



The virtues of being peripheral, recreational, and transnational: local wild food and medicinal plant knowledge in selected remote municipalities of Calabria, Southern Italy

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Research

Abstract

Background: The Italian “Strategy for Inner Areas” includes a series of actions to avoid depopulation of rural areas by safeguarding the territory from hydrogeological instability and triggering development. Such strategy classified each municipality according to the distance to a centre defined as a town where certain services are provided. This article analyses the ethnobotanical knowledge in four villages distant from a centre. Moreover, it discusses the effect of a millennium-old sacred natural site (SNS), the Certosa of Serra San Bruno, on the local ethnobotanical knowledge.

Methods: Sixty semi-structured interviews were conducted among elderly inhabitants of two peripheral and two ultra-peripheral Calabrian villages in 2017 and 2018. The interviews focused on the use of local wild and semi-wild plants currently gathered, for both culinary and medicinal purposes, and the modes of preparation and consumption.

Results: Our study reveals that in Calabria ethnobotanical knowledge is better preserved when it can contribute to household food security in contexts of remoteness and extremely poor economic conditions or when relative well-being allows spending time foraging as a recreational activity. Moreover, we found peculiar ethnobotanical practices in Serra San Bruno which may have been introduced by the monastic community and may

have contributed to the creation of a “glocal” ethnobotany by introducing knowledge from other European contexts.

Conclusions : In conclusion, the “Strategy for Inner Areas” should target the rich ethnobotanical traditional knowledge still present in Calabria as it may represent a powerful tool for achieving sustainable development of peripheral and ultra-peripheral areas.

Keywords: Ethnobotany; Inner Areas; Peripheral; Traditional Ecological Knowledge; Sacred Natural Sites

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Background

Around 60% of Italian territory is characterized by small municipalities located far from basic services such as schools, hospitals and mobility hubs (mainly train stations). Since 2012, the Italian government has promoted the “Strategy for Inner Areas”, a series of actions to prevent marginalization (and depopulation) of these rural areas by safeguarding the territory from hydrogeological instability, promoting their biocultural diversity, and triggering development. Indeed, territorial cohesion is also a common goal of the European Union which is aiming at “a more harmonious and balanced state of Europe” (European Commission 2011). Integrated territorial development, as a result of the coordination of different sectoral policies, promotes an optimal balance of social cohesion, as well as sustainability and competitiveness. Particularly, the Territorial Agenda of the European Union 2020 (European Commission 2011) includes the sustainable and efficient use of European territories as a key element of cohesion. As an example, a project was carried out in Dalmatia to manage and connect ecological and landscape heritage and cultural values at the regional level, promoting prudent management of cultural and natural resources and using local biodiversity to foster tourism and therefore economic development of inner Croatia (European Commission 2015).

In Italy, the national Strategy for Inner Areas has classified municipalities into the following categories: centers, intercommunal centers, belts, intermediate, peripheral and ultra-peripheral. With over 50% of the population residing in inner areas (intermediate, peripheral and ultra-peripheral), mainly located in the proximity of the Apennine Mountains, Calabria is an interesting region in which to study this classification in light of its possible effects on traditional ethnobotanical knowledge. Indeed, over 40% of Calabrian territory hosts peripheral and ultra-peripheral municipalities which lost 15% and 27% of their inhabitants, respectively, in the period 1981-2011. Such marginalized areas are often hotspots of biocultural diversity as they are home to National Parks (Pollino, Aspromonte, Sila) as well as the Arbereshe and Graecnic cultural and linguistic minorities.

In the last 20 years, a few ethnobotanical studies have been conducted in Calabria focusing on the northern province of Cosenza (Leporatti & Impieri 2007; Mattalia *et al.* 2019b), the central area (Lupia 2004; Maruca *et al.* 2019), and the southern province of Reggio Calabria which is home to the Graecanics minority (Nebel *et al.* 2006; Nebel & Heinrich 2009). In addition, Passalacqua *et al.* 2006; 2007; Tagarelli

et al. 2010; and Lupia *et al.* 2018 have published ethnobotanical data for different areas of Calabria.

As this study was conducted within the framework of the PRIN Project BioESSaNS, another aim of the present research was to assess whether traditional ecological knowledge was more persistent closer to a sacred natural site because of its spiritualness. We selected the Sacred Natural Site (SNS) of Santo Stefano, known as the Certosa di Serra San Bruno, founded by Bruno of Cologne in 1091. The site is located a few hundred meters outside the city center of Serra San Bruno, and it is still inhabited by Carthusian monks. We argue that the SNS of the Certosa di Serra San Bruno, inhabited by monks almost uninterruptedly for over 900 years, may have affected local traditional knowledge regarding the use of plants.

With regard to the peripheral context, we hypothesize that in remote areas with little access to main public infrastructures ethnobotanical TEK may be more important than in more urbanized areas as observed in other studies (Wezel & Oehl, 2005).

Therefore, in this study we aimed to explore the ethnobotanical knowledge in peripheral and ultra-peripheral contexts of Calabria's inner areas.

Specifically, the objectives of the study were:

- to document uses of wild and semi-domesticated plants for food and medicinal preparations in peripheral and ultra-peripheral contexts of inner Calabria;
- to discuss the recorded ethnobotanical traditional knowledge in light of peripheral and ultra-peripheral classification following the Italian “Strategy for inner areas”; and
- to collate the ethnobotanical information in order to evaluate the influence of the SNS of Certosa di Serra San Bruno on the traditional ecological knowledge of the near and distant communities of Serra San Bruno and Nardodipace.

Material and Methods

Study area

The current study was conducted at four sites of inner Calabria located in two areas of the region. The Northern sites, located in the Northern Tyrrhenian area, include the municipalities of Papisidero and Maierà, while the Southern sites, located in Central Calabria and the so-called Serre Calabresi, include Serra San Bruno and Nardodipace. In order to compare peripheral and ultra-peripheral municipalities, we included Mottafollone and Sant'Agata di Esaro, which were investigated in a previous study conducted in 2017-2018 and published in Mattalia *et al.* (2019b) (Fig. 1, Table 1).

