Vincenzo Ilardi & Francesco M. Raimondo

The genus *Fraxinus* L. (*Oleaceae*) in Sicily

Abstract

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On the basis of the revision of herbarium material, new collections and in-the-field surveys the genus *Fraxinus* has been analysed in Sicily under the taxonomic and distributive point of view. The results confirm that the specific taxa occurring in this island are *Fraxinus ornus* L., *F. angustifolia* Vahl subsp. *angustifolia* and *F. excelsior* L. The presence of this latter species, which is overridden in recent literature, is confirmed to the island. Its occurrence has been ascertained in only one among the localities reported in the past. Besides, frequent citation of *F. angustifolia* subsp. *oxycarpa* (Bieb. ex Willd.) Franco et Rocha Afonso, is to be referred to *F. angustifolia* subsp. *angustifolia*.

Introduction

According to recent literature the *Fraxinus* species occurring in Sicily are only *F. ornus* L. and *F. angustifolia* Vahl. As for this latter species, *F. angustifolia* subsp. *angustifolia* or *F. angustifolia* subsp. *oxycarpa* (Bieb. ex Willd.) Franco et Rocha Afonso, even at specific rank, are reported by different authors. In some cases, old reports concerning *F. angustifolia* had been assigned to *F. excelsior* L. which has later been excluded from the Sicilian flora. In fact there is substancial inconsistency in the taxonomy of *Fraxinus* in Sicily which led to recurrent misinterpretation.

On the other hand it is to be kept in mind that the *Fraxinus* taxa in Sicily take remarkable interest not only under the taxonomic point of view but also, and mostly, since from ancient times, within its whole distribution area, the genus *Fraxinus* is grown in Sicily for manna extraction. In fact, for many centuries ash groves sustained economically several local communities of northern Sicily. For this reason, in the past *Fraxinus* in Sicily was studied both in the cultivation area and outside it.

Therefore in the floristic Sicilian literature (Cupani 1696, Ucria 1779, Gussone 1842, Minà Palumbo 1875, Nicotra 1878, Tornabene 1887, Lojacono Pojero 1888, Ponzo 1900, Falci 1910) there is no consistency as far as the taxa occurring in the Region and their distribution are concerned. In particular the populations have been treated on the basis of

extremely variable morphological characters.

On the other hand, recent literature (Fiori 1926, Pignatti 1982, Greuter & al. 1989) on wild *Fraxinus* refers to historical data, since up-to-date taxonomical and distributive studies on both Sicily and Italy are lacking.

With the aim to clarify the critical features concerning the real taxonomic identity of *Fraxinus* species occurring in Sicily, a doctoral thesis has been carried out (Ilardi 1999) dealing with the revision and new surveys in the island. In this paper some of the main results are given.

Materials and methods

The study includes the verification of literature sources and the revision of *Fraxinus* herbarium collections preserved in Berlin (B), Catania (CAT), Naples (NAP) and in Palermo (PAL).

The field surveys were carried out between 1996 and 1998 on 42 wild populations in different localities covering the whole area of the island. In each of them morphological characters have been analysed and phenologic observations have been carried out taking especially into account leaves, anthesis (start and duration), and fruits. As refers the critical populations, these have monthly been monitored.

Furthermore, a large number of herbarium specimens at different phenological stages have been collected. They are preserved in the Palermo Herbarium Mediterraneum (PAL).

The morphological and phenological characters focused in the above mentioned populations are used in the following treatment of Sicilian *Fraxinus*.

Taxonomy and nomenclature refer to current European literature (Karpati 1970, Franco & Rocha Afonso 1972, Pignatti 1982, Greuter & al. 1989).

Results and discussion

The above field surveys and herbarium material revision led to accept *Fraxinus ornus* L., *F. angustifolia* Vahl subsp. *angustifolia* and *F. excelsior* L. for Sicily. The occurrence of this latter species on the Nebrodi Mts (N. Sicily), neglected in recent literature, has been confirmed in at least one of the localities mentioned by Gussone (1843). As for *F. angustifolia* subsp. *oxycarpa*, data concernig this subspecies are to be referred to *F. angustifolia* subsp *angustifolia*. Descriptions and data concerning such taxa are reported below based on the characters observed in the local populations.

Key to the species

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1 calyx and corolla present; inflorescence terminal on young leafy twigs....*Fraxinus ornus*
1 calyx and corolla absent; inflorescence axillary on 2nd year twigs
2 panicle; flowering period spring.....*Fraxinus excelsior*
2 raceme; flowering period winter .....*Fraxinus angustifolia* subsp. *angustifolia*

Accepted species

***Fraxinus ornus* L.**

Tree up to 15 m, crown globose, bark smooth and grey. Branches ascendent to erect, twigs patent to erect-patent, slightly compressed with tickened nodes. Lateral buds minute, roundish, brownish, pubescent; terminal buds larger than the lateral ones. **Leaves** bearing (2)-3-5 pairs opposite leaflets; rachys (6-)8 × 25(-30) cm including the petiole; the rachys is closely winged and sulcate on the upper side; it varies considerably even in the same individual, depending on its position in the branches and on the pairs of leaflets. The leaflets are asymmetrical and almost circular to broadly elliptic with petiolules 2-12 mm long. The lamina is roundish or less frequently cuneate at the base, apiculate or mucronate at the apex. The margin is entire at the basis and irregularly crenulate up to the apex; in the juvenile forms it is sharp-toothed. It is glabrous and deeply green above, pale green beneath and tomentose furnished with acaradomatia in the central vein, often even in the main lateral ones. The colour of the hairs varies from rusty-dark to whitish. The leaves vary notably in sizes, shape and number of leaflets not only within a population but also within a single individual, according to the side of the crown. The leaf itself may vary in shape and size, particularly the terminal leaflet which is usually more roundish and petiolulate than the lateral ones. The leaflets are 3-12 × 1.5-5.5 cm, including the petiolule. **Flowers** mostly hermaphrodite, appear along with the leaves at shooting renewal. clustered in terminal thyrses 8-20 cm long, they are upheld by thin pedicels 4-7 mm long. calyx small, deeply lobed, persisting even in the fruit, forming 4 sepals with a more or less sharp apex 1 mm long; corolla with 4 petals well-developed, linear, valvate, joined two each to the basis through staminal filaments white to cream-coloured-white, 8-13 × 1-2 mm with apex roundish to sharp. The androecium includes two anthers ovate, about 1 mm long; filaments whitish and hypogynous, 6-12 mm long; under the weight of the anthers they stand out between the petals favouring both entomophilous and anemophilous pollen dispersion. Pistil shorter or as long as the stamens. Ovary ovate, compressed, green, glabrous; style elongated and flattened; stigma tickened and almost bilobate. **Fruit** pendule, tongueform, 15-40 × 4-10 mm long and wide, narrowly elliptical to obovate. Basis rounded, cuneiform or thinned; apex rounded, truncate or retuse, from obtusely sharp to cuneate and narrowly pointed. Style frequently persistent. The ratio between length of samara and length of seed is not steady: in some individuals wings are shorter than seed, while they are longer in others. **Seeds** 7-16 mm long, are cylindric. Fruits are consistent both in shape and size in each single plant but very variable within each single population.

