

Article

Diversity of Vascular Flora in Organic and Conventional Olive Orchards in Crete, Greece

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Abstract

Olive orchards constitute important reservoirs of floristic diversity, including species that are strongly dependent on agroecosystems for their persistence. The conservation of floristic diversity enhances the provision of essential agroecosystem services, contributing to the sustainability of olive orchard agroecosystems. The main aim of this study was to provide a descriptive analysis of the floristic diversity of olive orchards, a topic that has not been investigated extensively in Crete. The study was designed to capture variation associated with management system (MS) and agroecological zone (AZ), providing a comprehensive assessment of floristic diversity. A seven-and-a-half-year floristic survey was conducted in the Messara Valley, Crete, Greece, across nine organic olive orchards implementing Green Infrastructure (GI), eight conventionally managed orchards, and two abandoned orchards. The orchards were located in both plain and hilly agroecological zones. Within each orchard, monthly surveys were conducted in three randomly assigned square sampling stations per hectare, which remained constant throughout the study period. A descriptive analysis and univariate comparisons between the MS and AZ were conducted using six pairs of organic and conventional orchards, with three pairs located in the hilly AZ and three in the plain AZ. In total, 331 species, belonging to 60 families and 28 taxonomic orders, were identified. Most recorded species were characterised as therophytes (55%) and hemicryptophytes (31%), mainly belonging to the families Asteraceae, Fabaceae, Poaceae, and Lamiaceae. Total species richness was higher in organic (257 species, 56 families) than in abandoned (195 species, 45 families) and conventional orchards (192 species, 50 families), however, the mean species richness did not differ statistically significantly among management systems. Mean species and family richness were significantly higher in the hilly AZ than in the plain AZ, and total species richness was also higher in the hilly AZ (316 species, 59 families) than in the plain AZ (128 species, 43 families). This study highlights the role of olive orchards as reservoirs of floristic diversity in Crete and demonstrates the influence of MS, Green Infrastructure and AZ in shaping the floristic diversity of these agroecosystems.



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1. Introduction

Agroecosystems host a diverse array of flora and fauna, underscoring their significance for biodiversity conservation [1–4]. Anthropogenic disturbance disrupts ecological succession, allowing species adapted to such disturbance to dominate over others that would otherwise outcompete them during succession [5–8]. However, the intensification of agricultural practices, such as the use of herbicides and intensive soil disturbance, can reduce floristic diversity in agroecosystems. Therefore, agricultural land, especially traditional, low-input cultivation systems, has been identified as an important habitat for conserving floristic diversity [2,5,9–11].

According to Bergmeier and Strid [12], approximately 138 plant taxa, highly dependent on agricultural land, have been recorded in agricultural and ruderal habitats in Greece. The Kriti (Crete) and Karpathos phytogeographical region is characterised by high floristic diversity, comprising approximately 1735 species, including 159 endemic taxa. Within this region, 2,678 records of species associated with traditional agriculture have been documented, the second-highest number among the floristic regions of Greece, accounting for 13.69% of all plant records associated with traditional agriculture in the country.

A large proportion of these floristic elements has been recorded in olive orchards [10,13–16], highlighting the role of olive orchards as important reservoirs of plant diversity and their contribution to biodiversity conservation [17]. Olive orchards occupy a substantial proportion of the Mediterranean and Cretan landscape, representing approximately 20% of the total land area and 70% of agricultural land in Crete [18], and therefore hold considerable cultural, socioeconomic, and agricultural significance [1,19,20]. The extensive geographic distribution and land coverage of olive orchards across the Mediterranean, including regions such as Crete, together with the agroecosystem services provided by biodiversity, underscore the importance of conserving floristic diversity in olive orchards [4,21–24]. These services include provisioning, regulating, and cultural services.

Biodiversity in olive orchards, together with the agroecosystem services it provides, can be enhanced through the establishment of Green Infrastructure (GI) [25]. Green Infrastructure (GI) in olive orchards comprises two complementary components. The first consists of GI elements, including (i) plantations of aromatic plants, fruit-bearing shrubs, and trees; (ii) stone refugia; (iii) brush piles; and (iv) artificial water sources/ponds, located within and/or around the olive orchards. The second comprises agroecological farming practices, including (i) minimum soil disturbance; (ii) the use of cover and companion crops; (iii) green manuring; (iv) shredding and incorporation of pruning residues; (v) rational use and minimisation of synthetic chemical inputs and irrigation water inputs [26]. The floristic composition of olive orchards is characterised by herbaceous annual therophytes, biennial and perennial hemicryptophytes, together with geophytes and phanerophytes, particularly in traditionally managed or abandoned orchards, according to Raunkiaer's plant life-form classification [27]. The vascular flora of olive orchards in Greece is usually dominated by monocotyledons, primarily belonging to the grass family (Poaceae), such as *Cynodon dactylon*, *Avena* spp. and *Bromus* spp. Dicotyledons belonging to the composite (Asteraceae) and legume (Fabaceae) families, including *Glebionis coronaria* and *Medicago polymorpha*, are also common [7,16]. Other dominant species include *Oxalis pes-caprae* and *Capparis spinosa* [4,10,28,29]. Floristic diversity in olive orchards is shaped by complex interactions between management systems [30] and agroecological zones (hilly and plain) [31]. It may be enhanced through the application of agroecological farming methods, such as Green Infrastructure (GI) [32], thereby improving the provision of agroecosystem services and supporting the sustainability of olive cultivation [3,15,17,18].

Despite the importance of olive orchards for the conservation of floristic diversity, only a limited number of studies have specifically investigated floristic diversity in olive orchards in Crete [10,33], one of the most floristically rich and diverse regions in Greece [34,35]. Most observations of floristic elements in olive orchards originate from broader floristic surveys of the Cretan and the Greek floras, and from field studies conducted in agricultural and ruderal habitats [13,15,36,37]. Several studies have reported sporadic observations of vascular flora diversity in olive orchards in Greece [7,10,16,24,38–40]; however, these studies have not covered such an extended study period or employed a compatible level of temporal replication, which are essential for ensuring the comprehensiveness of flora inventories and accounting for the effects of climatic variation on data interpretation. In addition, although observations of plant species in olive orchards managed under different management systems have been reported elsewhere in Greece and the Mediterranean, to our knowledge, no study has considered both management system and agroecological zone into the survey design. Such an approach may provide insights into species' environmental preferences and patterns of occurrence. These considerations, together with the long-term study period, demonstrate the novelty of this survey and contribute to a comprehensive floristic inventory of olive orchards in the study area. Furthermore, no other study at the global scale has considered the presence of Green Infrastructure in olive orchards, an important farming method that aligns with the objectives of the EU Green Deal, including the EU Common Agricultural Policy (CAP), the EU "Farm to fork strategy for 2030", the EU "Biodiversity Strategy for 2030" and the EU "Soil Strategy for 2030".

The main aim of the study was to provide a comprehensive description of the vascular flora composition and diversity in olive orchards in a representative olive-growing area of Greece, while accounting for the effects of time, management system, and agroecological zone. Specifically, we investigated whether floristic community composition differed among management systems and agroecological zones, identified patterns of species occurrence associated with management systems and agroecological zones. Moreover, we tested the hypothesis that organic and hilly olive orchards exhibit higher floristic diversity than conventional and plain orchards, respectively.

2. Materials and Methods

2.1. Study Area

The study area is located in the western part of Messara, a representative olive-producing region, in south-central Crete, Greece [31]. The area is composed of two distinct agroecological zones. The two agroecological zones are characterised by differences in landscape composition, edaphoclimatic conditions, and microclimate [31]. Compared with the plain zone, the hilly zone receives higher precipitation and experiences fewer temperature extremes. Calcareous soils dominate both zones; however, the hilly zone is characterised by silty-marly soils, schist, and limestone formations, whereas the plain zone is primarily composed of alluvial sediments [20,41]. Soils in the hilly zone have been affected by prolonged erosion, in contrast to the heavier and more fertile soils of the plain zone.

According to the Köppen climate classification, the climate in the study area is classified as a hot-summer Mediterranean climate (Csa), characterized by hot, dry summers and mild, wet winters, with an annual mean temperature of 17.5 °C and an average annual precipitation of approximately 600 mm [42]. Olive orchards managed at a lower intensity than those in the plain zone, dominate land use in the hilly zone, together with extensive areas of sclerophyllous vegetation, including phrygana and garigue ecosystems, and small human settlements. In contrast, the plain zone is dominated by crops, mainly olive orchards, with remnants of semi-natural habitats and urban areas [33]. The study area is

adjacent to two designated Natura 2000 sites of conservation importance for biodiversity and natural habitats [41].

Figure 1 presents the geographic distribution of the surveyed orchards and their proximity to the designated Natura 2000 sites.

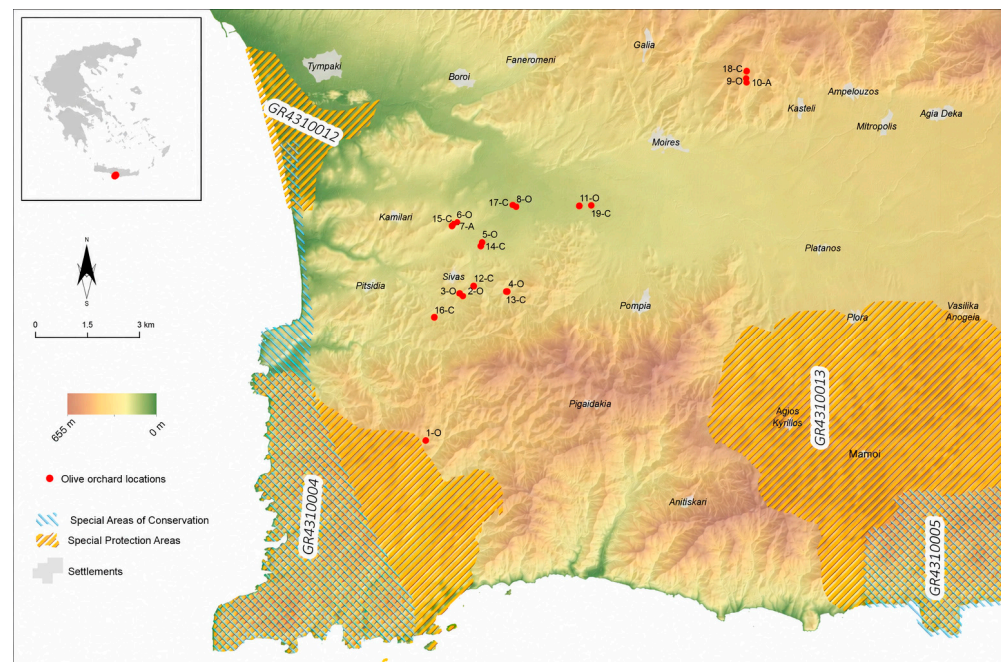


Figure 1. Geographical distribution of the 19 surveyed olive orchards in western Messara, Crete, Greece. Red dots indicate the locations of the surveyed orchards.

2.2. Survey Protocol

The survey was conducted monthly over a 7.5-year period, from May 2018 to September 2025, within the framework of the project LIFE IGIC—Improvement of Green Infrastructure in agroecosystems: reconnecting natural areas by countering habitat fragmentation (LIFE16 NAT/GR/000575) [32,43]. It included 19 olive orchards across two agroecological zones (hilly and plain): 13 orchards were located in the hilly zone and 6 orchards in the plain zone (Figure 1).

