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SALVATORE PASTA & TOMMASO LA MANTIA

NOTES ON THE STATUS AND THE CURRENT SPREAD  
OF *VIBURNUM TINUS* L. (*Viburnaceae*) IN SICILY (ITALY)

SUMMARY

The authors carried out a multi-disciplinary research in order to clarify the native status of *Viburnum tinus* in Sicily and update the knowledge about its current regional distribution. With this purpose, a large amount of scientific papers on forestry, botany and palaeo- and archaeobotany was consulted; more useful data issued from papers focused on local historical gardens, from archives and from herbarium specimens. The available data suggest that most of the extant nuclei may issue from the recent colonization of plants introduced just few centuries ago. Although the status of the stands found in some warm and humid sites in the surroundings of the city of Palermo and on the Sicani Mountain Range remains uncertain, with no doubt the majority of the other populations, including the seven new ones mentioned for the first time in this paper, issue from the recent spread of this species in several coastal and inland areas, a process which has been facilitated by its efficient seed dispersal strategy and its massive use as an ornamental plant in the green areas of the island.

*Keywords:* archives, climatic relicts, ecology, forestry, herbaria, Mediterranean, naturalisation, ornithochory, vegetation, woody plants

RIASSUNTO

*Note sullo status e l'attuale diffusione di Viburnum tinus L. (Viburnaceae) in Sicilia (Italia).* Gli autori hanno condotto uno studio multidisciplinare allo scopo di chiarire l'indigenato del laurotino, *Viburnum tinus*, in Sicilia e aggiornare le conoscenze sulla sua distribuzione attuale sull'isola. Con tale fine è stata consultata l'ampia letteratura scientifica disponibile in ambito forestale, botanico, paleo- e archeobotanico; numerosi altri dati utili sono emersi da lavori sui giardini storici, dagli archivi storici e dai campioni d'erbario. I dati disponibili portano a ipotizzare per molti dei nuclei attuali una origine per colonizzazione per dispersione da piante coltivate negli ultimi secoli. Sebbene rimanga qualche dubbio sul possibile indigenato di questa specie in alcuni siti caldo-umidi nelle adiacenze della città di Palermo e sui Monti Sicani, senza dubbio la maggior parte degli altri popolamenti, incluse le sette

nuove stazioni segnalate in questo lavoro, sono il risultato della recente espansione del laurotino in diverse stazioni costiere e interne, un processo facilitato dall'efficace strategia di dispersione dei semi e dall'estrema diffusione di questa specie come pianta ornamentale nelle aree verdi dell'isola.

*Parole chiave:* archivi, relitti climatici, ornitocoria, ecologia, scienze forestali, erbari, Mediterraneo, naturalizzazione, vegetazione, piante legnose

## INTRODUCTION

The Sicilian territory hosts a large number of woody species (LA MANTIA & PASTA, 2005). This island has played a major role in preventing the extinction of many forest tree species during Holocene glacial events (GARFÌ *et al.*, 2021) and represented the starting point for the spread of many of them soon afterwards (e.g., MAGRI *et al.*, 2006; CHEIKH ALBASSATNEH *et al.*, 2020). The overall picture about the natural history of the Sicilian forest vegetation is made even more complicated because of millennia of human introduction activities, whose impact on the past and present pattern (e.g., floristic composition, structure, distribution) of forest communities is still underestimated by many botanists focused on recent vegetation dynamics.

This note is focused on the status of the known Sicilian populations of a regionally rare woody species, *Viburnum tinus* L. (*Viburnaceae*), an evergreen thermophilous small tree with a discontinuous distribution pattern throughout the Mediterranean basin (KARLSSON *et al.*, 2005; LOMBARDO *et al.*, 2020, and references therein), probably introduced during historic times in north Africa (CHARCO GARCÍA, 2001) and naturalized in Madeira, Malta, the UK, Crete and the Aegean islands (GONÇALVES SILVA *et al.*, 2009; RAAB-STRAUBE, 2017). *V. tinus* probably represents a remnant element of the Paleogenic flora, as suggested by its inclusion - together with *V. rugosum* Pers. and *V. treleasei* Gand., narrow endemics to the Canary and Azores Islands respectively (MOURA *et al.*, 2015) - in the small basal section *Tinus*, counting 5-8 more species, mostly located in China (DONOGHUE *et al.*, 2004; LANDIS *et al.*, 2020), by its low flammability - a trait in common with several lauriphyllous trees belonging to plant families of tropical origin (QUÉZEL & MÉDAIL, 2003), and by its leaves bearing acarodomatia (GROSTAL & O'DOWD, 1994), an ancestral morpho-functional adaptation favouring mite/plant mutual symbiosis, a trait shared by several plant families counting many warm-temperate and/or tropical forest trees and lianas (e.g., Apocynaceae, Aquifoliaceae, Araliaceae, Dioscoreaceae, Fagaceae, Juglandaceae, Rubiaceae, Vitaceae: O'DOWD & WILLSON, 1991) and also reported for some frequently co-occurring evergreen lauriphyllous Mediterranean trees such as *Rhamnus alaternus* L. (MARTÍNEZ-SOLIS *et al.*, 1993) and *Laurus nobilis* L. (PENZIG & CHIABRERA, 1903).

Despite featuring among the characteristic species of the undergrowth of holm oak forest communities of the northern Mediterranean Basin (class *Quercetea*, order *Quercetalia* and alliance *Quercion ilicis* according to phytosociological literature: BRAUN-BLANQUET, 1936; RIVAS-MARTÍNEZ *et al.*, 1986; PIGNATTI, 1998; MUCINA *et al.*, 2016), in this context *V. tinus* prefers humid and shady microhabitats (COSTA-TALENS *et al.*, 1995). Additionally, this species proves to stand quite well frost stress, as reported by LARCHER (1981) and personally verified by one of us (SP, February 2021), who observed several healthy plants grown in pots in open air conditions after having experienced an intense cold winter season in Glarus (inner Switzerland). Due to frost hardness, *V. tinus* is used more and more frequently as an ornamental plant in several central European countries (ALKURDI *et al.*, 2019).

## MATERIAL AND METHODS

The authors consulted most of the scientific literature focused on Sicilian forestry, vascular flora, woody vegetation, palaeo – and archaeobotany, as well as the main reviews concerning local historical gardens – and archives looking for any data related to *V. tinus*. The main environmental characteristics of the localities hosting the Sicilian populations of *V. tinus* are reported in Table 1.

