

Phytosociological characterization of the *Celtis tournefortii* subsp. *aetnensis* microwoods in Sicily

L. Gianguzzi¹, D. Cusimano¹, S. Romano²

¹Department of Agricultural and Forest Sciences, University of Palermo, Via Archirafi 38 - I-90123 Palermo, Italy.

²Department of Earth and Marine Sciences, University of Palermo, Via Archirafi 22 - I-90123 Palermo, Italy.

Abstract

A work on the *Celtis tournefortii* subsp. *aetnensis* vegetation, endemic species located in disjointed sites in the Sicilian inland, is here presented. It forms microwoods with a relict character established on screes and detrital coverages, on a variety of lithological substrates (volcanics, limestones, quartzarenites). Based on the phytosociological analysis carried out in the territory, these vegetation aspects are framed in the alliance *Oleo-Ceratonion*, within which a new association (*Pistacio terebinthi-Celtidetum aetnensis*) is described, in turn diversified in the following subassociations: a) *typicum* subass. nova, on detrital calcareous cones of the north-western part of Sicily, in the Palermo province (Rocca Busambra, Pizzo Castelluzzo and northern slopes of Pizzo Telegrafo); b) *phlomidetosum fruticosae* subass. nova, typical of carbonate megabreccias, on the most xeric southern slopes of Pizzo Telegrafo (Caltabellotta territory, Agrigento province); c) *artemisietosum arborescentis* subass. nova, typical of quartzarenitic outcrops on the Nebrodi Mts. inland (Cesarò territory, Messina province); d) *rhamnetosum alaterni* subass. nova, widespread on cracked lava flows of the western side of Mount Etna (Catania province).

Keywords: biodiversity, *Celtis tournefortii* Lam. subsp. *aetnensis* (Tornab.), Mediterranean vegetation, phytosociology, *Pistacio-Rhamnetalia alaterni*, Sicily, syntaxonomy.

Introduction

In the genus *Celtis* [fam. *Celtidaceae* (ex *Ulmaceae-Celtidoideae*; Elias, 1970; Ueda *et al.*, 1997) or *Cannabaceae* (Sytsma *et al.*, 2002; Whittemore, 2005)], *Celtis tournefortii* Lam. represents one of the three species known for the European territory, together with *C. australis* L. and *C. plachoniana* K.I. Chr. (= *C. glabrata* Steven ex Planch., not Sprengel). It is widely distributed along the southern margin of the European Region, however with quite sparse and fragmentary stations, among Crimea, Iran and Anatolia, as well as on the Crete Island, the Balkan Peninsula – as far north as in Bulgaria (Zieliński *et al.*, 2012), Macedonia (Micevski, 1993) and the coasts of Bosnia and Herzegovina (Jalas & Suominen, 1976) – up to Sicily (Jalas & Suominen, 1976; Tutin *et al.*, 1964-80; Poli *et al.*, 1974, 1981; De Castro & Maugeri, 2006; Giardina *et al.*, 2007), where it reaches its extreme western limit and to which the present paper refers.

Therefore, these populations have a particular phytogeographical value and they are at the centre of taxonomic debates among various authors, tending in part to characterize one or more taxa endemic to the island territory (Strobl, 1880; Lojacono Pojero, 1888-1909; Raimondo & Schicchi, in Giardina *et al.*, 2007). On this basis – in the absence of precise comparative studies with a morpho-anatomical and physiological character – they are here referred to *Celtis tournefortii* Lam. subsp. *aetnensis* (Tornab.) Raimondo & Schicchi

(in Giardina *et al.*, 2007) [= *C. tournefortii* var. *aetnensis* Tornab.; *C. aetnensis* (Tornab.) Strobl; included *C. betulina* Lojac. and *Celtis asperrima* Lojac.].

The plant is a small tree, 4-6 (8) high, spring-flowering and autumn-fruiting, tending to form xeric-thermophilous communities, though it is a winter-deciduous species; this habitus, in fact, is not common among the Mediterranean woody species of xeric environments, more typically represented by evergreen sclerophyllous or summer-deciduous species. In Sicily the entity has a main subrange located on the volcanics of the western part of Mt. Etna (Poli *et al.*, 1974, 1981; Brullo & Marcenò, 1985; Brullo *et al.*, 2009), with other relict and disjointed nuclei distributed westward, on different lithological substrates. These latter sites affect the inner side of the Nebrodi Mts. (Giardina, 1990), the Sicilian hinterland south of the Madonie Mts. (Schicchi & Marino, 2011), the southern slope of Rocca Busambra (Lojacono Pojero, 1904; Troia, 1997) and limited biotopes of the Sicani Mts., in particular Pizzo Castelluzzo (Troia & Ilardi, 2002; Marino & Castellano, 2006), and the complex of Pizzo Telegrafo, at Contrada Cavallaro (Marcenò *et al.*, 1995, 2002) and among the S. Biagio, Cava Grande, Inchiuse, Utine, Cavallaro, Cannerie and Catusa districts (Gianguzzi *et al.*, 2014), in the Sambuca di Sicilia (Palermo province) and Caltabellotta territories (Agrigento province).

Under the phytosociological aspect, *Celtis tournefortii* subsp. *aetnensis* has been indicated so far as a more or less gregarious element in the following commu-

nities ascribed to the class *Quercetea ilicis*, though to different orders: a) *Quercus ilex* woods in the Etna area [*Celtido-Quercetum ilicis* n.n. (sub *C. aetnensis*) (Poli et al., 1973, 1981)]; b) *Quercus virgiliana* woods in the western side of Mt. Etna [*Celtido aetnensis-Quercetum virgiliana* Brullo & Marcenò, 1985 (sub *C. aetnensis*) (Brullo et al., 2009)]; c) *Euphorbia dendroides* maquis at Caltabellotta, in the Agrigento province [*Oleo-Euphorbietum dendroidis* Trinajstić (1973) 1984 subass. *celtidetosum tournefortii* Marcenò et al. 2002 (sub *C. tournefortii*) (Marcenò et al., 1995, 2002)].

