Scientific Publications

Research Journal of Ecology and Environmental Sciences, 2025, 5, 1111
www.scipublications.org/journal/index.php/rjees
DOI: 10.31586/rjees.2025.1111

Review Article

A review of *Opuntia ficus-indica* (L.) Mill. ethnobotany in Italy and North Africa

Miriam Patti [1], Meriem Miyassa Aci [1], Maria Rosaria Tassone [2], Carmelo Maria Musarella [1*]

[1] AGRARIA Department, Mediterranean University of Reggio Calabria, Loc. Feo di Vito snc, 89122 Reggio Calabria, Italy

[2] CREA, Council for Agricultural and Economics Research, Research Centre for Genomics and Bioinformatics, Montanaso Lombardo, Italy

*Correspondence: Carmelo Maria Musarella (carmelo.musarella@unirc.it)

Abstract: *Opuntia ficus-indica* (L.) Mill., commonly known as prickly pear, is a versatile plant widely used for food, medicinal, and cosmetic purposes in various regions of the Mediterranean and North Africa. This study provides a comparative ethnobotanical review of prickly pear uses in Algeria, Morocco, Tunisia, and Italy. In total, 74 articles were selected from ethnobotanical uses in Italy, Algeria, Morocco and Tunisia. In the Maghreb, the plant is used for fruit production and processed products, such as jams, oils, and flours, as well as for traditional medicinal purposes. In Algeria and Morocco, the fruits and cladodes are used to treat digestive disorders, diabetes, and skin diseases. In Tunisia, products derived from *O. ficus-indica* are also applied in the cosmetic industry and for erosion control. In Italy, particularly in Sicily and Calabria, the prickly pear is a vital resource, used for both food consumption and for medicinal purposes. The cladodes, rich in mucilage, are applied as topical remedies for skin problems, while the fruits are a key ingredient in the preparation of traditional desserts. Furthermore, *O. ficus-indica* has historically been used as forage and to produce natural dyes. Results indicate that the versatility of this species, combined with its ability to adapt to extreme climates, makes it a valuable resource for the development of new nutraceutical and cosmetic products. However, further scientific research is necessary to explore the bio-functional potential of this plant and to promote its broader and more sustainable use, especially in arid and semi-arid regions.

Keywords: Prickly Pear; Cactaceae; Food Uses; Natural Resources; Cosmetic Applications; Medicinal Uses; Traditional Knowledge; Mediterranean Ethnobotany

How to cite this paper:
Patti, M., Aci, M. M., Tassone, M. R., & Musarella, C. M. (2025). A review of Opuntia ficus-indica (L.) Mill. ethnobotany in Italy and North Africa. *Research Journal of Ecology and Environmental Sciences, 5*(1), 1111. Retrieved from https://www.scipublications.com/journal/index.php/rjees/article/view/1111

Academic Editor:
Antonio Jesus Mendoza-Fernandez

Received: August 21, 2024
Revised: December 11, 2024
Accepted: December 25, 2024
Published: January 2, 2025

1. Introduction

In the last few decades, there has been an increase in global awareness of human nutritional habits, with a significant interest in natural and healthier foods [1]. In addition to their nutritional value, plants and their components (stems, leaves, roots, flowers, and fruits) are also being investigated for their potential beneficial effects on human well-being. This is thought to be due to the presence of bioactive compounds [2,3].

The cactus *Opuntia ficus-indica* (L.) Mill., commonly referred to as prickly pear, cactus pear, or Indian fig tree, represents the most economically significant cactus crop [4]. The plant is cultivated primarily for its highly nutritious fruits, which are commonly referred to as *"tunas"* [5]. *Opuntia ficus-indica* is the most widespread within the Cactaceae family. The species demonstrates a high degree of adaptability to diverse climatic conditions. Its principal cultivation regions encompass the Mediterranean Basin, with a particular concentration in North Africa and Italy [7].

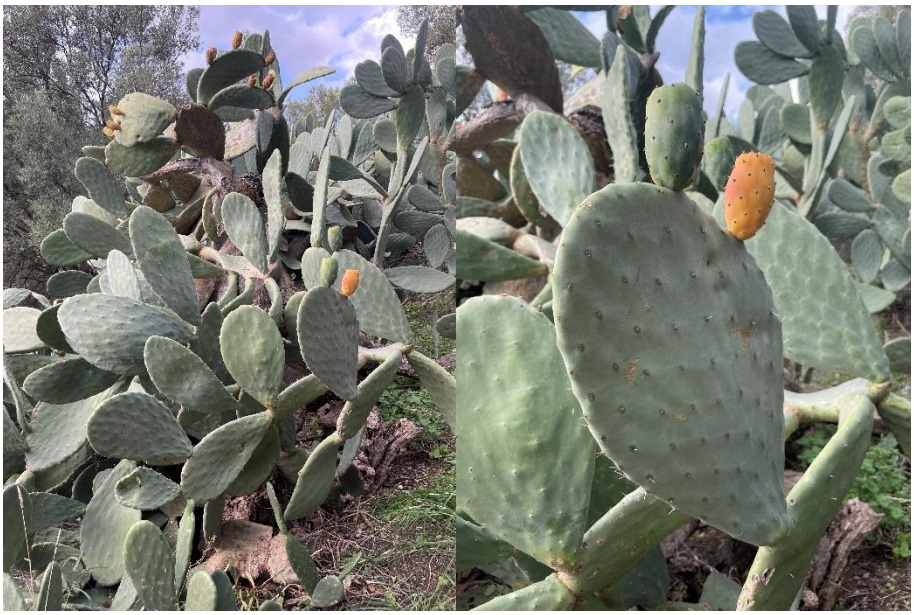
The species is distinguished by an aerial structure comprising cladodes, or paddles (Figure 1a), which serve to support the plant and store water. Additionally, they are a rich source of bioactive compounds with health-promoting properties, as evidenced by previous studies [8,9].