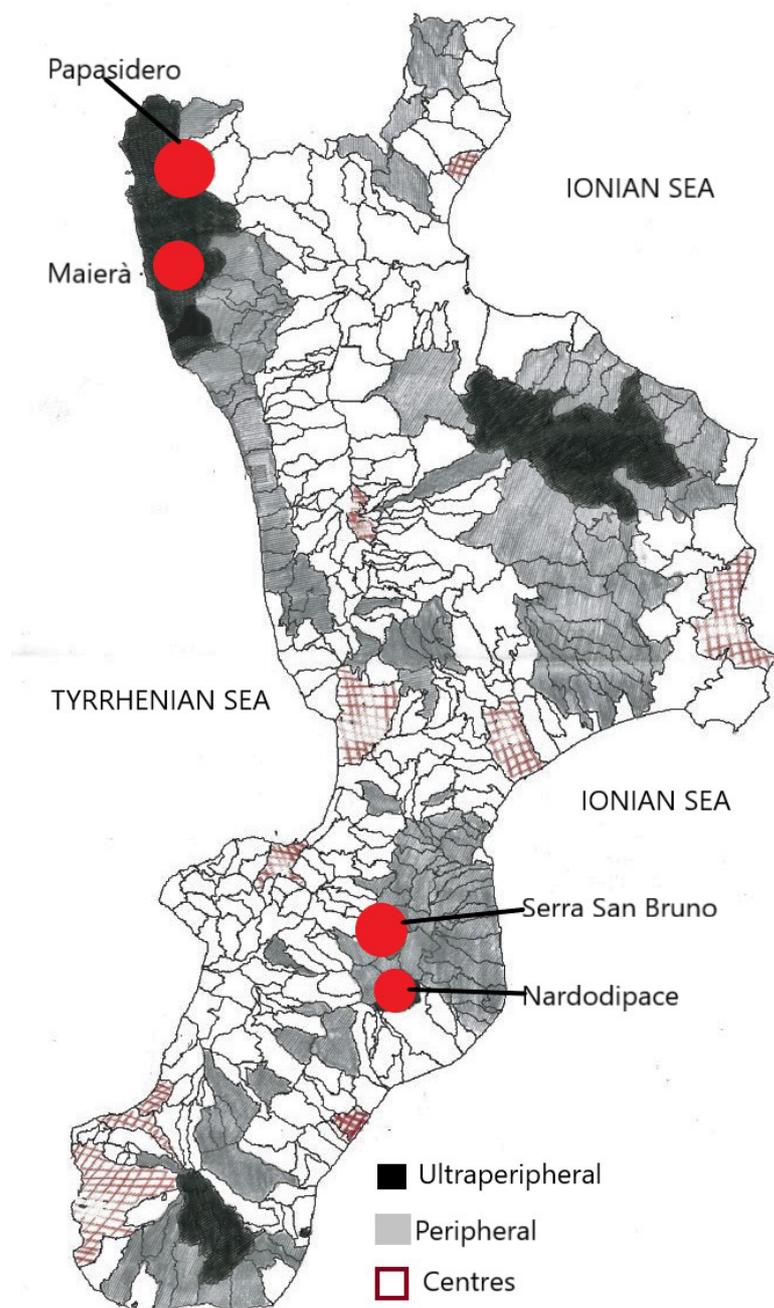


Figure 1. Map of the study area: T = Tyrrhenian sites including the municipalities of Papasidero and Maierà, and S = Calabrian Serre sites including Serra San Bruno and Nardodipace.

Table 1. Main characteristics of the study sites * previous study see Mattalia et al. 2019.

	Inhabitants	Altitude	Classification	Time to a "center" (minutes)
Papasidero (CS)	671	208	Ultra-peripheral	100 (Cosenza)
Maierà (CS)	1213	360	Ultra-peripheral	92 (Cosenza)
Nardodipace (VV)	1260	1080	Ultra-peripheral	100 (Catanzaro)
Serra San Bruno (VV)	6584	790	Peripheral	60 (Catanzaro)
Mottafollone (CS)*	1215	384	Peripheral	55 (Cosenza)
Sant'Agata di Esaro (CS)*	1841	450	Peripheral	67 (Cosenza)

Papasidero is located in Pollino National Park and is well-known for the Lao River which crosses the village and contributes to the touristic appeal of the area. Indeed, in summertime, canoeing and rafting are important economic resources for local residents. Besides tourism, animal breeding still plays an important role in the countryside around the village.

Maierà is a small municipality of Pollino National Park mainly devoted to tourism, as it is only a few kilometers away from the coast. Rural areas of the municipality are devoted to agriculture and especially to the production of olive oil and citrus fruits.

Nardodipace is the most elevated municipality in Calabria and since 2004 it has been part of the Natural Regional Park of the Serre. The main city center was created in the 1960s after flooding threatened the historical center. Indeed, as the municipality does not have direct access to the sea, the new center was built in Ciano, at over 1000 meters above sea level. However, a few locals still live in the historical center (Abitato vecchio, 650 m asl), in Ragonà (500 m asl), and in Santo Todaro (650 m asl).

Serra San Bruno lies in the heart of the Natural Regional Park of the Serre. Its economy is based on agricultural products, mushroom picking (especially *Boletus edulis* which is distributed all over Italy), and tourism. In addition, the tradition of charcoal making still persists which makes use of the forest heritage.

The study area is characterized by a temperate climate, warm, dry summers in Nardodipace and Serra San Bruno (Serre Calabresi area) and hot, dry summers in Papasidero and Maierà (Northern Tyrrhenian area). Average temperature in the Serre Calabresi area is around 12°C (Csb climate according to Köppen Geiger), while average precipitation is around 900 mm per year. The study areas of Northern Tyrrhenia are characterized by a Csa climate with an average annual temperature around 16°C and an average rainfall around 825 mm per year. In both areas, rains are concentrated during the winter months, with consistent snowfall in the area of Serre Calabresi.

The national Strategy for Inner Areas

The methodology developed for classifying Italian municipalities follows the criterion of time needed to get to a center. A center is defined as a municipality that simultaneously offers high schools, basic hospitals and railway stations with a daily traffic of over 2500 passengers. Peripheral municipalities are located between 40 and 75 (driving) minutes away

from a center, while ultra-peripheral residents need over 75 minutes to get to a center.

BioESSaNS

BioESSaNS (Biodiversity and Ecosystem Services of Sacred Natural Sites) is a multidisciplinary project which aims to improve our understanding of ecological dynamics and the relation between humans and the environment in Sacred Natural Sites as defined by the IUCN (“*areas of land or water that hold special spiritual significance for people and communities*”). We selected the municipalities of Serra San Bruno and Nardodipace to represent areas, respectively, close to (1 km from the town center) and distant from (11 km as the crow flies and 20 km driving) the SNS of the Certosa di Serra San Bruno.

Data collection and analysis

Two fieldwork campaigns were conducted in December 2017 and June 2018 in which 15 semi-structured interviews were gathered in each municipality, for a total of 60 interviews. Convenient sampling and snowball methods were applied in the selection of informants, mainly elderly individuals who spent most of their lives in the area. The Code of Ethics of the International Society of Ethnobiology was strictly followed, and prior informed consent was orally received. Interviews were conducted in the Italian language; however, many interviewees mostly answered in the local Calabrian dialect. The interviews focused on the use of local wild and semi-wild plants currently gathered, for both culinary and medicinal purposes, and the modes of preparation and consumption. We collected voucher specimens of leafy plants when possible and we stored them in the University of Gastronomic Sciences bearing codes between UNISGCAL001 and UNISGCAL062. Whenever possible, informants were asked to show mentioned plants in order to better identify the specimen according to the “Flora d’Italia” (Pignatti 1982). Taxonomic identification, botanical nomenclature, and family assignments followed the Flora Europaea and The Plant List database (Tutin *et al.* 1964) and the Angiosperm Phylogeny Group IV (Stevens 2001 onwards). Data were assembled into an Excel database and structured in the form of food and medicinal detailed use-reports.