Specimens examined

[Sicilia]: Madonie, road between Collesano and Polizzi "road embankments", 1180 m, 26.5.1994, *Vogt* 13959 & *Oberprieler* 8264 (B); Palermo, s. loco, s. d., *Todaro* (B); Palermo, s. loco, s. d., *Todaro* (B); Palermo, "In silvaticis, ad sepes reg. infer. et mont., 4.6.1898, *Ross* 163 (B); Catania, 1823, *Cosentini* (NAP); Palermo, Chiarandà, Marzo s. d., *Gussone* (NAP); Scillato presso Polizzi, settembre s. d., *Gussone* (NAP); Bocca di Falco presso Palermo, "in apricis sylvis submontosis", s. d., *Gussone* (NAP); Palermo nel

vallone di S. Martino, settembre s. d., [*Gussone*] (NAP); Castelbuono, s. d., *Minà* (NAP); Bosco di S. Fratello, s. d., [*Tineo*] (NAP, sub *F. sicula* Tineo); Capaci, "in collibus maritimis", *s. coll.* (PAL); Sicilia, Madonie, s. d., *s. coll.* (PAL); Palermo al Caputo, s. d., *s. coll.* (PAL); Sicilia, s. d., *Hohenack., Arzn. & Handelspfl.* 503 (PAL); Bosco della Ficuzza, "Dans le maquis à substrat siliceux", 750 m, 14.11.1995, *Certa, Scafidi & Schimmenti* (PAL); Palermo, "in sylvis submontosis", Aprili s. d., *Todaro* 1342 (PAL); Mirto, s. d., *Todaro* (PAL); Madonie, 6.1839, *s. coll.* (PAL); Favorita, 23.3.1876, *Lojacono* (PAL); Castelbuono, 3.5.1877, *Lojacono* (PAL); Castelbuono, 7.1838, [*Minà*] (PAL); Castelbuono, "in montosis", s. d., [*Minà*] (PAL, sub *F. ornus* var. *rotundifolia*); Castelbuono, s. d., [*Minà*] (PAL, sub *F. ornus* var. *garganica*); [Palermo], Ponte della Grazia, s. d., *s. coll.* (PAL, sub *F. ornus rotundifolia*); [Palermo], Bosco di Cannedda supra Renda, 8.8.1827, *s. coll.* (PAL); Lipari, Boschetti di Serra, 28.4.1877, *Lojacono* (PAL); [Castelbuono], "amolleo di La Cava, [*Minà*] 24 (PAL); Ficuzza, s. d., *s. coll.* (PAL); Madonie, s. d., *s. coll.* (PAL, sub *F. ornus* var. *nebrodensis*); Tra Aci Reale e Milo, s. d., *s. coll.* (PAL); Castelbuono, s. d., *Lojacono* (PAL); Palermo, "In silvaticis, ad sepes...", s. d., *Ross* 163 (PAL); Ficuzza, 12.5.1882, *Bonafede* (PAL, sub *F. oxycarpa* Willd.); Sicilia, prov. Palermo, Madonie Mountains, S from Piano Battaglia, Vallone Madonna degli Angeli, 1400 m, 9 Jun 1997, *Jury* 17321 (PAL); Etna, Bronte, 11.1832, *s. coll.* (CAT, sub *F. parvifolia* Lam.); Catania, Ognina, s. d., *s. coll.* (CAT, sub *F.excelsior*); Etna, Valle del Bove, 11.6.1905, *Cavara* (CAT, sub *F. excelsior*); Castelbuono, s. d., *Tineo* (CAT, sub *F. ornus* ? *angustifolia*); Castelbuono, s. d., *Tineo* (CAT, sub *F. ornus* ? *rotundifolia*); Etna, 5-5 s. d., *s. coll.* (CAT, sub *F. ornus argentea*); s. loco, s. d., *Di Giacomo* (CAT); Randazzo, Bosco ..., 13.6.1898, *s. coll.* (CAT); Madonie, Passo della Botte, 10.6.1905, *Cavara* (CAT, sub *F. ornus* var. *angustifolia*).

