

[Click here to view linked References](#)

1 Carmelo Maria Musarella^{1,2}

2 ***Solanum torvum* Sw. (Solanaceae): a new alien species for Europe**

3 ¹Department of Agraria, Mediterranean University of Reggio Calabria, Italy

4 ²Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén, Campus Universitario
5 Las Lagunillas s/n. 23071, Jaén (Spain).

6 Corresponding author: Carmelo Maria Musarella. Phone +39 0965 1694374; email: carmelo.musarella@unirc.it

7 ORCID: CM Musarella: 0000-0002-0120-190X

8

9 **Abstract**

10 The largest family of *Solanaceae* counts many species widespread worldwide, either wild and cultivated. A lot of
11 cultivated species of this family represent an important part of the world of food. These and other spontaneous plants
12 have several ethnobotanical uses. In this paper, the author reports for the first time about the presence, as casual alien
13 species, of *Solanum torvum* Sw. in Europe (Calabria region, Southern Italy). Actually, it was reported in Italy by
14 mistake until then. This species is native of West Indies and naturalized in several tropical and subtropical regions
15 worldwide. *S. torvum*, also used as rootstock for cultivated *Solanaceae*, can escape and invade natural habitats,
16 replacing the natural vegetation and creating changes in relationships with other species. Twenty-three plants of *S.*
17 *torvum* are located in a stream, living together with other alien and synanthropic species. This work deals with its
18 geographical distribution and new location, with its morphological, ecological and taxonomic characteristics. *S. torvum*,
19 can be considered in Italy and in Europe as an alien casual species, but further field investigations on this species are
20 necessary to avoid its diffusion.

21

22 **Keywords:** alien plant, Calabria, invasive species, *Solanum torvum*, southern Italy, xenophytes.

23

24 **Introduction**

25 *Solanum* L. (*Solanaceae*) is an important genus of angiosperms that records approximately 1,200 species distributed
26 worldwide (Knapp 2019). Humans select important agricultural food species of common use around the world from
27 wild types belonging to this genus, such as: *S. tuberosum* L. (potato), *S. lycopersicum* L. (tomato), *S. melongena* L.
28 subsp. *melongena* (eggplant), *S. aethiopicum* L. (bitter tomato), *S. muricatum* Aiton (pepino), and so on (Hammer and
29 Laghetti 2006). Other species, used for decorative purposes only, are alien plants in southern Italy when they escape
30 from cultivation (Stinca et al. 2012, 2016, 2017). Europe hosts overall sixty-two species belonging to the genus
31 *Solanum* (Valdés 2012), while in Italy there are twenty-three in total, out of those twenty are alien (Galasso et al. 2018)
32 and three are native (Bartolucci et al. 2018).

33 Calabria is the most southern region of the Italian Peninsula. Recently it was studied from different points of view in
34 order to increase the lack of botanical knowledge (Bartolucci et al. 2019; Bernardo 2000; Bernardo and Puntillo 2002;
35 Bernardo et al. 2011; Brullo et al. 2001; Cano et al. 2017; Crisafulli et al. 2010; Musarella and Tripodi 2004; Musarella
36 et al. 2018; Panuccio et al. 2018; Signorino et al. 2011; Spampinato 2014; Spampinato et al. 2017, 2018, 2019; Stinca
37 et al. 2016b). In particular, many authors carried out some researches investigating ethnobotanical uses of *Solanaceae*
38 (Kunkar and Kunkar 2000; Leporatti and Impieri 2007; Lupia and Lupia 2013; Maruca et al. 2019; Musarella et al.
39 2019; Passalacqua et al. 2006, 2007; Perrino and Calabrese 2018; Tagarelli et al. 2010). Considering the importance of
40 ethnobotanical aspect thanks to the old uses of spontaneous and cultivated plants, they allow agriculture to become
41 more conservative and clearly in contrast with the industrial paradigm in order to avoid future pandemics (Perrino and
42 Calabrese 2018).

43 There are also several phytotoponyms related with plant species in the region (Spampinato et al. 2017). Recently,
44 several field surveys, with the aim of monitoring the presence of alien species in the Calabria region, allowed the author
45 to find some for use in agriculture (Galasso et al. 2019; Musarella et al. in press a; Musarella et al. in press b). In this
46 context, they can be considered as genetic resources (Hammer and Laghetti 2006). Furthermore, a new alien plant
47 species was recorded in Europe for the first time: *Solanum torvum* Sw. (*Solanaceae*).