The present work takes the cue from a recent finding of some vegetation nuclei dominated by the species located on Pizzo Telegrafo, in the southern part of the Sicani Mts. (Gianguzzi et al., 2014), where the species constitute interesting microwoods with a relict character, belonging to a pioneer vegetation series typical of screes of carbonate nature. The paper deals with the phytosociological role of the species in the various vegetation aspects located in Sicily, considering that the aforementioned coenoses had been in turn ascribed to distinct orders of the class *Quercetea ilicis*.

Materials and Methods

The research started in 2008, after the finding of some microwoody nuclei of the species pinpointed in the southern part of the Sicani Mts., then extending the survey to the other known stations in Sicily.

Taxonomical and chorological analysis

For the determination of the species listed in the text, reference was made to the floras of Pignatti (1982) and Fiori (1923-29). The taxonomical nomenclature mainly follows Giardina et al. (2007) and Tutin et al. (1964-1980, 1993), except for *C. aetnensis* (Tornab.) Strobl., which refers to De Castro & Maugeri (2006). The exsiccata collected during the field research are kept at the Department of Agricultural and Forest Sciences of the University of Palermo.

The general distribution map of *Celtis tournefortii*

subsp. *aetnensis* in Sicily (Fig. 1) was realized on the basis of unpublished data collected during the present survey, in addition to references reported in the bibliography for Etna (Poli et al., 1974, 1981; Brullo & Marcenò, 1985; Brullo et al., 2009), Nebrodi Mts. (Giardina, 1990), Gangi at Portella d'Argento and Cozzo Ficilino (Schicchi & Marino, 2011), Rocca Busambra (Lojacono Poiero, 1904; Troia, 1997), Pizzo Castelluzo (Troia & Ilardi, 2002; Marino et al., 2005; Marino & Castellano, 2006) and Caltabellotta (Marcenò et al., 1995, 2002).

Description of the study area

For the ecological framework of the sites, several bibliographical contributions of geolithological (Masclé, 1974; Di Stefano & Vitale, 1992; Romano, 1999; Lentini et al., 2000) and bioclimatic nature (Gianguzzi, 1999; Gianguzzi et al., 2000, 2002; Gianguzzi & La Mantia, 2004; Drago, 2005) were consulted.

The distribution of *Celtis tournefortii* subsp. *aetnensis* in Sicily was localized in six separate sites (Fig. 1) – each of them with one or more stations –, whose main stational characteristics, summarized in Tab. 1, are reported below.

1) Carbonate complex of Pizzo Telegrafo (Bisacquino-Caltabellotta).

These microwoody nuclei – many of them previously unpublished and located on two separate sides of Pizzo Telegrafo (952 m a.s.l.) – cover a total area of well over 50 hectares. The species is spread out well beyond the biotope of Contrada Cavallaro already reported by Marcenò et al. (1995), and whose population was estimated to be only 300 individuals (Schicchi & Marino, 2011). In the northern slopes they are found on the various screes that characterize the area, at altitudes between 380 m and 785 m a.s.l. A further population is found along the southern slopes, affecting a very expansive area. These latter nuclei establish both on screes and on debris coverages in karst depressions, between 480 m and 782 m a.s.l. Under the geolitholo-

Tab. 1 - Characteristics of the surveyed sites, with mean altitude, exposure, lithological substrata and bioclimate.

Locality (municipality, administrative province)	Altitude (m)	Exposure	Substrate	Bioclimate
1) Pizzo Telegrafo (Palermo and Agrigento provinces)	380-790	various	Calcareous megabreccias and marly debris	Upper mesomediterranean lower subhumid
2) Pizzo Castelluzo (S. Stefano Quisquina, Palermo)	810-960	W/SW	Limestone	Upper mesomediterranean lower subhumid
3) Rocca Busambra (Monreale and Corleone, Palermo)	800-1100	S/SW	Limestone-dolomite	Upper mesomediterranean lower subhumid
4) Sicilian inland (Gangi, Palermo)	900-1000	S	Limestone	Upper mesomediterranean lower subhumid
5) Nebrodi district (Cesarò, Messina)	680-1260	SW	Quartzarenites	Mesomediterranean upper dry/ lower subhumid
6) South-western side of Mount Etna (Catania province)	380-1100	S, W	Basaltic lavas	Thermo-mesomediterranean upper dry/ lower subhumid