From an environmental point of view, cactus cladodes are an effective tool in the fight against desertification, erosion and soil problems [10-12]. The plant parts are fleshy, which enables them to tolerate prolonged drought conditions [13,14]. Additionally, the plant produces fleshy spinescent fruits, commonly known as cactus pear or prickly pear fruits (PPFs) (Figure 1b), which are typically consumed as fresh seasonal fruit [15].

Cacti employ a distinctive metabolic pathway, known as Crassulacean Acid Metabolism (CAM), to fix carbon dioxide. This process enables them to achieve a conversion efficiency of four to five times greater than that observed in C-4 plants [16]. Of note is the crop species *O. ficus-indica*, which plays a significant role in modern ethnobotanical culture [6].

In recent years, the cladodes of *O. ficus-indica* have garnered increasing attention for their ecological, environmental, and socio-economic benefits. Due to their rich composition, including water (88-95%), proteins (4-10 g/100 g of dry matter), lipids (1-4 g/100 g of dry matter), carbohydrates (64-71 g/100 g of dry matter), and fibers (around 18 g/100 g of dry matter) [17], as well as minerals and vitamins [18], they are considered a promising raw material for animal feed. Additionally, they are used in the production of renewable fuels and chemicals for industrial, food, medical, and cosmetic applications [19,20].

The present study represents a comparative ethnobotanical review of the different uses of *O. ficus-indica* in the Maghreb (Algeria, Morocco, and Tunisia) and Italy.



(a) (**b**)

Figure 1. (a) Typical aerial structure of *Opuntia ficus-indica* (L.) Mill. (Cactaceae); (b) cladodes and fruits (Ph. Miriam Patti, 01/12/2022, Bova, Reggio Calabria, Italy).

2. Materials and Methods

To collate the data, a comprehensive literature review was conducted on the *O. ficus-indica* plant and its ethnobotanical applications across the primary online research platforms, namely Scopus and Google Scholar. The search was carried out by entering '*Opuntia ficus-indica*' AND 'ethnobotany' on the search platforms. All ethnobotanical

articles that included the use of *O. ficus-indica* were considered. The scientific articles and books available for consideration included those that documented traditional ethnobotanical uses of *O. ficus-indica*, encompassing all potential applications, including food, medicine, and agropastoral practices. For North Africa, 24 bibliographic sources were selected, while for Italy, 50 bibliographic sources were selected.

Once the bibliographic sources had been selected, data were gathered on the local dialect name, the type of use, the plant used and the method of utilization, where applicable.

3. *Opuntia ficus-indica* in North Africa (Algeria, Morocco and Tunisia)

A total of 24 articles talking about ethnobotanical uses on *O. ficus-indica* in Morocco, Tunisia and Algeria were selected. Historical records indicate that the cactus pear was introduced to North Africa by the Spanish during the 16th century [21]. The area assigned to this species is currently in continuous expansion in Algeria, Morocco, and Tunisia, with the total area exceeding 30,000, 120,000, and 600,000 hectares, respectively [22].

In northern Algeria, the entire plant is utilized as a fence around houses and towns, with the fruits produced by the same fence plants are destined for human consumption. In contrast, in the south, the cladodes are used to feed small animals [7].

In Morocco, a considerable proportion of the fruit is processed into a variety of products, including jam, vinegar, flour and seed oil. In Tunisia, the production of fruits of *O. ficus-indica* is more intensive than in other countries of the Maghreb. The processed products are employed in both the agri-food and cosmetic industries. Furthermore, the plants have been applied in the control of erosion [22].

3.1. Common names of Opuntia ficus-indica

The coexistence of both Arabian and Berber cultures in Maghreb countries leads to the diversification of local languages and dialects and, consequently, to the diversification of names given to different crops. *Opuntia ficus-indica* has different common names, even in the same country. In Algeria, a single name, *"El Hendi"*, was identified [23]. In Morocco, multiple local designations for *O. ficus-indica* have been documented, including Sabbar, Handiya, Karmouss n'sara [24], Nawwar and Al'Handiyya [25].

3.2. Type of uses of Opuntia ficus-indica

The fruits and other parts of this species have been employed in traditional medicine for a variety of purposes in numerous countries [26].

In Algeria, the fruit is used raw or in decoctions for the treatment of digestive disorders and is held in high regard for its anti-diarrheal effect [23,27,28]. Additionally, it is employed in the manufacture of hair care products [23,29].

In a previous study, Sarri et al. [23] demonstrated the antidiabetic effect of the flower. Other significant applications include the preparation of infusions and decoctions with *Opuntia* cladodes and flowers for the treatment of intestinal inflammation and cystitis [30-33].