48 The aim of this paper is to assess the invasive status of these species and to report further information about it.

49

50 **Materials and methods**

51 Plant material was georeferenced (datum WGS84), collected, herborised and recorded in an electronic database
52 available at the Herbarium of “Mediterranea” University of Reggio Calabria (REGGIO), together with herbarium
53 specimens. The identification of the species was based on the original description made by Swartz (1788) and
54 Vorontsova and Knapp (2014). Moreover, the study was also based on the analyses of herbaria specimens preserved at

55 REGGIO, BISH, HNBU, K, LINN, LISU, M, MO, MPU, RSA and S (acronyms according to Thiers 2019,
56 continuously updated), available at JStor Global Plants (<http://plants.jstor.org/>).

57

58 **Results and discussion**

59 Swartz (1788) described *Solanum torvum* (turkey berry) for “*India occidentalis*” (West Indies). As a result of a
60 thorough research in scientific literature (Cambria et al. 2015; Galasso et al. 2018; Sobrino Vesperinas and Sanz Elorza
61 2012), it is possible to affirm that it represents the first report of *S. torvum* in Europe. In the past, Raimondo and
62 Orlando (1978) in Italy and Mallol and Maynés (2008) in Spain, reported this species by mistake. According to
63 Cambria et al. (2015), the record of Raimondo and Orlando (1978) must be referred to *S. lanceolatum*, while that of
64 Mallol and Maynés (2008) to *S. chrysotrichum*. Many farmers use the plant as compatible rootstock for eggplants and
65 tomato, because it withstands to several diseases (Bilotta et al. 2006; Daunay 2008; Gisbert et al. 2011; Gousset et al.
66 2005; King et al. 2010; Petran and Hoover 2014). However, also *S. torvum* has its pests, such as *Phthorimaea*
67 *operculella* (Zeller) (Lepidoptera: Gelechiidae) (Rondon 2010). The first record in Europe is here referred, in the
68 Metropolitan city of Reggio Calabria (southern Italy).

69

70 **Study area**

71 The Metropolitan city of Reggio Calabria is the southernmost part of Calabria region (southern Italy), it also has
72 several municipalities. One of these, Villa San Giovanni, is located in the northern part of the Strait of Messina
73 (Figure 1).

74

75 **Fig. 1** Map of the northern part of the Strait of Messina (Stretto di Messina) and its location in southern Italy (in black
76 box). In red, the site of the new record of *Solanum torvum* Sw.

77

78 According to the Bioclimatic map of Europe (Rivas-Martinez et al. 2004) and the updated one of Blasi and Michetti
79 (2005), Calabria region has both zones with Pluvioseasonal Oceanic Mediterranean bioclimate, and zones with
80 Submediterranean Oceanic Temperate bioclimate. Taking into account the nearest thermopluviometric station of Reggio
81 Calabria and according to the Worldwide Bioclimatic Classification System proposed by Rivas-Martínez and Rivas-
82 Saenz (1996–2017), the bioclimate of Villa San Giovanni is “Mediterranean type pluviseasonal oceanic” with a thermo-
83 Mediterranean thermotype and lower dry ombrotype.

84 According to the geological map of Calabria (VV.AA. 1967), this part of region is characterized by siliceous substrates
85 having two possible origins: metamorphic (schist, gneiss) and intrusive (granites).

86

87 ***Solanum torvum* Sw., Nova Genera & Species Plantarum seu Prodrum: 47. 1788**

88 Typus: Swedish Museum of Natural History Department of Botany (S), S-R-5814, lecto, designated by Vorontsova &
89 Knapp (2016)

90 Synonyms: *Solanum ferrugineum* Jacq.; *Solanum ficifolium* Ortega; *Solanum mayanum* Lundell.

91

92 Knapp (2009) refers that it is possible to find *S. torvum* in Bahamas, Greater and Lesser Antilles. According to Witt
93 and Luke (2017), this species has its origin in the following countries: Belize, Brazil, Colombia, Costa Rica, Ecuador,
94 French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Venezuela and the Caribbean. Its
95 usefulness in agriculture conditioned its current distribution throughout the tropics and subtropics (CABI 2019).