Table 1

Main characteristics of the localities hosting the known Sicilian populations of *V. tinus*.  
 MPA = Palermo Mts.; MTP = Trapani Mts.; MSI = Sicani Mts.; MAD = Madonie Mts.;  
 INN = inner Sicily; NEB = Nebrodi Mts., ETN = Etna Mt. Bioclimate according  
 to Rivas-Martínez Classification (source: Bazan *et al.*, 2015): UTme = Upper Thermo-Mediterranean,  
 LMme = lower Meso-Mediterranean; UMme = Upper Meso-Mediterranean, LSme = Lower  
 Supra-Mediterranean. calc = calcareous (limestone / dolomia); gyps. = gypsum; qz sandst. =  
 quartz sandstone; volc = volcanic; QI = *Quercion ilicis*; EA-QI = *Erico arboreae-Quercion ilicis*;  
 AU-LN = *Arbuto unedonis-Laurion nobilis*; OS-CS = *Oleo sylvestris-Ceratonion siliquae*; Ind =  
 indigenous, Nat = naturalized, Cas = casual, n.a. = not available, Spr. = spreading

Mt. Range	MPA	MTP	MSI	MAD	INN	NEB	PEL	SE-Sic	ETN
Alt. range (m a.s.l.)	50- 200	400- 750	500- 800	700- 800	400- 950	50- 1000?	0-50	450	400 1000
Bioclimate	UTme	UTme- LMme	UMme- LMme	UMme- LMme	UMme- LMme	LMme?	UTme	LMme	LSme- UMme
Substrate (bedrock)	calc	calc	calc	qz sandst.	gyps. / calc	qz sandst.	calc	qz sandst.	volc
Phytosoc. alliance	QI	QI	QI, AU-LN	EA-QI	n.a.	EA-QI?	OS- CS, QI	E-QI, QI	EA-QI
Status and Trend	Ind?	Nat?	Ind?, Spr.	Nat	Cas? Spr.	Cas?	Nat	Nat, Spr.	Nat, Spr.

The Sicilian specimens of *V. tinus* kept in the herbaria of Palermo (PAL) and Catania (CAT) were searched, too. A list of them is provided in the Table 2. The syntaxonomic nomenclature of the vegetation units cited in the text follows GUARINO *et al.* (2017); a complete prospect of these vegetation units is provided in the Table 3.

Table 2

Sicilian specimens of *Viburnum tinus* found in the herbaria of Palermo (PAL) and Catania (CAT)

<p><b>Palermo Mts.</b>          Favorita / s. coll. (probably A. Riccobono, G. Certa, <i>pers. comm.</i>) / 3.IV.1897 (PAL59858)          Panormi / s. d. / s. coll. / ex Flora Sicula Exsiccata - Hortus Catinensis - Tornabene (CAT9517)</p> <p><b>Sicani Mts.</b>          Santa Maria del Bosco – In sylvis montosis / VI / leg. Todaro / Todaro Flora Sicula Exsiccata n. 1297 (PAL59857)          Contrada Muscola, Chiusa Sclafani (PA) / UTM 33S 365422, 4168382, 480 m a.s.l., limestones / 7.X.1997 / legit G. Certa, G. Scafidi and E. Schimmenti (PAL59866)</p> <p><b>Madonie Mts.</b>          Madonie in sylvis montosis an culta? uti notatur a Guss. Syn. Fl. Sic. vol. 1 pag. 363 / s. d. / vivum et siccum in Horto Siculo / leg. Tornabene / Martio-Aprile (CAT9518)          Gibilmanna, 37°59' N – 14°00' E, brown soil on quartzarenite, 700-800 m a.s.l. / 18.06.1990 / legit F.M. Raimondo <i>et al.</i> – OPTIMA Iter Mediterraneum III in Sicily 2478 (PAL68937)</p> <p><b>Nebrodi Mts.</b>          Boschi di Mistretta / s. d. / ex Flora Sicula Exsiccata - Hortus Catinensis - Tornabene (CAT9516).</p> <p><b>Inner Sicily</b>          Nature Reserve “Monte Conca” near the town of Campofranco / legit L. Scuderi / 6.IV.2008 (CAT14092)</p>
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Table 3

Syntaxa cited in the text (nomenclature according to Guarino *et al.*, 2017)

<p>QUERCETEA ILICIS Br.-Bl. ex A. Bolòs y Vayreda &amp; O. de Bolòs in A. Bolòs y Vayreda 1950          QUERCETALIA ILICIS Br.-Bl. ex Molinier 1934 em. Rivas-Mart. 1975          QUERCION ILICIS Br.-Bl. ex Molinier 1934  <i>Oleo sylvestris-Quercetum virgilianae</i> Brullo 1984  <i>Rhamno alaterni-Quercetum ilicis</i> Brullo &amp; Marcenò 1985  <i>Pistacio lentisci-Quercetum ilicis</i> Brullo &amp; Marcenò 1985 subass. <i>viburnetosum tini</i> Gianguzzi <i>et al.</i> 1996  <i>Ampelodesmo mauritanici-Quercetum ilicis</i> subass. <i>viburnetosum tini</i> Gianguzzi <i>et al.</i> 2016  <i>Sorbo torminalis-Quercetum virgilianae</i> Brullo <i>et al.</i> 1996          ERICO ARBOREAE-QUERCION ILICIS Brullo, Di Martino &amp; Marcenò 1977  <i>Arabido turritae-Quercetum congestae</i> Brullo &amp; Marcenò 1985          ARBUTO UNEDONIS-LAURION NOBILIS Rivas-Mart., Fernández-González &amp; Loidi 1999  <i>Hedero helicis-Lauretum nobilis</i> Bueno &amp; Fernández Prieto 1991  <i>Acantho mollis-Lauretum nobilis</i> Gianguzzi, D'Amico &amp; Romano 2010          PISTACIO LENTISCI-RHAMNETALIA ALATERNI Rivas-Mart. 1975          OLEO-CERATONION SILIQUAE Br.-Bl. 1936 ex Guinochet &amp; Drouineau 1944 em. Rivas-Mart. 1975  <i>Myrto communis-Pistacietum lentisci</i> (Molinier 1954 em. O. de Bolòs 1962) Rivas-Mart. 1975</p>
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## RESULTS

The total absence of *V. tinus* in the palaeo- and archaeobotanical record of Sicily (PASTA *et al.*, *in press*), as well as the lack of any mention about the use of its wood on the island in press (SALA *et al.*, 2020) point out the extreme rarity of this species since millennia and support the hypothesis of its recent introduction.

The first author to quote *V. tinus* for Sicily was CUPANI (1696, p. 108), who mentioned “*Laurus sylvestris Corni foeminae folijs, subhirsutis C. B. P., Laurus Tinus, sivè sylvestris I.B.*” without specifying whether the species grew in the wild or was just cultivated in the botanical garden of Misilmeri near Palermo. One century later, UCRIA (1789; p. 142) cited *V. tinus* with the vernacular name of “lauru tinu” and listed it among the exotic plants which only occurred in botanical gardens, whilst the species was considered to be native to Sicily by GUSSONE (1821). In the same period, also PRESL (1826) cited *V. tinus* as growing in Sicily with no further remarks, and the same did TINEO (1827), who also reported the vernacular name “dentagini”. During the following decades, TODARO (1858) and TORNABENE (1887b) quoted *V. tinus* in their catalogues concerning the plants cultivated in the botanic gardens of Palermo and Catania, respectively. Even these scholars added no comment about its native status, and the authors of the main Italian floras published during the 19th century do not mention the species for Sicily (BERTOLONI, 1837) or consider it as ‘almost naturalized’ (PARLATORE, 1887).

Figure 1 and the following text provides more details on the current occurrence and distribution of the Sicilian populations of *V. tinus*.