Among the surveyed orchards, nine implemented Green Infrastructure (GI) and complied with the European Union (EU) organic production standards (Regulation (EU) 2018/848) [44,45], eight were managed under conventional farming practices in accordance with the EU regulatory framework for conventional agriculture, and the remaining two had not received agricultural inputs or undergone active farming management for an extended period. Green Infrastructure in the organic orchards included both GI elements and agroecological practices. A detailed description of the GI components, agroecological practices, and their technical implementation is available in Kabourakis (2025) [26] and in the LIFE IGIC Decision Support Tool [46].

The study employed a stratified, two-stage sampling design. Stratification into two agroecological zones was based on distinct edaphoclimatic conditions characterising the hilly and plain zones, as reported in the scientific literature [31]. Stratification into two management systems was based on the existing literature [2,28], which indicated differences in community composition and diversity. A greater number of orchards were selected in the hilly agroecological zone to reflect the higher number of olive orchards located in this zone within the study area and across Crete. The orchards were selected following discussions with local stakeholders and based on previous research conducted in the area [31,47–49]. The selection of the 19 orchards included six pairs of organic and

conventional orchards distributed across six locations, with one pair in each location, where the average distance between neighbouring orchards was approximately 150 m. Three pairs were located in the hilly agroecological zone, and three pairs were located on the plain agroecological zone. The paired sampling design provided six matched organic-conventional orchard pairs, allowing balanced comparisons between management systems and agroecological zones.

In each orchard, three square sampling stations per hectare were established, each covering an area of 16×16 m, resulting in three to seven sampling stations per orchard and a total of 69 sampling stations per sampling survey. Each orchard contained at least three permanent sampling stations, with the total number of stations determined by orchard area (three stations per hectare). The total sampling area across all surveyed olive orchards was 23 ha. Sampling stations remained permanent and repeatedly surveyed throughout the study period to improve and ensure the completeness of the floristic inventory. In total, 90 surveys were conducted during the study period. At the orchard level, stratification was achieved by dividing each orchard into sub-areas and randomly selecting one sampling station within each sub-area to ensure spatial representativeness and account for potential variability in edaphoclimatic conditions within each orchard. Zigzag transect surveys were conducted throughout the orchards in addition to surveys of the permanent sampling stations (station size 16×16 m), to detect species that may not have been recorded within the permanent sampling stations. The data collected during the zigzag transect surveys were combined with those collected from the sampling stations to compile a final list of species present in each orchard. Within each sampling station, all vascular plant species were identified to species level, and species richness was recorded.

Species identification was performed using botanical identification keys [15] and relevant taxonomic literature [13,36].

2.3. Nomenclature and Taxonomic Arrangement

The nomenclature and taxonomic arrangement of the families, genera, and species recorded in this study follow the classification adopted by the “Flora of Greece web” (Version VI, September 2024, electronic edition) [50], which serves as the standard taxonomic reference used by the Hellenic Botanical Society (HBS). This resource continuously updates the publications “Vascular plants of Greece: An annotated checklist” [35] and its supplement [51]. The classification system of taxonomic orders applied in this study follows the APG IV taxonomic system, which is largely compatible with the “Flora of Greece web” website. According to Dimopoulos et al., 2013 [35]: “The angiosperm family circumscription as proposed by the Angiosperm Phylogeny Group [52], known as APG III, is followed”. The only deviations between the two taxonomic systems concern the family *Amaranthaceae*, which was retained as *Chenopodiaceae*, and the families *Dipsacaceae*, *Morinaceae* and *Valerianaceae*, which were maintained separately from the family *Caprifoliaceae*, following the Euro + Med PlantBase taxonomy [53]. The nomenclature of the species inventory conforms to the International Code of Nomenclature for algae, fungi, and plants (ICN) and the scientific names according to the International Plant Names Index (IPNI). The Raunkiaer plant life forms associated with each species are presented in Table 4 and follow the classifications provided in the “Vascular Plants of Greece: An Annotated Checklist” [35].

2.4. Data Analysis

Data collected during each survey were compiled, organised, and analysed using Microsoft Excel (Microsoft Office 365) and IBM SPSS Statistics 26. Descriptive statistics were used to calculate species and family richness for each orchard, as well as the total

species and total family richness for each management system and agroecological zone. Additionally, species frequency, the relative species richness for each family, the relative species richness for each order and the relative family richness for each order were calculated across all the surveyed orchards.

Species frequency was calculated using Equation (1).

$$\text{Species Frequency} = \frac{\text{Number of olive orchards the species is present}}{\text{Total number of olive orchards surveyed}} \quad (1)$$

The relative species richness of each family was calculated using Equation (2).

$$\text{Relative species richness for each family} = \frac{\text{Number of species in the taxonomic family}}{\text{Total number of species}} \quad (2)$$

The relative family richness of each order was calculated using Equation (3).

$$\text{Relative family richness for each order} = \frac{\text{Number of families in taxonomic order}}{\text{Total number of families}} \quad (3)$$

The relative species richness of each order was calculated using Equation (4).

$$\text{Relative species richness for each order} = \frac{\text{Number of species in the taxonomic order}}{\text{Total number of species}} \quad (4)$$

The total species richness and family richness was calculated for each management system (MS) and agroecological zone (AZ) using Equations (5) and (6).

$$\text{Total species richness and family richness for each MS} = \frac{\text{Number of species recorded in each management system (organic, conventional)}}{\text{for the whole study period}} \quad (5)$$

$$\text{Total species richness and family richness for each AZ} = \frac{\text{Number of species recorded in each agroecological zone (hilly, plain)}}{\text{for the whole study period}} \quad (6)$$

The effect of management system and agroecological zone on species and family richness, was assessed by performing univariate statistical analysis (Student's *t*-tests), to compare the different management systems and agroecological zones. Statistical comparisons were performed using the 12 paired orchards, excluding the remaining seven unpaired locations. Management systems were compared using the six matched organic—conventional orchard pairs. For comparisons between agroecological zones, the six orchards located in the hilly zone were compared with the six orchards located in the plain zone using the IBM SPSS Statistics 26 software.

3. Results

The floristic community composition of the surveyed orchards is consistent with that of a typical Mediterranean olive orchard agroecosystem. The olive orchards were dominated by therophytes, representing 55% of the total recorded species, followed by hemicryptophytes (19%) and geophytes (11%). Phanerophytes (9%) and chamaephytes (6%) were also recorded. Overall, 331 species of vascular flora were recorded across the surveyed olive orchards, belonging to 28 taxonomic orders and 60 families (Table 1). Species richness was highest in the order Asterales (50 species), followed by Fabales (47 species), Lamiales (38 species), and Poales (37 species). The remaining taxonomic orders each comprised 25 species or fewer (Table 1).

Table 1. The taxonomic orders recorded in the surveyed olive orchards, along with (1) number of families within each order; (2) relative family richness for each order; (3) number of species within each order, and (4) relative species richness for each order.

Taxonomic Order	No of Families Within Order	Relative Family Richness for Each Order (%)	No of Species Within Order	Relative Species Richness for Each Order (%)
Alismatales	1	1.7	2	0.6
Apiales	1	1.7	12	3.6
Arecales	1	1.7	1	0.3
Asparagales	5	8.3	25	7.6
Asterales	2	3.3	50	15.1
Boraginales	1	1.7	13	3.9
Brassicales	2	3.3	10	3.0
Caryophyllales	6	10	18	5.4
Cucurbitales	1	1.7	2	0.6
Cupressales	1	1.7	1	0.3
Dipsacales	2	3.3	3	0.9
Ericales	1	1.7	1	0.3
Fabales	1	1.7	47	14.2
Fagales	1	1.7	1	0.3
Gentianales	3	5.0	10	3.0
Geraniales	1	1.7	6	1.8
Lamiales	7	11.7	38	11.5
Malpighiales	3	5.0	10	3.0
Malvales	3	5.0	8	2.4
Myrtales	2	3.3	3	0.9
Oxalidales	1	1.7	1	0.3
Poales	2	3.3	37	11.2
Ranunculales	3	5.0	11	3.3
Rosales	4	6.7	13	3.9
Santanales	1	1.7	1	0.3
Sapindales	1	1.7	1	0.3
Solanales	2	3.3	6	1.8
Vitales	1	1.7	1	0.3
Total Orders			28	
Total Families			60	
Total Species			331	

The most species-rich families were Asteraceae, with 49 species (14.8% of the total recorded species); Fabaceae, with 47 species (14.2%); and Poaceae, with 36 species (10.9%). Other species-rich families included Lamiaceae, with 19 species (5.7%); Orchidaceae and Boraginaceae, each represented by 13 species (3.9%); and Apiaceae, with 12 species (3.6%). The remaining families were represented by nine or fewer species (Table 2).

At the genus level, species richness was highest among genera within the Fabaceae, including *Trifolium* spp. (5 species), *Medicago* spp. (7 species) and *Lotus* spp. (4 species), and within the Poaceae, including *Bromus* spp. (6 species), *Hordeum* spp. (3 species) and *Avena* spp. (3 species). Other species-rich genera were *Erodium* and *Euphorbia*, each represented by four species (Table 3).

In terms of species frequency, the most frequently occurring species recorded across the surveyed olive orchards were: *Crepis vesicaria*, *Medicago polymorpha*, *Olea europaea* subsp. *europaea*, *Oxalis pes-caprae*, and *Sonchus oleraceus*, all of which were recorded in 100% of the surveyed olive orchards. *Avena barbata* and *Avena sterilis* were recorded in 95% of orchards, while *Bromus madritensis*, *Cynodon dactylon*, *Lactuca serriola*, and *Oloptum miliaceum* occurred

in 89% of orchards. *Heliotropium europaeum*, *Phellipanche mutelii* and *Sinapis alba* were recorded in 84% of orchards. Further details on the frequency of the remaining taxa are provided in Table 4.

Table 2. Taxonomic families recorded in the surveyed olive orchards, together with the number of species, and the relative species richness of each family.

Family Name	Number of Species (Species Richness)	Family Relative Species Richness (%)
Arecaceae	1	0.3
Acanthaceae	1	0.3
Amaranthaceae	2	0.6
Amaryllidaceae	3	0.9
Anacardiaceae	1	0.3
Apiaceae	12	3.6
Apocynaceae	1	0.3
Araceae	2	0.6
Asparagaceae	6	1.8
Asphodelaceae	1	0.3
Asteraceae	49	14.8
Berberidaceae	1	0.3
Boraginaceae	13	3.9
Brassicaceae	9	2.7
Campanulaceae	1	0.3
Capparaceae	1	0.3
Caryophyllaceae	5	1.5
Chenopodiaceae	6	1.8
Cistaceae	3	0.9
Convolvulaceae	3	0.9
Cucurbitaceae	2	0.6
Cupressaceae	1	0.3
Cyperaceae	1	0.3
Dipsacaceae	2	0.6
Euphorbiaceae	7	2.1
Fabaceae	47	14.2
Gentianaceae	2	0.6
Geraniaceae	6	1.8
Hypericaceae	1	0.3
Iridaceae	2	0.6
Juglandaceae	1	0.3
Lamiaceae	19	5.7
Lauraceae	1	0.3
Linaceae	2	0.6
Lythraceae	2	0.6
Malvaceae	4	1.2
Moraceae	2	0.6
Myrtaceae	1	0.3
Oleaceae	1	0.3
Orchidaceae	13	3.9
Orobanchaceae	5	1.5
Oxalidaceae	1	0.3

Table 2. Cont.