96

97 **Description**

98 Using personal observations, and according to Vorontsova and Knapp (2014) and CABI (2019), the author provides the
99 following update description of *S. torvum*. It is an erect shrub, 1 up to 3 (4,5) m tall, with a prickly stem. The young
100 stem and the branches are green and pubescent with trichomes, while the bark of older stems is brown to dark grey. The
101 leaves are evergreen, simple, broadly ovate, 5-21 cm long and 4-13 cm wide, entire or with up to seven broad triangular
102 lobes. Both surfaces are covered with fine stellate hairs and have scattered prickles along the main veins. The upper
103 surface is darker than the lower one. The base of the lamina is truncate and oblique, the apex acute up to acuminate. The
104 leaves have densely stellate-pubescent petioles, 1 up to 5.5 cm long, with some prickles up to 10 mm long, curved.
105 Dense and compact inflorescences up to 6 cm long, 1-4 times branched, consisting of 50-100 flowers, densely
106 pubescent with trichomes similar to those of the stems. Pentamerous flowers with slender and hairy sepals, 2-3 mm long
107 forming a calyx of 4-6 mm long. White to cream petals of about 1 cm long forming a stellate corolla of 1.5-2 cm in
108 diameter (Figure 2). Androecium consisting of yellow connivent stamens with anthers 6-8 mm long and about 1 mm
109 wide. Gynoecium made up of conical ovary, glandular, surmounted by a 10-12 mm style, glabrous, ending with a
110 capitate stigma protruding over the androecium. The fruits are globular berries 1-1.5 cm across, pale grayish green
111 when ripe, producing few to several flat woody seeds, 1.5 to 2 mm long (Figure 3).

112

113 **Fig. 2** Inflorescence of *Solanum torvum* Sw.

Fig. 3 Fruits of *Solanum torvum* Sw.

114

115 *Site location and ecology*

116 *Solanum torvum* was collected in the Fiumara Santa Trada, a stream in the Municipality of Villa San Giovanni, in the
 117 metropolitan city of Reggio Calabria (southern Italy). The population consists of twenty-three plants, sixteen tall
 118 between 1.7 and 4.5 m with flowers and fruits, seven ones lower and not mature. All the plants are located along the
 119 stream, between 33S 559178 E- 4232610 N (36 m a.l.m.) and 33S 559294 E- 4232588 N (48 m a.l.m.), on the banks
 120 and in the riverbed (Figure 4), with exposure to NW. *S. torvum* grows in disturbed habitats associated to a mixture of
 121 species in which other aliens predominate (*Eucalyptus camaldulensis* Dehnh. subsp. *camaldulensis*, *Ricinus communis*
 122 L., *Oxalis pes-caprae* L., *Arundo donax* L.), synantropics (*Rubus ulmifolius* Schott, *Bituminaria bituminosa* (L.) C.H.
 123 Stirt., *Dittrichia viscosa* (L.) Greuter subsp. *viscosa*, *Foeniculum vulgare* Mill. subsp. *piperitum* (Ucria) Bég.,
 124 *Galactites tomentosus* Moench, *Parietaria judaica* L., *Brassica fruticulosa* Cirillo subsp. *fruticulosa*, *Convolvulus*
 125 *althaeoides* L., *Euphorbia terracina* L., *Geranium robertianum* L., *Geranium rotundifolium* L., *Lathyrus clymenum* L.,
 126 *Lobularia maritima* (L.) Desv., *Oloptum thomasi* (Duby) Banfi & Galasso, *Silene latifolia* Poir., *Scrophularia*
 127 *peregrina* L., *Sonchus oleraceus* L.) and others (*Hypericum hircinum* L. subsp. *majus* (Aiton) N. Robson,
 128 *Ampelodesmos mauritanicus* (Poir.) T. Durand & Schinz, *Asparagus acutifolius* L., *Cytisus villosus* Pourr., *Dactylis*
 129 *glomerata* L. subsp. *glomerata*, *Galium aparine* L.) (Figure 5).

130
 131 **Fig. 4** Young plant of *Solanum torvum* Sw. along the riverbed

132
 133 **Fig. 5** Flowering plant of *Solanum torvum* Sw. on the bank of the stream, among other invasive and synantropic species