*Surroundings of Palermo*

In contrast with the extremely high number of citations referring to other woody species cultivated in the Plain of Palermo and its surroundings, *V. tinus* (named with the vernacular name of “dentagine”) features only twice in the official documents of the Bourbon period as “planted” (Archivio di Stato di Palermo, 1804) and “sown” (ARCHIVIO DI STATO DI PALERMO, 1806) in the Real Sito dei Colli (= royal estate of the Colli, a large surface of countryside located north of the city centre of Palermo, once hosting many villas and estates of local nobility and nowadays erased by urban sprawl; cf. SESSA, 2015). Additionally, this species has not been used in the reforestation interventions carried out in the nearby Monte Pellegrino (LA MANTIA, 2020). Reported as casually naturalised at Mondello since the end of 19th century (STROBL, 1883; LOJACONO-POJERO, 1903), *V. tinus* is a widespread plant in the urban park of Favorita and its neighbouring green areas (LOJACONO-POJERO, 1903; BUFFA *et al.*, 1986; GIUFFRIDA, 1990; MAZZOLA & DI MARTI-



Fig. 1 — Current distribution of the doubtfully native (1-2 and 5-11) and the probably escaped/naturalized (3-4 and 12-22) populations of *Viburnum tinus* in Sicily. Full circles: populations already reported in previous literature; empty circles = new records based on herbarium specimens and unpublished field records. 1: foothills of Mt. Pellegrino, 2: Santa Maria di Gesù, 3: Contrada Fontana Rossa, 4: top of Mt. San Giuliano, 5: Contessa Entellina, 6: Bisacquino, 7: Chiusa Sclafani, 8: San Carlo and Coste di Sibilla, 9: Sosio river watershed (incl. Bosco di Sant'Adriano), 10: Santo Stefano di Quisquina, 11: Castronovo di Sicilia, 12: Monte Conca, 13: Cefalù and Gibilmanna, 14: Mistretta, 15: Enna, 16: Milazzo, 17: NE slopes of Mt. Etna, 18: Zafferana Etnea, 19: Mt. Ceraulo, 20: Contrada Caudarella, Caltagirone, 21: Monte Difeso - Pedara, 22: Contrada Cialagra - Caltanissetta. For more details on the distribution see: [https://www.google.com/maps/d/edit?mid=1ztp6rL-jPC9VsPWJnBVYp2fwoT\\_VxDH&usp=sharing](https://www.google.com/maps/d/edit?mid=1ztp6rL-jPC9VsPWJnBVYp2fwoT_VxDH&usp=sharing)

NO, 1996, LA MANTIA, 2004). Probably escaped from there since long time, it currently occurs in many scattered nuclei of maquis in the foothills (up to 150 m a.s.l.) referred to *Rhamno alaterni-Quercetum ilicis* (BRULLO & MARCENÒ, 1985; BARTOLO *et al.*, 1992) and to *Pistacio lentiscii-Quercetum ilicis* subass. *viburnetosum tini* (GIANGUZZI *et al.*, 1996, 2017) all around Monte Pellegrino (RAIMONDO *et al.*, 1996) and in the very same habitats on the foothills of Mt. Grifone at Santa Maria di Gesù (RAIMONDO *et al.*, 1994).

#### Trapani Mts.

*V. tinus* currently grows on the N-facing slopes of Mt. San Giuliano from locality Runzi up to the top (600-750 m a.s.l.) together with other evergreen

species benefitting from the exceptionally wet local microclimatic conditions (SCUDERI, 2006; SCUDERI & PASTA, 2009), such as *Laurus nobilis* and *Hedera helix* L., dominating a lauriphyllic community which could be referred to *Hedero helicis-Lauretum nobilis* (L. Scuderi, *pers. comm.*). As its occurrence on Mt. San Giuliano was not reported on previous botanical literature (e.g., SAMMARTANO, 1826; PONZO, 1900), we cannot rule out the hypothesis that it is just recently escaped from the historic garden of 'Balio' build just on the top of the mount in the town of Erice during the second half of the 19th century (ROSSINI OLIVA & VALDÉS, 2001). On Mt. San Giuliano *V. tinus* also occurs at lower altitudes in Locality Fontanarossa, located at 400 m a.s.l. (L. Scuderi, *pers. comm.*).

#### *Sicani Mts.*

In this mountain range *V. tinus* was first observed at Santa Maria del Bosco on Mt. Genuardo by GUSSONE (1843) (Table 2) during the first half of the 19th century. Once again, the species occurs close to a Bourbon estate, located at Calatamauro (BENIGNO *et al.*, 1983). Nowadays the species still occurs there (E. Badalamenti and L. Scuderi, *pers. comm.*) and in other sites nearby, like Contrada Serradaino and Boschetto, or at Contrada Rocca Rossa near Contessa Entellina (GIANGUZZI *et al.*, 2007, 2010, 2016; CUTTONARO, 2012), and has apparently experienced a significantly fast spread during last 150 years. In fact, its presence has been recorded in several humid and shady sites - mostly located between 500 and 800 m a.s.l. and close to streams and creeks - such as Mt. Lucerta (MARCENÒ *et al.*, 1985), the watershed of Sosio river (MARCENÒ *et al.*, 1985; GARFÌ *et al.*, 2013), the territories of Chiusa Sclafani and Castronuovo di Sicilia at the end of 1990s (Table 2), the localities Coste di Sibilla (BAZAN *et al.*, 2007), Bosco di Sant'Adriano, Cozzo Danesi, Bisacquino (Contrada Gallinaro) and San Carlo (Contrada Zaffuti), the northern slopes of Mt. Gristia (CUTTONARO, 2012; GIANGUZZI *et al.*, 2016) and Contrada Pietrafucile (L. Scuderi, *pers. comm.*). In this area *V. tinus* may take part to evergreen lauriphyllic thermo-hygrophilous forest nuclei (*Acantho mollis-Lauretum nobilis*), to degraded holm oakwoods (*Ampelodesmo mauritanici-Quercetum ilicis* subass. *viburnetosum tini*) and to semi-deciduous oakwoods referred to *Sorbo torminalis-Quercetum virgilianae* (GIANGUZZI *et al.*, 2010, 2016).

#### *Madonie Mts.*

STROBL (1883) states "In Sicily and particularly in the Madonie it never appears to grow wild, but it commonly occurs as cultivated plant in gardens". Also TORNABENE (1887a) and LOJACONO-POJERO (1903) reported it as doubtfully native for this mountain range. During last decades its local naturalisation has been reported for Contrada Presti near Cefalù (RAIMONDO & MAZZOLA, 1984). The species has also been observed growing on acidic soils in

several oakwood nuclei (Table 2) referred to *Erico arboreae-Quercion ilicis* near Gibilmanna (RAIMONDO & MAZZOLA, 1984; RAIMONDO *et al.*, 2004; TAVILLA & CAMBRIA, 2020; V. Ilardi, *pers. comm.*).

#### *Nebrodi and Peloritani Mts.*

Although a 19th-century exsiccatum from Mistretta is kept in the herbarium of Tornabene (Table 2), this species was never recorded to occur in NE-Sicily (e.g., NICOTRA 1883) before CRISAFULLI (2003) reported it for the territory of Milazzo. Here *V. tinus* grows in the remnant patches of thermophilous woody communities (*Oleo sylvestris-Quercetum virgilianae*, *Myrto communis-Pistacietum lentisci*) as well as in abandoned olive orchards and hedgerows (Table 3). Considering that the territory of Milazzo hosts many ancient villas and private gardens, the hypothesis of its recent spread from locally cultivated individuals cannot be discarded (M. Crisafulli, *pers. comm.*).