Results and Discussion

Ethnobotany of two Calabrian inner areas

We recorded a total of 79 taxa belonging to 36 families (Table 2).

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Table 2. Recorded wild food and medicinal plant taxa in Maierà (M), Nardodipace (N), Papisidero (P), Serra San Bruno (S) Nr cit =Number of citations

Botanical taxon / Family / Voucher #	Site	Local name	Part(s) used	Nr cit	Food use	Nr cit	Medicinal use	Nr cit
<i>Allium ampeloprasum</i> L. and possibly other <i>Allium</i> spp. Amaryllidaceae	N	Agghiu servaggio	Bulb and Aerial parts	2	Seasoning	2		
<i>Apium graveolens</i> L. Apiaceae UNISGCAL054	N	Accia, Accio	Aerial parts and Roots	5	Seasoning	2	Boiled with lemon for abdominal pain; for burns	3
<i>Arbutus unedo</i> L. Ericaceae UNISGCAL016	M	Arrobete	Fruits	5	Raw; Ice cream; snow cones; Jam	5		
	N	Cacummaro	Fruits	4	Raw as a snack	4		
	P	Arrobete	Fruits	1	Liquor	1		
<i>Asparagus acutifolius</i> L. Asparagaceae UNISGCAL014	M	Asparago	Stems	6	To prepare omelets	6		
	N	Aspargi di spine	Stems	9	Cooked with eggs or in omelets; Cooked in pasta, a fritelle; preserved with vinegar	9		
	P	Asparago	Stems	7	Boiled and the fried or cooked with pasta	7		
	S	Aspargi di spine	Stems	9	Cooked with eggs or in omelets; Boiled and then in salads	9		
<i>Atropa belladonna</i> L.* Solanaceae	M	Belladonna	Leaves	1			For children to fall asleep*	1
<i>Beta vulgaris</i> L. Amaranthaceae UNISGCAL020	N	Secara, Secria	Aerial parts	1	Boiled	1		
	S	Secara, Secria	Aerial parts	3	Boiled	3		
<i>Borago officinalis</i> L. Boraginaceae UNISGCAL006	M	Vurraina	Aerial parts	7	Ravioli filling; Boiled in soup; Cooked with bell peppers; Flowers in salads	7		
	N	Vurraina	Aerial parts	3	Boiled and stir fried; a fritelle	3		
	P	Vurraina	Aerial parts	6	Filling for ravioli; To make green tagliatelle	3	Infusion for sore throat; Mixed decoction for sore throat and flu	3
	S	Vurraina	Aerial parts	8	Cooked in risotto or pasta; Boiled; Omelets; Cooked with sanguinaccio, Boiled and stir-fried	8		
<i>Brassica fruticulosa</i> Cirillo subsp. <i>fruticulosa</i> Brassicaceae UNISGCAL055	N	Cavolo servaggio, Rapa servaggia	Leaves	6	Boiled and stir fried	6		

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<i>Capparis spinosa</i> L. Capparaceae	M	Cappero	Fruits	1	Seasoning	1		
<i>Carduus pycnocephalus</i> L., <i>Cynara cardunculus</i> L. and possibly other <i>Carduus</i> spp. Asteraceae UNISGCAL060	M	Cardo fucsia	Roots	1	Boiled in salads	1		
	N	Carduni, Cardunari	Stems	3	Raw as a snack	3		
	S	Carduni, Cardunari	Buds and Stems	4	Preserved with vinegar or olive oil (buds); raw as a snack (stems)	4		
<i>Carlina acanthifolia</i> subsp. utzka (Hacq.) Meusel & Kästner Asteraceae	S	Carrozzelle	Tubers	2	Raw as a snack	2		
<i>Castanea sativa</i> L. Fagaceae	M	Castagna	Fruits	5	To prepare desserts; Liquor	5		
	N	Castagna	Fruits	13	Boiled; Roasted; Baked; Bread; Cooked in the ash	13		
	P	Castagna	Fruits	7	Cooked; Cooked and mashed in desserts e.g. castagnaccio	7		
	S	Castagna	Fruits	11	Boiled; Roasted; Bread; Dessert; Baked	11		
<i>Chelidonium majus</i> L. Ranunculaceae	S	No name	Latex	3			To treat (foot) warts	3
<i>Cichorium intybus</i> L. Asteraceae UNISGCAL008	M	Cicoria	Shoots	11	Boiled with garlic, olive oil and salt; Boiled in soup; Prepared with beans	11		
	N	Latariedi	Leaves	4	Mixed soup; Boiled and then stir-fried	4		
	P	Cicoria	Shoots	7	Boiled with garlic, olive oil and salt; Boiled with beans	7		
<i>Clematis vitalba</i> L. Ranunculaceae UNISGCAL011	M	Vingiarra	Buds and Roots	4	Boiled in omelets; Raw in salads	4		
	N	Ligunin(a), Liguniza, Ligunarari, Ligunaradi	Shoots	15	Omelets; A frittelle; Boiled and stir-fried; Boiled and then in salads	15		
	P	Vingiarra	Buds and Roots	4	Cooked in salads	3	Root infusion for toothache	1
	S	Ligunin(a), Liguniza, Ligunarari, Ligunaradi	Shoots	6	Omelets; Cooked in pasta; Boiled and then in salads	5	Leaves chewed with olive oil and then applied on the wounds	1
<i>Clinopodium nepeta</i> (L.) Kuntze Lamiaceae UNISGCAL028	M	Anipeta	Aerial parts	5	Seasoning (artichokes)	4	Bee stings	1
	N	Niepeta	Aerial parts	9			Infusion for abdominal pain; For flu; Bee stings	9
	P	Anipeta	Aerial parts	1			Decoction for toothache	1