Specimens from the monitored localities

AGRIGENTO: Cammarata, Cda Salaci, 16 May 1997, *Ilardi* (PAL); Monte Cammarata, 20 Sep 1997, *Ilardi* (PAL); S. Stefano di Quisquina, c/o Santuario di Santa Rosalia, 20 Sep 1997, *Ilardi* (PAL). CALTANISSETTA: Santa Caterina Villaermosa, 22 Jul 1998, *Fici & Ilardi* (PAL). CATANIA: Etna, Linguaglossa, Salto del Bue, 1000 m, 30 Jun 1997, *Ilardi* (PAL). MESSINA: S. Lucia del Mela, Valle del Fiume Mela, 26 Apr 1997, *Ilardi* (PAL); Frazzanò, Cda Daza, 29 Jun 1997, *Ilardi* (PAL); Castel di Tusa, 29 Jun 1997, *Ilardi* (PAL); Bosco di San Fratello, 11 Aug 1997, *Ilardi* (PAL); Frazzanò, Cda Malonome, 14 Aug 1997, *Ilardi* (PAL); Torrente Rosmarino, 14 Aug 1997, *Ilardi* (PAL); Longi, Stretta di Longi, 16 Aug 1997, *Gianguzzi & Ilardi* (PAL); Santa Lucia del Mela, Valle del Fiume Mela, 18 Aug 1997, *Ilardi* (PAL); tra S. Agata Militello e S. Fratello, 18 Aug 1997, *Ilardi* (PAL); Floresta, Cda Pietre Bianche, 1500-1550 m, 22 Oct 1997, *Ilardi* (PAL); Galati Mamertino, Cda Catafurco, 4 May 1998, *Gianguzzi & Ilardi* (PAL); Valle del Fiume Caronia, 16 May 1998, *Ilardi* (PAL); Mistretta, Monte Madonna delle Neve, 31 May 1998, *Ilardi* (PAL). PALERMO: Gibilmanna, 1 May 1997, *Ilardi* (PAL); Cefalù, Cda Presti, 1 May 1997, *Ilardi* (PAL); Cefalù, Cda Ferla, 1 May 1997, *Ilardi* (PAL); Pollina, Cda Serracasale 1 May 1997, *Ilardi* (PAL); lungo la strada litoranea tra Cefalù e Castelbuono, 2 May 1997, *Ilardi* (PAL); Madonie, Santuario di Guarneri, 2 May 1997, *Ilardi* (PAL); Coste di Cinisi, 5 May 1997, *Ilardi* (PAL); Coste di Isola delle Femmine, 5 May 1997, *Ilardi* (PAL); Coste di Capaci, 5 May 1997, *Ilardi* (PAL);

Misilmeri, Valle dei Cucchi, 13 May 1997, *Ilardi* (PAL); tra Misilmeri e Belmonte Mezzagno, 13 May 1997, *Ilardi* (PAL); Pioppo, Cda Costalunga, 4 Jul 1997, *Ilardi* (PAL); Madonie, Monte Quacella, 22 Jul 1997, *Ilardi* (PAL); Monte Busambra, 31 Jul 1997, *Ilardi* (PAL); Pollina, Cda Vitammare, 18 Sep 1997, *Ilardi* (PAL); tra Bisacquino e Palazzo Adriano, 20 Sep 1997, *Ilardi* (PAL); tra Mezzojuso e Campofelice di Fitalia, 20 Sep 97, *Ilardi* (PAL); Cinisi, Piano Margi 15 Oct 1997, *Ilardi* (PAL); Carini, c/o Montagna Longa, 7 Nov 1997, *Ilardi* (PAL); Cinisi, Cda Margi, 7 Nov 1997, *Ilardi* (PAL). TRAPANI: Castellammare del Golfo, Monte Inici, 26 Apr 1997, *Ilardi* (PAL); Castellammare del Golfo, Dagala Secca, 1 May 1997, *Ilardi* (PAL); Castellammare del Golfo, 8 Aug 1997, *Ilardi* (PAL); Scopello, c/o Riserva Naturale dello Zingaro, 11 Sep 1997, *Ilardi* (PAL).

Phenology

Depending on exposition and altitude, close to the coastline flowering begins at the end of March until April, both foliation and flowering can be postponed 20 days later in the highest localities. After setting a contemporaneous quick growth of samara and seeds takes place ending within two months. The fruits start to change colour in the last ten days of September and scalar ripening proceeds over the whole October month when all samaras show a brightly dark colour. Seed dispersal starts at the end of autumn and, being scalar, proceeds uninterruptedly during the whole winter.

It has been noted that both induction to flowering and flower sex is likely to be subject to light-exposure gradient. In fact, a great number of individuals growing under shade, e.g. in a plain dominated by other trees, produces few or no panicles at all at shooting renewal. Besides, flowers generated under such shading conditions are mostly masculine as without gynoecium.

Ecology and distribution (Fig. 1)

As a heliophilous and moderately thermophile species, indifferent to the geo-pedologic substratum. *Fraxinus ornus* is an Euro-North-Mediterranean-Pontic taxon (Pignatti 1982). In Sicily it occurs frequently in the whole central-northern area showing a gradient gradually decreasing until it disappears towards the South. This is to be correlated to climatic requirements of such species which does not thrive on areas under a bio-climate from intra-Mediterranean to thermo-Mediterranean with dry ombro-type. On the northern slope it occurs commonly from the sea level up to more than 1400 m a.s.l., on a broad area whose bio-climate ranges between thermo-Mediterranean lower sub-humid, in the basal plain, to medium-humid lower supra-Mediterranean in the highest localities.

Remarks

Leaflets are not consistent in shape and number within each single leaf as well as samaras are not consistent in shape, as has been stressed out, varying even within a single individual. On the basis of such unsteady characters, several taxa at variety rank have been described such as *F. ornus* var. *juglandifolia* Ten., var. *garganica* Ten., var. *rotundifolia* Ten., var. *cordata* Ten., var. *angustifolia* Ten., var. *lanceolata* Fiori, etc.