#### *Inner Sicily*

*V. tinus* has also been observed growing in several localities in inner Sicily. More in detail, its presence has been recorded on gypsum-rich soils at Enna (LO GIUDICE & CRISTAUDO, 2004), where it grows as a casually escaped plant near the ruins of Castello di Lombardia in the old city centre (A. Cristaudo, *pers. comm.*), and in the Nature Reserve named “Monte Conca”, located around 400 m a.s.l. and on soils developed from outcropping calcareous sandstones in locality Cialagra (550 m s.l.m.) near Caltanissetta, where several seedlings and saplings of *V. tinus* were found in a site hosting several large individuals of *Quercus virgiliana* Ten. and other woody plants such as *Arbutus unedo* L., *Crataegus monogyna* Jacq. and *Teucrium flavum* L. (G. Clementi and S. Tirrito, 29.05.2021, *pers. comm.*) (Figure 1 and Table 1).

#### *Mt. Etna*

*V. tinus* is not mentioned among the native woody plants in none of the earliest inventories of the vascular flora of the volcano (RAFINESQUE-SCHMALTZ, 1815; STROBL, 1880-1888; TORNABENE, 1890), and is explicitly mentioned as absent in all eastern Sicily by BACCARINI (1901). SCUDERI (1828) did not mention it neither, albeit he reported the presence of small “viburni” (*Viburnum* spp.) colonizing the lava flows of 1736 in the southern sector of the forest of Catania.

SCIANDRELLO *et al.* (2020) report *V. tinus* as growing on the eastern slopes of Mt. Etna between 700 and 1000 m a.s.l. Actually, BRULLO *et al.* (1999, 2009) observed it growing in the mesic oakwoods referred to *Arabido turritae-Quercetum congestae* near Caselle (c. 1000 m a.s.l.), but this species appears to be far more common at lower altitudes: for instance, scattered individuals were observed growing in the undergrowth of semi-deciduous oakwoods (*Erico*



*arboreae-Quercion ilicis*) near Zafferana Etnea by S. Pasta and A. Troia (c. 600 m a.s.l., VII.1994, unpubl.), whilst SIRACUSA (1998) observed it in similar forest communities near Sant'Alfio (municipality of Milo, c. 530 m a.s.l.), TURRISI & POLI MARCHESE (2007) recorded its presence at Mt. Ciraulo (municipality of Mascalucia, c. 525 m s.l.m.), and S. Pasta, C. and C. Catalano observed it growing on the eastern slopes of Mt. Difeso near Pedara (c. 800 m s.l.m., 20.06.2021).

#### *South-Eastern Sicily*

The recent colonization of *V. tinus* within an *Opuntia ficus-indica* (L.) Mill. plantation in locality Rangasile near Caltagirone (Fig. 2) was first noticed by T. La Mantia (January 2018). Since its discovery this small population is constantly increasing and now counts about 15 individuals; the first of them have probably reached this site after escaping from a private or public garden in the surroundings. Local prickly pear orchards prove to be an attractive place for many seed dispersers and a suitable place for the survival, establishment and spread of many other woody plants growing in the adjacent patches of semi-natural vegetation, i.e. oak wood fragments with *Q. suber* L., *Q. pubescens* Willd., *Q. ilex* L. and tall shrublands with *Rhus coriaria* L., *Prunus spinosa* L. and *Cytisus infestus* C. Presl (BADALAMENTI *et al.*, submitted).



Fig. 2 — Mature individual of *Viburnum tinus* within a prickly pear orchard in the territory of Caltagirone (photo: T. La Mantia).

## DISCUSSION

The ecological information inferred from occurrence data (Table 1) points out that the extant Sicilian populations of *V. tinus* show no clear preference for any soil/substrate type and mostly occur in woodlands and areas with a sparse wood cover, such as forest fringes, hedgerows and abandoned orchards. The species appears to meet its optimum between 450 and 800 m a.s.l., i. e. under meso-Mediterranean climate, with the exception of the nuclei near Palermo, which enjoy exceptionally humid conditions under thermo-Mediterranean mesoclimate.

Some Sicilian scholars consider *V. tinus* as a native ‘relict’ species which only survived in the island where it met very peculiar warm and humid microclimatic conditions. Indeed, the occurrence of this species in moist mid-altitude (400-800 m a.s.l.) sites, deep gorges or closed valleys matches very well with some of the main types of glacial refugia individuated by MÉDAIL & DIADEMA (2009). In one hand, this hypothesis needs to be supported by further evidence, and we should expect to find some more co-occurring ‘relicts’ growing in these refugial sites, which is not the case. On the other hand, we must avow that some ‘true’ relicts, like *Ptilostemon greuteri* Raimondo & Domina, a peculiar evergreen lauriphyllid woody thistle (RAIMONDO & DOMINA, 2006), or *Zelkova sicula* Di Pasquale, Garfì & Quézel, a deciduous summergreen tree belonging to a genus linked to more mesic conditions, were able to survive even ‘alone’ (with no similar co-occurring plants) under thermo- and meso-mediterranean bioclimatic belts thanks to favourable stochastic events and/or peculiar microtopographic patterns (GARFÌ *et al.*, 2021).

Most of the Sicilian populations of *V. tinus*, a plant sacred to all the monotheistic religions of the Mediterranean area (ZOHARY, 1982; BALLERO, 2016), grow in close vicinity of sanctuaries, convents and cemeteries (e.g., Santa Maria del Bosco, Gibilmanna, Sant’Adriano, Rotoli on the western foothills of Mt. Pellegrino, Santa Maria di Gesù). Elsewhere, like in the Bourbon estates of ‘La Favorita’ and that of Calatamauro, this species has been deliberately planted, as in many other Italian and circum-Mediterranean localities, where *V. tinus* has been extensively used to build hedgerows due to its quick response to regular pruning and shaping (‘ars topiaria’). As a matter of fact, *V. tinus* features among the ten most common plants cultivated in Sicilian historical gardens (BAZAN *et al.*, 2005). Hence, local frugivorous birds (JORDANO, 1982; DEBUSSCHE *et al.*, 1987; DEBUSSCHE & ISENMANN, 1989, 1992; HERRERA, 1995) may be main responsible for the fast dispersal of its shiny blue metallic and lipid-rich fruits (MIDDLETON *et al.*, 2020) and in its recent spread throughout the

region has probably been underestimated, like in the case of other woody plants with bird-dispersed edible fleshy and/or juicy fruits (e.g., *Celtis australis* L., *Ficus carica* L., *Laurus nobilis* L., *Olea europaea* L., *Vitis vinifera* L., T. La Mantia and R. da Silveira Bueno, *pers. obs.*). This is almost certainly the case of the isolated individuals and small nuclei of *V. tinus* found in inner and south-eastern Sicily and on Mt. Etna, where this species results to be cultivated in more than 40% of the historical gardens considered by CRISTAUDDO *et al.* (2010).