Family Name	Number of Species (Species Richness)	Family Relative Species Richness (%)
Papaveraceae	4	1.2
Plantaginaceae	7	2.1
Poaceae	36	10.9
Polygonaceae	2	0.6
Portulacaceae	1	0.3
Primulaceae	1	0.3
Ranunculaceae	5	1.5
Rhamnaceae	1	0.3
Rosaceae	8	2.4
Rubiaceae	7	2.1
Santalaceae	1	0.3
Scrophulariaceae	4	1.2
Solanaceae	3	0.9
Thymeleaceae	1	0.3
Urticaceae	2	0.6
Valerianaceae	1	0.3
Verbenaceae	1	0.3
Vitaceae	1	0.3

Total species richness and family richness differed between management systems and agroecological zones. Organic orchards had higher total species and family richness than abandoned and conventional orchards. In total, 257 species were recorded in organic orchards, compared with 195 and 192 species in abandoned and conventional orchards, respectively. Similarly, 56 families were recorded in organic orchards, compared with 50 families in conventional orchards and 43 families in abandoned orchards. Regarding agroecological zones, higher total species and family richness were recorded in hilly orchards than in those in the plain agroecological zone. In total, 316 species and 59 families were recorded in the hilly agroecological zone, compared with 128 species and 43 families in the plain zone (Table 4).

Although higher total species and family richness were observed in organic orchards and the hilly agroecological zone than in conventional orchards and the plain agroecological zone, respectively, no statistically significant differences were found in mean species or mean family richness between management systems ($p > 0.05$). In contrast, mean species richness was statistically significantly higher in the hilly agroecological zone than in the plain zone ($p = 0.01$). Similarly, mean family richness tended to be higher in the hilly agroecological zone than in the plain zone, although this difference was not statistically significant ($p = 0.057$) (Table 4).

Table 3. Taxonomic orders, families and species recorded in the surveyed olive orchards, together with their Raunkiaer life-forms, conservation status, and species frequency.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional						Abandoned						
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	120	130	140	150	160	170	180	190	7A	10A		
Alismatales	Araceae	<i>Arisarum vulgare</i> O.Targ.Tozz.	Geophyte	-	+	+				+					+		+				+	+	+	42%	
		<i>Arum concinnatum</i> Schott	Geophyte	-				+		+		+	+						+			+		+	37%
Apiales	Apiaceae	<i>Ammi majus</i> L.	Therophyte	PD 67/81											+								+	11%	
		<i>Bupleurum gracile</i> d'Urv.	Therophyte	-																			+		5%
		<i>Coriandrum sativum</i> L.	Therophyte	-							+														5%
		<i>Daucus carota</i> L.	Therophyte/ Hemicryptophyte	-	+	+	+		+		+	+	+	+				+	+		+	+	+	+	74%
		<i>Eryngium campestre</i> L.	Hemicryptophyte	-									+								+		+	+	21%
		<i>Foeniculum vulgare</i> Mill.	Hemicryptophyte	-							+	+						+					+	+	26%
		<i>Lagoecia cuminoides</i> Soy.-Will	Therophyte	-									+											+	11%
		<i>Scandix pecten-veneris</i> L.	Therophyte	-	+						+		+		+			+				+	+	+	42%
		<i>Smyrniololus atrum</i> L.	Hemicryptophyte	-								+													5%
		<i>Tordylium apulum</i> L.	Therophyte	-										+									+	+	16%
		<i>Torilis arvensis</i> Huds.	Therophyte	-										+											5%
<i>Torilis leptophylla</i> (L.) Rchb.f.	Therophyte	-									+	+	+										16%		
Arecales	Areaceae	<i>Phoenix theophrasti</i> Greuter	Phanerophyte	-								+												5%	

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency					
					Organic								Conventional						Abandoned							
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly		
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	120	130	140	150	160	170	180	190	7A	10A			
Asparagales	Amaryllidaceae	Allium ampeloprasum L.	Geophyte	-	+	+				+						+		+				+		32%		
		Allium subhirsutum L.	Geophyte	-	+			+		+		+				+						+	+	37%		
		Narcissus tazetta L.	Geophyte	-						+										+		+		16%		
	Asparagaceae	Asparagus aphyllus L.	Chamaephyte	-	+	+	+	+		+		+			+	+		+	+		+	+	+	+	68%	
		Drimia numidica (Jord. & Fourr.) J.C.Manning & Goldblatt	Geophyte	-	+						+		+										+	+	26%	
		Muscari comosum (L.) Mill.	Geophyte	-	+						+	+	+			+		+					+	+	42%	
		Muscari speizenhoferi (Heldr. ex Osterm.) H.R.Wehrh	Geophyte	-	+																				5%	
		Ornithogalum narbonense L.	Geophyte	-	+						+							+					+		21%	
		Prospero autumnale (L.) Speta	Geophyte	-																			+		5%	
		Asphodelaceae	Asphodelus ramosus L.	Geophyte	-									+								+			11%	
		Iridaceae	Gladiolus italicus Mill.	Geophyte	-	+						+		+	+					+						26%
			Moraea sisyrinchium (L.) Ker Gawl.	Geophyte	-							+		+					+					+		21%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency			
					Organic								Conventional						Abandoned					
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A	
Orchidaceae		<i>Anacamptis collina</i> (Banks & Sol. ex Russell) R.M.Bateman, Pridgeon & M.W.Chase	Geophyte	PD 67/81	+		+					+										+	+	26%
		<i>Anacamptis coriophora</i> subsp. <i>Fragrans</i> (Pollini) R.M.Bateman	Geophyte	PD 67/81																		+		5%
		<i>Anacamptis papilionacea</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase	Geophyte	PD 67/81				+																5%
		<i>Anacamptis pyramidalis</i> (L.) Rich.	Geophyte	PD 67/81																		+		5%
		<i>Himantoglossum robertianum</i> (Loisel.) P.Delforge	Geophyte	-																		+		5%
		<i>Ophrys cretica</i> (Vierh.) E.Nelson	Geophyte	PD 67/81																			+	5%
		<i>Ophrys lutea</i> Cav.	Geophyte	PD 67/81									+										+	11%
		<i>Ophrys scolopax</i> subsp. <i>Heldreichii</i> (Schltr.) E.Nelson	Geophyte	PD 67/81									+										+	11%
		<i>Orchis italica</i> Poir.	Geophyte	PD 67/81																		+		5%
		<i>Serapias bergonii</i> E.G.Camus	Geophyte	PD 67/81													+					+		11%
		<i>Serapias lingua</i> L.	Geophyte	PD 67/82									+										+	11%
		<i>Serapias parviflora</i> Parl.	Geophyte	PD 67/83																		+		5%
		<i>Serapias</i> sp.	Geophyte	PD 67/84		+		+									+					+		21%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	120	130	140	150	160	170	180	190	7A	10A		
Asterales	Asteraceae	<i>Anthemis chia</i> L.	Therophyte	-						+												+	+	16%	
		<i>Artemisia arborescens</i> L.	Chamaephyte	-		+																			5%
		<i>Asteriscus aquaticus</i> (L.) Less.	Therophyte	-	+										+										11%
		<i>Atractylis cancellata</i> L.	Therophyte	-																				+	5%
		<i>Bellis annua</i> L.	Therophyte	-							+							+					+		16%
		<i>Calendula arvensis</i> L.	Therophyte	-	+	+			+	+	+	+			+		+	+			+	+	+		63%
		<i>Carlina lanata</i> L.	Hemicryptophyte	-											+										5%
		<i>Carthamus lanatus</i> L.	Therophyte	-	+	+	+																+		21%
		<i>Cichorium intybus</i> L.	Hemicryptophyte	-										+										+	11%
		<i>Cichorium pumilum</i> Jacq.	Therophyte	-	+																				5%
		<i>Cirsium</i> sp.	Hemicryptophyte	-																		+			5%
		<i>Crepis commutata</i> (Spreng.) Greuter	Hemicryptophyte	-	+			+	+	+		+			+	+	+	+	+		+	+	+	+	74%
		<i>Crepis neglecta</i> subsp. <i>Cretica</i> (Boiss.) Vierh.	Therophyte	-	+												+	+					+		21%
		<i>Crepis vesicaria</i> subsp. <i>vesicaria</i>	Hemicryptophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	100%
		<i>Crupina crupinastrum</i> (Moris) Vis.	Therophyte	-																			+		5%
		<i>Dittrichia graveolens</i> (L.) Greuter	Therophyte	-	+																	+		+	16%
		<i>Dittrichia viscosa</i> (L.) Greuter	Chamaephyte/ Hemicryptophyte	-	+											+						+			16%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 120	Hilly 130	Plain 140	Hilly 150	Hilly 160	Plain 170	Hilly 180		Plain 190	Hilly 7A
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status																			
		<i>Echinops spinosissimus</i> Turra	Hemicryptophyte	-						+		+										+	16%
		<i>Erigeron bonariensis</i> L.	Hemicryptophyte	-				+							+								11%
		<i>Erigeron canadensis</i> L.	Therophyte/ Hemicryptophyte	-	+	+		+	+			+	+	+		+			+			+	53%
		<i>Erigeron sumatrensis</i> Retz.	Hemicryptophyte	-				+															5%
		<i>Filago pyramidata</i> (L.) Huds.	Therophyte	-																		+	5%
		<i>Galactites tomentosus</i> Moench	Therophyte	-								+				+			+	+		+	26%
		<i>Geropogon hybridus</i> (L.) Sch.Bip.	Therophyte	-	+																+		11%
		<i>Glebionis coronaria</i> (L.) Cass. ex Spach	Therophyte	-	+	+		+	+	+	+				+	+	+	+	+		+	+	74%
		<i>Hedypnois rhagadioloides</i> subsp. <i>Tubaeformis</i> (Ten.) Hayek	Therophyte	-										+							+		11%
		<i>Helichrysum stoechas</i> subsp. <i>barrelieri</i> (Ten.) Nyman	Chamaephyte	-	+		+					+				+	+			+	+	+	42%
		<i>Helminthotheca echioides</i> (L.) Holub	Therophyte	-		+	+						+	+						+			26%
		<i>Hypochaeris achyrophorus</i> L.	Therophyte/ Hemicryptophyte	-						+		+				+					+	+	26%
		<i>Lactuca serriola</i> L.	Therophyte/ Hemicryptophyte	-	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+		+	89%
		<i>Lactuca tuberosa</i> Jacq.	Hemicryptophyte	-	+			+						+				+					21%
		<i>Lamyropsis cynaroides</i> (Lam.) Dittrich	Hemicryptophyte	-								+						+					5%

Table 3. Cont.