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<i>Corylus avellana</i> L. Betulaceae UNISGCAL023	N	Nucilli	Fruits	4	Raw; Nutella	4		
	P	Nocciola	Fruits	3	Raw	3		
	S	Nucilli	Fruits	7	Raw	7		
<i>Crataegus monogyna</i> Jacq. Rosaceae UNISGCAL027	S	Biancospino	Flowers	3			Infusion as tranquilizer; As expectorant	3
<i>Crepis biennis</i> Lapeyr. Asteraceae	N	Pelusielli, Pilusiedi	Aerial parts	6	Boiled and stir fried	6	On wounds as a plaster	1
<i>Crocus vernus</i> (L.) Hill* Iridaceae	P	Zaferan	Flowers	1			It was used with rosemary and thyme for inhalation. Then it was also drunken.	1
<i>Cynodon dactylon</i> (L.) Pers. Poaceae UNISGCAL034	M	Gramigna	Roots	3			Mixed decoction for bronchitis and sore throat; Infusion of roots for renal colic; Good for kidneys	3
	N	Gramigna	Roots	4			Infusion for cough; For rheumatism	4
<i>Eruca vesicaria</i> (L.) Cav. Brassicaceae	M	Rucola selvatica	Leaves	1	Raw in salad	1		
<i>Eucalyptus</i> spp. Myrtaceae	P	Iucalipto	Leaves	1			Cough syrup	1
<i>Fagus sylvatica</i> L. Fagaceae	S		Fruit	2			"To feel drunken" ("t'imbriaica")	2
<i>Ficus carica</i> L. Moraceae	M	Fico	Fruits: Latex	14	Dried; To make "honey" (fig syrup); Prepared with nuts (skin of citrus fruits- cedar fruit-, and <i>Laurus</i>); Jam	14	Mixed decoction for bronchitis and flu; Latex to help cicatrisation; Mixed decoction for sore throat and cough; Mixed decoction for flu; Mixed decoction for breathing; Infusion of dried figs as panacea	5
	N	Fichi	Fruits	14	Jam; Raw; Dried	14	Infusion for sore throat and cough	1
	P	Fico	Fruits; Latex	8	Dried; Prepared with nuts (skin of citrus fruits- cedar fruit-, <i>Laurus</i> and liquors)	8	Infusion for flu; Mixed decoction for abdominal pain; Decoction for bronchitis; Mixed decoction for sore throat and flu; Decoction of mandarin peel and dried fig for cough	4

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	S	Fichi	Fruits	5	Raw	3	Infusion with wine for flu; Decoction as panacea with chamomile and mallow	3
<i>Foeniculum vulgare</i> Mill. Apiaceae UNISGCAL026	M	Finocchio	Aerial parts and Seeds	9	Seasoning (olives, eggplant; taralli; sausages);Liquor	9	Infusions for digestion	2
	N	Anieddu, Finocc	Seeds and Aerial parts	13	Raw in salads; Boiled ("Tuber"); Seasoning; Liquor; Mixed soups; Cooked with pasta, Boiled and stir-fried; Boiled	13	Infusion for abdominal pain	3
	P	Finocchio	Aerial parts, Seeds and Roots*	11	Fresh for seasoning (especially olives); dry for sausages; dry to make broth; to cook pasta with fava beans; Syrup from roots*	11	Infusions for digesting; Infusions for rheumatisms; Mixed decoction for sore throat and flu	4
<i>Fragaria vesca</i> L. Rosaceae UNISGCAL052	M	Fragoline	Fruits	8	Raw; Liquor	8		
	N	Fragoline	Fruits	9	Liquor; Jam; Raw	9		
	P	Fragoline	Fruits	5	Liquor, Raw, Preserved with alcohol	5		
	S	Fragoline	Fruits	8	Liquor; Jam; Raw; Preserved in alcohol	8		
<i>Fragaria viridis</i> Weston Rosaceae		Fragole verdi	Fruits	2			Infusion for fever and flu in children	2
<i>Glycyrrhiza glabra</i> L.* Leguminosae UNISGCAL035	P	Liquirizia	Roots	1	Raw	1		
<i>Hypericum perforatum</i> L. Hypericaceae UNISGCAL056	N	Fiore di Sant'Antonio	Aerial parts	6			Preserved in olive oil for arthrosis and skin (especially burns)	6
<i>Hypochoeris</i> spp. Asteraceae UNISGCAL057	N	Viediruni; Vierirune; Asparago selvatico; Spiche di cuostole; Cime di cuostole (stems); Cuostole (leaves)	Stems and leaves	11	Boiled and then in salads (stems); Boiled and stir-fried; Soup (leaves)	11		
	S	Viediruni; Vierirune; Asparago	Stems	14	Boiled and then in salads; a frittelle; cooked with pasta;	14		

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		selvatico; Spiche di cuostole; Cime di cuostole (stems); cuostole (leaves)			omelets (stems); cooked with pasta (leaves)			
<i>Humulus lupulus</i> L. Cannabaceae	S	Luppari	Shoots	5	Boiled and in omelets	5		
<i>Juglans regia</i> L. Juglandaceae	M	Noce	Fruits	6	Raw; Prepared with figs; Jam; Liquor	6		
	N	Noce	Fruits	12	Raw; Filling for fried figs; Liquor; Dessert	12		
	P	Noce	Fruits	6	Raw; To make desserts; To prepare dry figs; Liquor	6		
	S	Noce	Fruits	10	Raw; Liquor; Dessert; Pizza garniture	10		
<i>Lactuca serriola</i> L. Asteraceae	M	Scarola	Leaves	1	Boiled in salads	1		
	P	Scarola	Leaves	1	To make green tagliatelle	1		
<i>Laurus nobilis</i> L. Lauraceae UNISGCAL038	M	Lauro	Leaves	9	Seasoning (baccalà; chili peppers; figs); Liquor; To cook pork's liver;	7	Infusion for helping digestion; Mixed decoction for sore throat and cough; Mixed decoction for relaxing and minor medical disorders	2
	N	Afra	Leaves	12	Seasoning (jellied pork)	9	Infusion for abdominal pain; For stomach pain	5
	P	Lauro	Leaves	5	Seasoning (jellied pork); To prepare " Fegato alla veneziana"	4	Mixed decoction for sore throat and flu	1
	S	Afra	Leaves	13	Seasoning (jellied pork); Omelets	8	Infusion for abdominal pain; toothache; For flu	10
<i>Leopoldia comosa</i> (L.) Parl. Asparagaceae	M	Cipollozzi	Bulbs	7	Roasted in the ash; Cooked with vinegar; Fried with sausage	7		
	N	Cipolline selvatiche	Bulbs	1	Preserved with vinegar	1		
	P	Cipollozzi	Bulbs	6	Cooked in omelets; preserved with olive oil	6		
	S	Cipolline selvatiche	Bulbs	5	Stir-fried; Preserved with vinegar or olive oil	5		