Additionally, the mucilage present in the cladodes is employed as an ointment for the treatment of dermatological conditions [32].

In addition to the medicinal applications, no food-related uses were identified in this region. Table 1 presents a comprehensive overview of the various applications of *O. ficus-indica* in Algeria.

In Morocco, *O. ficus-indica* has a long history of use in traditional medicine. As documented by Bellakhdar et al. [33], the flowers are employed for their diuretic and antibiotic effects, and they are utilized in infusions to treat uterine, kidney, and bladder infections. The same applications were documented by Fatiha et al. [34], additionally confirmed the utilization of the entire plant in the treatment of genitourinary disorders.

In a further investigation, Merzouki et al. [25] identified additional effects, namely antidiarrheal and calefacient properties (a sensation of warmth). Furthermore, dried and ground flowers (flower powder) have been employed in the treatment of gastric discomfort [24,35-38]. The fruits and flowers have been taken in decoctions, powders, and infusions (for oral and external use), and have been reported to treat respiratory, skeletal, circulatory, and urinary problems [21,34,36,37]. In Morocco, *O. ficus-indica* has been employed in the treatment of diabetes mellitus [38-41]. As in Algeria, according to Lyoussi et al. [42], mucilage from the plant is rubbed on the skin to treat skin inflammation. However, there is less information on Tunisia than on other North African states. Nevertheless, some applications have been recorded regarding the use of decoctions with *O. ficus-indica* leaves to treat the kidneys and eliminate kidney stones [43-46].

Table 1. Ethnobotanical uses of *Opuntia ficus-indica* (L.) Mill. (Cactaceae) in Algeria.

Country	Common name	Purpose	Plant Part	Method of use	References
Algeria	El Hendi	Antidiarrheal	Fruits	Raw	Baziz (2021)
		Digestive disorders	Fruits	Raw	Bendif (2021)
		Digestive disorders Hair care	Fruits	Raw	Hamel et al. (2018)
		Digestive disorders Antidiarrheal Anti-Flu	Fruits	Raw	Mechaala et al. (2022)
		Dermatologic	Cladodes	Poultice	
		Hair care	Fruits	Raw	Miara et al. (2019)
		Antidiarrheal Antidiabetic	Fruits Flowers	Decoction Beverage	Sarri et al. (2015)
		Antidiarrheal	Fruits	Raw	Souilah et al. (2022)
		Urinary inflammations and cystitis	Cladodes Fruits	Infusion or beverage	Zatout et al. (2021)

In 2018, Mouhaddach et al. [47], conducted a more detailed study on the medicinal uses of different parts of the cactus, including cladodes, flowers, seeds, and roots. The cladodes have been demonstrated to possess analgesic and anticholesterolemic properties. They are cultivated through the process of drying and growing, and the resulting powder can be taken with water or milk to provide relief from a variety of aches and pains, including stomachaches, back pain, and leg pain. Additionally, the cladodes can be sliced and prepared in brine to reduce cholesterol levels. The mucilage derived from cladodes is employed in both medicinal and cosmetic applications. The application of a mixture of freshly collected cactus material, milk, and mucilage to the liver is believed to have a curative effect on liver diseases. Similarly, the topical application of this mixture to the hair is thought to result in a softer appearance. The flower powder decocted in water has been demonstrated to have therapeutic effects in the treatment of kidney and prostate diseases, as well as in the alleviation of leg and back aches. When mixed with honey, this powder has been shown to possess efficacy in the management of asthma and liver disease. Conversely, seed powder has been employed in the treatment of dermatological problems and cardiovascular disorders. Finally, dried and ground roots have been combined with honey or milk for the treatment of asthma.

A comprehensive overview of these applications is presented in Table 2.

Research Journal of Ecology and Environmental Sciences, 2025, 5, 1111
www.scipublications.org/journal/index.php/rjees
DOI: 10.31586/rjees.2025.1111

Table 2. Ethnobotanical uses of *Opuntia ficus-indica* (L.) Mill. (Cactaceae) in Morocco and Tunisia.

Country	Common name	Purpose	Plant part	Method of use	References
Morocco	Hendi	Urinary inflammations and cystitis	Flowers	Infusion or Decoction	Ammor et al. (2020)
	Kermous Hendiya	Urinary inflammations and cystitis	Flowers	Infusion	Bellakhdar et al. (1991)
	-	Antidiabetic	Seeds	Extract	Berraaouan et al. (2015)
	Handya, Zaaboul	To treat urolithiasis	Flowers Fruits	Infusion	Chakit et al. (2022)
	Híndi (arabe)	Digestive disorders	Flowers	The powdered flower is used against stomach disorders	De Natale & Pollio (2012)
	Hindiya	Stomach pain	Flowers	Powder	El-Hilaly et al. (2003)
	Dreg, lhandia	Genito-urinary disorders	Entire Plant	Infusion	Fatiha et al. (2019)
	Aknari	Kidney disease Digestive disorders Stomach pain	Flowers Flowers Fruits	Decoction Raw Raw	Idm'hand et al. 2020)
	Hendiya, Kermous	Antidiabetic	Flowers	Raw	Jouad et al. (2001)
	El handia	Dermatologic Stomach pain	Mucilage Flowers	Rubbing the ointment for skin disease Powdered and ingested	Lyoussi et al. (2023)
	Nawwar, Al'Handiyya	Diuretic Antidiarrheal	Flowers	Infusion Infusion	Merzouki et al. (2000)