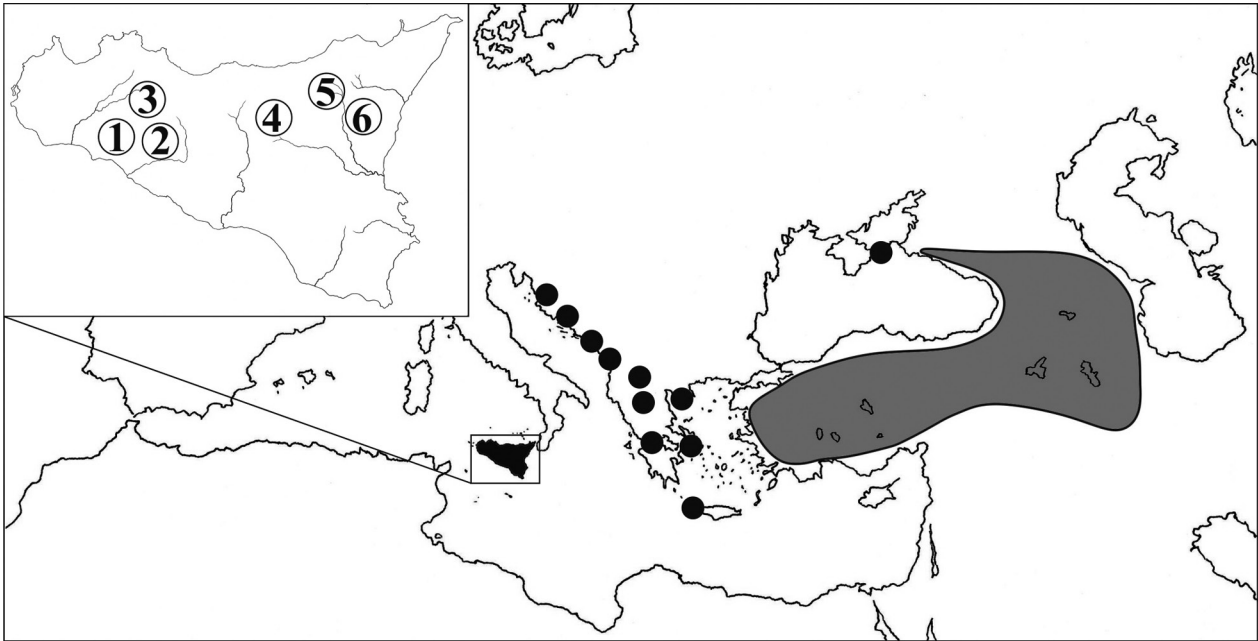


Fig. 1 - Distribution map of *Celtis tournefortii* s.l. and, in the detail, location of the sites in Sicily, referred to the subsp. *aetnensis*: (1) Pizzo Telegrafo (Bisacquino, Caltabellotta); (2) Pizzo Castelluzzo (S. Stefano Quisquina); (3) Rocca Busambra (Corleone); (4) Portella Argento (Gangi); (5) Nebrodi Mts. inland (Cesarò); (6) Mount Etna.

gical aspect, they mainly are calcareous megabreccias and marly debris referred to the Mount Magaggiaro-Pizzo Telegrafo Unit (Di Stefano & Vitale, 1992). The area lies within the SCI ITA 040006 “Complesso Monte Telegrafo e Rocca Ficuzza” and the SPA ITA 020048 “Monti Sicani, Rocca Busambra e Bosco della Ficuzza”.

2) Pizzo Castelluzzo (S. Stefano Quisquina).

Small site located along the southern slopes of Pizzo Castelluzzo (Ilardi & Troia, 2002; Marino & Castellano, 2006; Schicchi & Marino, 2011); the species is found with sparse nuclei, spread over an area of about 2 hectares, between 810 and 960 m a.s.l. The habitat is represented by a scree relatively sheltered from cold winds. Sporadic other presences of the species on the sidelines of the rocky outcrops extending up to the summit. Under the geological aspect, they are carbonate and silicate-carbonate substrates of the Sicani Units, sometimes with cherty marls and limestones (Di Stefano & Vitale, 1992).

3) Southern slopes of Rocca Busambra (Monreale and Corleone).

The site falls within the Nature Reserve “Bosco Ficuzza, Rocca Busambra, Bosco del Cappelliere e Gorgo del Drago”, as well as the SCI ITA 020008 “Rocca Busambra e Rocche di Rao” and the SPA ITA 020048 “Monti Sicani, Rocca Busambra e Bosco della Ficuzza”. These are isolated nuclei distributed over an area of about 1-2 hectares, between 800 and about 1100 (1200) m a.s.l. (Troia, 1997). They are calcareous-

dolomitic substrates (Mascle, 1974), within which the microwoods mainly establish on detrital cones pedologically poor and somewhat xeric.

4) Sicilian inland (Gangi, Palermo province).

Small site located close to the evaporitic outcrops of the Sicilian inland, beyond the extreme southern limit of Madonie Mts., on detrital coverages of carbonate nature (Schicchi & Marino, 2011).

5) Quartzarenitic complex of the southern side of the Nebrodi Mts. (Cesarò, Messina province).

The site, located in the southern and innermost part of the Nebrodi Mts., consists of four distinct and among them isolated stations, on a total area of about 2 hectares. Two of them are located along the southern slopes of the quartzarenitic spikes, respectively, of Rocca Rappiti (1335 m) and Rocca Nadore (1038 m), at altitudes of about 1248 m and 1005 m a.s.l. (Giardina, 1990). The third station is located in Contrada Mercadante (Giardina, 1990), between 850 m and 875 m a.s.l. The fourth station falls within the SCI ITA 070026 “Forre Laviche del Simeto”, located on outcrops in the northeast of the Serravalle River (Poli *et al.*, 1974). Under the geological aspect, the coenosis establishes on isolated quartzarenitic banks, emerging within the brown clays of the Numidian Flysch dominating the entire area, these latter unsuitable for the establishment of the species. These various substrates are referred to the Nicosia Unit of the Sicilide Complex, sometimes with the presence at the top of marly limestones and marls with cherty strips (Lentini *et al.*, 2000).

6) South-western side of Mount Etna.

This is the main subrange of the species, whose northern limit is placed between the towns of Bronte and Maletto, extending to south-east up to the towns of Nicolosi and Belpasso, particularly along the lava flow of 1910 (Poli *et al.*, 1974; Romano, 1999). Under the conservation aspect, the subrange affects the areas of the Etna Regional Park, of the SCI ITA 070023 “Monte Minardo”, of the SCI/SPA ITA070017 “Sciare di Roccazzo della Bandiera” and the SCI/SPA ITA070018 “Piano dei Grilli”.