On the one hand, we cannot rule out the hypothesis that at least some of the Sicilian nuclei are native and represent the original source of the plants introduced in the public and private gardens of the surroundings. Indeed, *V. tinus* behaves like a native plant in the foothills of the mountains near Palermo and in the Sicani Mts., where it grows in 'near-natural' conditions and counts numerous healthy populations. On the other hand, considering that this territory was already intensely explored during the 17th century by Francesco Scaglione, apothecary of the town of Prizzi and one of the most active informers of Francesco Cupani, one might wonder why its local occurrence remained unrecorded until GUSSONE (1843).

Whenever the native status of some Sicilian populations of *V. tinus* would be demonstrated, with no doubt private and public gardens played and still play a key role in favouring the naturalisation of cultivated individuals of extra-insular origin, a phenomenon already ascertained for other bird-dispersed plant species, such as *Chamaerops humilis* L. (PASTA *et al.*, 2014).

In the end, *V. tinus* is currently facing a sort of 'forced turnover' due to two counteracting processes triggered by anthropogenic disturbance: on the one side, several native relict stands are prone to local extinction events due to global warming and habitat disruption, on the other side the species is spreading (mostly northwards) due to its massive use for gardening purposes, as it has been observed in many European countries such as in southern France (F. Médail, *pers. comm.*).

We hope that future genetic analyses may help to dispel the doubts about the native status of *Viburnum tinus* in Sicily, to detect any really relict population and to shed light on the recent establishment and spread of the species throughout the island.

## CONCLUSIONS

This note points out not only the importance of taking into account and bringing together the data issuing from palaeo- and archaeobotanical

research, but also the ‘humanistic’ information reported on the available historical sources concerning agriculture and forest plantation activities and the literature on historical gardens. Such a multidisciplinary approach allows to better document and trace the cases of plant introduction (GRIMALDI *et al.*, 2018) and or shrinkage/extinction (DI DOMENICO *et al.*, 2011). In our opinion this approach is very much needed to deal with the history of tree cover, as it supports the correct assessment of the native status of forest woody species and prevents the risk of simplistic interpretations of current forest vegetation patterns.

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#### REFERENCES

- ALKURDI M.I.S., SUPUKA J., FERIANCOVÁ L. & BIHUNOVÁ M., 2019. *Viburnum tinus* L. as a new Mediterranean element for central Europe urban landscapes. *J. Agric. Veterin. Sci.*, 7(6): 50-58.
- ARCHIVIO DI STATO DI PALERMO, 1804. Intendenza Reali Siti di Campagna, vol. 19.
- ARCHIVIO DI STATO DI PALERMO, 1806. Intendenza Reali Siti di Campagna, vol. 28.
- BACCARINI P., 1901. Appunti sulla vegetazione di alcune parti della Sicilia Orientale. *Nuovo Giorn. bot. ital.*, n. s., 8(4): 577-602.
- BADALAMENTI E., RUSSO M., SALA G. & LA MANTIA T., *submitted*. Plant a prickly pear you get a forest: *Opuntia ficus-indica* in the ecological restoration of Mediterranean areas at desertification risk. *Restoration Ecology*.
- BALLERO M., 2016. Le Piante e la Bibbia. *Carlo Adelfio Ed.*, Sassari.
- BARTOLO G., BRULLO S., MINISSALE P. & SPAMPINATO G., 1992. Contributo alla conoscenza dei boschi a *Quercus ilex* della Sicilia. *Acta Bot. Malac.*, 15 [1990]: 203-215, 9 figg.
- BAZAN G., CASTELLANO G., MARINO P. & SCHICCHI R., 2007. Nuclei di vegetazione forestale a

- leccio e viburno dei Monti Sicani (Sicilia). P. 397 in: Raimondo F.M. & Venturella G. (eds.), Riassunti: Relazioni - Comunicazioni - Poster. 102° Congr. Naz. Soc. Bot. Ital.
- BAZAN G., GERACI A. & RAIMONDO F.M., 2005. La componente floristica dei giardini storici siciliani. *Quad. Bot. ambientale appl.*, 16: 93-126.
- BAZAN G., MARINO P., GUARINO R., DOMINA G. & SCHICCHI R., 2015: Bioclimatology and vegetation series in Sicily: a geostatistical approach. *Ann. bot. fennici*, 52(1-2): 1-18.
- BENIGNO A.M., CHIOVARO S. & RUSSOTTO C., 1983. Santa Maria del Bosco. Pp. 28-35 in: Guli A. (a cura di), Il parco. Immagine e realtà. *Quad. Ist. Urbanistica e Pianif. Territ.*, Fac. di Architettura di Palermo, 11.
- BERTOLONI A., 1833-1854. Flora italica, sistens plantas in Italia et insulis circumstantibus sponte nascentes. Vol. 3. Bononiae: ex Typographeo Richardii Masii, 637 pp.
- BRAUN-BLANQUET J., 1936. La Chênaie d'Yeuse Méditerranéenne (*Quercion ilicis*): Monographie phytosociologique. *Mém. Soc. Etud. Sci. nat.*, 5: 3-147.
- BRULLO S., GIANGUZZI L., LA MANTIA A. & SIRACUSA G., 2009. La classe *Quercetea ilicis* in Sicilia. *Boll. Accad. gioenia Sci. nat.*, ser. 4, 41 (369) (2008): 1-124.
- BRULLO S. & MARCENÒ C., 1985. Contributo alla conoscenza della classe *Quercetea ilicis* in Sicilia. *Not. fitosoc.*, 19 (1) (1984): 183-229.
- BRULLO S., SCELSI F., SIRACUSA G. & SPAMPINATO G., 1999. Considerazioni sintassonomiche e corologiche sui querceti caducifogli della Sicilia e della Calabria. *Monti e Boschi*, 50(19): 16-29.
- BUFFA M., VENTURELLA G. & RAIMONDO F.M., 1986. Contributi botanici alla conoscenza del verde storico a Palermo. 2. Carta della vegetazione del Parco della Favorita. *Naturalista sicil.*, 10 (suppl.): 3-90 + 1 carta (scala 1:4.000).
- CAMBRIA S. & TAVILLA G., 2020. Check-list of the vascular flora of the "Bosco di Gibilmanna", a Special Area of Conservation (S.A.C.) in northern Sicily (Italy). *Biodiversity J.*, 11(2): 369-382.
- CHARCO GARCÍA J., 2001. Guía de los árboles y arbustos del norte de África: claves de determinación, descripciones, ilustraciones y mapas de distribución. *Agencia Española de Cooperación Internacional*, Madrid, 671 pp.
- CHEIKH ALBASSATNEH M., ESCUDERO M., PONGER L., MONNET A.-C., ARROYO J., NIKOLIC T., BACCHETTA G., BAGNOLI F., DIMOPOULOS P., LERICHE A., MÉDAIL F., ROIG A., SPANU I., VENDRAMIN B., HAMPE A. & FADY B., 2020. A comprehensive, genus-level time-calibrated phylogeny of the tree flora of Mediterranean Europe and an assessment of its vulnerability. *Botany Letters*, 167(2): 276-289.
- COSTA-TALENS M., PÉREZ-BADIA R. & SORIANO P., 1995. Acerca de algunos bosques relictuales en el Mediterráneo occidental, *Viburno tini-Fraxinetum orn* ass. nova. *Fitosociologia*, 29: 181-185.
- CRISAFULLI M., 2003. Milazzonatura. Ambiente, flora e fauna del territorio di Milazzo. *Azienda Turismo Milazzo - Legambiente Tirreno*, Spadafora (ME), 190 pp.
- CRISTAUDDO A., MAUGERI G., CATARA S. & ROMANO D., 2010. La biodiversità dei giardini storici dell'area etnea. *Quad. Bot. ambientale appl.*, 21: 23-28.
- CUPANI F., 1696. Hortus Catholicus seu Illustrissimi et Excellentissimi Principis Catholicae Ducis Misilmeris [...]. Neapoli, *Apud Franciscum Benzi*, (xx) + 262 pp.
- CUTTONARO P., 2012. Le specie e le fitocenosi forestali nel paesaggio vegetale dei Monti Sicani (Entrotterra della Sicilia centro-occidentale). Tesi di Dottorato in Agro-Ecosistemi mediterranei, *Università Studi Palermo, Facoltà Agraria, Dip. Sistemi Agro-Ambientali*, 725 pp.
- DEBUSSCHE M., CORTEZ J. & RIMBAULT I., 1987. Variation in fleshy fruit composition in the Mediter-