-	Calefacient	Cladodes	Mixed with 'Rass al Hannout' (spice mix) preparation and ingested	Mouhaddach et al. (2018)
	Analgesic		The dry material was ground to powder and then taken with water to alleviate stomach suffering	
			Cladode powder was swallowed with water or milk to relieve back pain	
	To treat cholesterol		Cladode powder was mixed with water and then applied to the legs to alleviate leg ache	
			Young cladodes were sliced and prepared in brine to reduce cholesterol levels	
	Liver diseases		Mucilage was collected from cladodes and then freshly mixed with milk	
	Hair care		Mucilage was collected from cladode and then freshly applied to the hair	
			To make hair softer	
	Kidney diseases	Flowers	Decoction of dry and ground flowers	
	Analgesic		Decoction of dry and ground flowers	
	Used for asthma		Dry and ground flowers was mixed with honey	
	Prostate diseases		Decoction of dry and ground flowers	
	Liver diseases		Dry and ground	
	Dermatologic	Seeds	Seeds were dried and ground to cure diseases of the skin	
	Cardiovascular		Seeds were dried and ground	
	Respiratory	Roots	Dry and ground roots was mixed with honey or milk	
			Used for asthma	
	Respiratory	Flowers	Decoction, powder, infusion (oral and external use)	

	Sabbar, Handiya, Karmouss nsara	Digestive Skeleton Circulatory Urinary Diuretic	Fruits		Ouhaddou et al. (2014)
	Prickly pear	Antidiabetic	Flowers Fruits	Powder	Tahraoui et al. (2007)
Tunisia	Figuier de Barbarie Figuier d'Inde	Elimination of kidney stones	Cladodes Fruits	Decoction Cataplasm	Ben salah et al. (2019)
		Stomach pain Antidiarrheal Dermatologic	Fruits	Raw	
	-	Kidney disease	Cladodes	Extract	Wannes & Tounsi (2022)

Research Journal of Ecology and Environmental Sciences, 2025, 5, 1111
www.scipublications.org/journal/index.php/rjees
DOI: 10.31586/rjees.2025.1111

4. Opuntia ficus-indica *in Italy*

A total of 50 bibliographic sources has been selected regarding the ethnobotanical uses od *O. ficus-indica.* Prickly pear cacti were introduced to Europe by the first Spanish colonists between the end of the 15th century and the beginning of the 16th century [48].

The commercially cultivated *O. ficus-indica* is grown for fruit production in Southern Italy, particularly on the island of Sicily, where over 4000 ha of specialized plantations yield 60000 t of fruit [49].

The introduction of *O. ficus-indica* has been met with considerable enthusiasm in Sicily, where it has become a significant fruit crop and medicinal plant [50]. There is evidence that this species was being used as a food source for humans at least 9,000 years before the present day [51], or as early as 12,000 years ago [52]. This would have been prior to the species being cultivated [53].

Italy, and Sicily in particular, represents an atypical example in the appreciation of *O. ficus-indica*. The exploitation of the cactus pear has a long history, with multiple uses documented since the 18th century. These include the use of the fruit as a filler in farming systems and as an emergency fodder. It was referred to as “bread for the poor” [54,55]. Furthermore, this taxon is important in other regions of the world, including Mexico, where prickly pear is extensively utilized as animal fodder [56].

In 1975, the establishment of modern plantations for the fruit industry marked a significant turning point. Cactus pear production is particularly well-suited to environments that are unsuitable for other crops. In Italy, cactus pear cultivation is concentrated in Sicily, accounting for 90% of the total production. Most of this cultivation occurs in the San Cono hills, in south-western Ethneo, and in the Belice valley [22,57].

4.1. Common names of Opuntia ficus-indica

The plant is commonly known as “fico d’India” or "ficodindia". Other local Italianized terms are also used, but dialectal names are generally adaptations of the main term.

Analysing the etymology of the name “Fucurinia”, it is assumed to come from India, but it comes from the so-called West Indies, i.e. the Americas [58]. Research conducted in various countries in southern Italy has shown various local names for the plant, as well as for the fruit: Ficarazzi, Fichilindi, Fichi a paletta, Ficundiani, Ficundiana, Ficundianu, Ficuniano, Fik de mori, Fik palet, Pittara, Sico tu trucu, Sicovindo, Stidda (Calabria); Fecurìnia, Ficundiano, Ficurenia, Ficurinie, Figurine (Campania); Zavat (Emilia-Romagna); Figu turco (Liguria); Agnus (Piemonte); Sicodiani (Puglia); Figu morisca (Sardinia); Ficudinia, Ficu d'innia, Ficudinnia, Ficurinnia (Sicily); Erba da callì (Toscana) [59].

4.2. Types of use of Opuntia ficus-indica

Opuntia ficus-indica has been employed in a multitude of ways (Tab. 3). In the modern era, prickly pear cacti are cultivated primarily for their large sweet fruits (commonly referred to as “tunas”), which are available in local and commercial markets worldwide [60,61].