134
 135 *Taxonomic notes*

136 *Solanum torvum* belongs to the section *Torva* of subgenus *Leptostemonum*, also known as the “spiny Solanums” (Stern
 137 et al. 2011). *S. torvum* is the original name given by Swartz (1788). Knapp (2011) proposed it for conservation with a
 138 conserved type, but his proposal was not accepted because unnecessary (Applequist 2013). Therefore, Vorontsova and
 139 Knapp (2016) selected a lectotype from the Swartz herbarium in S (S-R-5814). *S. torvum* could be confused with other
 140 species of its genus, such as *S. anguivi* Lam.. However, the characteristics of *S. torvum* are pale grayish green fruits at
 141 maturity, inflorescences with simple, small gland-tipped trichomes, perfect flowers, and leaves from broadly elliptic up
 142 to ovate (Vorontsova and Knapp 2014). Lots of authors reported variously about its chromosome number: n = 12
 143 (Fedorov 1969), n = 24 (Randell and Symon 1976), n = 12 (Vorontsova and Knapp 2014). Nowadays, in Europe, there
 144 are four species belonging to the section *Torva*, according to this new record: *S. bonariense* L., *S. chrysotrichum*
 145 Schltl., *S. lanceolatum* Cav. and *S. torvum* Sw.. The following key, made up with personal observations and adapted
 146 from Cambria et al. (2015) and Knapp et al. (2019), could be useful to avoid confusions among these four species:

- 147 1. Stem and leaves sparsely stellate hairy, glabrescent with age, unarmed or rarely with very sparse prickles 0.5-2 mm
 148 long. Orange-red fruits.....*Solanum bonariense*
 149 1. Stem and leaves, densely stellate hairy, usually armed with prickles 2.5-10 mm long. Green up to yellow fruits
 1502
 151 2. Whitish stem indumentum. Purplish-blue corolla *S. lanceolatum*
 152 2. Ferruginous stem indumentum. White corolla3
 153 3. Shrub up to 4,5 m tall. Young stems and pubescent green up to brownish leaves. Trichomes on the inflorescences and
 154 pedicels glandular. Curved prickles..... *S. torvum*
 155 3. Shrub up to tree 1.5–9 m tall. Young stems and densely ferruginous pubescent leaves. Trichomes on the
 156 inflorescences and pedicels not glandular. Straight prickles up to slightly curved
 157 *S. chrysotrichum*

158
 159 *Invasiveness and impacts*

160 *Solanum torvum*, used as rootstock for *S. melongena* in Italy, can escape from cultivated fields, replacing native
 161 vegetation and rapidly overtopping most herbs, grasses and other shrubs: however, it cannot survive under a closed
 162 forest canopy (CABI 2019). Moreover, its prickly stem and leaves, can damage people, livestock and wildlife, and its
 163 consumption in traditional meals also caused poisoning in humans (CABI 2019).

164 According to Pyšek et al. (2004) and Galasso et al. (2018), *Solanum torvum* can be considered as alien casual species in
 165 Italy and Europe. However, the population is made up of sixteen mature plants that bloom and bear fruit along a stream.
 166 This suggests that the plants occurring in the new site have already produced new individuals in the past: this could lead
 167 us to think that the species it can be considered as a naturalized alien.

168
 169 **Conclusions**

170 This paper reports the presence of *S. torvum* in Europe for the first time, confirming that several authors reported its
 171 presence by mistake at first. Thanks to the numerous data collected in the field, it was possible to introduce here an
 172 assessment of the invasive status of these species. Moreover, I provided more information about *S. torvum* and a more
 173 complete key for the identification of species of *Solanum* section *Torva* in Europe. Mature plants blended with the
 174 younger ones, spread in the investigated area, let us thinking that this species could expand its presence along the
 175 stream and in the neighboring areas. For this reason, further field investigations are necessary to update the invasive
 176 status to this new alien species, and to monitor its diffusion.

177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237

Compliance with Ethical Standards
Conflict of Interest: The authors declare that they have no conflict of interest.
This Research involved Human Participants who gave a verbal informed consent prior to the interview.

Specimena visa

Solanum torvum Sw.