Phytosociological, synecological and syndinamical analyses

The study of the plant communities was carried out based on 32 unpublished phytosociological relevés, in addition to other four already published by Marcenò *et al.* (2002), in order to characterize the typological variability of the phytocoenoses in relation to the ecological parameters. The vegetation study was carried out according to the Zurich-Montpellier School methodology, adopting the abundance-dominance indices proposed by Braun-Blanquet (1964), updated on the basis of the latest acquisitions (Géhu & Rivas-Martínez, 1981; Biondi, 1994, 2011; Biondi *et al.*, 2004, 2011; Rivas-Martínez, 2005; Blasi *et al.*, 2011; Géhu, 2011; Pott, 2011). On the basis of the total set of phytosociological relevés a 36 relevés × 82 species matrix was obtained, in turn subjected to cluster analysis (UPGMA) based on Euclidean distance measures performed with the software Syntax 2000 (Podani, 2001).

For the syntaxonomical treatment, we followed the criteria of the International Code of Phytosociological Nomenclature (Weber *et al.*, 2000) and the scheme proposed by Rivas-Martínez *et al.* (2001, 2002) up to the alliance, apart from some updating listed in the bibliography. The synecological analysis was performed according to the methodological principles of Synphytosociology (Géhu & Rivas-Martínez, 1981). The references to sigmeta refer to the Carta delle serie di vegetazione d'Italia (Bazan *et al.*, 2010; Blasi, 2010) and any other studies reported in the text.

Results

Phytosociological and synecological analysis

Multivariate analysis performed on the phytosociological relevés reported in Tab. 2, allowed to obtain the dendrogram reported in Fig. 2. In the graph four clusters, corresponding to as many subassociations of the same association, are highlighted, all well differentiated from the floristic and ecological point of view, and which are described below.

PISTACIO TEREBINTHI-CELTIDETUM AETNENSIS ass. nova hoc loco (holotypus rel. 12, Tab. 2)

Characteristic/Differential species: *Celtis aetnensis* (dom.), *Pistacia terebinthus*.

Structure and ecology: Microwoody community dominated by *Celtis aetnensis*, associated with *Pistacia terebinthus* – other winter deciduous which shapes the physiognomy of the coenosis –, as well as various lianous elements of the Mediterranean maquis (*Clematis cirrhosa*, *Rubia peregrina*, *Smilax aspera*, *Asparagus acutifolius*, *Lonicera etrusca*) and other thermophilous sclerophytes (*Asparagus albus*, *Euphorbia characias*, *Ruta chalepensis*, *Olea europaea* var. *sylvestris*, ecc.). The coenosis constitutes vegetation aspects with a generally linear growth, 3-5 (8) m high, established on clastic material located along steep slopes, watersheds, karst depressions or at the base of cliffs of various nature, as well as on cracked lava flows; it is found at altitudes ranging from 380 m (Sicani Mts., Pizzo Telegrafo) to over 1000 m a.s.l. (Rocca Busambra, Rocca Rapiti, Rocca Nadore, Mt. Etna). On calcareous-dolomitic substrates it generally tends to circumscribe the outer and most stabilised margins of screes, placed close to rocky cliffs or steep slopes; they mainly are active cones, constantly fed by new contributions of detrital material originated from landslides and erosion processes. It can also be found on the terraces between cultivated fields (Mt. Etna), as well as among the heaps of stones accumulated over time by the man between the arable crops – locally known as “chirchiarì” – as well as on rocky ridges, isolated outcrops or more or less fissured lava flows, in areas little exposed to the cold northerly winds (Fig. 3).

Syndinamism: These microwoods represent the most developed aspect of the “submountain and hilly Sicilian, detrital, indifferent edaphic, thermo-mesomediterranean subhumid series of the Etna hackberry” (*Pi-*

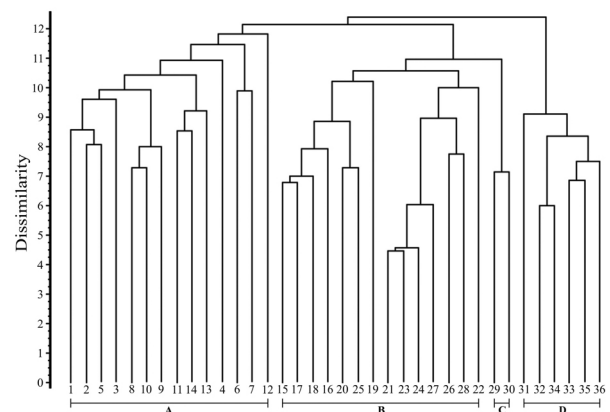


Fig. 2 - Dendrogram obtained through the synoptic comparison among the coenoses reported in Tab. 2 (cluster analysis, UPGMA). *Pistacio terebinthi-Celtidetum aetnensis* ass. nova: A) *typicum* subass. nova (rel. 1-14); B) *phlomidetosum fruticosae* subass. nova (rel. 15-28); C) *artemisietosum arborescentis* subass. nova (rel. 29-30); D) *rhamnietosum alaterni* subass. nova (rel. 31-36).

