comprises 259 taxa (220 mosses, 39 hornworts and liverworts). Geographically the flora covers the area from the Mediterranean Sea to the Syrian-African Rift Valley, and in addition includes the Golan Heights and the south part of Mt. Hermon. This paper provides some highlights on the taxonomic and floristic research, particularly species diversity and species composition, on phytogeographic elements and on endemism. A comparison also is made between the Israeli bryophyte flora and that of Europe.

### Introduction

The Bryophyte Flora volume comprises two parts: I. *Bryopsida* (mosses) by Ilana Herrnstadt & C. Clara Heyn, and II. *Anthocerotopsida* (hornworts) and *Hepaticopsida* (liverworts) by Helene Bischler and Suzanne Jovet-Ast. The following aspects are noteworthy.

### Composition of the local flora

The bryophyte flora includes 259 taxa comprising 9% of flora of Israel. This exceeds the general world wide percentage (Bischler & Jovet-Ast 1975; Herrnstadt 1992; Herrnstadt & al. 1991; Jovet-Ast & al. 1965, 1966, 1975).

There are 220 taxa of mosses. The most commonly represented order is *Pottiales* with 43% of the total number of species (Table 1). Within the *Pottiales*, almost all the species belong to the family *Pottiaceae*.

Eighty four moss taxa have been recorded from Israel for the first time. Four species and three varieties are new to science and one new name was added.

There are 39 taxa of liverworts. The most commonly represented order is *Marchantiales* with 62% of the total number of species (Table 2). The family *Ricciaceae* comprises 63% of the total number of species in the order *Marchantiales*.

Table 1. Summary of the orders, families, genera, and species of mosses treated in the Flora.

Order	Number of families	Number of genera	Number of species	Number of species as percent of total
Fissidentales	1	1	10	5
Dicranales	2	4	5	2
Pottiales	2	25	91	43
Grimmiales	1	3	10	5
Encalyptales	1	1	2	1
Funariales	3	6	16	8
Bryales	3	6	27	13
Orthotrichales	1	2	7	3
Leucodontales	3	6	6	3
Hypnales	3	10	36	17
Total number	20	64	210	

Table 2. Summary of the orders, families, genera, and species of hornworts and liverworts treated in the Flora.

Order	Number of families	Number of genera	Number of species	Number of species as percent of total
Anthocerotales	1	1	2	5
Jungermanniales	5	5	6	15
Metzgeriales	3	3	3	8
Sphaerocarpales	2	2	4	10
Marchantiales	8	11	24	62
Total number	19	22	39	

### Endemism

Among the mosses 5,5% of the taxa are endemic to Israel and the eastern Mediterranean or southwestern Asia.

Species endemic to Israel are *Pterygoneurum crossidioides*, *Acaulon longifolium*, *Pottia gemmifera*, *Phascum galilaeum*, *Ph. cuspidatum* var. *marginatum*, *Ph. cuspidatum* var. *arcuatum*, *Barbula ehrenbergii* var. *gemmaipara* (Herrnstadt & Heyn 1993, 1999).

Species endemic to southwestern Asia and the eastern Mediterranean are *Gymnostomum mosis*, *Cinclidotus pachyloma*, *Tortula pseudohandelii*, *T. rigescens* and *T. echinata*.

Among the local hornworts and liverworts no endemic taxon has been found.

### Phytogeographical element

About 50% of the local mosses are Mediterranean elements. Approximately 25% show a temperate pattern of distribution. Five percent are boreal and a similar percent are continental western and central Asian plants. A few species of paleotropical origin have penetrated north along the Syrian-African Rift Valley.

Of the local liverworts, about 51% have present-day tropical distribution. Some 26% are Mediterranean or European-Mediterranean elements, 8% are boreal, and 15% show a north-south disjunct range.

### A comparison between the floras of Israel and Europe

A summary of the orders of mosses, liverworts and hornworts in the local flora and a comparison of the number of species (represented as percent of the total) with the European flora is presented in Figures 1 and 2.

Among the mosses the largest order, *Pottiales*, comprises 43,3% of the total number (91) of species, compared with only 19,5% of the total number of species in Europe. This order is characterized by morphological and physiological adaptations to variable conditions and harsh environments (Zander 1993). *Pottiales* by far has the largest geographical distribution, including the more arid desert regions, of any of the orders in the local flora.

*Funariales* with a relatively higher presence of species in Israel compared to Europe (7,6% in Israel compared to 6,5% in Europe) represents an order with a large sporophytic plasticity as well gametophytes with a wide range of ecological tolerance to diverse microhabitats.

The hornwort and liverwort orders *Anthocerotales*, *Sphaerocarpaceales* and *Marchantiales*, which are characterised by drought tolerant species or species with large, resistant spores, comprise 77% of the total number of species in the local flora compared to only 18% of the total in Europe. The *Jungermanniales* (the largest order in Europe) and the *Metzgeriales*, which are characterised mainly by sciophilous species, comprise only 23% of the total number of species in the local flora compared to 82% of the total in Europe (Table 2).