Species ID					Olive Orchards																	Species Frequency		
					Organic							Conventional							Abandoned					
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly		Plain	Hilly
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	120	130	140	150	160	170	180	190	7A	10A	
		<i>Leontodon tuberosus</i> L.	Hemicryptophyte	-	+		+					+											+	21%
		<i>Matricaria chamomilla</i> L.	Therophyte	-	+																			5%
		<i>Notobasis syriaca</i> (L.) Cass.	Therophyte	-								+								+			+	16%
		<i>Pallenis spinosa</i> (L.) Cass.	Therophyte/Hemicryptophyte	-	+							+									+	+		21%
		<i>Phagnalon rupestre</i> subsp. <i>gracum</i> Boiss. & Heldr.	Chamaephyte	-	+	+	+					+					+					+	+	37%
		<i>Reichardia picroides</i> (L.) Roth	Hemicryptophyte	-	+	+	+	+		+		+		+	+		+				+	+		58%
		<i>Gelasia cretica</i> Willd	Hemicryptophyte	-																			+	5%
		<i>Senecio vulgaris</i> L.	Therophyte	-	+	+		+	+	+	+	+		+	+	+	+			+	+	+	+	79%
		<i>Sonchus asper</i> (L.) Hill	Therophyte	-	+	+	+		+		+		+	+	+	+	+		+		+			63%
		<i>Sonchus oleraceus</i> L.	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	100%
		<i>Symphyotrichum squamatum</i> (Spreng.) G.L.Nesom	Chamaephyte/Hemicryptophyte	-	+	+	+	+	+				+	+		+			+		+			53%
		<i>Taraxacum</i> sp.	-	-	+							+											+	16%
		<i>Tolpis umbellata</i> Bertol.	Therophyte	-								+	+							+	+		+	26%
		<i>Tolpis virgata</i> (Desf.) Bertol.	Hemicryptophyte	-								+									+		+	16%
		<i>Tragopogon porrifolius</i> subsp. <i>Eriospermus</i> (Ten.) Greuter	Therophyte/Hemicryptophyte	-	+		+			+	+	+		+				+				+	+	47%
		<i>Urospermum picroides</i> (L.) Scop. ex F.W.Schmidt	Therophyte	-	+	+	+	+		+	+		+	+	+	+	+	+		+	+	+		79%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency			
					Organic								Conventional									Abandoned		
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain		Hilly	Hilly	
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A	
Boraginales	Campanulaceae	<i>Xanthium strumarium</i> L.	Therophyte	-							+			+									11%	
		<i>Campanula erinus</i> L.	Therophyte	-																		+	5%	
	Boraginaceae	<i>Anchusa aegyptiaca</i> (L.) A.DC.	Therophyte	-														+					5%	
		<i>Anchusa azurea</i> Mill.	Hemicryptophyte	-	+	+	+				+												21%	
		<i>Anchusa undulata</i> subsp. <i>hybrida</i> (Ten.) Bég.	Hemicryptophyte	-			+	+					+										16%	
		<i>Borago officinalis</i> L.	Therophyte	-																			+	5%
		<i>Cerinthe major</i> L.	Therophyte	-															+					5%
		<i>Cynoglossum columnae</i> Ten.	Therophyte	-	+						+	+							+					16%
		<i>Cynoglossum creticum</i> Mill.	Hemicryptophyte	-	+	+					+	+	+		+			+			+		+	47%
		<i>Echium angustifolium</i> subsp. <i>angustifolium</i>	Therophyte/ Hemicryptophyte	-	+	+	+				+		+				+	+				+	+	47%
		<i>Echium italicum</i> subsp. <i>biebersteini</i> (Lacaita) Greuter & Burdet	Hemicryptophyte	-	+	+	+				+				+				+				+	37%
		<i>Echium plantagineum</i> L.	Therophyte/ Hemicryptophyte	-				+					+						+				+	21%
		<i>Heliotropium dolosum</i> De Not.	Therophyte	-	+									+						+				5%
		<i>Heliotropeum europaeum</i> L.	Therophyte	-	+		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	84%
		<i>Neotostema apulum</i> (L.) I.M.Johnst.	Therophyte	-															+					5%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
Brassicales	Brassicaceae	<i>Biscutella didyma</i> L.	Therophyte	-																		+	+	11%	
		<i>Capsella bursa-pastoris</i> (L.) Medik.	Therophyte/ Hemicryptophyte	-								+													5%
		<i>Eruca vesicaria</i> (L.) Cav.	Therophyte	-	+																			+	11%
		<i>Hirschfeldia incana</i> (L.) Lagr.-Foss	Therophyte/ hemicryptophyte	-	+						+	+						+				+			26%
		<i>Raphanus raphanistrum</i> L.	Therophyte	-								+	+												11%
		<i>Sinapis alba</i> L.	Therophyte	-	+	+		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	84%
		<i>Sinapis arvensis</i> L.	Therophyte	-																					0%
		<i>Sisymbrium officinale</i> (L.) Scop.	Therophyte	-															+						5%
		<i>Sisymbrium orientale</i> L.	Therophyte	-															+						5%
	Capparaceae	<i>Capparis spinosa</i> var. <i>canescens</i> Coss.	Chamaephyte/ Phanerophyte	-		+	+			+	+	+	+	+	+	+	+	+	+	+		+		74%	
Caryophyllales	Amaranthaceae	<i>Amaranthus blitoides</i> S.Watson	Therophyte	-	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+			84%	
		<i>Amaranthus retroflexus</i> L.	Therophyte	-		+		+	+	+	+				+		+	+	+	+	+	+		63%	
	Caryophyllaceae	<i>Agrostemma githago</i> L.	Therophyte	-									+											5%	
		<i>Cerastium glomeratum</i> Thuill.	Therophyte	-									+											5%	
		<i>Silene colorata</i> Poir.	Therophyte	-																				+	5%
			<i>Silene vulgaris</i> (Moench) Garcke	Chamaephyte/ Hemicryptophyte	-						+		+					+						+	21%
			<i>Stellaria media</i> (L.) Vill.	Therophyte/ Hemicryptophyte	-		+		+			+	+				+				+	+		+	42%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 12C	Hilly 13C	Plain 14C	Hilly 15C	Hilly 16C	Plain 17C	Hilly 18C		Plain 19C	Hilly 7A
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status																			
	Chenopodiaceae	<i>Atriplex</i> sp.	Chamaephyte	-				+														5%	
		<i>Beta</i> sp.	Therophyte/ Hemicryptophyte	-										+			+					11%	
		<i>Chenopodiastrum murale</i> (L.) S.Fuentes, Uotila & Borsch	Therophyte	-	+	+		+	+					+		+				+		37%	
		<i>Chenopodium album</i> L.	Therophyte	-		+		+	+	+	+	+			+	+	+		+	+	+	68%	
		<i>Chenopodium opulifolium</i> Schrad. ex W.D.J.Koch & Ziz	Therophyte	-		+		+	+	+	+				+	+	+			+		47%	
		<i>Chenopodium vulvaria</i> L.	Therophyte	-							+					+	+			+		21%	
	Polygonaceae	<i>Polygonum aviculare</i> L.	Therophyte	-					+													5%	
		<i>Rumex bucephalophorus</i> L.	Therophyte	-							+											+	11%
	Portulacaceae	<i>Portulaca oleracea</i> L.	Therophyte	-		+		+	+	+	+					+						+	37%
	Tamaricaceae	<i>Tamarix parviflora</i> DC.	Phanerophyte	-																			0%
Cucurbitales	Cucurbitaceae	<i>Bryonia cretica</i> L.	Geophyte/ Hemicryptophyte	-															+		+	11%	
		<i>Ecballium elaterium</i> (L.) A.Rich.	Geophyte	-	+						+											11%	
Cupressales	Cupressaceae	<i>Cupressus sempervirens</i> L.	Phanerophyte	-	+	+	+	+	+		+	+			+	+				+	+	58%	
Dipsacales	Dipsacaceae	<i>Lomelosia brachiata</i> (Sm.) Greuter & Burdet	Therophyte	-	+																	5%	
		<i>Scabiosa atropurpurea</i> L.	Hemicryptophyte	-									+			+				+	+	21%	
	Valerianaceae	<i>Valerianella</i> sp.	Therophyte	-												+					+	11%	

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 12C	Hilly 13C	Plain 14C	Hilly 15C	Hilly 16C	Plain 17C	Hilly 18C		Plain 19C	Hilly 7A
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status																			
Ericales	Primulaceae	<i>Anagallis arvensis</i> L.	Therophyte/Hemicryptophyte	-	+	+			+	+	+	+		+		+	+	+		+	+	+	74%
		<i>Anthyllis vulneraria</i> L.	Hemicryptophyte	-	+																+		11%
		<i>Bituminaria bituminosa</i> (L.) C.H.Stirt.	Hemicryptophyte	-								+										+	11%
		<i>Calicotome villosa</i> (Poir.) Link	Phanerophyte	-																		+	5%
		<i>Ceratonia siliqua</i> L.	Phanerophyte	-	+					+													11%
		<i>Cicer arietinum</i> L.	Therophyte	-																			0%
		<i>Coronilla scorpioides</i> (L.) W.D.J.Koch	Therophyte	-								+										+	11%
		<i>Ebenus cretica</i> L.	Chamaephyte	-								+											5%
Fabales	Fabaceae	<i>Genista acanthoclada</i> DC.	Chamaephyte/Phanerophyte	-																		+	5%
		<i>Hippocrepis biflora</i> Spreng.	Therophyte	-											+		+						11%
		<i>Hippocrepis ciliata</i> Willd.	Therophyte	-													+						5%
		<i>Anthyllis circinnata</i> (L.) D.D.Sokoloff	Therophyte	-								+										+	11%
		<i>Lathyrus aphaca</i> L.	Therophyte	-								+										+	11%
		<i>Lathyrus cicera</i> L.	Therophyte	-								+						+				+	16%
		<i>Lotus cytisoides</i> L.	Hemicryptophyte	-				+				+			+		+	+		+		+	37%
		<i>Lotus edulis</i> L.	Therophyte	-	+		+	+		+		+			+		+				+	+	47%
		<i>Lotus ornithopodioides</i> L.	Therophyte	-	+	+	+	+	+	+	+	+		+	+	+	+				+	+	79%
		<i>Lotus peregrinus</i> L.	Therophyte	-				+						+									11%
		<i>Lupinus albus</i> L.	Therophyte	-				+															5%
		<i>Lupinus angustifolius</i> L.	Therophyte	-																		+	5%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional						Abandoned						
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
		<i>Medicago arabica</i> L.	Therophyte	-													+							5%	
		<i>Medicago arborea</i> L.	Phanerophyte	-		+	+	+	+			+												26%	
		<i>Medicago ciliaris</i> (L.) All.	Therophyte	-															+					5%	
		<i>Medicago littoralis</i> Rohde ex Loisel.	Therophyte	-	+																			5%	
		<i>Medicago orbicularis</i> (L.) Bartal.	Therophyte	-	+		+	+	+			+			+		+	+					+	53%	
		<i>Medicago polymorpha</i> L.	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	100%
		<i>Medicago scutellata</i> (L.) Mill.	Therophyte	-															+					5%	
		<i>Melilotus indicus</i> (L.) All.	Therophyte	-							+				+				+			+		+	26%
		<i>Onobrychis caput-galli</i> (L.) Lam.	Therophyte	-	+		+								+	+	+	+	+				+		42%
		<i>Ononis pubescens</i> L.	Therophyte	-									+										+	+	16%
		<i>Ononis viscosa</i> subsp. <i>breviflora</i>	Therophyte	-																			+		5%
		<i>Ornithopus compressus</i> L.	Therophyte	-												+									5%
		<i>Lathyrus oleraceus</i> Lam.	Therophyte	-						+	+		+												16%
		<i>Scorpiurus muricatus</i> L.	Therophyte	-	+								+					+	+						21%
		<i>Coronilla securidaca</i> L.	Therophyte	-	+								+		+								+	+	26%
		<i>Sulla spinosissima</i> (L.) B.H.Choi & H.Ohashi	Therophyte	-	+														+						11%
		<i>Lotus tetragonolobus</i> L.	Therophyte	-	+								+						+				+	+	26%
		<i>Trifolium angustifolium</i> L.	Therophyte	-	+														+				+	+	21%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
		Trifolium campestre Schreb.	Therophyte	-	+		+					+			+		+			+		+	+	42%	
		Trifolium repens L.	Hemicryptophyte	-	+							+	+									+	+	26%	
		Trifolium stellatum L.	Therophyte	-									+										+	+	16%
		Trifolium tomentosum L.	Therophyte	-									+											+	11%
		Tripodion tetraphyllum (L.) Fourr.	Therophyte	-	+			+	+		+		+					+					+		37%
		Vicia hybrida L.	Therophyte	-									+											+	11%
		Vicia peregrina L.	Therophyte	-									+											+	11%
		Vicia sativa L.	Therophyte	-		+			+	+	+		+				+		+					+	42%
		Vicia faba L.	Therophyte	-						+	+									+					16%
	Juglandaceae	Juglans regia L.	Phanerophyte	-										+	+					+				16%	
Gentianales	Apocynaceae	Nerium oleander L.	Phanerophyte	-		+		+			+			+	+	+								32%	
	Gentianaceae	Blackstonia perfoliata (L.) Huds.	Therophyte	-	+		+																	11%	
		Centaurium pulchellum (Sw.) Hayek ex Hand.-Mazz., Stadlm., Janch. & Faltis	Therophyte	-	+						+		+			+		+				+	+	37%	
	Rubiaceae	Crucianella latifolia L.	Therophyte	-								+											+	11%	
		Crucianella macrostachya Boiss.	Therophyte	-																			+	5%	
	Rubiaceae	Galium aparine L.	Therophyte	-		+						+	+	+					+	+	+		+	42%	
		Galium setaceum Lam.	Therophyte	-									+									+		11%	
		Rubia tinctorum L.	Hemicryptophyte	-																			+	5%	
		Sherardia arvensis L.	Therophyte	-																		+		5%	
			Valantia hispida L.	Therophyte	-																		+	5%	