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<i>Malus sylvestris</i> Mill. Rosaceae	M	Mele selvagge	Fruits	5			Mixed decoction for relaxing and minor medical disorders; Mixed decoction for sore throat and cough; Decoction of mallow fresh leaves and dried apples for cough	5
	N	Meli	Fruits	3	Jam	2	Infusion for sore throat	1
	P	Mele selvagge	Fruits	4	Fresh, Jam	4		
	S	Meli	Fruits	4	Jam; Liquor	4		
<i>Malva sylvestris</i> L. Malvaceae UNISGCAL040	M	Malva	Aerial parts and Roots	10			For healthy infusions; Mixed decoction for bronchitis and sore throat; Mixed decoction for flu; Mixed decoction for minor medical disorders; Mixed decoction for for improving breathing; Boiled leaves for wounds; Decoction of mallow fresh leaves with dried apples for cough	10
	N	Marva, Milieji	Fresh or dried aerial parts and Roots	3			Infusion for sore throat	3
	P	Magola	Aerial part and Roots	9			Mixed decoction for abdominal pain; Roots' infusion for sore throat; Mixed decoction for sore throat and flu; Infusion with honey for bronchitis and sore throat; Infusion of dried roots for flu; Healthy infusion with dried figs and wine	9
	S	Marva	Fresh or dried aerial parts and Roots	8			Decoction as panacea; Infusion for abdominal pain; for chest; as tranquilizer; for flu	8
<i>Matricaria chamomilla</i> L. Asteraceae UNISGCAL043	M	Camomilla	Aerial parts	12			Infusions for abdominal pain; Infusion for bronchitis; Mixed decoction for improving breathing; Mixed decoction for	12

							bronchitis and flu; Chamomile water good for eyes	
	N	Cacomira	Aerial parts	9			Infusion as mild tranquilizer; as sleep-inducing; for flu; for abdominal pain; Fomentation for eyes	9
	P	Campomilla	Aerial parts	9			Infusion as tranquilizer; Mixed decoction for abdominal pain; For cataract and other eye-related medical disorder; Mixed decoction for sore throat and flu	9
	S	Cacomira	Aerial parts	12			Infusion as mild tranquilizer; for pains of pregnancy; as sleep-inducing; for toothache; for eyes; for sore throat; for abdominal pain	12
<i>Mentha</i> spp. Including <i>Mentha arvensis</i> L. Lamiaceae UNISGCAL046	M	Menta	Leaves	2	To prepare eggplant "alla scapece"; Liquor	2		
	N	Menta	Leaves	5	Seasoning	3	To be put under armpit to stop breastfeeding*; Infusion for abdominal pain	3
	P	Menta	Leaves	7	To cook eggplant and zucchini and green beans; To season potatoes	6	"It refreshes the intestine"	1
	S	Menta	Leaves	7	Seasoning; Liquor	3	Infusion for abdominal pain; Poultice for epistaxis	4
<i>Mespilus germanica</i> L. Rosaceae	N	Nespola	Fruits	2	Raw	2		
<i>Morus alba</i> L. Moraceae	N	Amure di cierzio ianca	Fruits	5	Raw; Liquor	5		
<i>Morus nigra</i> L. Moraceae	M	Cersi	Fruits	1	Raw	1		
	N	Amure di cierzio	Fruits	6	Raw; Liquor	6		
	P	Cersi	Fruits	2	Raw	2	For flank pain*; Raw is good for heart	2
	S	Amure di cierzio	Fruits	1	Jam	1		

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<i>Myrtus communis</i> L. Myrtaceae	M	Mirtiddu	Fruits	8	Jam; Liquor; Preserved in alcohol	8		
	N	Mirtillo	Fruits	2	Liquor	2		
	P	Mirtiddu	Fruits	6	Jam, Liquor	2	Syrup for urinary bladder as anti-inflammatory	1
<i>Nasturtium officinale</i> R.Br. Brassicaceae UNISGCAL048	M	Crescione	Aerial parts	3	Stir fried; Pancakes	3		
	N	Crisciò, Schiafuni, Sgiafuni	Aerial parts	4	Raw in salads	4		
	S	Crisciò, Schiafuni, Sgiafuni	Aerial parts	4	Boiled	2	Good for kidneys; good for prostate	3
<i>Olea europaea</i> L. Oleaceae	P	Olivo	Leaves	2	Seasoning (e.g. goat)	1	Infusion for controlling high blood pressure	1
<i>Opuntia ficus-indica</i> (L.) Mill. Cactaceae	N	Fichilindi	Leaves	8	Sundried; Raw; Baked	8		
	S	Fichilindi	Leaves	3	Raw	3		
<i>Origanum vulgare</i> L. Lamiaceae UNISGCAL053	M	Arregano	Aerial parts	5	Seasoning	5		
	N	Arigano	Aerial parts	10	Seasoning	10		
	P	Arregano	Aerial parts	7	Seasoning	7		
<i>Origanum majorana</i> L. Lamiaceae	M	Maggiorana	Leaves	1	Seasoning	1		
<i>Papaver somniferum</i> L.* Papaveraceae	M	Papagna	Pistil	2			For children to fall asleep*	2
	S	Papavero	Pistil	3			Sleep inducing*	3
<i>Parietaria officinalis</i> L. Urticaceae UNISGCAL017	N	Erba di muro; Erba du vient	Aerial parts	5			Infusion for cough; Fomentation to treat respiratory ways	5
	S	Erba di muro; Erba du vient	Aerial parts	4			Poultice for warts; Infusion for personal cleaning; For abdominal pain	4
<i>Pimpinella anisoides</i> V.Brig Apiaceae UNISGCAL058	N	Ciminu	Seeds	2	Seasoning for biscuits; Liquor	2		
<i>Pinus pinea</i> L. Pinaceae	N	Pinolo	Fruits	2	Raw	2		
<i>Plantago lanceolata</i> L. Plantaginaceae UNISGCAL009	S	Rapuzzella	Leaves	1			To treat skin to prevent infections	1
<i>Portulaca oleracea</i> L. Portulacaceae UNISGCAL012	M	Andracchia	Aerial parts	4	Raw in salad	4		
<i>Prunus cerasus</i> L. Rosaceae	M	Amarena selvatica	Fruits	2	Jam	2		