ITALY: Villa San Giovanni (Reggio Calabria), Vallone Santa Trada, under the A2 Mediterranean motorway overpass, along a stream, 49 m a.s.l., 33S 559294.36 E - 4232588.43 N, 08/01/2019, Carmelo Maria Musarella (REGGIO).
ANGOLA: Ambriz, 1853, F. Welwitsch., LISU220817 (LISU). **BELIZE:** Near Cowpen, Swasey Branch, Monkey River, 1942/03/16, Percy H. Gentle, MO-159618 (MO); Plants of Corozal District, British Honduras, San Antonio, 1931, Gentle P.H., K001160868 (K). **BRAZIL:** Paraíba João Pessoa Conj. João Agripino, 29/11/1990, Agra M.F. & Góis G., K001058849. **CÔTE D'IVOIRE:** Abidjan, Campus universitaire d'Abidjan, 1967/04/21, M. Bonzi, HNBU02280 (HNBU). **COUNTRY UNKNOWN:** Ind. occ., no date, Swartz O.P., S-R-5814 (Lectotypus) (S); Ind. occ., no date, Anon., LINN-HS365-2-1 (LINN); West Indies, 01/1819, Herb. Gay J., K001161194 (K). **DOMINICA:** On P. Bupaits Head, St. Domingo, 1793, no collector, K001161201 (K); St Domingo, 1837, no collector, K001161193 (K). **INDIA:** [Harkan Charace] Madras, 08/1845, no collector, K001152876 (K). **INDONESIA:** Jawa, 1859, Horsfield T., K001080492 (K); Jawa, 1802, Horsfield T., K001080493 (K); Java, no date, Siebold P.F. von, M0166041 (M). Mexico: Chiquilistlan, 1892/05/30, Marcus E. Jones, RSA0017366 (RSA). **PAPUA NEW GUINEA:** Pacific Ocean, Melanesia, Papua New Guinea, New Britain, East New Britain Province, Sali Vallage, 1968/10/16, Millar A.N., BISH1014310 (BISH). **SAINT KITTS AND NEVIS:** Saint Kitts: ex Ins. Sti Christoph. Ind. Occid., no date, no collector, S09-42981 (S). **SENEGAL:** Culta, 1828-1-1, Richard, MPU011202 (MPU). **THAILAND:** Doi Sutep, Nordostseite im Schilflande, 1905/03/17, Hosseus, C.C., M0166039 (M).

Acknowledgments

The author is very grateful to Stefania Griso for the linguistic revision of the text.

References

Applequist WL (2013) Report of the Nomenclature Committee for Vascular Plants: 65. Taxon 62:1315-1326
Bartolucci F, Domina G, Alessandrini A et al. (2019) Notulae to the Italian native vascular flora: 7. Italian Botanist 7: 125–148. <https://doi.org/10.3897/italianbotanist.7.36148>
Bartolucci F, Peruzzi L, Galasso G, et al. (2018) An updated checklist of the vascular flora native to Italy.
Bernardo L (2000) Fiori e piante del Parco del Pollino, 2a edition. Prometeo, Castrovillari (CS)
Bernardo L, Peruzzi L, Passalacqua NG (2011) Flora vascolare della Calabria: Prodomo. Inf Bot Ital 43(2):185-332
Bernardo L, Puntillo D (2002) Le orchidee spontanee della Calabria. Prometeo, Castrovillari (CS)
Bilotta M, Morra L, Verazza A (2006) *Solanum torvum* si conferma portinnesto ideale per melanzana. L'Informatore Agrario, 49:31-34
Blasi C, Michetti L (2005) Biodiversity and climate. In "Biodiversity in Italy". Blasi C. (Ed. in chief). Roma
Brullo S, Scelsi F, Spampinato G (2011) La vegetazione dell'Aspromonte. Laruffa Editore, Reggio Calabria
CABI (2019) Invasive Species Compendium. Wallingford: CAB International. <https://www.cabi.org/ISC/datasheet/50559#779A2AA4-CECA-400A-86DD-2C522152AB0B>. Accessed 27 april 2019
Cambria S., Banfi E., Verloove F. & Domina G. (2015) *Solanum lanceolatum* (Solanaceae) in Sicily: a new alien species for the European flora. Fl. Medit., 25: 115-120. <https://doi.org/10.7320/FIMedit25.115>
Cano E, Musarella CM, Cano-Ortiz A, Piñar Fuentes JC, Spampinato G, Pinto Gomes C (2017) Morphometric analysis and bioclimatic distribution of *Glebionis coronaria* s.l. (Asteraceae) in the Mediterranean area. Phytokeys 81: 103–126. <https://doi.org/10.3897/phytokeys.81.11995>
Crisafulli A, Cannavò S, Maiorca G, Musarella CM, Signorino G, Spampinato G (2010) Aggiornamenti floristici per la Calabria. Inf Bot Ital 42 (2):437-448
Daunay MC (2008) Eggplant. In: Prohens J, Nuez F (Eds.), Handbook of Plant Breeding: Vegetables II. Springer, New York, USA, pp. 163–220
Fedorov A (1969) Chromosome numbers of flowering plants. V.L. Komarov Botanical Institute, Leningrad
Galasso G, Conti F, Peruzzi L et al. (2018) An updated checklist of the vascular flora alien to Italy, Plant Biosyst, 152(3): 556-592. <https://doi.org/10.1080/11263504.2018.1441197>
Galasso G, Domina G, Ardenghi NMG, Aristarchi C et al. (2019) Notulae to the Italian alien vascular flora: 7. Italian Botanist 7: 157–182. <https://doi.org/10.3897/italianbotanist.7.36386>
Gisbert C, Prohens J, Raigón MD, Stommel JR, Nuez F (2011) Eggplant relatives as sources of variation for developing new rootstocks: Effects of grafting on eggplant yield and fruit apparent quality and composition. Sci Hortic-Amsterdam 128:14-22. <https://doi.org/10.1016/j.scienta.2010.12.007>
Gousset C, Collonnier C, Mulya K, Mariska I, Rotino GL, Besse P, Servaes A, Sihachakr D (2005) *Solanum torvum*, as a useful source of resistance against bacterial and fungal diseases for improvement of eggplant (*S. melongena* L.). Plant Science 168(2): 319-327. <https://doi.org/10.1016/j.plantsci.2004.07.034>