The primary use of prickly pears is as fresh fruit, although they are also employed in the production of cakes and preserves [62]. Furthermore, they constitute the principal ingredient in the preparation of typical Calabrian sweets: *”i mustazzola”* and *”i sulicchiati”*. To prepare them, the thorns of the fruits are removed, the fruit is cut into pieces, boiled, and then added to the dough [63].

In Sicily, this taxon has become so well-established that it may be considered a typical specimen of the island's coastline. In Sicilian culture, two dishes are prepared using *O. ficus-indica*: *”Mostarda di ficurinia*" or *”Pizichintì”*, which is a pastry made with the mucilage of this species boiled and mixed with a dough made from wheat, almonds, hazelnuts,

cinnamon and sugar, and *"Sucu pa pasta cu li ficurinnia"*, a sauce for pasta made with olive oil, garlic, and pulp of the seedless *O. ficus-indica* fruit [64].

It is a plant whith several uses in ethnobotany [65]. In the popular traditions of Sicily, *O. ficus-indica* is employed in human medicine. In ancient remedies, the mucilage of the prickly pear cactus is used to treat coughs and whooping coughs. A similar use has been documented in Sardinia [66], and Campania [67].

It is notable that the same plant can have different effects depending on the preparation method. For instance, an infusion [68-71], or a decoction of flowers [72-76], has been observed to have diuretic properties. Additionally, the mucilage and epidermis of the prickly pear fruit have been demonstrated to possess hemostatic properties [63,71,75,77]. Furthermore, a concentrated decoction of the root of the prickly pear plant with olive oil has been documented to have a curative effect on meteorism [68]. These findings have been corroborated by research conducted in other regions, including Brazil [78].

Research Journal of Ecology and Environmental Sciences, 2025, 5, 1111
www.scipublications.org/journal/index.php/rjees
DOI: 10.31586/rjees.2025.1111

Table 3. Ethnobotanical uses of *Opuntia ficus-indica* (L.) Mill. (Cactaceae) in Italy.

Survey area	Common name	Purpose	Plant part	Method of use	References
Apulia	Fid'dìnie	Diaphoretic Laxative For skin problems	Cladodes	-	Bianchi & Gallifuoco (2004)
	Ficarìzza	Food Laxative	Fruits	Raw as snack	Biscotti et al. (2021)
	Sicodiani	For wounds	Cladodes	-	Frigino et al. (1999)
Basilicata	-	Food	Fruits	-	Caneva et al. (1997)
Calabria	Ficu'nniana	Skin problems	Cladodes	The cladode is heated in ash and applied to the corresponding part of the skin when the spleen is swollen and there is pain. Again, after being heated, the cladode is also used as a resolvent for boils and as a healer for burns.	Barone (1963)
	Ficu ndiani	Agropastoral	Cladodes	Before planting, pieces of cladodes were interred as fertilizer	Gentile et al. (2022)
	Ficundianu, Stidda	Healing Liver disorders	Cladodes	Cladodes roasted and placed directly on the skin, or even the mucilage of these mixed with olive oil are applied to sores and burns. The mucilage of the crushed cladodes, reduced to a pulp and left to drain through a cloth, is drunk to cure various liver ailments	Leporatti & Pavesi (1989)
	Ficundiana	Dermatologic Antirheumatic	Cladodes	The epidermis of the cladodes is removed and used to heal the wounds and skin excoriation Used topically as antirheumatic for the knees	Maruca et al. (2019)
	Fik palet,	Food	Cladodes	Peels sundried and then batter-fried Liquor	Mattalia et al. (2020a)

	Fichi a paletta, Fik de mori			Raw as snack	
	Fichilindi	Food	Cladodes	Raw or baked	Mattalia et al. (2020b)
	Pittara	Dermatologic	Cladodes	The mucilage used as a wound cicatrizer	Musarella et al. (2019)
		Ludic		Cladodes were cut and a handcar was realized by assembling the pieces with the cane	
	Sico tu trucu, Ficarazzi (fruits); Pittara (plant)	Food	Fruits	Raw as snack	Nebel et al. (2006)
	Ficundianu, Stidda	Antispasmodic Diuretic	Flowers	Infusion	Passalacqua et al. (2007)
	Ficuniano	Antispasmodic Antidiarrhoeic Diuretic To treat bronchitis Anti-inflammatory	Flowers Fruits	Infusion	Tagarelli et al. (2010)
		Magic remedies	Cladodes	A "paletta" (cladode) was placed near the fireplace. It was believed that when the stem of the plant dried, the fever or the hepato-splenomegaly would disappear	
Campania	-	Back pain	Cladodes	-	De Feo et al. (1992a)
	-	For corns and chilblains	Cladodes	-	De Feo et al. (1992b)