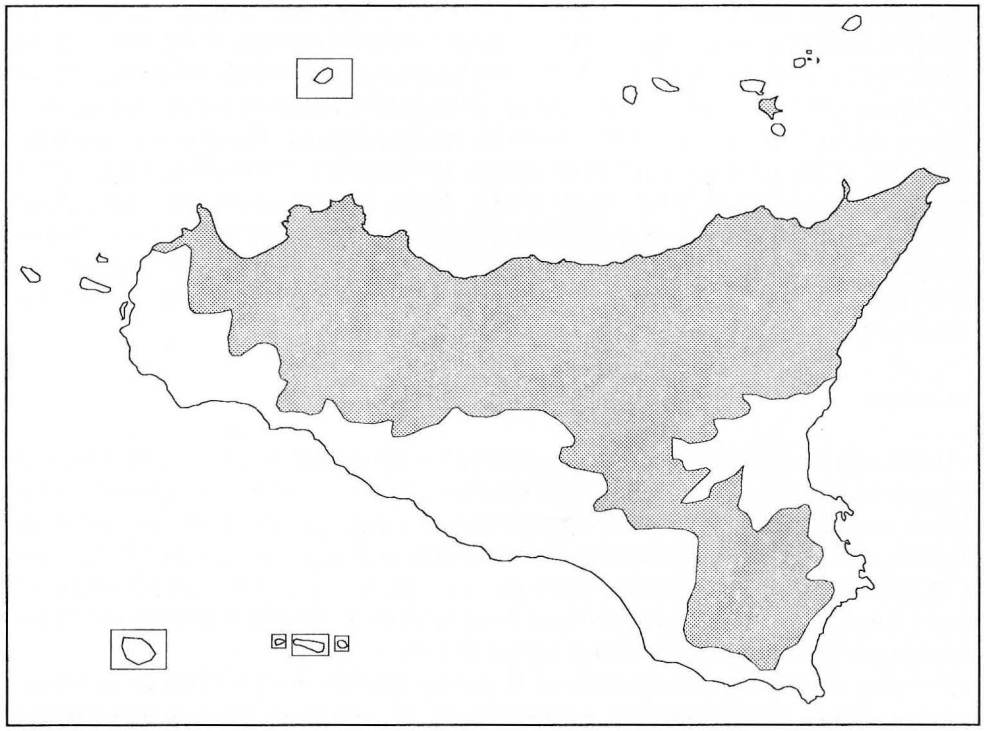

Fig. 1. Distribution area of *Fraxinus ornus* in Sicily.

***Fraxinus excelsior* L.**

Tree up to 15 m high; trunk erect; shortly branched; bark smooth and greyish on young branches, fissured in the oldest ones. Buds conical, dull, blackish or rarely dark brown; apical buds bigger than the lateral ones. Young branches and leaf petioles glabrous. Twigs flattened at the 3-5 apical nodes. **Leaves** on leaf scars of the 2nd year twigs; leaflets 9-13 sessile, 8-11 × 2-3.5 cm, ovate-lanceolate; lamina toothed, with more teeth than the lateral veins, glabrous above, rather hairy beneath on the midrib. **Flowers** mostly hermaphrodite; perianth absent; 2 short stamens with anthers oval pointed, purple; ovary conical; panicles axillary. **Fruits** 30-35 × 8-9 mm, are narrowed at the base, emarginate to bilobe and more or less persistently mucronate.

Specimens examined

[Sicilia]: Caronia, vallate della Tassita, s. d. [*Gussone*] (NAP); Boschi di Cannata, s. d., *Citarda* (PAL); Castelbuono, "In humentibus", Aprili s. d., *Todaro* 1234 [1] (PAL); Castelbuono, "In humentibus", Aprili s. d., *Todaro* 1234 [2a] (PAL, mixed with *F. angustifolia* subsp. *angustifolia*).

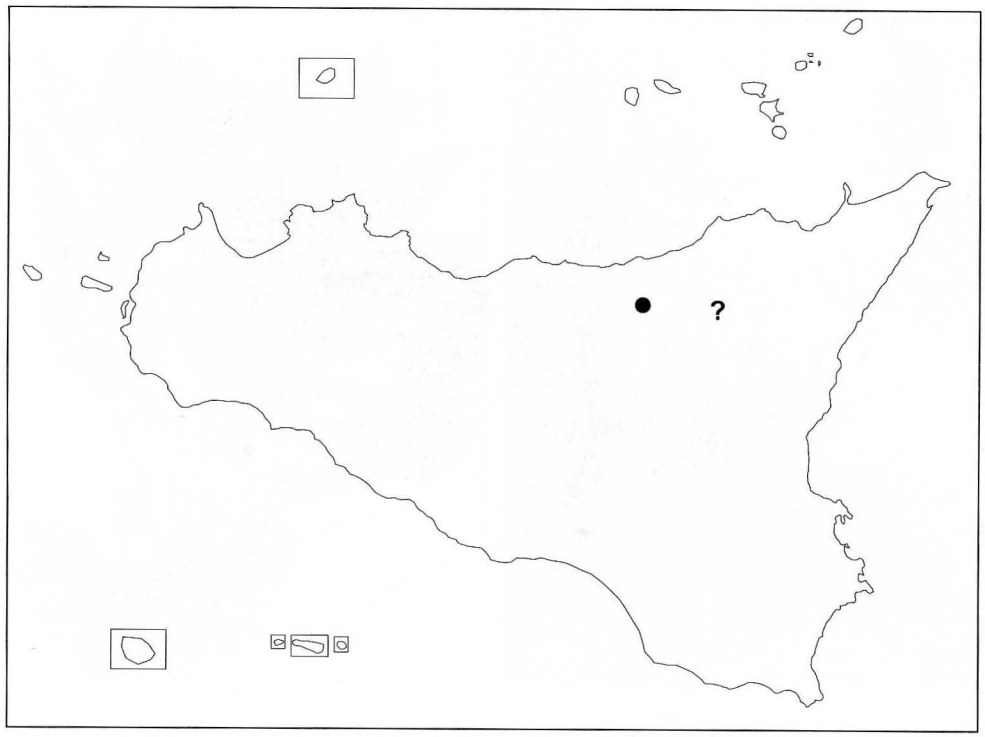

Fig. 2. (●) Location of the single ascertained growing site of *Fraxinus excelsior*. (?) Location of a second growing site known in literature and not confirmed so far.

Specimens from the monitored localities

MESSINA: Caronia, Cda Tassita, 3 Oct 1997, *Ilardi* (PAL); Caronia, Cda Tassita, 17 Feb 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 17 Mar 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 17 Apr 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 8 May 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 22 May 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 15 Jun 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 26 Aug 1998, *Ilardi* (PAL); Caronia, Cda Tassita, 20 Oct 1998, *Ilardi* (PAL).