238 Hammer K, Laghetti G (2006) Small Agricultural Islands and Plant Genetic Resources. C.N.R., Bari.

239 King SR, Davis AR, Zhang X, Crosby K (2010) Genetics, breeding and selection of rootstocks for Solanaceae and
240 Cucurbitaceae. *Sci Hortic* 127:106-111. <https://doi.org/10.1016/j.scienta.2010.08.001>

241 Knapp S (2009) Synopsis and lectotypification of *Solanum* (Solanaceae) species endemic in the West Indies. *An Jardin*
242 *Bot Madrid* 66(1):65-84. <https://doi.org/10.3989/ajbm.2209>

243 Knapp S (2011) Proposal to conserve the name *Solanum torvum* (Solanaceae) with a conserved type. *Taxon* 60:1523-
244 1524

245 Knapp S, Vorontsova MS, Särkinen T (2019) Dichotomous keys to the species of *Solanum* L. (Solanaceae) in
246 continental Africa, Madagascar (incl. the Indian Ocean islands), Macaronesia and the Cape Verde Islands. *PhytoKeys*
247 127: 39–76. <https://doi.org/10.3897/phytokeys.127.34326>

248 Kunkar A, Kunkar E (2000) Le piante officinali in Calabria e loro possibile utilizzo. Laruffa Editore, Reggio Calabria

249 Leporatti ML, Impieri M (2007) Ethnobotanical note about some uses of medicinal plants in Alto Tirreno Cosentino
250 area (Calabria, Southern Italy). *J Ethnobiol Ethnomed* 3:34. <https://doi.org/10.1186/1746-4269-3-34>

251 Lupia C, Lupia R (2013) *Etnobotanica: piante e tradizioni popolari di Calabria*. Grafi.Co s.r.l., Crotone.

252 Mallol A, Maynés J (2008) Nous xenòfits al baix empordà (Catalunya). *Acta Bot Barc* 51:59-77.

253 Maruca G, Spampinato G, Turiano D, Laghetti G, Musarella CM (201) Ethnobotanical notes about medicinal and useful
254 plants of the Reventino Massif tradition (Calabria region, Southern Italy). *Genet Resour Crop Ev.*
255 <https://doi.org/10.1007/s10722-019-00768-8>

256 Musarella CM, Cano-Ortiz A, Piñar Fuentes JC, Navas-Ureña J, Pinto Gomes CJ, Quinto-Canas R, Cano E, Spampinato
257 G (2018) Similarity analysis between species of the genus *Quercus* L. (Fagaceae) in southern Italy based on the fractal
258 dimension. *PhytoKeys* 113:79–95. <https://doi.org/10.3897/phytokeys.113.30330>

259 Musarella CM, Laface VLA, Morabito A, Cano-Ortiz A, Cannavò S, Spampinato G (IN PRESSa) Aggiornamenti sulla
260 flora alloctona calabrese: novità e conferme. *Notiziario della Società Botanica Italiana*, XX: XXX-XXX

261 Musarella CM, Paglianiti I, Spampinato G (2019) Ethnobotanical study in the Poro and Preserre Calabresi territory
262 (Vibo Valentia, S-Italy). *Atti Soc Tosc Sci Nat, Mem, Serie B.* <https://doi.org/10.2424/ASTSN.M.2018.17>

263 Musarella CM, Stinca A, Laface VLA, Petrilli R, Spampinato G (IN PRESSb) New data on the alien vascular flora of
264 Calabria (southern Italy).