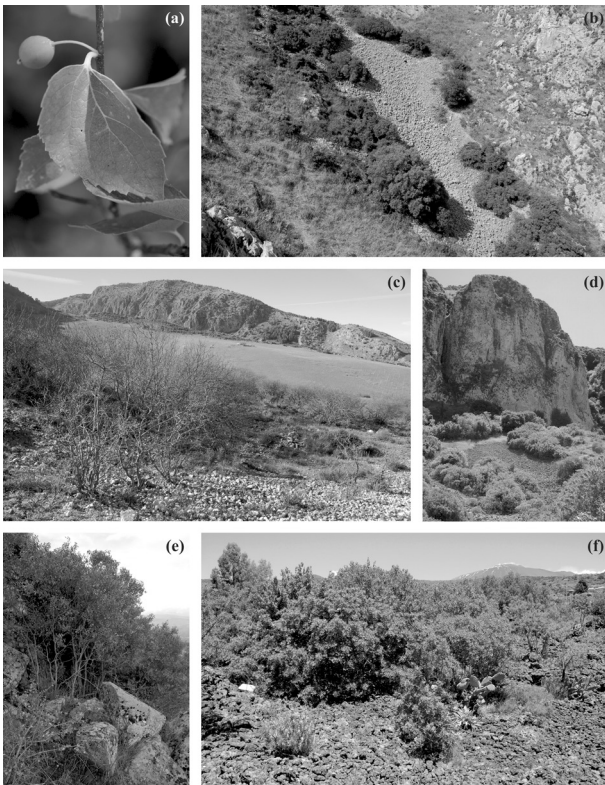


Fig. 3 - Twig with fruit of *Celtis tournefortii* subsp. *aetnensis* (a) and aspects of residual microwoods of the *Pistacio terebinthi-Celtidetum aetnensis* ass. nova, diversified in the following subassociations: - *typicum* subass. nova, on detrital cones of calcareous nature, on the northern slopes of Pizzo Telegrafo (Sicani Mts.), at Cozzo Pozzillo (b) and, in wintry habitus, in contrada S. Biagio (c); - *phlomidetosum fruticosae* subass. nova, on the most xeric screes of the southern slopes of Pizzo Telegrafo (d); - *artemisietosum arborescentis* subass. nova, among the quartzarenitic blocks at Rocca Rapiti (e), in Cesarò territory; - *rhamnetosum alaterni* subass. nova, on the cracked lava flows of the western slope of Mount Etna (f), here at Adrano.

stacio terebinthi-Celtido aetnensis sigmetum). It is an edaphophilous series with a glareicolous and pioneer character, whose peculiarity is inherent in the habitat dynamics itself, greatly influenced by the continuous reworking of the substrate due to continuous intake caused by erosion and landslides, as well as by the peculiar microclimatic conditions, with remarkable daily and yearly temperature range. Inwards of the debris cone, the sigmetum normally finds catenal contacts with shrubby aspects of the detrital microgeoseries, whereas outwards – where typically the debris of greater size locate – it finds catenal contacts with aspects of further *Quercus ilex* woody series. Upwards instead it puts itself into contact with the geoseries tied to the rupicolous environments of the rocky cliffs (Fig. 4).

Bioclimate: Upper thermomediterranean/mesomediterranean, with upper dry/subhumid ombrotype.

PISTACIO TEREBINTHI-CELTIDETUM AETNENSIS TYPICUM subass. nova hoc loco (holotypus rel. 12, Tab. 2)

Table: 2, relevés 1-14.

Differential species: *Ruta chalepensis*, *Smyrniolum olusatrum*, *Prunus spinosa*.

Substrate: Detrital cones placed close to shady cliffs of carbonate nature.

Bioclimate: Upper mesomediterranean lower submid.

Syndinamism: Microwoods 3-4.5 (6) m high, tied to detrital series, in catenal contact inwards of the scree with the pioneer shrub community with *Smilax aspera*, and outwards with the series of the holm oak community (*Aceri campestris-Quercus ilecis* sigmetum), representative of the most advanced and stabilized aspects.

Distribution: Sicani Mts. and Sicilian inland, in Bisacquino territory (northern slopes of Pizzo Telegrafo, in Contrada S. Biagio), S. Stefano Quisquina (Pizzo Castelluzzo), Corleone (southern slopes of Rocca Busambra) and Gangi (Cozzo Ficilino).

PHLOMIDETOSUM FRUTICOSAE subass. nova hoc loco (holotypus rel. 25, Tab. 2)

Syntaxonomical notes: Marcenò *et al.* (2002) describe for the Caltabellotta area (south-western Sicily) the *Oleo-Euphorbietum dendroidis* Trinajstić (1974) 1984 subass. *celtidetosum tournefortii* Marcenò, Romano & Ottonello 2002, on the basis of a synoptic table

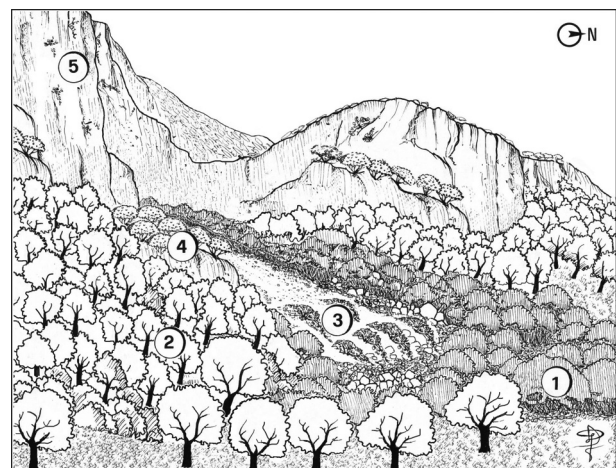


Fig. 4 - Schematic transect of the plant landscape of Pizzo Telegrafo (Sicani Mts.), in Contrada S. Biagio: (1) *Celtis tournefortii* subsp. *aetnensis* microwoods (*Pistacio terebinthi-Celtidetum aetnensis* ass. nova *typicum* subass. nova); (2) *Quercus ilex* subsp. *ilex* wood (*Aceri campestris-Quercetum ilecis*); (3) shrubby aspects of detrital areas (*Smilax aspera* community); (4) *Euphorbia dendroides* maquis (*Euphorbietum dendroidis*); (5) chasmophytic community (*Dianthion rupicolae*).