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	N	Amarene, Ciliegie	Fruits	4	Jam; Raw	4		
	S	Amarene, Ciliegie	Fruits	3	Jam; Preserved with sugar	3		
<i>Prunus domestica</i> L. Rosaceae	M	Prugni	Fruits	2	Jam; Raw	2		
	N	Prugni, Pruna	Fruits	7	Jam; Raw	7		
	P	Prugne "peroni"; "vilici"; "agostarico"; "di ottobre"	Fruits	3	Raw; Jam	3	Good for intestine	1
<i>Pyrus piraster</i> Burgsd. Rosaceae	M	Peri	Fruits	6	Raw	5	Mixed decoction for relaxing and minor medical disorders; Mixed decoction for sore throat and cough; Mixed decoction for flu	3
	N	Peri	Fruits	2	Jam	2		
	P	Peri var."Proini"	Fruits	3	Fresh	3		
<i>Quercus pubescens</i> Willd* and possibly other <i>Quercus</i> spp. Fagaceae	N	Ghianda	Fruits	3	Coffee*; Bread*	3		
<i>Robinia pseudoacacia</i> L. Leguminosae	S	Robino	Dried Flowers	1			For abdominal pain	1
<i>Rosmarinus officinalis</i> L. Lamiaceae UNISGCAL021	M	Rosemarino	Aerial part	4	Seasoning	4		
	N	Rosamarina	Aerial part	4	Seasoning	4		
	P	Rosemarino	Aerial part	6	Seasoning	6		
	S	Rosamarina	Aerial part	8	Seasoning	8		
<i>Rubus idaeus</i> L. Rosaceae UNISGCALG059	S	Formosa	Fruits	3	Raw; Preserved in alcohol	3		
<i>Rubus ulmifolius</i> Schott Rosaceae UNISGCAL029	M	Muri	Fruits	6	Raw, Jam	6		
	N	Amure di ruviettu, Muori di ruvattari	Fruits, Shoots and Leaves	13	Jam; Liquor; Raw; Dessert; (fruits) A frittelle (shoots)	13	Locally applied for wounds; Boiled for menstruation pain (leaves)	4
	P	Muri	Fruits	6	Jam, Liquor; Raw (with sugar)	6		
	S	Amure di ruviettu, Muori di ruvattari	Fruits and Shoots	13	Jam; Liquor; Preserved in alcohol; Raw (fruits)	13	Infusion for sore throat; for stomach pain; mouthwash (shoots)	4
<i>Ruscus aculeatus</i> L. Asparagaceae UNISGCAL033	N	Pungitopo	Stems	6	Boiled; Preserved with vinegar; A frittelle; Cooked with pasta	6		

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	S	Pungitopo	Stems	5	Boiled	5		
<i>Ruta graveolens</i> L. Rutaceae	S	Ruta	Leaves	2			Infusion as panacea	2
<i>Salvia officinalis</i> L. Lamiaceae UNISGCAL037	M	Salvia	Leaves	5	Seasoning (e.g. Chicken)	5	Infusion for headache	1
	N	Salvia	Leaves	7	Seasoning	2	Infusion for sore throat; for abdominal pain; for stomach pain	5
	P	Salvia	Leaves	5	Seasoning	5		
	S	Salvia	Leaves	6	Seasoning	6		
<i>Sambucus nigra</i> L. Adoxaceae	M	Sambuco	Flowers	3	To season taralli; To make "pancakes"; Liquor	3		
	N	Pepe di maio, Sambuco	Flowers	11	Dried and then as a seasoning to make pittachina; Seasoning; To prepare bread (seeds)	11	Infusion locally applied for eyes	2
	P	Sambuco	Flowers	3	Fried flower	3		
	S	Pepe di maio, Sambuco	Flowers and Fruits	13	Dried and then as a seasoning to make pittachina; Seasoning (flowers); Jam (berries)	13	Infusion to treat cough (berries)	2
<i>Sinapis arvensis</i> L. Brassicaceae UNISGCAL041	M	Senape selvatica	Young Leaves	1	Boiled	1		
<i>Sinapis pubescens</i> L. Brassicaceae UNISGCAL062	S	Razza, Vruocollo di razza	Aerial parts	11	Cooked in risotto or pasta; stir Fried	11		
<i>Silybum marianum</i> (L.) Gaertn.* Asteraceae	P	Cardo mariano	Stem and Roots*	4	Boiled (stem)	3	Syrup for cough (roots)*	1
<i>Spartium junceum</i> L. Leguminosae	P	Sparto	Roots*	1			Healthy infusion*	1
<i>Sorbus domestica</i> L. Rosaceae	M	Sorbo	Fruits	2	Raw	2		
	N	Zorbu	Fruits	2	Raw	2		
<i>Taraxacum campylodes</i> G.E.Haglund Asteraceae UNISGCAL042	M	Cicoria	Leaves	1	Boiled	1		
	N	Cicoria matta; Cicoria, Latariedi	Aerial parts	9	Mixed soup; Boiled and then stir-fried; Boiled and then in salads; Raw in salads	9		
	P	Cicoria	Leaves	3	Boiled then in salads, Omelets	3		
	S	Cicoria matta; Cicoria, Latariedi	Aerial part	14	Mixed soup; Boiled and then stir-fried; Boiled and then in salads; Raw in salads	14		
<i>Thymus</i> spp. Lamiaceae	M	Timo	Aerial part	2	Seasoning	2		
	P	Timo	Aerial part	2	Seasoning	1	With rosemary and <i>Crocus vernus</i> for inhalation. Then it was also drunken*	1

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	S	Timo	Aerial part	3	Seasoning	3		
<i>Tilia cordata</i> Mill. Malvaceae	N	Tiglio	Dried flowers	4			Infusion as a tranquilizer	4
	S	Tiglio	Dried flowers	7			Infusion as a tranquilizer ; for flu; as expectorant; Poultice for personal cleaning	7
<i>Trifolium pratense</i> L. Leguminosae UNISGCAL061	N	Suria	Flowers	2	Sucked as a snack	2		
<i>Urtica dioica</i> L. Urticaceae UNISGCAL050	M	Ardica	Leaves	1	Ravioli filling	1		
	N	Ordica, Ardica, Artichi	Aerial part	7	Cooked in risotto or pasta; Boiled and then in salads; A frittelle; Cooked in polenta	6	Poultice locally applied for facial paralysis	2
	P	Ardica	Stem; Leaves	6	Filling for ravioli; Stem boiled then in salads; To make green gnocchi	4	Locally applied for shoulder pain. To be used three times every seven days.	1
	S	Ordica, Ardica, Artichi	Aerial part and roots	14	Quiche; Cooked in risotto or pasta; Boiled and then in salads; Gnocchi; Soup; A frittelle (aerial parts)	14	Poultice for washing hair (aerial parts); Infusion for abdominal pain (roots)	4
<i>Viola odorata</i> L. Violaceae	M	Viola mammola	Flowers	1	Raw in salad	1		
<i>Ziziphus jujuba</i> Mill. Rhamnaceae	M	Giuggiola	Fruit	3	Raw	3	Mixed decoction for sore throat and cough; Mixed decoction for relaxing and minor medical disorders; Mixed decoction for improving breathing	3
	N	Zunzuru	(Dried) Fruits	4	Raw	4		

Around 25% of the taxa (n=19) are common to all sites, while around 44% of taxa were recorded in only a single municipality. In the Northern Tyrrhenian sites, 51 taxa were mentioned (44 in Maierà and 37 in Papasidero, 30 were common to both). In the Serre Calabresi sites, we recorded 65 taxa (53 in Nardodipace, 41 in Serra San Bruno, 29 common to both). Most reported botanical families include Rosaceae (11 taxa), Asteraceae (9 taxa), and Lamiaceae (6 taxa). Some plants are very common and versatile as in the case of *Ficus carica* and *Laurus nobilis* which are used in all the sites for both food and medicinal purposes. *Mentha* spp., *Urtica dioica* and *Foeniculum vulgare* are also used as both food and medicine in three sites.