Ecology and distribution (Fig. 2)

This species, which belongs to the European-Caucasian geographic element, occurs in the Nebrodi Mts in the Tassita locality, few kilometres from Caronia Municipality (Messina, N. E. Sicily) (Figs. 3-4). Here there is a small population of a hundred individuals growing in an area of few dozens hectares, on rocky substratum rich in rough debris between 1300 and 1400 m a.s.l., within the beech vegetation belt.

The local bio-climate, showing mean annual rainfall higher than 1000 mm, mean annual temperature about 10° C and a dry period not exceeding two months, is included in the medium humid lower Supra-Mediterranean belt (Di Benedetto & al. 1983, Brullo & al. 1996).

Fig. 3. Gussone's specimen of *Fraxinus excelsior* (in NAP) from the single confirmed Sicilian locality (Tassita, Messina province).

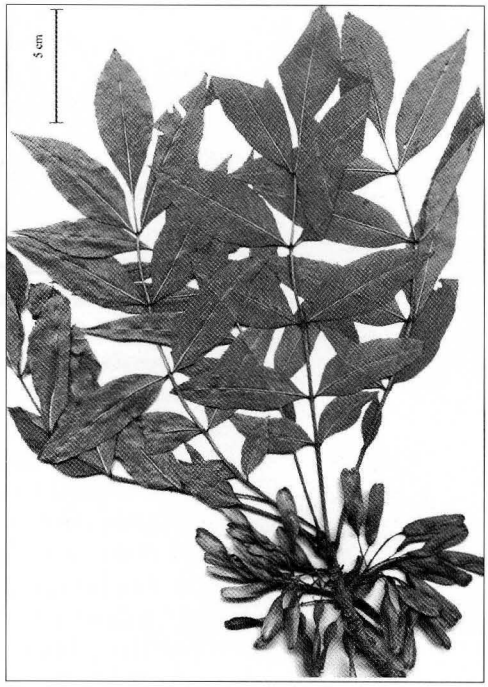

Fig. 4. Specimen of *Fraxinus excelsior* recently collected in the Tassita locality (Messina province) (*Ilardi*, 1998, PAL).

Besides, such locality lies in an area subject to hidden rainfall diminishing, frequently in form of fog, thermal excess and reducing water loss due to evapo-transpiration in summer. Finally, between December and April snowfalls are frequent and, some years, long-lasting even until late spring. It is a biotope of remarkable interest where a rare relic forest community occurs, characterised by *Taxus baccata* L., *Ulmus glabra* Hudson, *Acer pseudoplatanus* L., *Ilex aquifolium* L., *Daphne laureola* L., etc. Here *Fraxinus excelsior* stresses out the affinity of such coenosis with others, relevant to higher latitudes.

Remarks

According to ancient literature (Gussone 1842, Nicotra 1878, Lojacono 1888, Falci 1910) *F. excelsior* occurs in several parts of northern Sicily. Nevertheless it mainly refers to individuals of *F. angustifolia* bearing dark brown buds, as confirmed by the examined herbarium material (NAP, PAL). Among this material, two specimens kept in PAL, collected by Citarda in the locality "Boschi di Cannata" in the eastern Nebrodi Mts (Fig. 5), really belong to *F. excelsior*. But, since our repeated surveys have been unsuccessful, this locality is still to be confirmed.

Two other *F. excelsior* specimens (PAL) (one of them mixed with *F. angustifolia* in a single sheet), labelled "Castelbuono" in Madonie Mts where only *F. angustifolia* occurs, are seriously doubtful.

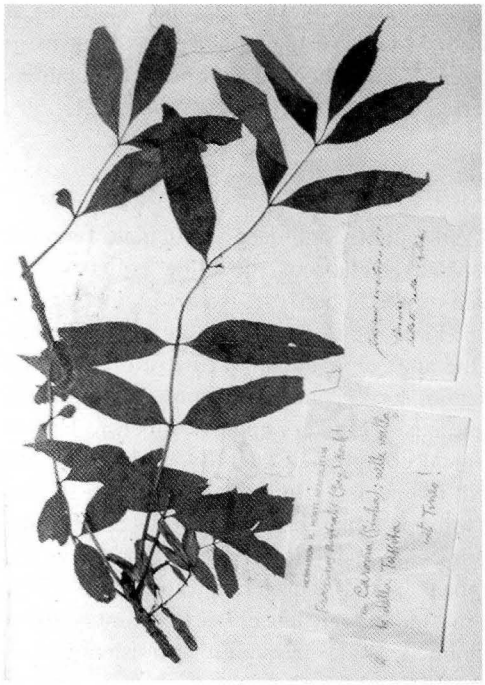

Fig. 5. Citarda's specimens from the locality "Boschi di Cannata", not confirmed so far.

Fig. 6. Coincidence of flowering and foliation in the Sicilian population of *Fraxinus excelsior*.

The *F. excelsior* population in the Nebrodi Mts is isolated both geographically, as the southernmost localities lie in the Apennine range (probably Monte Terminillo in Latium, at least 1000 km away from Sicily), and genetically, as crossing even with other populations of southern ash is to be excluded. In fact *F. angustifolia* subsp. *angustifolia* blooms between the end of November and the end of January, whereas *F. excelsior* between half April and half May. Such difference in flowering times excludes any possible hybridisation.

In recent past, the population, now included in a totally protected area within the "Parco Regionale dei Nebrodi", was exploited with forest uses as proved by the reduced trunk diameter, rarely exceeding 40 cm, and by stumps mostly bearing two or three trunks. At present the highest individuals do not exceed 15 m in height, whereas in Central Europe *F. excelsior* often reaches 40 m in height and about 2 m in diameter.

In the Nebrodi Mountains flowers appear together with leaves (Fig 6). Such phenology, typical of sect. *Ornus*, diversifies the Sicilian *F. excelsior* population from all other ones, early flowering respect to foliation.

This particular phenology can lead to hypothesise some evolutionary divergence affecting the Sicilian population, likely to be considered as a local deme. Comparison between Sicilian and Central-European specimens does not show any significant morphological difference. Furthermore, leaf blades of specimens from Val di Susa (Piedmont, N. Italy) have been compared with the Sicilian ones showing that there is not

any difference in the leaf structure. Accordingly, it can be inferred that the geographical isolation of the small population in the Nebrodi Mountains has not been as long as to produce an appreciable morphological divergence from Central-European populations and that phenological differences could be referred to the low latitude.