- anean region: the importance of ripening season, life-form, fruit type and geographical distribution. *Oikos*, 49: 244-252.
- DEBUSSCHE M. & ISENMANN P., 1989. Fleshy fruit characters and the choices of bird and mammal seed dispersers in the Mediterranean region. *Oikos*, 56: 327-338.
- DEBUSSCHE M. & ISENMANN P., 1992. A Mediterranean bird disperser assemblage: composition and phenology in relation to fruit availability. *Rev. d'Ecologie (Terre et Vie)*, 47: 411-432.
- DI DOMENICO F., LUCCHESI F. & MAGRI D., 2011. Late Glacial and Holocene history of *Buxus sempervirens* L. in Italy. *Ann. Bot. (Roma)*, 1: 45-58.
- DONOGHUE M.J., BALDWIN B.G., LI J. & WINKWORTH R., 2004. *Viburnum* phylogeny based on chloroplast trnK intron and nuclear ribosomal ITS DNA sequences. *Syst. Bot.*, 29: 188-198.
- GARFÌ G., CARIMI F., FAZAN L., GRISTINA A.S., KOZLOWSKI G., LIVRERI CONSOLE S., MOTISI A. & PASTA S., 2021. From glacial refugia to hydrological microrefugia: factors and processes driving the persistence of the relict tree *Zelkova sicula*. *Ecol. Evol.*, 1-18. doi: 10.1002/ece3.7253
- GARFÌ G., MERCATI F., FONTANA I., COLLESANO G., PASTA S., VENDRAMIN G.G., DE MICHELE R. & CARIMI F., 2013. Habitat features and genetic integrity of wild grapevine *Vitis vinifera* L. subsp. *sylvestris* (C.C. Gmel.) Hegi populations: a case study from Sicily. *Flora*, 208: 538-548.
- GIANGUZZI L., CASTORAO BARBA A. & BAZAN G., 2017. History and forest vegetation dynamics of the Favorita Park in the Palermo suburbs (NW Sicily). Abstracts Int. Conf. *Into the woods. Overlapping perspectives on the history of ancient forests*, 49.
- GIANGUZZI L., CUTTONARO P., CUSIMANO D. & ROMANO S., 2016. Contribution to the phytosociological characterization of the forest vegetation of the Sicani Mountains (inland of north-western Sicily). *Plant Sociol.*, 53: 5-43.
- GIANGUZZI L., D'AMICO A. & ROMANO S., 2010. Phytosociological remarks on residual woodlands of *Laurus nobilis* in Sicily. *Lazaroa*, 31: 67-84.
- GIANGUZZI L., ILARDI V. & RAIMONDO F.M., 1996. La vegetazione del promontorio di Monte Pellegrino (Palermo). *Quad. Bot. ambientale appl.*, 4 (1993): 79-137.
- GIANGUZZI L., ROMANO S., D'AMICO A. & INCARDONA G., 2007. Caratterizzazione fitosociologica di alcuni nuclei residuali di laureto sui Monti Sicani (Sicilia centro-occidentale). P. 407 in: Raimondo F.M. & Venturella G. (eds.), *Riassunti: Relazioni - Comunicazioni - Poster, 102° Congr. Naz. Soc. Bot. Ital.*
- GIUFFRIDA R., 1990. Il Parco della Favorita di Palermo da sito reale a luogo di pubblica fruizione. *BCA - Boll. Inf. trimestrale divulgazione attività organi Amministrazione Beni Cult. Amb. Regione Siciliana*, A. 9-10(1-2) [1988-1989]: 55-78.
- GONÇALVES SILVA J.J., BARONE R. & MENEZES DE SEQUEIRA M., 2009. First record of naturalized *Viburnum tinus* L. (Caprifoliaceae), in the Island of Madeira (Portugal). *Bol. Mus. Mun. Funchal.*, 59(323): 5-15.
- GRIMALDI I.M., MUTHUKUMARAN S., TOZZI G., NASTASI A., BOIVIN N., MATTHEWS P.J. & VAN ANDEL T., 2018. Literary evidence for taro in the ancient Mediterranean: A chronology of names and uses in a multilingual world. *PLoS ONE*, 13(6): e0198333.
- GROSTAL P. & O'DOWD D.J., 1994. Plants, mites and mutualism - leaf domatia and the abundance and reproduction of mites on *Viburnum tinus* (Caprifoliaceae). *Oecologia*, 97: 308-315.
- GUARINO R., CUSIMANO D., ILARDI V. & PASTA S., 2017. Syntaxonomic list of the vegetation units. Pp. 281-370 in: Guarino R. & Pasta S. (eds.), *Botanical Excursions in Central and Western Sicily. Field Guide for the 60th IAVS Symposium*. University Press, Palermo.
- GUSSONE G., 1821. *Catalogus plantarum quae asservantur in Regio Horto serenissimi Francisci Borbonii principis iuventutis in Boccadifalco, prope Panormum*. Adduntur nonnul-