265 Musarella CM, Tripodi G (2004) La flora della rupe e dei ruderi di Pentidattilo (RC). *Inf Bot Ital* 36(1):3-12

266 Panuccio MR, Fazio A, Musarella CM, Mendoza-Fernández AJ, Mota JF, Spampinato G (2018) Seed germination and
267 antioxidant pattern in *Lavandula multifida* (Lamiaceae): A comparison between core and peripheral populations. *Plant*
268 *Biosyst* 152(3):398-406. <https://doi.org/10.1080/11263504.2017.1297333>

269 Passalacqua NG, De Fine G, Guarrera PM (2006) Contribution to the knowledge of the veterinary science and of the
270 ethnobotany in Calabria region (Southern Italy). *J Ethnobiol Ethnomed* 2:52. <https://doi.org/10.1186/1746-4269-2-52>

271 Passalacqua NG, Guarrera PM, De Fine G (2007) Contribution to the knowledge of the folk plant medicine in Calabria
272 region (Southern Italy). *Fitoterapia*, 78(1):52-68. <https://doi.org/10.1016/j.fitote.2006.07.005>

273 Perrino EV, Calabrese G (2018) Endangered segetal species in southern Italy: distribution, conservation status, trends,
274 actions and ethnobotanical notes. *Genet Resour Crop Evol.* 65:2107-2134. <https://doi.org/10.1007/s10722-018-0678-6>

275 Petran A, Hoover E (2014) *Solanum torvum* as a Compatible Rootstock in Interspecific Tomato Grafting. *J Horticulture*
276 1: 103. doi:10.4172/2376-0354.1000103

277 Pyšek P, Richardson DM, Rejmánek M, Webster GL, Williamson M, Kirschner J (2004) Alien plants in checklists and
278 floras: towards better communication between taxonomists and ecologists. *Taxon* 53:131–143

279 Raimondo FM, Orlando A (1978) Prima segnalazione in Italia di *Solanum torvum* Sw. *Inf Bot Ital* 10(1):43-45

280 Randell BR, Symon DE (1976) Chromosome numbers in Australian *Solanum* species. *Aust J Bot* 24:369-379

281 Rivas-Martínez S, Penas A, Díaz TE (2004) Bioclimatic and biogeographic maps of Europe.
282 <http://www.globalbioclimatics.org/form/maps.htm>. Accessed 27 april 2019

283 Rivas-Martínez S, Rivas-Saenz S (1996–2019) Worldwide bioclimatic classification system. Phytosociological research
284 center, Spain. <http://www.globalbioclimatics.org>. Accessed 27 april 2019

285 Rondon SI (2010) The Potato Tuberworm: A Literature Review of Its Biology, Ecology, and Control. *Am. J Pot Res*
286 87:149-166. <https://doi.org/10.1007/s12230-009-9123-x>

287 Salerno G, Stinca A (2017) First European record of *Solandra maxima* (Sessé & Moc.) P.S.Green (Solanaceae). *Annali*
288 *di Botanica* 7: 67-70. <https://doi.org/10.4462/annbotrm-13848>

289 Signorino G, Cannavò S, Crisafulli A, Musarella CM, Spampinato G (2011) *Fagonia cretica* L.. In: Schede per una
290 Lista Rossa della Flora vascolare e crittogamica Italiana. *Inf Bot Ital* 43(2):381-458

291 Sobrino Vesperinas E, Sanz Elorza M (2012) *Solanum* L.: 166-195. In: Castroviejo S. (Eds.), *Flora iberica: plantas*
292 *vasculares de la Península Ibérica e Islas Baleares*, 11. Real Jardín Botánico, CSIC, Madrid.

293 Spampinato G (2014) *Guida alla flora dell'Aspromonte*. Laruffa Editore, Reggio Calabria.

294 Spampinato G, Crisarà R, Cannavò S, Musarella CM (2017) Phytotoponyms of southern Calabria: a tool for the analysis
295 of the landscape and its transformations. *Atti Soc Tosc Sci Nat Mem serie B* 124:61-72.
296 <https://doi.org/10.2424/ASTSN.M.2017.06>

297 Spampinato G, Massimo DE, Musarella CM, De Paola P, Malerba A, Musolino M (2019) Carbon Sequestration by

298 Cork Oak Forests and Raw Material to Built up Post Carbon City. In: Calabrò F., Della Spina L., Bevilacqua C. (eds)
 299 New Metropolitan Perspectives. ISHT 2018. Smart Innovation, Systems and Technologies, vol 101. Springer, Cham.
 300 https://doi.org/10.1007/978-3-319-92102-0_72