Fraxinus angustifolia* Vahl subsp. *angustifolia

- Tree up to 25 m high, bark grey to purplish-grey lightly and deeply reticulate-fissured. Winter buds dark, shoots and petioles glabrous. **Leaves** glabrous, including leaflets to (2)-3-4- (5-6) pairs; rachis to 5-20 cm long, sulcate on the upper side, narrowly winged and partly closed forming a channelled. Leaflets 3-11 × 0.6-2(-3) cm sessile or subsessile, cuneate at the basis, lanceolate to ovate with the apex elongate and acute or obtuse; first pair of leaflets generally smaller, terminal leaflet larger; margins entire or irregularly toothed on the upper part and entire toward the basis. **Flowers** appearing before leaves; perianth absent; pedicels 4-12 mm; ovary conical compressed laterally, style elongated more or less arcuate in the fruit; stigma divided; filaments 1-4 mm long, generally shorter than anthers. Racemes 4-10 cm long, more or less spreading, becoming deflexed after the anthesis. Short racemes, more or less globose with male flowers are frequent at the beginning of the anthesis so that the species appears partially proterandrous. **Fruits** 25-60 × 6-13 mm, variable in shape even in the same individual, lanceolate to elliptic. Apex rounded, truncate, cuspidate to narrowly pointed; style frequently persistent; basis cuneate, more or less elongated or rounded. Samara and length of the wings are variable in rate. **Seeds** always longer than the wing of the samara.

Phenology

The early racemes appear in the second half of November, and scalar flowering last over the whole December until the second half of January. From the recorded observations it emerges that, at the end of January, flowers complete their pattern showing quite dried and dark stigmas and anthers.

Foliation, depending on seasonal climate trend, exposition and altitude, starts between the last ten days of February and the first ten days of March, lasting about one month. After setting, samaras are subject to a rapid growth and, in the first half of March, reach their final size.

Seeds are in their final size between the end of May and the first half of June. In the last ten days of August, samaras increasingly change their colour, with a progression of ripening all over September until the second ten days of October. After reaching ripe, they are dislocated and seed dispersal usually ends by the end of October, while the few samaras, still persistent in the tree even all over the winter, often show visible marks of phytophagous attacks.

Specimens examined

[Sicilia]: Madonie, "in nemoribus montosis", s. d., *s. coll.* (PAL, sub *F. brachycarpa* Tin.); Palermo, "in silvaticis subhumidis", s. d., *s. coll.* (PAL, sub *F. rostrata* Guss.); Sicilia, Palermo, presso al fiume Oreto, s. d., *s. coll.* (PAL, sub *F. oxycarpa* Willd.);

Ficuzza, "in nemoribus ..., s. d., *s. coll.* (PAL, sub *F. rostrata* Guss.); Misilmeri, "ad sepes ad fluviorum ripas, et in locis humentibus ..., s. d., [*Gussone*] (PAL, sub *F. excelsior* L.); Misilmeri, "Ad saepes, ad fluviorum, ripas, et humentibus nemorum", Aprile s. d., *Gussone* (NAP, sub *F. excelsior*); Misilmeri al ponte, Gussone (NAP, sub *F. excelsior*); Misilmeri, s. d., *Gussone* (NAP, sub. *F. excelsior*); Ficuzza, Novembre, s. d., *Gussone* (NAP, sub *F. excelsior* "ob colorum gemmorum"); Madonie, s. d., *Tineo* (NAP, *sub F. australis* (Gay) Koch!); Ficuzza, in nemoribus, s. d., [*Gussone*] (NAP, sub *F. rostrata*); Ficuzza, ottobre s. d., [*Gussone*] (NAP, sub *F. rostrata*); Sicilia, Troina, s. d., *Gussone* (NAP, sub *F. parvifolia* Lam.!); Castebuono, s. d., *s. coll.* (NAP, sub *F. parvifolia*); Fiume grande presso Termini, s. d., [*Gussone*] (NAP, sub *F. parvifolia*); Scillato sotto Polizzi, s. d., [*Gussone*] (NAP, sub *F. parvifolia*); Bosco di Policoro, s. d., [*Gussone*] (NAP); Madonie, "in nemoribus montosis", s. d., *s. coll.* (PAL, sub *F. brachycarpa* Tin.); Palermo, "in silvaticis subhumidis", s. d., *s. coll.* (PAL, sub *F. rostrata* Guss.); Palermo, presso al fiume Oreto, s. d., *s. coll.* (PAL, sub *F. oxycarpa* Willd.); Ficuzza, "in nemoribus ..., s. d., *s. coll.* (PAL, sub *F. rostrata* Guss.); Misilmeri, "ad sepes ac fluviorum ripas, et in locis humentibus ...., s. d., [*Gussone*] (PAL, sub *F. excelsior* L.); Madonie, 1878, [Tineo] (PAL, sub *F. brachycarpa*); Castelbuono, "In humentibus", Aprili s. d., *Todaro* 1234 [2b] (PAL, sub *F. excelsior* L.; mixed with *F. excelsior*); Castelbuono, "In humentibus", Aprili s. d., *Todaro* 1234 [3]; Isnello, 8.1880, *s. coll.* (PAL, sub *F. excelsior* L.); Ficuzza, s. d., *s. coll.* (PAL, sub *F. excelsior*); s. loco, s. d., *Minà* (PAL, *sub F. excelsior*); Boschi di Cannata, s. d., *Citarda* (PAL, sub *F. rostrata* Guss.); Isnello, 13.6.1847, *s. coll.* 347 (PAL, sub *F. rostrata*); Madonie, 6.1839, *s. coll.* (PAL, sub *F. rostrata* Guss.); Ficuzza, ..., Augusto s. d., Lojacono (PAL, sub *F. rostrata* Guss.); Sicile, Palermo, Chiusa Sclafani, dans le bord du torrent Giulfo, 440 m, 21.8.1996, *Certa & C. Di Martino* (PAL, sub *F. angustifolia* Vahl subsp. *oxycarpa* (Bieb. ex Willd.) Franco et Rocha Afonso; Sicile, Palermo, Prizzi, le long des bords humides du fleuve Raia, 590 m, 23.8.1996, *Certa & C. Di Martino* (PAL, sub *F. angustifolia* Vahl subsp. *oxycarpa* (Bieb. ex Willd.) Franco et Rocha Afonso; Siracusa all'Anapo, 30.6.1903, *Cavara* (CAT, *sub F. excelsior* var. *rostrata* Guss.); Siracusa all'Anapo, 14.6.1896, *Cavara* (CAT, sub *F. excelsior* var. *rostrata* Guss.); Madonie, s. d., Tineo (CAT, sub *F. rostrata* Guss.).