In total we recorded 20 taxa which are used for both food and medicinal preparations. Such versatile plants were mainly mentioned in Papasidero (9 taxa) and Nardodipace (8 taxa). As for medicinal taxa, the most important are *Malva* and *Matricaria* which were widely used in all the studied communities. The Venn diagram illustrates that 19 taxa are common to all the sites, while 9 are common to all except Serra San Bruno, and 6 taxa were reported only in Nardodipace and Serra San Bruno. Twenty taxa are common to the six municipalities including *Asparagus*, *Borago officinalis*, *Sambucus nigra* and *Urtica dioica*, which are very common wild species in several areas of Italy (Ghirardini *et al.* 2007).

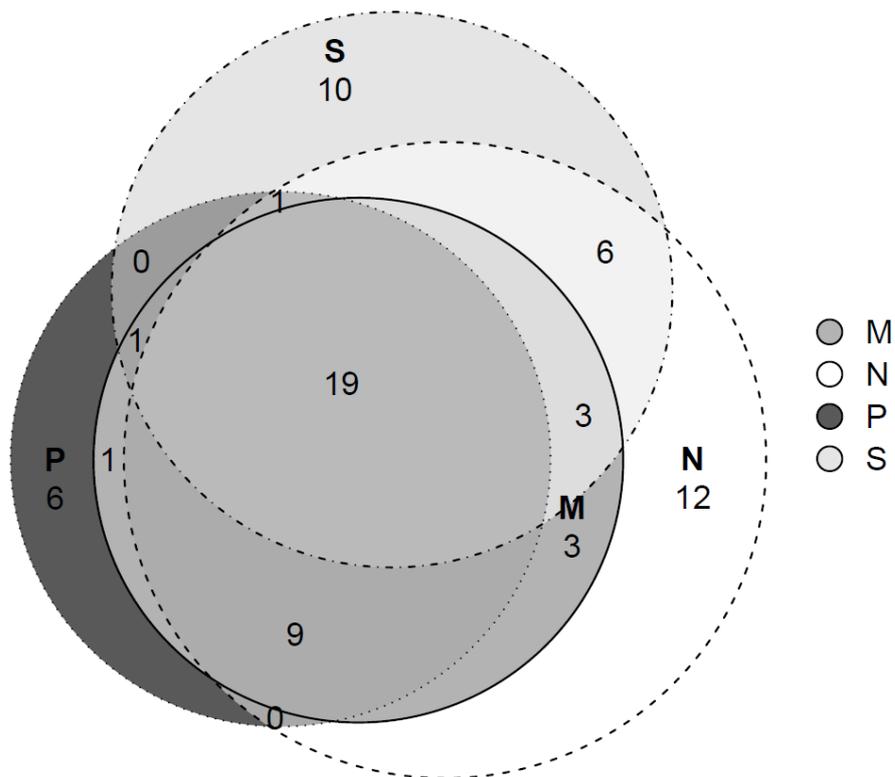


Figure 1. Venn diagram of mentioned wild food and medicinal plant taxa the four study sites M= Maierà; N= Nardodipace; P=Papasidero; S=Serra San Bruno.

The decoctions of the Tyrrhenian sites

In the Northern Tyrrhenian sites we recorded nine recipes for decoctions to treat various symptoms. Such decoctions include between 2 and 6 wild and cultivated taxa. Indeed, different plant parts were used (peels, fruits, roots, aerial parts). The main ingredients especially included dried *Ficus carica* and *Malva* spp.; Table 3 lists the ingredients.

Most of the recipes (apart from 5 and 6) are meant to improve breathing and treat the respiratory system and in particular bronchitis, flu, cough, and sore throat. Recipe 5 is prepared for abdominal pain,

while recipe 6 is for relaxing and treating minor ailments. The composition of the recipe varies from family to family and sometimes also on the availability of ingredients. However, in the Northern Tyrrhenian climate, most of the listed ingredients are very common and available, dried or fresh, throughout the year. Several female interviewees, the ones who generally know such recipes, reported preparing such “*decottu*” in the night, leaving it outside the window, and drinking it the following morning after such preparations have received the “*sereno*” (dew). Such multi-ingredient recipes were not found in the Serre Calabresi area.

Table 3. Ingredients of decoctions recorded in Northern Tyrrhenian. Numbers from 1 to 9 refer to each mentioned recipe.

Recipe	1	2	3	4	5	6	7	8	9
<i>Borago officinalis</i> (aerial parts)	x								
<i>Citrus × limon</i> (peel)					x				
<i>Citrus reticulata</i> (peel)									x
<i>Citrus x sinensis</i> (peel)					x				
<i>Cynodon dactylon</i> (roots)		x							
<i>Ficus carica</i> (dried fruits)	x	x	x	x	x		x		x
<i>Foeniculum vulgare</i> (seeds)	x								
<i>Hordeum vulgare</i> (grain)		x		x	x				
<i>Laurus nobilis</i> (leaves)	x		x			x			
<i>Malus</i> spp. (fruits)			x			x		x	
<i>Malva</i> (roots or aerial parts)	x	x		x	x	x	x	x	
<i>Matricaria chamomilla</i> (dried flower)	x	x			x		x		
<i>Pyrus</i> spp. (fruits)			x	x		x			
<i>Ziziphus jujuba</i> (fruits)		x	x			x	x		

Ethnobotanical knowledge and practice in peripheral and ultra-peripheral contexts

Among the six municipalities included in the analysis of peripheral and ultra-peripheral areas, the lowest number of taxa was mentioned in Papisidero (ultra-peripheral), while the highest number of taxa was mentioned in Mottafollone (peripheral), as presented in Table 4. The highest percentage of food taxa was recorded in Serra San Bruno, while the lowest in Mottafollone. Indeed, the latter municipality has quite a high percentage of taxa used simultaneously for food and medicine, second only to Sant'Agata di Esaro, for which just 3% of taxa are only used medicinally. This may be due to the high number of pharmacies and para-pharmacies present in the municipality, which may have contributed to the erosion of the TEK related to only-medicinal taxa, while the use of some multifunctional species may

The highest number of taxa mentioned by at least three people was registered in Mottafollone and Nardodipace, which are respectively the “least” peripheral and the “most” ultra-peripheral. Nardodipace can be considered the most ultra-peripheral for several reasons including the fact that the municipality is the highest in Calabria (over 1000 m asl) and that inhabitants mentioned not trusting the closest hospital (Locri) and, when possible, travelling to Catanzaro for health issues (over 100 minutes of

tortuous (mountain) roads). Indeed, Nardodipace is highly isolated, and moreover its main center was relocated around 60 years ago, from 600 m asl to over 1000 m asl, due to a flood, which also contributed to such peripheralization. On the contrary, within our sample, Mottafollone was the closest municipality to a center, Cosenza, which offers all the necessary services. In these two contexts of Nardodipace and Mottafollone we recorded the highest number of taxa being very remotely located and not so isolated, respectively. The municipality of Nardodipace is characterized by extreme poverty and geographical isolation and this may have contributed to the persistence of TEK related to wild plants. Many publications (however none of them regarding Europe) agree with this correlation between remoteness and richness of wild plant foraging knowledge (Misra *et al.* 2008; De La Torre *et al.* 2012; Bonta *et al.* 2019), especially in the medicinal domain (Ballabh *et al.* 2017; Bhattarai *et al.* 2006; Sarri *et al.* 2015; Kumar *et al.* 2009; Amjad *et al.* 2017).