	-	Antirheumatics	Cladodes	-	De Feo & Senatore (1993)
	Figurine	Food	Cladodes	Raw or boiled in salads	De Natale et al. (2020)
	Ficurenia	Food	Fruits	Raw as snack	Di Novella et al. (2013)
	Figurine	Dermatologic	Cladodes	Mucilage used as a skin lenitive	Mautone et al. (2019)
	Ficurinie	Food	Fruits	Raw as snack	Menale et al. (2016)
	Fecurìnia	Food	Fruits	Fruits were deprived of the thorns, and the peels were dried in the sun, and preserved for the winter to be fried with potatoes. The pulp of the fruits, on the other hand, was consumed fresh	Salerno & Guarrera (2008)
		Agropastoral	Cladodes	The cladodes are broken up and interred where vegetables, especially cucumbers, are planted to make the soil more fertilized, moist and fresh.	
		Respiratory disease	Flowers Cladodes	Decoction for cough, bronchitis and pneumonia	Savo et al. (2013)
		Making ships go faster	Cladodes	Cladodes are rubbed on the hull of ships to make them go faster	
Latium	-	Used for pertussis	Cladodes	-	Guarrera (1994)
Liguria	-	Treat varicose veins	Cladodes	Frictions with plant mucilage to treat varicose veins	Maccioni et al. (1994-1995)
	-	Astringent	Cladodes	-	Maccioni et al. (2000)

Marche	-	Purgative effect	Fruits	-	Guarrera (1981)
Sardinia	-	For burns	Cladodes	-	Atzei et al. (1994)
		Dislocation and swelling			
	-	Skin problems	Cladodes	-	Ballero et al. (1994)
	Figu morisca	Dermatologic	Cladodes	Direct application for skin disease, viral infection (herpes) and joint pains	Ballero et al. (2001)
		Antitussive	Fruits	Jam for cough catarrhal	
		Antirheumatics	Cladodes	Used for myalgia and arthritis	Bruni et al. (1997)
		Skin problems		-	
		For burns		Used for burns, oedemas, insect bites and nettle inflammation	Palmese et al. (2001)
Sicily	-	Diuretic	Flowers	Decoction	Amico & Sorce (1997)
	-	Diuretic	Flowers	Decoction	Arcidiacono et al. (1999)
		Digestive disorders	Cladodes	A liquid is extracted from the mucilage of the cladodes	
	Ficudinia	Food	Fruits	With the fruits, typical sweets are prepared: "*mustazzola*" and "*sulicchiati*". To prepare, the fruits are cleaned of their thorns and cut into small pieces, then boiled, then added to the mixture	Arcidiacono et al. (2010)
	-	Diuretic	Flowers	Decoction	

	Hemostatic	Cladodes	Mucilage is applied directly to the skin as a hemostatic	Barbagallo et al. (1979)
-	Diuretic	Flowers	Infusion	Catanzaro (1968)
	Digestive disorders	Roots	Decoction with olive oil treat meteorism	
-	Diuretic	Flowers	Decoction	Catanzaro (1970)
Ficudinnia	Fodder	Fruits	Raw fruit given to animals	Galt & Galt (1978)
Ficurinnia	Diuretic	Flowers	Infusion and decoction	Guarrera (2009)
	Hemostatic	Cladodes	Mucilage and epidermis are hemostatic	
	Domestic		Cladodes were used as a container for the crystallization of *"manna di pala"*, obtained from the sap of *Fraxinus sp.*	
-	Urological disease Kidney disease	Flowers	Decoction	Leonti et al. (2009)
	Diuretic and gastrointestinal refreshing	Flowers	Decoction with flowers	Lentini et al. (1988)
-	Diuretic	Flowers	Decoction	Lentini et al. (1994)
-	Emetic Skin inflammation Stomatitis	Cladodes	-	Lentini et al. (1995)
-	For kidney stones	Cladodes	-	Lentini et al. (1997)
Ficurinnia	Food	Fruits	*"Sucu pa pasta cu li ficurinnia"*, sauce for pasta with fruits without seeds	

				"Mostarda di ficurinia", a typical dessert prepared with boiled *Opuntia* fruit mucilage and other ingredients.	Lentini & Venza (2007)
		Laxative Treat tuberculosis	Cladodes	Infusion and decoction	
	Ficu d'innia, Ficudinia	Food	Fruits	Make cake and preserves	Licata et al. (2016)
	-	Kidney disease	Flowers	Treat renal colic	Pitrè (1896)
Tuscany	-	Antitussive	Cladodes	-	Chiavoni & Raffo (1994)
	Fico d'India	Intestinal astringent, cicatrizing	Cladodes	Cladodes, well crushed to obtain a poultice, placed between two gauzes, is applied on slow-healing wounds	Manganelli & Tomei (1999)
		For diarrhea	Fruits	Fresh fruit is eaten for diarrhea	

Research Journal of Ecology and Environmental Sciences, 2025, 5, 1111
www.scipublications.org/journal/index.php/rjees
DOI: 10.31586/rjees.2025.1111

As documented by Ballero et al. [66], the mucilage of *O. ficus-indica* is employed directly in the treatment of dermatological problems, herpetic infections (herpes), and joint discomfort in the Fluminimaggiore region of southwestern Sardinia.

An important use is that reported by Leonti et al. [50], who indicate that prickly pear petals can be used to treat urological problems. Similarly, Pitrè [79] and Lentini et al. [80] cite the same part of the plant as a cure for kidney colic and kidney stones. Alternatively, a paste comprising desiccated cactus flowers was applied topically to relieve the symptoms of measles [69].