Specimens from the monitored localities

AGRIGENTO: Valle del Sosio, 20 Sep 1997, *Ilardi* (PAL); Valle del Fiume Sosio, 20 Sep 1997, *Ilardi* (PAL); Cammarata, Cda Salaci, 21 Dec 1997, *Ilardi* (PAL); San Carlo, c/o Centrale elettrica, 10 Feb 1998, *Ilardi* (PAL). ENNA: tra Piazza Armerina e Valguarnera Caropepe, 6 Feb 1998, *Ilardi* (PAL); c/o ruderi di Gibellina, 8 Feb 1998, *Ilardi* (PAL); MESSINA: Valle del Fiume Caronia, 500-600 m, 16 Jul 1998 *Ilardi* (PAL). PALERMO: Geraci Siculo, Cda Pintorna, 11 Jul 1997, *Ilardi* (PAL); Cefalù, Cda Guarneri, 8 Aug 1997, *Ilardi* (PAL); Cefalù, Cda Zurrica, 8 Aug 1997, *Ilardi* (PAL); Torrente Azzirolo presso il bivio per Mezzojuso, 20 Sep 1997; *Ilardi* (PAL); Pianotta di Vicari c/o Bivio per Villafrati, 20 Sep 1997, *Ilardi* (PAL); Valle del Sosio, 20 Sep 1997, *Ilardi* (PAL); Valle del Fiume Sosio, 20 Sep 1997, *Ilardi* (PAL); tra Villafrati e Mezzojuso, 21 Dec 1997, *Ilardi* (PAL); tra Gangi e S. Mauro Castelverde, 23 Dec 1997, *Ilardi* (PAL); Mezzojuso, Cda Ponte Grande, 6 Jan 1998, *Ilardi* (PAL); Ficuzza, Fiume Frattina, 1 Feb

1998, *Ilardi* (PAL); Marineo, c/o sfiatatoio della Diga sul Lago Scanzano, 1 Feb 1998, *Ilardi* (PAL); tra Collesano e Bivio Monciarrati, 4 Feb 1998, *Ilardi* (PAL); tra Collesano e Bivio Monciarrati, 4 Feb 1998, *Ilardi* (PAL); tra Isnello e Castelbuono, 5 Feb 1998, *Ilardi* (PAL); tra Palazzo Adriano e Prizzi, 10 Feb 1998, *Ilardi* (PAL); Chiusa Sclafani, Torrente Malotempo, 10 Feb 1998, *Ilardi* (PAL); Chiusa Sclafani, Cda Biviraturella, 10 Feb 1998, *Ilardi* (PAL); tra Alia e Vallelunga, 10 Feb 1998 *Ilardi* (PAL). RAGUSA: tra Vittoria e Comiso, 20 Aug 1997, *Ilardi* (PAL); Foce Fiume Irminio, boschetto igrofilo retrodunale, 21 Aug 1997, *Ilardi* (PAL); Marina di Ragusa, Foce del Fiume Irminio, 30 Jan 1998, *Ilardi* (PAL). SIRACUSA: Lentini, affluente del S. Leonardo, 6 Feb 1998, *Ilardi* (PAL); Siracusa, Agnone, 6 Feb 1998, *Ilardi* (PAL).

Ecology and distribution (Fig. 7)

Fraxinus angustifolia subsp. *angustifolia* occurs along watercourses and in moist, non-brackish, hinterland environments from the western (Gibellina, Trapani province) to the eastern coastline.

Such species is less frequent in the westernmost part of Sicily, where it has been found in a single locality along the Sossio stream near Marsala (Trapani), and in the coastline and its close hinterland of southern Sicily, where it has been found along the final sections of the Belice, Verdura and Irminio rivers. In the northern coastal slope, between Finale di Pollina (Palermo) and Messina, it only grows spontaneous in the Valley of the Caronia stream and in the slopes of Madonna delle Nevi Mount (Santo Stefano di Camastra, Messina). In these two latter localities *F. angustifolia* subsp. *angustifolia* is part of the forest formation dominated by deciduous oaks belonging to the pubescent oak pattern (*Quercus* sp. pl.) and by *Quercus gussonei* Brullo. Where the phreatic layer is superficial the species reaches up to 900 m a.s.l.

Remarks

As regards distinction between *F. angustifolia* subsp. *angustifolia* and *F. angustifolia* subsp. *oxycarpa* it has to be pointed out that sharp-shaped samara, which characterises the subsp. *oxycarpa*, sometimes can also be found in *F. angustifolia* subsp. *angustifolia*. Similar individuals occurring within the south Italian and Sicilian range were described as *Fraxinus rostrata* by Gussone (1826).

Conclusions

As result of the investigations carried out and of the data presented, in Sicily the genus *Fraxinus* is represented by three specific taxa: *Fraxinus ornus* L., *F. excelsior* L. and *F. angustifolia* Vahl subsp. *angustifolia*.

F. ornus is spread in great part of the island on calcareous and siliceous soils from the coast up to 1500 m.

F. excelsior is confirmed within a locality characterised by the presence of a submontane relic forest formation and known from the literature of half XIX century; its occurrence is to be excluded for the territory of Castelbuono (Madonie) as could be presumed by a critical sample of the second half of the XIX century kept in PAL.