- lae adnotationes, ac descriptiones novarum aliquot specierum. *Typ. A. Trani*, Neapoli, pp. xi + 84.
- GUSSONE G., 1843. Florae Siculae Synopsis exhibens plantas vasculares in Sicilia insulisque adjacentibus hucusque detectas secundum systema Linneanum dispositas. *Typ. Tramater*, Neapoli, Vol. 1: v + 575 pp.
- HERRERA C.M., 1995. Plant-vertebrate seed dispersal systems in the Mediterranean: Ecological, evolutionary, and historical determinants. *Ann. Rev. Ecol. Syst.*, 26: 705-727.
- JORDANO P., 1982. Migrant birds are the main seed dispersers of blackberries in Southern Spain. *Oikos*, 38: 183-193.
- KARLSSON L.M., HIDAYATI S.N., WALCK J.L. & MILBERG P.E.R., 2005. Complex combination of seed dormancy and seedling development determine emergence of *Viburnum tinus* (Caprifoliaceae). *Ann. Bot.*, 95(2): 323-330.
- LA MANTIA T., 2004. Ecologia e agricoltura nel parco della Favorita. Pp. 89-122 in: Amara O. & Barbera G. (eds.), Tenuta Reale "La Favorita". *Fabio Orlando Ed.*, Palermo.
- LA MANTIA T., 2020. Storia dei rimboschimenti di Monte Pellegrino (Palermo). *Naturalista sicil.*, 44(1-2): 209-240.
- LA MANTIA T. & PASTA S., 2005. The Sicilian phanerophytes: still a noteworthy patrimony, soon a lost resource? Pp. 515-526 in: M. Marchetti (ed.), Proc. IUFRO Conference "Monitoring and indicators of forest biodiversity in Europe – from ideas to operationality". *EFI Proceedings*, 51.
- LANDIS M.J., EATON D.A.R., CLEMENT W.L., PARK B., SPRIGGS E.L., SWEENEY P.W., EDWARDS E.J. & DONOGHUE M.J., 2020. Joint phylogenetic estimation of geographic movements and biome shifts during the global diversification of *Viburnum*. *Syst. Biol.*, 1-20. doi: 10.1093/sysbio/syaa027
- LARCHER W., 1981. Low temperature effects on Mediterranean sclerophylls: an unconventional viewpoint. Pp. 259-266 in: Margaris N.S., Mooney H.A. (eds.), Components of productivity of Mediterranean-climate regions: Basic and applied aspects. *W. Junk Publ.*, The Hague, Boston, London.
- LO GIUDICE R. & CRISTAUDDO A., 2004. Chorological and ecological survey on the vascular and bryophytic flora in Enna territory (Erei Mountains, C-Sicily). *Fl. Medit.*, 14: 357-417.
- LOJACONO-POJERO M., 1903. Flora Sicula o descrizione delle piante spontanee o indigenate in Sicilia, Vol. 2(1) (Gamopetalae Calyciflorae). *Tipo-Litogr. S. Bizzarrilli*, Palermo 240 + xiv pp., 21 tavv.
- LOMBARDO E., BANCHEVA S., DOMINA G. & VENTURELLA G., 2020: Distribution, ecological role and symbioses of selected shrubby species in the Mediterranean Basin: a review. *Plant Biosystems*, 154(4): 438-454.
- MAGRI D., VENDRAMIN G.G., COMPS B., DUPANLOUP I., GEBUREK T., GÖMÖRY D., LATAŁOWA M., LITT T., PAULE L., ROURE J.M., TANTAU I., VAN DER KNAAP W.D., PETIT R.J. & DE BEAULIEU J.-L., 2006. A new scenario of the Quaternary history of European beech populations: palaeobotanical evidence and genetic consequences. *New Phytol.*, 171: 199-211.
- MARCENÒ C., COLOMBO P. & PRINCIOTTA R., 1985. Ricerche climatologiche e botaniche sui Monti Sicani (Sicilia centro-occidentale). La flora. *Naturalista sicil.*, ser. 4, 8(suppl.): 69-133.
- MARTÍNEZ-SOLIS I., IRANZO J., ESTRELLES E. & IBARS A.M., 1993. Leaf domatia in the section *Alaternus* (Miller) DC. of the genus *Rhamnus* (Rhamnaceae). *Bot. J. Linn. Soc.*, 112: 311-318.
- MAZZOLA P. & DI MARTINO C., 1996. La florula decorativa del promontorio di Monte Pellegrino (Palermo). *Quad. Bot. ambientale appl.*, 4 [1993]: 35-48.
- MÉDAIL F. & DIADEMA K., 2009. Glacial refugia influence plant diversity patterns in the Mediterranean Basin. *J. Biogeogr.*, 36: 1333-1345.

- MIDDLETON R., SINNOTT-ARMSTRONG M., OGAWA Y., JACUCCI G., MOYROUD E., RUDALL P.J., PRYCHID C., CONEJERO M., GLOVER B.J., DONOGHUE M.J. & VIGNOLINI S., 2020. *Viburnum tinus* fruits use lipids to produce metallic blue structural color. *Current Biology*, 30(19): 3804-3810.
- MOURA M., CARINE M.A., MALÉCOT V., LOURENÇO P., SCHAEFER H. & SILVA L., 2015. A taxonomic reassessment of *Viburnum* (Adoxaceae) in the Azores. *Phytotaxa*, 210(1): 4-23.
- MUCINA L., BÜLTMANN H., DIERSSEN K., THEURILLAT J.-P., RAUS TH., ARNI A., ŠUMBEROVÁ K., WILLNER W., DENGLER J., GAVILÁN GARCÍA R., CHYTRÝ M., HÁJEK M., DI PIETRO R., IAKUSHENKO D., PALLAS J., DANIÉLS F.J.A., BERGMIEIER E., SANTOS GUERRA A., ERMAKOV N., VALACHOVI M., SCHAMINÉE J.H.J., LYSENKO T., DIDUKH Y.P., PIGANTI S., RODWELL J.S., CAPELO J., WEBER H.E., SOLOMESHCH A., P., AGUIAR C., HENNEKENS S.M. & TICHÝ L., 2016. Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. *Appl. Veg. Sci.*, 19(suppl. 1): 3-264.
- NICOTRA L., 1883. Prodrromus Florae Messanensis plantas exhibens phanerogamas sponte virentes juxta methodum naturalem digestas. Messanae, *Typis Ribera*, 460 + v pp.
- O'DOWD D.J. & WILLSON M.F., 1991. Associations between mites and leaf domatia. *Trends Ecol. Evol.*, 6: 179-182.
- PARLATORE F., 1887. Flora Italiana ossia descrizione delle piante che crescono spontanee o vegetano come tali in Italia e nelle isole ad essa aggiacenti disposte secondo il metodo naturale. Vol. 7. *Tip. Successori Le Monnier*, Firenze, 300 pp.
- PASTA S., BUSCEMI I., CRISAFULLI A., GIOVINO A., LO CASCIO P., BUORD S., GUARINO R. & LA MANTIA T., 2014. Ecologia e distribuzione di *Chamaerops humilis* L. (Arecaceae) nella Sicilia nord-orientale. *Naturalista sicil.*, 38(2): 291-306.
- PASTA S., DI MAGGIO C., DI PASQUALE G., D'AMORE G., FORGIA V., INCARBONA A., MADONIA G., MORALES-MOLINO C., ROTOLO S.G., SINEO L., SPECIALE C., SULLI A., TINNER W. & VACCHI M., *in press*. The impact of climate, resource availability, natural disturbances and human subsistence strategies on the Sicilian landscape dynamics during Holocene. In: Polizzi G., Ollivier V. & Bouffier S. (eds.), Actes du Colloque Interdisciplinaire 'Watertraces: De l'hydrogéologie à l'archéologie hydraulique en Méditerranée antique'. *Archaeopress*, Oxford.
- PENZIG O. & CHIABRERA C., 1903. Contributo alla conoscenza delle piante acarofile. *Malpighia*, 17: 429-487 + plates XVI-XVIII.
- PIGNATTI S., 1998. I boschi d'Italia. Sinecologia e biodiversità. *U.T.E.T.*, Torino 677 pp.
- PONZO A., 1900. La flora trapanese. *Tip. Puccio*, Palermo 140 pp.
- PRESL C.B., 1826. Flora sicula exhibens plantas vasculosas, in Sicilia aut sponte crescentes aut frequentissime cultas, secundum systema naturale digestas. Tomus primus. *A. Borrosch*, Praga, XVII+216 pp.
- QUÉZEL P. & MÉDAIL F., 2003. Écologie et biogéographie des forêts du Bassin Méditerranéen. Paris, *Elsevier*, 571 + i pp.
- RAAB-STRAUBE (von) E., 2017. Viburnaceae. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity.
- RAFINESQUE SCHMALTZ C.S., 1815. Chloris aethnensis, o le Quattro Florule del Monte Etna, catalogo metodico delle piante di quel vulcano. Appendice a: Recupero G. (ed.), Storia naturale e generale dell'Etna, Catania (estr. 15 pp.).
- RAIMONDO F.M. & DOMINA G., 2006. *Ptilostemon greuteri* (Compositae), a new species from Sicily. *Willdenowia*, 36(special issue): 169-175.
- RAIMONDO F.M., GIANGUZZI L. & DI MARTINO C., 1996. La flora vascolare del Promontorio del Monte Pellegrino (Palermo). *Quad. Bot. ambientale appl.*, 4 [1993]: 13-34.