301 Spampinato G, Musarella CM, Cano-Ortiz A, Signorino G (2018) Habitat, occurrence and conservation status of the
 302 Saharo-Macaronesian and Southern-Mediterranean element *Fagonia cretica* L. (Zygophyllaceae) in Italy. J Arid Land
 303 10(1):140–151. <https://doi.org/10.1007/s40333-017-0076-5>

304 Stern SR, Agra M de F, Bohs L (2011) Molecular delimitation of clades within New World species of the "spiny
 305 solanums" (*Solanum* subgenus *Leptostemonum*). Taxon 60:1429-1441

306 Stinca A, Chianese G, D'Auria G, Del Guacchio E, Fascetti S, Perrino EV, Rosati L, Salerno G, Santangelo A (2017)
 307 New alien vascular species for the flora of southern Italy. Webbia, 72(2):295-301.
 308 <https://doi.org/10.1080/00837792.2017.1349236>

309 Stinca A, Croce A, D'Auria G, Salerno G, Santangelo A, Rosati L, Motti R (2016a) Nuovi dati sulla flora vascolare
 310 aliena della Campania (Sud Italia) [New data on the alien vascular flora of Campania (South Italy)]. Atti Soc Tosc Sci
 311 Nat Mem serie B 122(2015):89–110. <https://doi.org/10.2424/ASTSN.M.2015.09>

312 Stinca A, D'Auria G, Motti R (2012) Integrazioni alla flora vascolare aliena della Campania (Sud Italia). Inf Bot Ital 44
 313 (2):287-293

314 Stinca A, Galasso G, Banfi E (2016b) First Italian record of *Paspalum notatum* Flügge (Poaceae) and its typification.
 315 Acta Bot. Croat. 75(1): 153-156. <https://doi.org/10.1515/botcro-2016-0012>

316 Swartz O (1788) Nova genera & species plantarum; seu, Prodrum descriptionum vegetabilium, maximam partem
 317 incognitorum. Pritzel (2nd ed.), P. 47. Holmiae. <https://doi.org/10.5962/bhl.title.4400>

318 Tagarelli G, Tagarelli A, Piro A (2010) La medicina popolare usata per curare la malaria in Calabria (Italia
 319 meridionale). J Ethnobiol Ethnomed 6:27. <https://doi.org/10.1186/1746-4269-6-27>

320 Thiers B (2019) Index Herbariorum: A global directory of public herbaria and associated staff. New York: The New
 321 York Botanical Garden. <http://sweetgum.nybg.org/ih/>. Accessed 29 april 2019

322 Valdés B (2012) Solanaceae. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant
 323 diversity. Published on the Internet <http://ww2.bgbm.org/EuroPlusMed/> Accessed 29 april 2019

324 Vorontsova MS, Knapp S (2014) *Solanum torvum*. In: Solanaceae source. Knapp (Ed.).
 325 <http://www.solanaceaesource.org/content/solanum-torvum>. Accessed 27 april 2019

326 Vorontsova MS, Knapp S (2016) A revision of the spiny solanums, *Solanum* subgenus *Leptostemonum* (Solanaceae) in
 327 Africa and Madagascar. Systematic Botany Monographs, 99. The American Society of Plant Taxonomists

328 VV.AA. (1967) Carta Geologica della Calabria Scala 1: 25.000. Servizio Geologico Italiano. Cassa per opere di
 329 pubblico interesse nell'Italia meridionale (Cassa per il Mezzogiorno). Rilevamento Geologico Compagnia Aero-
 330 Ricerche

331 Witt A, Luke Q (2017) Guide to the naturalized and invasive plants of Eastern Africa, [ed. By Witt, A., Luke, Q.].
 332 Wallingford, UK: CABI. vi + 601 pp. <http://www.cabi.org/cabebooks/ebook/20173158959>
 333 doi:10.1079/9781786392145.0000. Accessed 27 april 2019









Figure 5

[Click here to access/download;Figure;Fig 5.jpg](#) 



Manuscript with corrections

[Click here to view linked References](#)



Click here to access/download
attachment to manuscript
Solanum torvum_REV_ENG 2.docx



Responses to the comments of the reviewse

[Click here to view linked References](#)



Click here to access/download
attachment to manuscript
RESPONSES FOR THE REVIEWERS.docx