Bioclimate: Upper mesomediterranean lower sub-mid.

Syndinamism: Microwoods 3-4 m high, established in the rocky clefts of large quartzarenitic blocks, in predominantly southern facing stations. They constitute the most advanced aspects of an edapho-xerophilous series, put in catenal contact with: a) rupicolous microgeoseries; b) *Teucrio siculi-Quercus ilicis* holm oak series, tied to cooler and more humid sandstone rocky areas; c) *Festuco heterophyllae-Quercus congestae* sigmetum, typical of the clays of the Numidian flysch (Brullo et al., 2009).

Distribution: Nebrodi Mts. in Cesarò territory (Rocca Rapiti, Rocca Nadore, Contrada Mercadante and Castel di Bolo).

RHAMNETOSUM ALATERNI subass. nova hoc loco (holotypus rel. 36, Tab. 2)

Table: 2, rel. 31-36.

Differential species: *Rhamnus alaternus*, *Phillyrea latifolia*.

Substrate: More or less fractured lava flows and outcrops.

Bioclimate: Upper thermomediterranean and mesomediterranean, with upper dry-upper submid ombrotype.

Syndinamism: Microwoods 4-6 m high, established among the cracks of lava rocks, facing south/ southwest, in catenal contact with: a) *Celtido-Quercus virgiliana* sigmetum, typical of lava soils predominantly occupied by pistachio crops with *Pistacia vera*; b) *Festuco heterophyllae-Quercus congestae* sigmetum, which substitutes the previous one at altitudes higher than 800 m a.s.l.; c) the *Teucrio siculi-Quercus ilicis* series, tied to cooler and more humid lava rocky substrates (Brullo et al., 2009).

Distribution: southern-western and western slopes of Mount Etna.

Syntaxonomy

Under the syntaxonomical aspect, the described *Celtis aetnensis* coenoses are referred to the alliance *Oleo-Ceratonion* (order *Pistacio-Rhamnetalia alaterni*, class *Quercetea ilicis*), according to the scheme reported at the end of the text.

Concluding remarks

A synoptic comparison among the *Celtis tournefortii* subsp. *aetnensis* coenoses is reported in Tab. 3. Microwoods dominated by *Celtis tournefortii* subsp. *aetnensis* subject of this paper are scattered throughout the Sicilian range of the species, where they form impenetrable communities, sometimes even extended, denoting the important pioneer role of this entity in

Tab. 3 - Simplified synoptic table (sporadic species are not reported) of the *Celtis tournefortii* subsp. *aetnensis* communities relative to Tab. 2 [*Pistacio terebinthi-Celtidetum aetnensis typicum* subass. nova (1a), *phlomidetosum fruticosae* subass. nova (1b), *artemisietosum arborescentis* subass. nova (1c) and *rhamnetosum alaterni* subass. nova (1d)] and of the other coenoses with the presence of the species already reported for Sicily by other authors: 2 (Marcenò et al., 2002: Tab. 1, ril. 12 and 16, *Oleo-Euphorbietum dendroides* subass. *celtidetosum tournefortii*); 3 (Poli et al., 1981: *Celtido-Quercetum ilicis* n.n.); 4 (Brullo & Marcenò, 1985: Tab. 4, *Celtido aetnensis-Quercetum virgiliana*).