Compared to the local flora, the European flora is much richer in number of species. This fact could be related to the local paucity of acidic soils, the absence of extended maquis and forests, as well as the lack of the high altitudes found in parts of Europe.

### Concluding remarks

This flora summarises twenty-two years of research on the bryophytes native to Israel. Our region has attracted very few bryophyte specialists and there was ample scope for

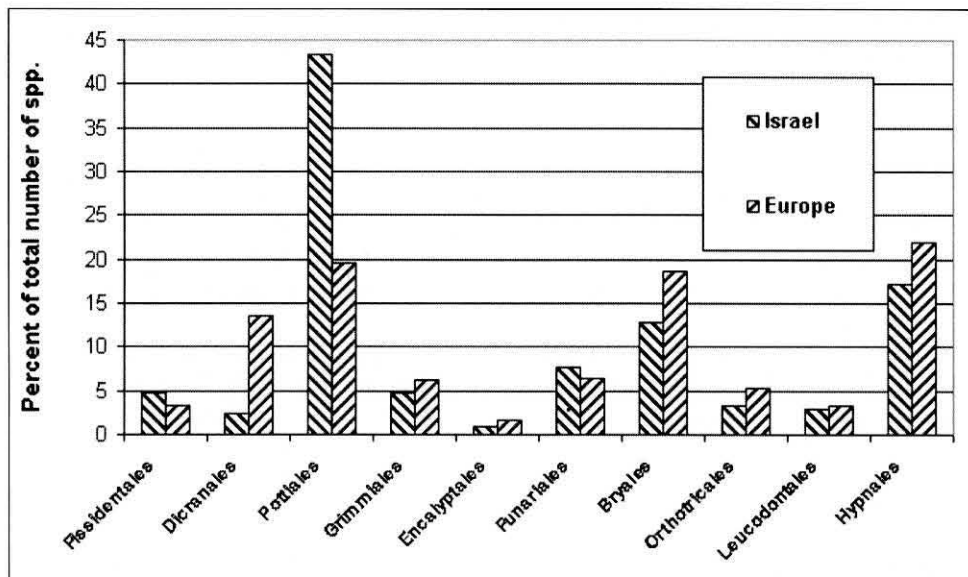


Fig. 1. Summary of the orders of mosses in the local flora and a comparison of the number of species (represented as percent of the total) with the European flora.

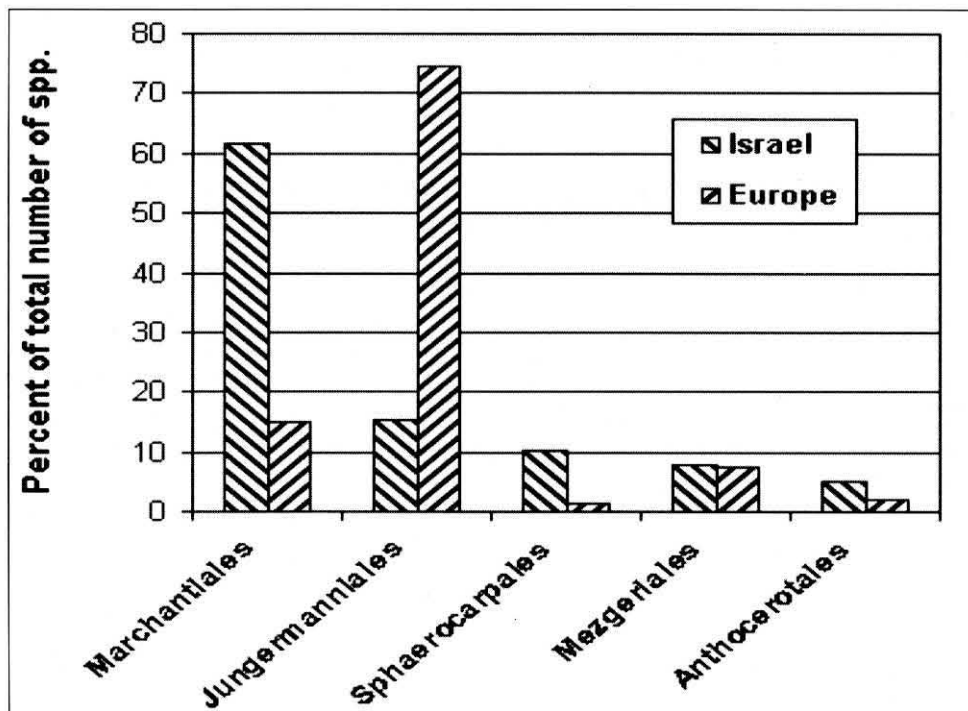


Fig. 2. Summary of the orders of liverworts and hornworts in the local flora and a comparison of the number of species (represented as percent of the total) with the European flora.

augmenting the existing data and interpretations. The research was rewarding because this small country has been found to have an unexpectedly wide diversity of species.

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