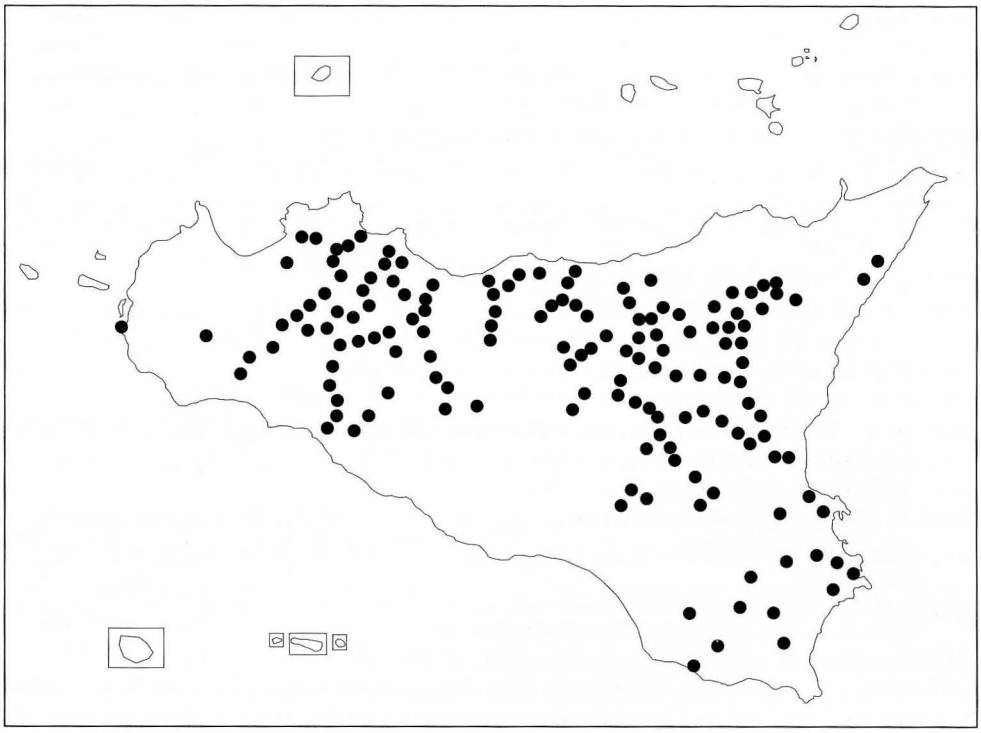

Fig. 7. Sicilian distribution of *Fraxinus angustifolia* subsp. *angustifolia* coinciding with the hydrographic system.

Finally, *F. angustifolia* subsp. *angustifolia* is distributed in the whole territory of the island where it is localized near the water courses.

The occurrence of *F. angustifolia* Vahl subsp. *oxycarpa* (Bieb. ex Willd.) Franco et Rocha Afonso in Sicily is excluded.

The most meaningful datum arising from this study, apart from the confirmation of the occurrence of *F. excelsior* and the exclusion of *F. angustifolia* subsp. *oxycarpa* from Sicily, is given by the finding again of *F. excelsior* in a locality of particular interest from both phytogeographical and phytocoenotic point of view. In this single growing site the *F. excelsior* population bears phenological features diverging from those of other ones in the general range. These biological aspects, together with the geographical and reproductive isolation of the Sicilian population, suggest further careful studies especially as far as taxonomy is concerned.

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References

Brullo, S., Scelsi, F., Siracusa G., & Spampinato, G. 1996: Caratteristiche bioclimatiche della Sicilia. — Giorn. Bot. Ital. **130(1):** 177-185.

Cupani, F. 1696-97: Hortus catholicus etc. cum supplemento. — Neapoli.

Di Benedetto, L., Leonardi, S. & Poli, E. 1983: *Taxus baccata* L. in Sicilia. — Not. Soc. It. Fitosoc. **18:** 1-18.

Falci, R. 1910: Il frassino da manna in Sicilia. — Boll. Reale Orto Bot. Giardino Col. Palermo **9:** 145-168.

Fiori, A. 1926: Nuova Flora Analitica d'Italia **2:** 242-243. — Firenze.

Franco, J. & Rocha Afonso, M. L. 1972: *Fraxinus* L. — Pp. 53-54 in: Tutin, T. G., Burges, N. A., Chater, A. O., Edmondson, J., Heywood, V. H., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.), Flora europaea, **1.** — Cambridge.

Greuter, W., Burdet, H. M. & Long, G. 1989: Med-Checklist **4.** — Gèneve & Berlin.

Gussone, G. 1826: Plantae rariores, quas in Itinere per Oras Jonii et Adriatici Maris et per Regiones Samnii et Apruttii collegit Joannes Gussonei. — Neapoli.

— 1843: Florae siculae Synopsis, **1.** — Neapoli.

Ilardi, V. 1999: Indagini sui frassini da manna in Sicilia finalizzate al recupero e alla conservazione del patrimonio varietale. — Palermo. Tesi di dottorato di ricerca in "Risorse vegetali", unpublished.

Kárpáti, Z. E. 1970: Eine kritisch-taxonomische Ubersicht dei in Europa wildwachsenden Eschen-Arten und deren Unterarten. — Feddes Repert. **81:** 171-186.

Lojacono Pojero, M. 1888: Flora Sicula **2(2):** 49-50. — Palermo.

Minà Palumbo, F. 1875-1876: Monografia sulla coltivazione del frassino. — Agric. Ital. **2(19):** 307-312, **(20):** 363-366, **(21):** 407-411, **(22-23):** 487-491, **(24):** 554-559, **(25):** 606-612.

Nicotra, L. 1884: Prodromus florae Messanensis. — Messanae (1878-83).

Pignatti, S. 1982: Flora d'Italia **2:** 322-323. — Bologna.

Ponzo, A. 1900: La flora trapanese. — Palermo.

Tornabene, F. 1887: Flora sicula viva et exsiccata. — Catania.

Address of the authors:
Dr V. Ilardi & Prof. F. M. Raimondo, Dipartimento di Scienze Botaniche dell'Università, Via Archirafi 38, I-90123 Palermo, Italy.