Column number	1	2	3	4	5	6	7
Coenoses	1a	1b	1c	1d	2	3	4
Number of relevés	14	14	2	6	2	3	8
Physiognomically dominant and differential species							
<i>Celtis tournefortii</i> Lam. subsp. <i>aetnensis</i> (Tornab.)	V	V	2	V	2	2	V
Raimondo & Schicchi	V	II	.	V	1	1	V
<i>Pistacia terebinthus</i> L.	II	II	.	I	1	.	.
<i>Euphorbia dendroides</i> L.	I	I	2	.	2	.	.
<i>Olea europaea</i> L. var. <i>silvestris</i> (Mill.) Lehr	I	I	.	.	.	1	3
<i>Quercus ilex</i> L. subsp. <i>ilex</i>	.	.	.	.	.	.	IV
<i>Quercus virgiliana</i> (Ten.) Ten.	.	.	.	I	2	.	V
Ch. of the subassociations of the <i>Pistacio-Celtidetum aetnensis</i> ass. nova							
<i>Ruta chalepensis</i> L.	V	I	.	.	2	.	.
<i>Smyrnum olusatrum</i> L.	V	.	.	.	.	.	.
<i>Prunus spinosa</i> L.	III	.	.	.	.	.	.
<i>Phlomis fruticosa</i> L.	.	V	.	.	2	.	.
<i>Artemisia arborescens</i> (Vaill.) L.	.	.	2	.	.	.	.
<i>Ruscus aculeatus</i> L.	.	.	2	.	.	.	III
<i>Anagyris foetida</i> L.	.	.	2	.	.	.	.
<i>Rhamnus alaternus</i> L.	.	.	.	V	.	.	III
<i>Phillyrea latifolia</i> L.	I	.	.	.	IV	.	.
Ch. of unities of the class <i>Quercetea ilicis</i>							
<i>Asparagus acutifolius</i> L.	V	V	2	V	2	3	V
<i>Euphorbia characias</i> L.	V	IV	2	V	1	.	V
<i>Arisarum vulgare</i> Targ.-Tozz.	IV	IV	1	I	1	.	I
<i>Hedera helix</i> L. subsp. <i>helix</i>	I	II	2	.	.	1	IV
<i>Cyclamen hederifolium</i> Aiton subsp. <i>hederifolium</i>	IV	IV	2	III	1	.	.
<i>Tamus communis</i> L.	III	I	2	III	.	.	.
<i>Asparagus albus</i> L.	III	II	1	.	1	.	.
<i>Smilax aspera</i> L.	III	III	.	IV	1	.	.
<i>Prasium majus</i> L.	II	II	.	I	2	.	.
<i>Clematis cirrhosa</i> L.	III	IV	.	V	1	.	.
<i>Rubia perigrina</i> L. subsp. <i>longifolia</i> (Poir.) O. Bolòs	IV	II	.	.	1	.	V
<i>Allium subhirsutum</i> L.	V	II	.	V	.	.	.
<i>Rosa sempervirens</i> L.	II	I	.	.	.	.	IV
<i>Lonicera etrusca</i> Santi	II	.	.	.	2	.	V
<i>Cyclamen repandum</i> Sm.	IV	I	.	.	.	.	.
<i>Teucrium flavum</i> L.	I	II	.	.	.	.	.
<i>Osyris alba</i> L.	II	I	.	.	.	.	.
<i>Pyrus spinosa</i> Forssk.	II	.	.	.	1	.	.
<i>Lonicera implexa</i> Aiton	.	.	.	.	.	2	III
<i>Ampelodesmos mauritanicus</i> (Poir.) T. Dur. & Sch.	I	.	.	.	.	.	.
<i>Chamaerops humilis</i> L.	.	I	.	.	.	.	.
<i>Achnatherum bromoides</i> (L.) P. Beauv.	.	I	.	.	.	.	.
<i>Thalictrum calabricum</i> Spreng.	.	I	.	.	.	.	.
<i>Calicotome infesta</i> (C. Presl) Guss. subsp. <i>infesta</i>	.	.	.	I	.	.	.
<i>Carex distachya</i> Desf.	.	.	.	.	.	.	V
<i>Paeonia mascula</i> (L.) Miller	.	.	.	.	.	.	III
<i>Asplenium onopteris</i> L.	.	.	.	.	.	.	II
<i>Aristolochia rotunda</i> L.	.	.	.	.	.	.	I
<i>Asplenium trichomanes</i> L.	.	.	.	.	.	.	I
<i>Dryopteris villarii</i> (Bellardi) Weynar subsp. <i>pallida</i> (Bory) Heywood	.	.	.	.	.	.	I
Other species							
<i>Rubus ulmifolius</i> Schott	II	IV	.	1	2	.	IV
<i>Acanthus mollis</i> L.	III	I	2	.	.	1	.
<i>Dactylis glomerata</i> L. subsp. <i>hispanica</i> (Roth) Nym.	I	.	.	.	1	3	V
<i>Galium aparine</i> L. subsp. <i>aparine</i>	III	II	2	.	.	.	.
<i>Umbifucus horizontalis</i> (Guss.) DC.	III	I	2	.	.	.	.
<i>Geranium robertianum</i> L. subsp. <i>purpureum</i> (Vill.) Nym.	III	II	.	V	.	.	.
<i>Vicia villosa</i> Roth subsp. <i>varia</i> (Host) Corb.	III	I	.	.	.	.	II

the colonization of detrital substrates. The most expressive nuclei were found on the carbonate slopes of Pizzo Telegrafo, in the southern part of the Sicani Mts., where they represent the most advanced forest aspects of an edapho-xerophilous series, located on detrital coverages, present along the karst depressions of the mountains, on cones at the base of the slopes or at the bottom of the most xeric canyons.

In the other phytocoenotic types hitherto described in Sicily, *Celtis tournefortii* subsp. *aetnensis* has been instead considered as gregarious element in the following vegetation aspects: 1) *Euphorbia dendroides* maquis [*Oleo-Euphorbietum dendroidis* Trinajstić (1973) 1984 subass. *celtidetosum tournefortii* Marcenò *et al.* 2002; Marcenò *et al.*, 1995, 2002]; 2) *Quercus ilex* woods (*Celtido-Quercetum ilicis* n.n.; Poli *et*

al., 1973, 1981); 3) *Quercus virgiliana* woods (*Celtido aetnensis-Quercetum virgiliana* Brullo & Marcenò, 1985; Brullo *et al.*, 2009).

However, these phytocoenoses, dominated by other species, are tied to the *Celtis tournefortii* subsp. *aetnensis* microwoods described by us. Indeed, the first two are also located on rocky outcrops placed in catenal contact with the aforementioned microwoods (*Euphorbia dendroides* maquis in the thermomediterranean; *Quercus ilex* woods in the mesomediterranean), whereas the *Celtido aetnensis-Quercetum virgiliana* (Brullo & Marcenò, 1985) is an oak community where the species at issue is in any case relegated on small rocky surfaces, placed within volcanic Andosols, quite spread on the western side of Mt. Etna.