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency			
					Organic								Conventional									Abandoned		
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A	
Geraniales	Geraniaceae	<i>Erodium cicutarium</i> (L.) L'Hér.	Therophyte	-	+				+			+										+	21%	
		<i>Erodium gruinum</i> (L.) L'Hér.	Therophyte	-	+				+			+					+			+		+	32%	
		<i>Erodium malacoides</i> (L.) L'Hér.	Therophyte/ Hemicryptophyte	-	+	+		+	+	+	+	+		+		+	+	+		+		+	74%	
		<i>Erodium moschatum</i> (L.) L'Hér.	Therophyte/ Hemicryptophyte	-				+	+			+								+	+	+	+	37%
		<i>Geranium molle</i> L.	Therophyte	-									+										+	11%
		<i>Geranium rotundifolium</i> L.	Therophyte	-				+					+											11%
Lamiales	Acanthaceae	<i>Acanthus spinosus</i> L.	Hemicryptophyte	-	+					+		+										+	21%	
	Lamiaceae	<i>Ajuga iva</i> (L.) Schreb.	Hemicryptophyte	-													+						5%	
		<i>Lamium amplexicaule</i> L.	Therophyte	-				+	+		+	+					+			+	+		37%	
		<i>Lavandula stoechas</i> L.	Phanerophyte	-		+		+	+			+											21%	
		<i>Melissa officinalis</i> L.	Hemicryptophyte	-												+							5%	
		<i>Micromeria nervosa</i> (Desf.) Benth.	Chamaephyte	-						+		+										+	+	21%
		<i>Origanum dictamnus</i> L.	Chamaephyte	PD 67 /81		+							+											11%
		<i>Origanum onites</i> L.	Chamaephyte	-		+					+		+			+	+						26%	
		<i>Prasium majus</i> L.	Phanerophyte	-	+																	+	+	16%
		<i>Salvia Rosmarinus</i> Spenn.	Phanerophyte	-		+			+	+	+	+				+								32%
		<i>Salvia fruticosa</i> Mill.	Phanerophyte	-												+						+		11%
		<i>Salvia verbenaca</i> L.	Hemicryptophyte	-																			+	5%
		<i>Salvia viridis</i> L.	Therophyte	-		+							+			+								16%
		<i>Satureja thymbra</i> L.	Chamaephyte	-							+		+											11%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
		<i>Sideritis romana</i> subsp. <i>curvidens</i> (Stapf) Holmboe	Therophyte	-																		+	5%		
		<i>Stachys cretica</i> subsp. <i>cretica</i>	Hemicryptophyte	-						+		+						+						16%	
		<i>Stachys spinosa</i> L.	Chamaephyte	-														+						5%	
		<i>Teucrium alpestre</i> Sm.	Chamaephyte	-																			+	5%	
		<i>Thymbra capitata</i> (L.) Cav.	Chamaephyte	-									+											5%	
		<i>Vitex agnus-castus</i> L.	Phanerophyte	-															+						5%
	Oleaceae	<i>Olea europaea</i> subsp. <i>europaea</i>	Phanerophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	95%	
	Orobanchaceae	<i>Parentucellia latifolia</i> (L.) Caruel	Therophyte	-	+																			5%	
		<i>Bellardia trixago</i> (L.) All.	Therophyte	-	+		+						+										+	21%	
		<i>Parentucellia viscosa</i> (L.) Caruel	Therophyte	-	+													+						11%	
		<i>Orobanche pubescens</i> d'Urv.	Therophyte	-									+							+				+	16%
		<i>Orobanche mutelii</i> F.W.Schultz	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+		84%	
		<i>Kickxia elatine</i> (L.) Dumort.	Therophyte	-		+	+	+			+	+		+	+		+	+		+					53%
	Plantaginaceae	<i>Misopates orontium</i> (L.) Raf.	Therophyte	-				+																5%	
		<i>Plantago afra</i> L.	Therophyte	-									+				+	+				+	+	16%	
		<i>Plantago lagopus</i> L.	Therophyte	-	+								+									+	+	21%	
		<i>Plantago lanceolata</i> L.	Hemicryptophyte	-										+										5%	
		<i>Veronica cymbalaria</i> Bodard	Therophyte	-					+	+														11%	

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
Laurales	Scrophulariaceae	Veronica persica Poir.	Therophyte	-					+	+		+		+									+	26%	
		Scrophularia lucida L.	Hemicryptophyte	-									+								+		+	16%	
		Scrophularia peregrina L.	Therophyte	-																	+			5%	
		Verbascum macrurum Ten.	Hemicryptophyte	-																			+	5%	
		Verbascum sinuatum L.	Hemicryptophyte	-		+					+				+	+		+					+	+	37%
	Verbenaceae	Verbena officinalis L.	Hemicryptophyte	-										+								+			11%
Malpighiales	Euphorbiaceae	Laurus nobilis L.	Phanerophyte	-			+																	5%	
		Andrachne telephioides L.	Chamaephyte	-											+			+	+						16%
		Chrozophora tinctoria (L.) A.Juss.	Therophyte	-	+				+		+	+	+						+					+	37%
		Euphorbia chamaesyce L.	Therophyte	-																			+	+	11%
		Euphorbia exigua L.	Therophyte	-														+							5%
		Euphorbia helioscopia L.	Therophyte	-	+						+	+					+	+				+	+		37%
		Euphorbia peplus L.	Therophyte	-				+					+			+		+	+				+	+	37%
		Mercurialis annua L.	Therophyte	-						+	+	+			+			+		+	+	+			42%
	Hypericaceae	Hypericum triquetrifolium Turra	Geophyte	-		+	+		+	+		+				+	+	+	+				+	+	58%
		Linaceae	Linum bienne Mill.	Therophyte/ Hemicryptophyte	-	+		+																	
	Linum strictum L.		Therophyte	-	+		+									+		+		+			+	+	37%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 12C	Hilly 13C	Plain 14C	Hilly 15C	Hilly 16C	Plain 17C	Hilly 18C		Plain 19C	Hilly 7A
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status																			
Malvales	Cistaceae	<i>Cistus creticus</i> L.	Chamaephyte	-	+																		5%
		<i>Cistus parviflorus</i> Lam.	Chamaephyte	-	+																		5%
		<i>Fumana arabica</i> (L.) Spach	Chamaephyte	-																+	+		11%
	Malvaceae	<i>Hibiscus trionum</i> L.	Therophyte	-									+										5%
		<i>Malva nicaeensis</i> All.	Therophyte/Hemicryptophyte	-	+	+		+	+	+	+	+	+	+	+	+	+		+	+	+		89%
		<i>Malva sylvestris</i> L.	Therophyte/Hemicryptophyte	-											+				+				11%
		<i>Malva unguiculata</i> (Desf.) Alef.	Phanerophyte	-						+				+				+		+		+	26%
	Thymeleaceae	<i>Thymelaea hirsuta</i> (L.) Endl.	Phanerophyte	-	+							+					+			+			21%
Myrtales	Lythraceae	<i>Lythrum junceum</i> Banks & Sol.	Therophyte/Hemicryptophyte	-																+		5%	
		<i>Punica granatum</i> L.	Phanerophyte	-	+																	5%	
	Myrtaceae	<i>Myrtus communis</i> L.	Phanerophyte	-			+															5%	
Oxalidales	Oxalidaceae	<i>Oxalis pes-caprae</i> L.	Geophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	100%
Poales	Cyperaceae	<i>Cyperus rotundus</i> L.	Geophyte	-					+	+	+	+						+	+				32%
		<i>Aegilops</i> sp.	Therophyte	-								+			+	+				+	+		26%
		<i>Aira elegans</i> Willd.	Therophyte	-								+								+			11%
	Poaceae	<i>Avena barbata</i> Pott ex Link	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	95%
		<i>Avena sativa</i> L.	Therophyte	-											+					+			11%
		<i>Avena sterilis</i> L.	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	95%
		<i>Brachypodium distachyon</i> (L.) P.Beauv.	Therophyte	-		+																	5%
		<i>Briza maxima</i> L.	Therophyte	-								+			+					+	+		21%
		<i>Briza minor</i> L.	Therophyte	-								+									+	+	11%

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A
		<i>Bromus diandrus</i> Roth	Therophyte	-		+		+	+		+	+		+	+	+	+	+	+	+		+	68%
		<i>Bromus hordeaceus</i> L.	Therophyte	-	+									+			+					+	21%
		<i>Bromus intermedius</i> Zumagl.	Therophyte	-		+																	5%
		<i>Bromus madritensis</i> L.	Therophyte	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+	89%
		<i>Bromus rigidus</i> Roth	Therophyte	-													+						5%
		<i>Bromus sterilis</i> L.	Therophyte	-				+				+											16%
		<i>Catapodium rigidum</i> (L.) C.E.Hubb.	Therophyte	-								+		+									16%
		<i>Cynodon dactylon</i> (L.) Pers.	Geophyte	-	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	89%
		<i>Dactylis glomerata</i> L.	Hemicryptophyte	-								+											5%
		<i>Dasypyrum villosum</i> (L.) Borbás	Therophyte	-						+					+		+					+	21%
		<i>Gastridium ventricosum</i> (Gouan) Schinz & Thell.	Therophyte	-	+						+	+			+						+	+	32%
		<i>Hordeum bulbosum</i> L.	Hemicryptophyte	-								+								+		+	16%
		<i>Hordeum murinum</i> L.	Therophyte	-	+	+		+	+	+		+	+		+		+		+	+	+	+	74%
		<i>Hordeum vulgare</i> L.	Therophyte	-					+	+	+											+	21%
		<i>Hordeum vulgare</i> subsp. <i>spontaneum</i> (K.Koch) Asch. & Graebn.	Therophyte	-					+	+	+	+				+			+	+		+	42%
		<i>Hyparrhenia hirta</i> (L.) Stapf	Hemicryptophyte	-			+	+															11%

Table 3. Cont.