- RAIMONDO F.M., GIANGUZZI L. & ILARDI V., 1994. Inventario delle specie "a rischio" nella flora vascolare nativa della Sicilia. *Quad. Bot. ambientale appl.*, 3 [1992]: 65-132.
- RAIMONDO F.M. & MAZZOLA P., 1984. Aggiunte alla flora delle Madonie (Sicilia). *Atti Accad. Sci. Lett. Arti Palermo*, ser. 4, 40 [1980-1981]: 231-241.
- RAIMONDO F.M., MAZZOLA P. & DOMINA G., 2004. Check-list of the vascular plants collected during Iter Mediterraneum III. *Bocconea*, 17: 65-231.
- RIVAS-MARTÍNEZ S., 1975. La vegetación de la clase *Quercetalia ilicis* en España y Portugal. *Anal. Inst. Bot. Cavanilles*, 31(2) [1974]: 205-259.
- RIVAS-MARTÍNEZ S., COSTA M. & IZCO J., 1986. Sintaxonomía de la clase *Quercetea ilicis* en el Mediterráneo occidental. *Not. Fitosoc.*, 19(2): 71-98.
- ROSSINI OLIVA S. & VALDÉS B., 2001. Il Giardino del Balio (Erice, Sicilia): integrazione della flora autoctona in un parco urbano. *Inform. bot. ital.*, 33(1): 311-315.
- SALA G., PASTA S., MAGGIORE V. & LA MANTIA T., 2020. Traditional use of wood in Sicily. Pp. 411-443 in: Carapezza A., Badalamenti E., La Mantia T., Lo Cascio P. & Troia A. (eds.), *Life on Islands. 1. Biodiversity in Sicily and surrounding islands*. Studies dedicated to Bruno Massa. *Danaus ed.*, Palermo.
- SAMMARTANO L., 1826. Saggio storico, statistico, mineralogico, medico, botanico, sul Monte Erice, sua città e suoi dintorni. *Lorenzo Dato*, Palermo, 140 + vii pp.
- SCIANDRELLO S., MINISALE P. & GIUSSO DEL GALDO G., 2020. Vascular plant species diversity of Mt. Etna (Sicily): endemism, insularity and spatial patterns along the altitudinal gradient of the highest active volcano in Europe. *PeerJ*, 8: e9875.
- SCUDERI L., 2006. Flora e vegetazione della provincia di Trapani (Sicilia). Tesi di Dottorato in Scienze Ambientali I 'Fitogeografia dei Territori Mediterranei', *Univ. Studi Catania*, 541 pp.
- SCUDERI L. & PASTA S., 2009. Contributi alla conoscenza della flora vascolare della provincia di Trapani (Sicilia occidentale). I. Taxa autoctoni inediti. *Naturalista sicil.*, 33(3-4): 97-112.
- SCUDERI S., 1828. Trattato dei boschi dell'Etna. *Da' Torchi della Regia Università degli Studi Catania*, (2) + 140 pp. + tabella f.-t. (estratto).
- SESSA E., 2015. Le Tenute Reali dei Borbone in Sicilia. Pp. 135-162 in: Davì G., Mauro E. (eds.), *La Casina Cinese nel regio Parco della Favorita di Palermo. Centro Reg. Inv., Catalog. e Doc., Regione Siciliana*, Palermo.
- SIRACUSA G., 1998. Vegetazione di forra nel territorio di Sant'Alfio (Etna, Sicilia orientale). *Boll. Accad. gioenia Sci. nat.*, ser. 4, 30 (353): 313-319.
- STROBL G., 1880-1888. Flora des Ätna. *Österr. Bot. Zeitschr.*, 30-38 (reprint, 402 pp.).
- STROBL G., 1883. Flora der Nebroden mit Bezug auf die Flora ganz Siciliens. *Flora (Regensburg)*, 66: 564-577.
- TINEO V., 1827. *Catalogus plantarum Hortii Regii Panormitani, ad annum 1827*. Regali Typographia, Panormi, VIII+284 pp.
- TODARO A., 1858. Index Seminum R. Horti Botanici Panormitani, An. MDCCCLVII. Quae pro mutua commutatione offerentur. *Typographia Console*, Panormi, 46 pp.
- TORNABENE F., 1887a. Flora sicula viva et exsiccata. *Ex Typis Galati, Catinae*, 687 pp.
- TORNABENE F., 1887b. Hortus Botanicus Regiae Universitatis Studiorum Catinae. *Ex Typis Galati, Catinae*, 264 + i + iv pp.
- TORNABENE F., 1890. Flora Aetnea. vol. II. Dicotyledoneae-Calyciflorae. Sistens Ordines XIX (a XX ad XLVIII). *Ex Typis Galati, Catinae*, 661 pp.
- TURRISI R.E. & POLI MARCHESE E., 2007. Elementi della flora del Monte Etna (Sicilia) molto rari o presumibilmente estinti. P. 240 in: Raimondo F.M., Venturella G. (eds.), *Riassunti: Relazioni - Comunicazioni - Poster. 102° Congr. Naz. Soc. Bot. Ital., Collana Sicilia Foreste*, 34.

UCRIA (da) B. (fra') (= Aurifici o Orefice M.), 1789. Hortus Regius Panormitanus aere vulgaris anno MDCCLXXX noviter extractus septoque ex indigenis, exoticisque plerisque complectens plantas; accurante p. f. Bernardino ab Ucria S. Francisci RR. Provincia Vallis Mazariensis [...]. *Typis Regiis*, Panormi, 498 pp.

ZOHARY M., 1982. Plants of the Bible. Cambridge, *Cambridge Univ. Press*, 224 pp.

*Addresses of the authors* — S. PASTA, Istituto di Bioscienze BioRisorse (IBBR), Consiglio Nazionale delle Ricerche, Corso Calatafimi, 414 - 90129 Palermo (I); e-mail: salvatore.pasta@ibbr.cnr.it; T. LA MANTIA, Università degli Studi di Palermo, Dipartimento Scienze Agrarie, Alimentari e Forestali (SAAF), Viale delle Scienze, ed. 4 - 90128 Palermo (I); e-mail: tommaso.lamantia@unipa.it