Syntaxonomic scheme

QUERCETEA ILICIS Br.-Bl.1947 in Br.-Bl., Roussine & Nègre 1952

Pistacio-Rhamnetalia alaterni Rivas-Martínez 1975

Oleo-Ceratonion Br.Bl.1936 ex Guinochet & Drouineau em. Rivas-Martínez 1975

Pistacio terebinthi-Celtidetum aetnensis ass. nova

typicum subass. nova

phlomidetosum fruticosae subass. nova

artemisietosum arborescentis subass. nova

rhamnetosum alaterni subass. nova

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Appendix 1: Location and data of relevés

Table 1: rel. 1-5, Pizzo Telegrafo (Bisacquino, Palermo), Contrada S. Biagio, 02.05.2008; rel. 6-7, Pizzo Telegrafo (Bisacquino, Palermo), Contrada S. Biagio, 09.01.2014; rel. 8-10, Pizzo Telegrafo (Bisacquino, Palermo), upper part of Contrada S. Biagio, 04.05.2008; rel. 11, Pizzo Castelluzzo (S. Stefano Quisquina, Palermo), southern slope, 03.05.2008; rel. 12, Rocca Busambra (Corleone, Palermo), below the cliffs of Contrada Pirrello, 09.01.2014; rel. 13, Rocca Busambra (Corleone, Palermo), above Piano Pilato, at Casale di Sopra, 05.05.2008; rel. 14, Rocca Busambra (Corleone, Palermo), below the cliffs of Contrada Pirrello, 08.10.2008; phlomidetosum fruticosae subass. nova (rel. 15-28); rel. 15-18, Pizzo Telegrafo (Caltabellotta, Agrigento), at Contrada Cavallaro (from Marcenò *et al.* 2002, relevés 13,14,15 and

17 of Tab. 1); rel. 19, Pizzo Telegrafo (Caltabellotta, Agrigento), at Contrada Cavallaro, 08.04.2008; rel. 20, Pizzo Telegrafo (Caltabellotta, Agrigento), east of Contrada Inchiusa, 03.06.2008; rel. 21-24, Pizzo Telegrafo (Caltabellotta, Agrigento), detrital coverages in the depressions between Contrada Canneria and Contrada Catusa, 03.06.2008; rel. 25, Pizzo Telegrafo (Caltabellotta, Agrigento), upper part of Contrada Inchiusa, 03.06.2008; rel. 26, Pizzo Telegrafo (Bisacquino, Palermo), at Cozzo Pozzillo, 03.06.2008; rel. 27-28, Pizzo Telegrafo (Caltabellotta, Agrigento), detrital coverages in the depressions west of the summit, 22.10.2008; artemisietosum arborescentis subass. nova (rel. 29-30): rel. 29, Cesarò (Messina), south-eastern slope of Rocca Rapiti, 22.10.2008; rel. 30, Cesarò (Messina), south-western slope of Rocca Nadore, 22.10.2008; rhamnetosum alatarni subass. nova (rel. 31-36): rel. 31, Bronte (Catania), along a rocky escarpment on the Simeto River, 22.10.2008; rel. 32-36, Etna, Adrano (Catania), on an old lava flow in Contrada Fumata, at the Bronte-Schettino crossroads, 10.06.2011.

Appendix 2: Sporadic species

Ferula communis L. subsp. *communis* + (2), 1 (13), + (31), + (32), + (33); *Thapsia garganica* L. subsp. *garganica* + (4), + (31), + (32), + (33), + (34); *Centranthus ruber* (L.) DC. 1 (11), + (13), 1 (30), 1 (36); *Torilis arvensis* (Huds.) Link subsp. *arvensis* 2 (4), + (5), + (10), + (26); *Foeniculum vulgare* Mill. subsp. *vulgare* + (16), 1 (17), + (20), + (25); *Parietaria judaica* L. + (19), + (21), 1 (22), + (28); *Bituminaria bituminosa* (L.) E. H. Stirton + (11), + (12), + (16), + (25); *Lactuca viminea* (L.) J. & C. Presl + (31), + (32), + (34), + (36); *Urtica pilulifera* L. + (21), 2 (22); + (28); *Fumaria capreolata* L. subsp. *capreolata* 1 (8), + (9), + (10); *Calamintha nepeta* (L.) Savi subsp. *nepeta* + (14), + (31), 1 (35); *Melica ciliata* L. subsp. *ciliata* + (20), + (25), 1 (35); *Origanum heracleoticum* L. + (23), 1 (24), + (25); *Calystegia sylvatica* (Kit.) Griseb. + (8), + (26), + (27); *Isatis tinctoria* L. subsp. *canescens* (DC.) Arcang. 1 (11), + (36); *Asphodeline lutea* (L.) Rchb. + (19), 1 (33); *Silene vulgaris* (Moench) Garcke subsp. *vulgaris* + (34), + (36); *Rumex scutatus* L. + (35), + (36); *Polypodium cambricum* L. 2 (31); *Brassica rupestris* Raf. subsp. *rupestris* 1 (25); *Elymus panormitanus* (Parl.) Tzvelev 1 (25); *Theligionum cynocrambe* L. + (3); *Reichardia picroides* (L.) Roth + (26); *Galium verrucosum* Huds. subsp. *verrucosum* + (33).

Appendix 3: List of the other syntaxa reported in the text

Aceri campestris-Quercetum ilicis Brullo 1984; *Dianthion rupicolae* Brullo & Marcenò 1979; *Euphorbie-*

tum dendroidis Guinochet in Guinochet & Drounieau 1944; Euphorbietum dendroidis Guinochet in Guinochet & Drounieau 1944 subass. celtidetosum tournefortii Marcenò, Ottonello & Romano 2002; Festuco heterophyllae-Quercetum congestae Brullo & Marce-

nò 1985; Oleo oleaster-Quercetum virgilianae Brullo 1984; Rhamno alaterni-Quercetum ilicis Brullo & Marcenò 1985; Teucrio siculi-Quercetum ilicis Gentile 1969 em. Brullo & Marcenò 1985.