Olive Orchards																									Species Frequency
Species ID					Organic								Conventional						Abandoned						
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 120	Hilly 130	Plain 140	Hilly 150	Hilly 160	Plain 170	Hilly 180	Plain 190	Hilly 7A	Hilly 10A		
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	120	130	140	150	160	170	180	190	7A	10A		
		<i>Lagurus ovatus</i> L.	Therophyte	-								+									+		+	16%	
		<i>Lolium perenne</i> L.	Hemicryptophyte	-		+	+						+											16%	
		<i>Lolium rigidum</i> Gaudin	Therophyte	-				+	+	+	+		+		+	+		+	+					+	53%
		<i>Melica ciliata</i> L.	Hemicryptophyte	-									+												5%
		<i>Phalaris minor</i> Retz.	Therophyte	-					+	+	+		+		+			+	+		+		+	+	53%
		<i>Phragmites australis</i> subsp. <i>australis</i>	Geophyte/ Hemicryptophyte	-										+						+		+		+	21%
		<i>Oloptum miliaceum</i> (L.) Röser & Hamasha	Chamaephyte/ Hemicryptophyte	-		+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+	+	89%
		<i>Rostraria cristata</i> (L.) Tzvelev	Therophyte	-							+		+	+	+			+				+		+	37%
		<i>Setaria verticillata</i> (L.) P.Beauv.	Therophyte	-			+		+	+	+	+	+		+	+	+			+	+	+			63%
		<i>Sorghum halepense</i> (L.) Pers.	Geophyte	-			+	+				+							+	+				+	32%
		<i>Stipellula capensis</i> (Thunb.) Röser & Hamasha	Therophyte/ Hemicryptophyte	-						+									+				+		16%
		<i>Triticum aestivum</i> L.	Therophyte	-										+											5%
Ranunculales	Berberidaceae	<i>Leontice leontopetalum</i> subsp. <i>leontopetalum</i>	Hemicryptophyte	Vulnerable in The Red Data Book Of Rare And Threatened Plants Of Greece												+					+		11%		
		<i>Fumaria officinalis</i> L.	Therophyte	-													+						5%		
	Papaveraceae	<i>Roemeria hybrida</i> (L.) DC.	Therophyte	-						+													5%		
		<i>Papaver purpureo-marginatum</i> Kadereit	Therophyte	-					+	+		+						+				+	+	32%	
		<i>Papaver rhoeas</i> L.	Therophyte	PD 67/81		+					+	+	+					+				+	+	37%	

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency				
					Organic								Conventional									Abandoned			
					Hilly	Hilly	Hilly	Hilly	Plain	Hilly	Plain	Hilly	Plain	Hilly	Hilly	Plain	Hilly	Hilly	Plain	Hilly		Plain	Hilly	Hilly	
Order	Family	Species Name	Raunkiaer Life Form Classification	Conservation Status	10	20	30	40	50	60	80	90	110	12C	13C	14C	15C	16C	17C	18C	19C	7A	10A		
	Ranunculaceae	Anemone coronaria L.	Geophyte	-								+		+	+							+	+	26%	
		Nigella arvensis L.	Therophyte	-																			+	5%	
		Ranunculus asiaticus L.	Hemicryptophyte	-									+										+	+	16%
		Ranunculus bullatus L.	Hemicryptophyte	-																			+		5%
		Ranunculus neapolitanus Ten.	Hemicryptophyte	-																		+			5%
	Moraceae	Ficus carica L.	Phanerophyte	-	+									+							+	+		21%	
		Morus sp.	Phanerophyte	-											+									5%	
	Rhamnaceae	Rhamnus alaternus L.	Phanerophyte	-	+																			5%	
	Rosaceae	Eriobotrya japonica (Thunb.) Lindl.	Phanerophyte	-		+	+		+		+					+								26%	
		Prunus armeniaca L.	Phanerophyte	-			+									+								11%	
		Prunus webbii (Spach) Fritsch	Phanerophyte	-				+				+	+		+	+								26%	
		Prunus persica (L.) Batsch	Phanerophyte	-			+									+								11%	
		Pyrus spinosa Forssk.	Phanerophyte	-			+						+			+								16%	
		Rubus sanctus Kuntze	Phanerophyte	PD 67/81				+						+	+	+					+		+	32%	
		Sanguisorba minor Scop.	Hemicryptophyte	-							+		+											11%	
		Sarcopoterium spinosum (L.) Spach	Chamaephyte	-	+								+										+	16%	
		Parietaria cretica L.	Therophyte/ Hemicryptophyte	-		+																		5%	
		Urticaceae	Urtica urens L.	Therophyte	-			+	+	+		+									+	+		32%	
Santalales	Santalaceae	Osyris alba L.	Phanerophyte	-																	+		5%		
Sapindales	Anacardiaceae	Pistacia lentiscus L.	Phanerophyte	-	+																		5%		

Table 3. Cont.

Species ID					Olive Orchards																Species Frequency		
					Organic								Conventional									Abandoned	
					Hilly 10	Hilly 20	Hilly 30	Hilly 40	Plain 50	Hilly 60	Plain 80	Hilly 90	Plain 110	Hilly 120	Hilly 130	Plain 140	Hilly 150	Hilly 160	Plain 170	Hilly 180		Plain 190	Hilly 7A
Order	Family	Species Name	Raunkiær Life Form Classification	Conservation Status																			
Solanales	Convolvulaceae	<i>Convolvulus altheoides</i> L.	Hemicryptophyte	-										+				+			+	16%	
		<i>Convolvulus arvensis</i> L.	Geophyte/Hemicryptophyte	-		+	+			+	+		+	+		+	+		+	+	+	63%	
		<i>Convolvulus dorycnium</i> L.	Chamaephyte/Phanerophyte	-													+					5%	
	Solanaceae	<i>Mandragora officinarum</i> L.	Hemicryptophyte	-	+					+		+				+	+				+	+	37%
		<i>Solanum nigrum</i> L.	Phanerophyte	-	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+		79%
		<i>Solanum tuberosum</i> L.	Geophyte	-						+		+											11%
Vitales	Vitaceae	<i>Vitis vinifera</i> L.	Phanerophyte	-								+		+								11%	
Total number of species per olive orchard					109	71	62	66	63	94	67	155	40	73	71	55	95	58	37	50	66	114	148

Table 4. Total species and family richness across the different management systems and agroecological zones, together with the mean species and family richness ($\pm$ standard error), and the significance of univariate comparisons between the paired olive orchards.

Factor		Total Species Richness	Total Family Richness
Management System (MS)	Organic	257	56
	Conventional	192	50
	Abandoned	195	45
Agroecological Zone (AZ)	Hilly	316	59
	Plain	128	43
Univariate comparisons of paired olive orchards			
Factor		Mean Species richness	Mean family richness
Management System (MS)	Organic	66.83 $\pm$ 7.05	28.17 $\pm$ 1.74
	Conventional	63.17 $\pm$ 7.91	26.33 $\pm$ 1.45
	Significance	NS	NS
Agroecological Zone (AZ)	Hilly	78.33 $\pm$ 5.20	26.33 $\pm$ 1.54
	Plain	54.67 $\pm$ 5.41	25.17 $\pm$ 1.17
	Significance	$p = 0.01$	T ($p = 0.057$)

Values shown are main effect means $\pm$ SE; NS: not significant ($p > 0.1$); T: trend ($0.1 > p > 0.05$).

4. Discussion

This study confirms the rich floristic diversity of olive orchards and highlights their importance as islands of biodiversity [54], supporting previous findings reported from mainland Greece [1,4,7] and across the Mediterranean region [17,55–60].

Our findings provide additional evidence and insights into the floristic diversity of olive orchards in Crete, a topic that has not previously been systematically investigated. The findings are consistent with previous sporadic descriptions of olive orchard flora in Crete reported by Varhamidis [10], as well as with broader floristic surveys that included cultivated crops and natural habitats [13,15,33]. The results regarding the floristic composition of olive orchards are also consistent with previous studies on floristic diversity conducted in mainland Greece and across the Mediterranean region [4,7,10,16,24,38–40,61].

Across these studies, olive orchards were found to be dominated by annual therophytes and by biennial and perennial hemicryptophytes, as previously reported for Lesvos island and Thessaly in mainland Greece [4,7,55]. The high abundance of therophytes and hemicryptophytes can be attributed to evolutionary adaptations, including the production of large numbers of seeds, seed dormancy (resulting in high seed longevity), rapid growth and short life cycles, which enable them to establish in disturbed habitats [5]. The dominance of therophytes and hemicryptophytes has been also reported on grazed land in Crete [62] and in other anthropogenically disturbed land habitats [63,64], supporting the hypothesis that the prevalence of these life forms is associated with anthropogenic disturbance in agroecosystems. Similarly the higher frequency of chamaephytes and phanerophytes in less disturbed land [65] supports the finding that spontaneous chamaephytes and phanerophytes are more common in abandoned olive orchards and is consistent with previous floristic surveys in olive orchards [6,66].

The floristic community of the surveyed olive orchards is mainly composed of species belonging to the families Asteraceae, Fabaceae, and Poaceae. The high number of species within these families [67], together with the fact that they are among the most species-rich families recorded in olive orchards [7], probably explains this pattern. This pattern is better explained by the evolutionary adaptations and life-form strategies of species

within these families, which are predominantly therophytes and hemicryptophytes. These adaptations include the production of large numbers of seeds, rapid growth, and short life cycles enabling these species to establish and persist in disturbed habitats. Similar floristic composition has also been recorded in previous studies in Crete, mainland Greece and the Mediterranean region. These studies likewise recorded monocotyledons, such as *Avena* spp., *Bromus* spp. and *Cynodon dactylon*, and dicotyledons such as *Crepis vesicaria*, *Heliotropium europaeum*, *Lactuca serriola*, *Malva nicaeensis*, *Medicago polymorpha*, *Oxalis pes-caprae*, *Sinapis alba* and *Sonchus oleraceus* [7,16,57].

The higher total species and family richness together with the higher mean species and family richness observed in organic orchards compared with the conventional orchards, suggest a positive influence of organic management on the floristic diversity of olive orchards, although the differences between the two management systems were not statistically significant. Similar findings have also been reported in previous studies conducted in Greece and other Mediterranean regions [7,28] and are probably explained by the less intensive management and the absence of synthetic chemical fertilisers in organically managed olive orchards [7,24,42]. This positive effect is likely attributable to the lower management intensity and the absence of synthetic chemical fertilisers in organically managed olive orchards. We hypothesise that the lack of statistical significance between management systems may be explained by the wide range of farming practices applied within both systems, which may reduce the magnitude of the expected differences. Since Green Infrastructure (GI) elements and agroecological practices were implemented only in the organic orchards included in this study, the higher total species and family richness, together with the higher mean species richness observed in organic orchards, may indicate that GI has a positive influence on floristic diversity, potentially contributing to the development of High Nature Value (HNV) olive orchards.

To the best of our knowledge, this is the first study to report significantly higher plant species richness in hilly than in plain agroecological zones within olive orchard agroecosystems. This finding may be attributed to the lower intensity of agricultural management typically applied in hilly olive orchards. Furthermore, differences in edapho-climatic conditions between the two agroecological zones, including higher precipitation and less extreme temperature fluctuations [41], may also contribute to the higher flora species richness observed in hilly olive orchards.