In the case of Mottafollone, the social-economic context is favored by its relative closeness to services which allows local inhabitants to make the most of their wild plant resources while being able to easily access other resources in the city. Indeed, in peripheral contexts, as in the case of Mottafollone,

the increasing importance of new culinary trends promoting healthy and “green” lifestyles (see Łuczaj et al. 2012; Łuczaj & Pieroni 2016) may have

contributed to the local corpus of ethnobotanical knowledge.

Table 4 Number of wild food and medicinal plant taxa reported per municipality. F= taxa used for food purposes only; FM= taxa used for both food and medicinal purposes; M= taxa used for medicinal purposes only

	Nr taxa	Nr Fam	Nr taxa*	Nr Ftaxa*	Nr FMtaxa*	Nr Mtaxa*	% Ftaxa*	% FMtaxa*	% Mtaxa*
Maierà (U)	44	21	27	16	7	4	59	26	15
Mottafollone (P)	58	28	42	19	18	5	45	43	12
Nardodipace (U)	53	26	42	24	11	7	57	26	17
Papasidero (U)	37	18	27	15	10	2	56	37	7
Sant'Agata d'Esaro (P)	43	22	36	19	16	1	53	44	3
Serra San Bruno (P)	41	23	35	22	8	5	63	23	14

* here are considered only taxa mentioned by at least three interviewees. Ftaxa= Food taxa; FMtaxa=Food and Medicinal taxa (simultaneously); Mtaxa= Medicinal taxa (U) = Ultra-peripheral (P) = Peripheral

The municipalities located in between (Serra San Bruno, Maierà, Papasidero, Santa Caterina di Esaro) rely on wild plant resources to a lesser extent for several reasons, including remittance economics and the easy access to seasonal tourism jobs on the coast (Papasidero, Maierà), as well as the taboo of wild plant gathering as it is a sign of poverty. This phenomenon has been recorded in other Mediterranean countries as there is a tendency to consider wild plant foraging as a symbol of backwardness and lack of resources (González Turmo 1997; Barão & Soveral, 2010).

SNS and TEK: The case of the Certosa of Serra San Bruno

We assessed the richness of TEK in municipalities close to (Serra San Bruno) and distant from (Nardodipace) the selected SNS of the Certosa of Serra San Bruno. We found a lower number of ethnobotanical taxa in proximity to the SNS, as we found 41 taxa in Serra San Bruno and 53 in Nardodipace. This result is in line with the findings of a previous study we carried out in Tuscany (Mattalia et al. 2019a) in which we found that SNSs inhabited for centuries may have a negative effect on local TEK due to their contribution to health and food security. However, when observing the data from a qualitative perspective we found that, surprisingly, Serra San Bruno does not share many important taxa characteristic of Calabrian ethnobotany, such as *Foeniculum vulgare*, *Arbutus unedo*, *Cichorium intybus*, *Clinopodium nepeta*, and *Myrtus officinalis*. At the same time, it presents some very uncommon uses such as dried flowers of *Sambucus nigra* as a seasoning in a special dish called “*la pitta china cullu pipi di maju*”, which is a kind of focaccia, filled with fresh ricotta, dried elderberry flowers, and bacon. We

argue that such a difference cannot be due only to geographical position, but also to the peculiar character of this municipality whose life has been heavily influenced by the presence of such an important SNS such as the Certosa di Serra San Bruno over nine centuries. Indeed, the ethnobotanical knowledge of the religious community which has been inhabiting this site, nearly uninterruptedly for many centuries, may have created a “glocal” ethnobotany when merging with the local TEK (as in the case of Piedmontese Waldensians described by Bellia & Pieroni 2015). For instance, the founder himself, Saint Bruno was born in Germany and lived a long time in France, and thus he, as well as other members of this religious community, may have introduced, over the course of nine centuries, some ethnobotanical knowledge from other (more Northern) European contexts. The exchanges with other monastic communities, especially with the ones in France, are well documented and lasted centuries (Gritella 1991). However, we also must acknowledge that French domination in Calabria may have had a role in shaping such glocal ethnobotany. Indeed, the domination contaminated the local dialect, originating phytonyms such as “*formosa*” (*Rubus idaeus*) from French *framboise* (while in Italian would be *lampone*). However, the fact that some very peculiar uses were recorded only in Serra San Bruno and not in other areas also dominated by French argues for the stronger influence of the international monastic community.

In addition, the Certosa, located a few hundred meters away from the town center, has probably contributed to the persistence of old trees around the main religious buildings, thus promoting biodiversity

as is the case with other SNSs (Frascaroli *et al.* 2016). Finally, this SNS is not only a tourist destination (and therefore an economic resource for the area) but also an important social space for meeting, walking, and enjoying the cool shade on hot summer days.

Conclusions

Our study reveals that in Calabria ethnobotanical TEK is better preserved when it can contribute to household food security, in contexts of remoteness and extremely poor economic conditions (Nardodipace), or when relative well-being allows local inhabitants to spend time foraging as an integrative and recreational activity (Mottafollone). In other peripheral or ultra-peripheral areas which are not as remotely located nor affluent, ethnobotanical practices may be considered as taboo- a practice that disadvantaged inhabitants perform due to their lack of (economic) resources.

Regarding the correlation between the SNS of the Certosa di Serra San Bruno and the richness of TEK in close and distant sites, we found some uncommon ethnobotanical uses. These uncommon uses may suggest that the religious community which has been inhabiting this site, almost uninterruptedly for many centuries, may have contributed to the creation of a “glocal” ethnobotany by introducing knowledge from other (more Northern) European contexts.

In conclusion, the “National Strategy for Inner Areas” should target the rich ethnobotanical TK still present in Calabrian, promoting small-scale business and tourism based on such intangible heritage as it may represent a powerful tool for achieving sustainable development of peripheral and ultra-peripheral areas.

Declarations

List of abbreviations: SNS= Sacred Natural Sites; TEK= Traditional Ecological Knowledge

Ethics approval and consent to participate: Ethical approval granted by the University of Gastronomic Sciences ethics committee. All participants provided oral prior informed consent

Consent for publication : Not applicable

Availability of data and materials : The data was not deposited in public repositories. All data are published in the manuscript.

Competing interests: The authors declare that they have no competing interests

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