In southern Italy, *O. ficus-indica* is employed for a variety of purposes, including food [81], medicinal [82-94], but also ludic, agropastoral and magical. The fruits and cladodes are consumed raw as snacks in Calabria [1,95-99] and Campania [100-102]. The mucilage within the cladodes is utilized topically for dermatological problems in Calabria [103-107] and Campania [108,109].

It is notable that the same plant may exhibit different effects. For instance, the fruit of *O. ficus-indica* designated as *"ficurinnia"*, has been observed to induce constipation when consumed with seeds. Conversely, when consumed without seeds, it has been demonstrated to function as a laxative [64].

The mucilaginous cladodes are used as a popular medicine treatment for gastritis, with the mucilage extracted and consumed orally [63].

Some applications are more localized and specific. For example, the use of *O. ficus-indica* cladodes rubbed on the hull of ships was observed on the Amalfi Coast (Campania) [67], with the apparent objective of increasing the speed of the vessels. Another application is as a fuel source for ovens or as a bird trap [77].

In 1978, Galt & Galt [69] conducted a more detailed study on the use of some wild plants on the islands of Pantelleria in Sicily. They focused on *O. ficus-indica* (*ficus-dinnia*), which, although cultivated by some, grows wild on the island. Cactus fruits are utilized as a dietary supplement for swine. The cactus pads were harvested and placed over the young tomato plants, providing protection from direct sunlight. In the past, the pads were also employed as makeshift plates for men, who consumed their midday meals in the fields.

In Sicily, cactus pads were employed as containers for the crystallization of *"manna"* or *"manna di pala"*, a vegetable product derived from the sap of certain *Fraxinus* species (*F. ornus* L. subsp. *ornus* and *F. angustifolia* Vahl subsp. *angustifolia*). It is a natural sweetener with mild laxative, emollient and cough-sedative properties [74].

A practice unique to the National Park of Cilento and Vallo di Diano is the utilization of the "skin" (epicarp) of the fruits of the prickly pear, which were previously denuded of thorns, dried in the sun, and preserved throughout the winter for frying with potatoes [110]. Another noteworthy application of cladodes is their incorporation into the soil surrounding vegetable crops, particularly cucumbers, to enhance soil fertility [110]. A comparable utilization was documented by Gentile et al. [111].

Malaria is an endemic disease in Italy, but it was eradicated by the mid-20th century. Tagarelli et al. [112] elucidated the prophylactic and therapeutic remedies employed by folk medicine to treat malaria in Calabria (southern Italy), where it was perceived as a condition of supernatural origin. Therefore, recourse was had to magical remedies believed to be linked to the disease. A cladode, known locally as a *"paletta"*, was placed in proximity to fireplaces. It is hypothesized that the application of the plant in a dried state may result in the alleviation of symptoms such as fever and hepatosplenomegaly.

The *O. ficus-indica* plant is also employed in northern Italy. In Tuscany, it is utilized as an antitussive [113], a gastrointestinal tonic and astringent [114] and to treat diarrhea [120]. In the Marche region, the laxative effect consuming the fruit at its maximum ripeness has been identified [115]. In the Liguria region, cladodes are employed for their astringent effect and to treat varicose veins by fractionating the plant mucilage [116,117].

5. Conclusions

The ethnobotanical studies conducted in North Africa have demonstrated the significance of *O. ficus-indica* as a vital source of sustenance, forage, and hydration for local communities and their livestock. Additionally, it serves as a valuable resource to produce cosmetics and traditional medicinal remedies. Despite the growing interest in this species in North Africa, the surveys conducted in Algeria are less comprehensive than those conducted in Morocco, and its traditional uses are limited to flowers and fruits. In rural Moroccan communities, all parts of the prickly pear are utilized, with one part often employed for a variety of medicinal purposes. The medicinal applications of *O. ficus-indica* are numerous and comparable in both Morocco and Algeria. However, the most frequently cited effects are its digestive and diuretic properties. In conclusion, the promising features for future studies are the promising nutritional and medicinal properties associated with the high adaptability of *O. ficus-indica*, even in the most extreme environments of North Africa.

In Italy, particularly in Calabria and Sicily, this taxon is fully exploited in all its parts. This includes the dietary use of fruits and cladodes, the medicinal use of the mucilage as a healer and disinfectant, and the preparation of infusions to treat kidney and digestive problems. This demonstrates the ubiquitous nature of this species and its potential for use in a wide range of applications.

The non-food uses of prickly pear offer excellent potential, given the bio-functional, medicinal, nutraceutical, and cosmetic properties that can be exploited. Several products have been the subject of recent patent applications [22,118].

A plethora of methodologies exists for the processing of *O. ficus-indica* fruits, cladodes, and seeds. The extensive range of products and by-products derived from cacti has the potential to confer significant benefits to a vast number of people, including those residing in arid and semi-arid regions across the globe. Cacti represent a significant source of bioactive compounds, making them an excellent candidate for nutraceutical preparations and functional foods. The scientific data have revealed a high content of certain chemical constituents in fruits, cladodes, seeds, and flowers of this cactus, which can add value to the products derived from this specis. Furthermore, some constituents have demonstrated potential as health-promoting substances. Further exploitation of the functional properties of cactus products in the food, cosmetic, and pharmaceutical industries is a possibility, although further scientific research in these fields is required.