Several species recorded in olive orchards have experienced long-term population declines in agricultural landscapes as a result of agricultural intensification. One such species recorded in the surveyed olive orchards is *Leontice leontopetalum*. Historically reported as a common weed, *L. leontopetalum* is now listed in The Red Data Book of Rare and Threatened Plants of Greece [68] and is currently recorded only sporadically in certain areas of Crete. Similar patterns have also been observed for other agricultural species, particularly archaeophytes, as reported in previous floristic studies [36,58]. In total, 16 of the species recorded in this study are protected under the Greek Presidential Decree 67/81 (PD 67/81) [69]. The endangered species *L. leontopetalum*, together with the majority of the protected species listed under the Presidential Decree 67/81 (PD 67/81), most of which belong to the family Orchidaceae, were recorded only in the surveyed organic and abandoned olive orchards. This finding suggests that traditional management and agroecological farming practices may contribute to the conservation of floristic diversity [4,7,58]. Moreover, several species appear to show a preference for specific agroecological zones, supporting the hypothesis that agroecological zones are important drivers of agroecosystem community composition [31]. The occurrence of species associated with the phrygana ecosystems of the adjacent Natura 2000 area within nearby olive orchards—including *Muscari spreitzenhoferi*, *Cistus creticus*, *Cistus parviflorus*, *Genista acanthoclada*, and *Calicotome villosa*—highlights

the importance of High Nature Value (HNV) olive orchards that implement Green Infrastructure (GI). Such orchards may contribute to improving ecological connectivity between protected natural areas and surrounding agricultural landscapes by providing semi-natural habitat patches within agricultural land that act as islands of biodiversity.

Further analyses examining the effects of individual farming practices are needed to better understand the drivers of floristic community composition in olive orchards. Such analyses may help identify management systems and farming practices that promote floristic diversity and support the environmental sustainability of olive cultivation in Crete.

5. Conclusions

This study represents the first comprehensive floristic survey in olive orchards in the Messara Valley, and provides the first detailed descriptive analysis of the floristic composition and diversity of one of the largest olive oil-producing regions in Crete and Greece. In addition, the study provides new records of species in the olive orchards in the study area. The extended study period (seven and a half years), the replicability of the survey, and the consideration of the factors of management system and agroecological zones in the study design underlines the novelty of this floristic investigation. Differences in total species and family richness, together with the observed preference of certain species for a particular management system (organic, conventional, and abandoned), indicate the potential influence of management system and Green Infrastructure (GI) on shaping floristic community composition. However, further investigation is required as no statistically significant differences between management systems were observed. The apparent preference of several species of conservation concern such as *Leontice leontopetalum*, and Orchidaceae species, and endemic species, such as *Ebenus cretica*, with organic and low-input olive orchard management, highlights the potential contribution of Green Infrastructure (GI) to the conservation of floristic diversity in olive orchards.

The survey highlights the importance of agroecological zone as a factor influencing floristic composition in olive orchards. The statistically significantly higher species richness observed in olive orchards located in the hilly agroecological zone, compared with orchards in the plain, suggests that more favourable edaphoclimatic conditions, together with the lower intensity of farming practices and inputs used in traditional olive production systems, may support and conserve floristic diversity.

In conclusion, the high diversity of flora species recorded in olive orchards, including protected species of conservation importance, confirms that olive orchards serve as important reservoirs of floristic diversity. As such, they play a key role in conserving plant biodiversity and may enhance ecological connectivity between neighbouring protected natural areas, such as Natura 2000 sites, and the wider agricultural landscape.

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Abbreviations

The following abbreviations are used in this manuscript:

GI	Green Infrastructure
EU	European Union
MS	Management System
AZ	Agroecological Zone
O	Organic
C	Conventional
A	Abandoned
PD 67/81	Presidential Decree 67/81
HBS	Hellenic Botanical society
HNV	High Nature Value
NS	Not Significant
T	Trend
HMU	Hellenic Mediterranean University

References

1. Loumou, A.; Giourga, C. Olive Groves: “The Life and Identity of the Mediterranean”. *Agric. Hum. Values* **2003**, *20*, 87–95. [\[CrossRef\]](#)
2. Gomiero, T.; Pimentel, D.; Paoletti, M.G. Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture. *Crit. Rev. Plant Sci.* **2011**, *30*, 95–124. [\[CrossRef\]](#)
3. Solomou, A.D. Farmland Abandonment and High Nature Value Farming in Mediterranean Landscapes: Plant Biodiversity Outcomes and Biocultural Trade-Offs. *Land* **2026**, *15*, 793. [\[CrossRef\]](#)
4. Solomou, A.; Sfougaris, A. Determining Indicators of Terrestrial Biodiversity in Olive Grove and Natural Mediterranean Ecosystems. *Int. J. Trend Res. Dev.* **2016**, *3*, 292–299.
5. Schippers, P.; Van Groenendael, J.M.; Vleeshouwers, L.M.; Hunt, R. Herbaceous Plant Strategies in Disturbed Habitats. *Oikos* **2001**, *95*, 198–210. [\[CrossRef\]](#)
6. Maccherini, S.; Santi, E.; Bonini, I.; Amici, V.; Pruscini, S.; Palazzo, D.; Selva, F.C. The Impact of Land Abandonment on the Plant Diversity of Olive Groves. *Biodivers. Conserv.* **2013**, *22*, 3067–3083. [\[CrossRef\]](#)
7. Scheepens, N.; Stavrianakis, G.; Komba, R.; Sentas, S.; Kizos, T. Indications of Understorey Management Practices Impact on Vascular Plant and Arthropod Diversity in Olive Groves on Lesvos, Greece. *Entomol. Hell.* **2024**, *33*, 110–125. [\[CrossRef\]](#)
8. Pereira, A.J.; Porto, M.; Correia, O.; Beja, P. Traditional Ploughing Is Critical to the Conservation of Threatened Plants in Mediterranean Olive Groves. *Agric. Ecosyst. Environ.* **2024**, *359*, 108775. [\[CrossRef\]](#)
9. Tarifa, R.; Martínez-Núñez, C.; Valera, F.; González-Varo, J.P.; Salido, T.; Rey, P.J. Agricultural Intensification Erodes Taxonomic and Functional Diversity in Mediterranean Olive Groves by Filtering out Rare Species. *J. Appl. Ecol.* **2021**, *58*, 2266–2276. [\[CrossRef\]](#)
10. Vahamidis, P.; Chachalis, D.; Akrivou, A.; Karanasios, E.; Ganopoulou, M.; Argiri, A.; Mandoulaki, A.; Hatzigiannakis, E.; Arampatzis, G.; Panagopoulos, A.; et al. Weed Species’ Diversity and Composition as Shaped by the Interaction of Management, Site, and Soil Variables in Olive Groves of Southern Greece. *Agronomy* **2024**, *14*, 640. [\[CrossRef\]](#)
11. Terzi, M.; Barca, E.; Cazzato, E.; D’Amico, F.S.; Lasorella, C.; Fracchiolla, M. Effects of Weed Control Practices on Plant Diversity in a Homogenous Olive-Dominated Landscape (South-East of Italy). *Plants* **2021**, *10*, 1090. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Bergmeier, E.; Strid, A. Regional Diversity, Population Trends and Threat Assessment of the Weeds of Traditional Agriculture in Greece: Weeds of Greek Traditional Agriculture. *Bot. J. Linn. Soc.* **2014**, *175*, 607–623. [\[CrossRef\]](#)
13. Turland, N.J.; Chilton, L.; Press, J.R. *Flora of the Cretan Area: Annotated Checklist & Atlas*; EPIC series; H.M.S.O: London, UK, 1993.

14. Strid, A. *Atlas of the Aegean Flora Part 1: Text & Plates*; Botanischer Garten und Botanisches Museum, Berlin-Dahlem: Berlin, Germany, 2016.
15. Strid, A. *Atlas of the Aegean Flora. Part 2: Maps*; Botanischer Garten und Botanisches Museum, Berlin-Dahlem: Berlin, Germany, 2016.
16. Solomou, A.D.; Sfougaris, A.I. Herbaceous Plant Diversity and Identification of Indicator Species in Olive Groves in Central Greece. *Commun. Soil Sci. Plant Anal.* **2013**, *44*, 320–330. [\[CrossRef\]](#)
17. Rey, P.J.; Manzaneda, A.J.; Valera, F.; Alcántara, J.M.; Tarifa, R.; Isla, J.; Molina-Pardo, J.L.; Calvo, G.; Salido, T.; Gutiérrez, J.E.; et al. Landscape-Moderated Biodiversity Effects of Ground Herb Cover in Olive Groves: Implications for Regional Biodiversity Conservation. *Agric. Ecosyst. Environ.* **2019**, *277*, 61–73. [\[CrossRef\]](#)
18. ELSTAT. Available online: <https://www.statistics.gr/el/statistics/-/publication/SPG06/> (accessed on 15 June 2026).
19. Rackham, O.; Moody, J.A. *The Making of the Cretan Landscape*; Manchester University Press: Manchester, UK, 1996.
20. Stobbelaar, D.J.; Kuiper, J.; van Mansvelt, J.D.; Kabourakis, E. Landscape Quality on Organic Farms in the Messara Valley, Crete: Organic Farms as Components in the Landscape. *Agric. Ecosyst. Environ.* **2000**, *77*, 79–93. [\[CrossRef\]](#)
21. Bärberi, P.; Burgio, G.; Dinelli, G.; Moonen, A.C.; Otto, S.; Vazzana, C.; Zanin, G. Functional Biodiversity in the Agricultural Landscape: Relationships between Weeds and Arthropod Fauna. *Weed Res.* **2010**, *50*, 388–401. [\[CrossRef\]](#)
22. Balzan, M.V.; Sadula, R.; Scalvenzi, L. Assessing Ecosystem Services Supplied by Agroecosystems in Mediterranean Europe: A Literature Review. *Land* **2020**, *9*, 245. [\[CrossRef\]](#)
23. Ruymbeke, K.V.; Ferreira, J.G.; Gkisakis, V.D.; Kantelhardt, J.; Manevska-Tasevska, G.; Matthews, P.; Niedermayr, A.; Schaller, L.; Bańkowska, K.; Mertens, K.; et al. Assessing the Impact of Farm-Management Practices on Ecosystem Services in European Agricultural Systems: A Rapid Evidence Assessment. *Sustainability* **2023**, *15*, 12819. [\[CrossRef\]](#)
24. Stavrianakis, G.; Sentas, E.; Tscheulin, T.; Kizos, T. Does Biodiversity Affect Olive Fly Populations? Evidence from Different Understorey Treatments. *Discov. Conserv.* **2024**, *1*, 3. [\[CrossRef\]](#)
25. Zografakis, I.; Pereira, C.S.; Pavão, F.A.; Alves, C.; Loulakis, A.; Chasourakis, I.; Kabourakis, E. Boosting Biodiversity in Olive Orchards: The Benefits of Organic Farming and Green Infrastructure. Available online: <https://climed-fruit.eu/wp-content/uploads/2025/10/Boosting-biodiversity-in-olive-orchards.pdf> (accessed on 12 July 2026).
26. Kabourakis, E.; Zografakis, I.; Loulakis, A.; Chasourakis, I.; Volakakis, N. Green Infrastructure Establishment for Sustainable Olive Orchards The Case of LIFE IGIC Project. Available online: https://climed-fruit.eu/wp-content/uploads/2025/09/FV-Bonus-TA_Green-Infrastructure_EN.pdf (accessed on 12 July 2026).
27. Midolo, G.; Axmanová, I.; Divíšek, J.; Dřevojan, P.; Lososová, Z.; Večeřa, M.; Karger, D.N.; Thuiller, W.; Bruehlheide, H.; Ačić, S.; et al. Diversity and Distribution of Raunkiaer's Life Forms in European Vegetation. *J. Veg. Sci.* **2024**, *35*, e13229. [\[CrossRef\]](#)
28. Solomou, A.; Sfougaris, A. Comparing Conventional and Organic Olive Groves in Central Greece: Plant and Bird Diversity and Abundance. *Renew. Agric. Food Syst.* **2011**, *26*, 297–316. [\[CrossRef\]](#)
29. Loulakis, A.; Georgiadis, C.; Kollaros, D.; Demetriou, J.; Chasourakis, I.; Zografakis, I.; Kabourakis, E. Faunistic Updates on Greek Ants: First Record of *Strumigenys Membranifera* (Emery, 1869) from Crete and *Strumigenys Baudueri* (Emery, 1875) from Andros. *Biodivers. Data J.* **2026**, *14*, e183362. [\[CrossRef\]](#) [\[PubMed\]](#)
30. Simões, M.; Belo, A.; Pinto-Cruz, C.; Pinheiro, A. Natural Vegetation Management to Conserve Biodiversity and Soil Water in Olive Orchards. *Span. J. Agric. Res.* **2014**, *12*, 633–643. [\[CrossRef\]](#)
31. Gkisakis, V.D.; Volakakis, N.G.; Kabourakis, E.M. Agroecological Zones as an Important Driver of Canopy Arthropod Community in Olive Agroecosystems. *Biol. Control* **2020**, *149*, 104319. [\[CrossRef\]](#)
32. Life IGIC. Available online: <https://www.lifeigic.eu/en/> (accessed on 12 July 2026).
33. Allen, H.D.; Randall, R.E.; Amable, G.S.; Devereux, B.J. The Impact of Changing Olive Cultivation Practices on the Ground Flora of Olive Groves in the Messara and Psiloritis Regions, Crete, Greece. *Land Degrad. Dev.* **2006**, *17*, 249–273. [\[CrossRef\]](#)
34. Panitsa, M.; Kagiampaki, A.; Kougioumoutzis, K. *Plant Diversity and Biogeography of the Aegean Archipelago: A New Synthesis*; Broken Hill Publishers Ltd.: Nicosia, Cyprus, 2018.
35. Dimopoulos, P.; Raus, T.; Bergmeier, E.; Constantinidis, T.; Iatrou, G.; Kokkini, S.; Strid, A.; Tzanoudakis, D. *Vascular Plants of Greece: An Annotated Checklist*; Botanic Garden and Botanical Museum Berlin-Dahlem: Berlin, Germany; Hellenic Botanical Society: Athens, Greece, 2013.
36. Fielding, J.; Nicholas, T. *Flowers of Crete*; Board of Trustees of the Royal Botanic Gardens: London, UK, 2005.
37. Turland, N.; Phitos, D.; Kamari, G.; Bareka, P. Weeds of the Traditional Agriculture of Crete. *Willdenowia* **2004**, *34*, 381–406. [\[CrossRef\]](#)
38. Solomou, A.D.; Sfougaris, A. Contribution of Agro-Environmental Factors to Yield and Plant Diversity of Olive Grove Ecosystems (*Olea Europaea* L.) in the Mediterranean Landscape. *Agronomy* **2021**, *11*, 161. [\[CrossRef\]](#)
39. Kakampoura, B.; Panitsa, M. Plant Diversity of Olive Groves under Different Management Practices: A Case Study on Lesbos Island (East Aegean Area, Greece). *Flora Mediterr.* **2022**, *32*, 375–386. [\[CrossRef\]](#)

40. Michail, I.; Tsahatsanis, P.; Kontele, B.; Karagianni, I.; Kolokitha, K.; Benista, G.; Gkisakis, V. Effect of Farming System on Ant Assemblages and Ground Cover Fauna in Greek Olive Groves. *AGROFOR Int. J.* **2024**, *9*, 58–67.
41. Daliakopoulos, I.; Tsanis, I. *Historical Evolution of Dryland Ecosystems*; CASCADE: Eugene, OR, USA, 2014; p. 126.
42. Gkisakis, V.D.; Bärberi, P.; Kabourakis, E.M. Olive Canopy Arthropods under Organic, Integrated, and Conventional Management. The Effect of Farming Practices, Climate and Landscape. *Agroecol. Sustain. Food Syst.* **2018**, *42*, 843–858. [[CrossRef](#)]
43. Samaritakis, V. nhmc. Available online: https://www.nhmc.uoc.gr/wp-content/uploads/2023/09/natura2000_texnikos_odigos_final (accessed on 12 July 2026).
44. Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007. 2018, Vol. 150. Available online: <http://data.europa.eu/eli/reg/2018/848/oj> (accessed on 12 July 2026).
45. European Commission-CINEA-D2 LIFE 3.0-LIFE Project Public Page. Available online: <https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE16-NAT-GR-000575/improvement-of-green-infrastructure-in-agroecosystems-reconnecting-natural-areas-by-countering-habitat-fragmentation> (accessed on 12 July 2026).
46. Green Infrastructure in Olive Orchards. Available online: <https://lovaps.hmu.gr/apps/green-report/index/> (accessed on 12 July 2026).
47. Kabourakis, E. *Code of Practices for Ecological Olive Production Systems in Crete*; CABI: Oxfordshire, UK, 1999.
48. Kabourakis, E. *Prototyping and Dissemination of Ecological Olive Production Systems: A Methodology for Designing and a First Step towards Validation and Dissemination of Prototype Ecological Olive Productions Systems (EOPS) in Crete*; Wageningen University and Research: Wageningen, The Netherlands, 1996.
49. Volakakis, N.G.; Eyre, M.D.; Kabourakis, E.M. Olive Fly *Bactrocera Oleae* (Diptera, Tephritidae) Activity and Fruit Infestation Under Mass Trapping in an Organic Table Olive Orchard in Crete, Greece. *J. Sustain. Agric.* **2012**, *36*, 683–698. [[CrossRef](#)]
50. Vascular Plants of Greece Checklist | Flora of Greece—An Annotated Checklist. Available online: <https://portal.cybertaxonomy.org/flora-greece/intro> (accessed on 14 June 2026).
51. Dimopoulos, P.; Raus, T.; Bergmeier, E.; Constantinidis, T.; Iatrou, G.; Kokkini, S.; Strid, A.; Tzanoudakis, D. Vascular Plants of Greece: An Annotated Checklist. Supplement. *Willdenowia* **2016**, *46*, 301–347. [[CrossRef](#)]
52. THE ANGIOSPERM PHYLOGENY GROUP. An Update of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants: APG III: APG III. *Bot. J. Linn. Soc.* **2009**, *161*, 105–121. [[CrossRef](#)]
53. HBS Newsletter | Hellenic Botanical Society. Available online: <https://www.hbs.gr/en/newsletter> (accessed on 15 June 2026).
54. Cano, D.; Martínez-Núñez, C.; Pérez, A.J.; Salido, T.; Rey, P.J. Small Floral Patches Are Resistant Reservoirs of Wild Floral Visitor Insects and the Pollination Service in Agricultural Landscapes. *Biol. Conserv.* **2022**, *276*, 109789. [[CrossRef](#)]
55. Radić Lakoš, T.; Milović, M.; Jelaska, S.D. Possible Implications of Two Management Types in Olive Groves on Plant Diversity. *Agric. Conspec. Sci.* **2014**, *79*, 209–220.
56. Fekete, R.; Vincze, O.; Süveges, K.; Bak, H.; Malkócs, T.; Löki, V.; Urgyán, R.; Molnár, V.A. The Role of Olive Groves in the Conservation of Mediterranean Orchids. *Glob. Ecol. Conserv.* **2023**, *44*, e02490. [[CrossRef](#)]
57. Huqi, B.; Dhima, K.; Vasilakoglou, I.; Keco, R.; Salaku, F. Weed Flora and Weed Management in Established Olive Groves in Albania. *Weed Biol. Manag.* **2009**, *9*, 276–285. [[CrossRef](#)]
58. Pereira, A.J.; Clemente, A.; Correia, O.; Porto, M. Conservation Value of Mediterranean Traditional Olive Groves: A Quantitative Assessment of an Ultimate Refuge for Threatened Arable Flora. *Biodivers. Conserv.* **2025**, *34*, 4501–4523. [[CrossRef](#)]
59. de la Torre, V.; Díaz-Portero, M.Á.; Goded, S.; Calmaestra, R.G.; Moreno-Opo, R. Herbaceous Covers in Traditional Olive Orchards Maintain Bird and Butterfly Diversity in Central Spain. *Eur. J. Wildl. Res.* **2025**, *71*, 29. [[CrossRef](#)]
60. Jiménez, M.N.; Castro-Rodríguez, J.; Navarro, F.B. The Effects of Farming System and Soil Management on Floristic Diversity in Sloping Olive Groves. *Renew. Agric. Food Syst.* **2023**, *38*, e15. [[CrossRef](#)]
61. Solomou, A.D.; Sfougaris, A.I. Determinants of Woody Plant Species Richness in Abandoned Olive Grove Ecosystems and Maquis of Central Greece. *Commun. Soil Sci. Plant Anal.* **2015**, *46*, 317–325. [[CrossRef](#)]
62. Panitsa, M.; Tzanoudakis, D.; Sfenthourakis, S. Turnover of Plants on Small Islets of the Eastern Aegean Sea within Two Decades. *J. Biogeogr.* **2008**, *35*, 1049–1061. [[CrossRef](#)]
63. Castro, H.; Lehsten, V.; Lavorel, S.; Freitas, H. Functional Response Traits in Relation to Land Use Change in the Montado. *Agric. Ecosyst. Environ.* **2010**, *137*, 183–191. [[CrossRef](#)]
64. Erfanian, M.B.; Alatalo, J.M.; Ejtehadi, H. Severe Vegetation Degradation Associated with Different Disturbance Types in a Poorly Managed Urban Recreation Destination in Iran. *Sci. Rep.* **2021**, *11*, 19695. [[CrossRef](#)] [[PubMed](#)]
65. Lazarina, M.; Charalampopoulos, A.; Psaralexi, M.; Krigas, N.; Michailidou, D.-E.; Kallimanis, A.S.; Sgardelis, S.P. Diversity Patterns of Different Life Forms of Plants along an Elevational Gradient in Crete, Greece. *Diversity* **2019**, *11*, 200. [[CrossRef](#)]
66. Siebert, S.F. Traditional Agriculture and the Conservation of Biological Diversity in Crete, Greece. *Int. J. Agric. Sustain.* **2004**, *2*, 109–117. [[CrossRef](#)]

67. POWO. *Plants of the World Online*; Royal Botanic Gardens, Kew: London, UK, 2016. Available online: <https://powo.science.kew.org/> (accessed on 16 June 2026).
68. The Red Data Book of Rare and Threatened Plants of Greece | Hellenic Botanical Society. Available online: <https://www.hbs.gr/en/publications/red-data-book-greece> (accessed on 16 June 2026).
69. YPEN. Available online: <https://ypen.gov.gr/perivallon/viopoikilotita/nomothesia/> (accessed on 12 July 2026).

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