Despite the extensive knowledge gathered on *O. ficus-indica*, there remains a significant research gap regarding its lesser-known traditional uses and the potential of some of its biofunctional properties. This gap underscores the importance of further investigation to fully exploit and valorize this species, especially in underexplored regions, and to promote its potential applications across diverse sectors such as nutrition, medicine, and cosmetics.

Despite the considerable advances that have been made, there is still much to be discovered, presenting exciting prospects for future research and innovation.

Author Contributions: Conceptualization, C.M.M.; methodology, M.M.A., M.R.T. and C.M.M.; validation, C.M.M.; investigation, M.P., M.M.A., M.R.T. and C.M.M.; data curation, M.P., M.M.A., M.R.T. and C.M.M.; writing—original draft preparation, M.P., M.M.A. and M.R.T.; writing—review and editing, M.P., M.M.A., M.R.T. and C.M.M.; visualization, M.P. and C.M.M.; supervision, C.M.M.; project administration, C.M.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

[1] Alkerwi, A.; Sauvageot, N.; Malan, L.; Shivappa, N.; Hébert, J.R. Association between Nutritional Awareness and Diet Quality: Evidence from the Observation of Cardiovascular Risk Factors in Luxembourg (ORISCAV-LUX) Study. *Nutrients* **2015**, *7*, 2823-2838. https://doi.org/10.3390/nu7042823

[2] Nebel, S.; Pieroni, A.; Heinrich, M. Ta chòrta: wild edible greens used in the Graecanic area in Calabria, Southern Italy. *Appetite* **2006**, 47(3), 333-342. https://doi.org/10.1016/j.appet.2006.05.010

[3] Giraldo-Silva, L.; Ferreira, B.; Rosa, E.; Dias, A.C. *Opuntia ficus-indica* Fruit: A Systematic Review of Its Phytochemicals and Pharmacological Activities. *Plants* **2023**, 12(3), 543. https://doi.org/10.3390/plants12030543

[4] Nobel, P.S.; De la Barrera, E.; Beilman, D.W.; Doherty, J.H.; Zutta, B.R. Temperature limitations for cultivation of edible cacti in California. *Madroño* **2002**, 228-236.

[5] García, F.H.; Coll, L.A.; Cano-Lamadrid, M.; Lluch, D.L.; Barrachina, Á.A.C.; Murcia, P.L. Valorization of prickly pear [*Opuntia ficus-indica* (L.) Mill]: Nutritional composition, functional properties and economic aspects. In Invasive Species-Introduction Pathways, Economic Impact, and Possible Management Options. IntechOpen, **2020**.

[6] Nobel, P.S. [ED.] Cacti: biology and uses. University of California, Berkeley, California, USA, **2002**.

[7] Griffith, M.P. The origins of an important cactus crop, *Opuntia ficus-indica* (Cactaceae): new molecular evidence. American *Journal of Botany* **2004**, 91(11), 1915-1921. https://doi.org/10.3732/ajb.91.11.1915

[8] Rocchetti, G.; Pellizzoni, M.; Montesano, D.; Lucini, L. Italian *Opuntia ficus-indica* cladodes as rich source of bioactive compounds with health-promoting properties. *Foods* **2018,** 7(2), 24. https://doi.org/10.3390/foods7020024

[9] Madrigal-Santillán, E.; Portillo-Reyes, J.; Madrigal-Bujaidar, E.; Sánchez-Gutiérrez, M.; Mercado-Gonzalez, P.E.; Izquierdo-Vega, J.A.; ... Morales-González, J.A. *Opuntia* genus in Human Health: A Comprehensive Summary on Its Pharmacological, Therapeutic and Preventive Properties. Part 1. *Horticulturae* **2022**, 8(2), 88. https://doi.org/10.3390/horticulturae8020088

[10] Rodrigues, C.; Paula, C.D.D.; Lahbouki, S.; Meddich, A.; Outzourhit, A.; Rashad, M.; Pari, L.; Coelhoso, I.; Fernando, A.L.; Souza, V.G. *Opuntia* spp.: an overview of the bioactive profile and food applications of this versatile crop adapted to arid lands. Foods, 2023, 12(7), p.1465. https://doi.org/10.3390/foods12071465.

[11] Iqbal, M.A.; Hamid, A.; Imtiaz, H.; Rizwan, M.; Imran, M.; Sheikh, U.A.A.; Saira, I. Cactus pear: A weed of dry lands for supplementing food security under changing climate. Planta Daninha **2020**, 38, e020191761. https://doi.org/10.1590/S0100-83582020380100040.

[12] Rocha Filho, R.R.; Santos, D.C.; Véras, A.S.C.; Siqueira, M.C.B.; Novaes, L.P.; Mora-Luna, R.; Monteiro, C.C.F.; Ferreira, M.A. Can spineless forage cactus be the queen of forage crops in dryland areas? J. Arid Environ. **2021**, 186, 104426. https://doi.org/10.1016/j.jaridenv.2020.104426.

[13] El-Mostafa, K.; El Kharrassi, Y.; Badreddine, A.; Andreoletti, P.; Vamecq, J.; El Kebbaj, M. S.; Latruffe, N.; Lizard, G.; Nasser, B.; Cherkaoui-Malki M. Nopal cactus (*Opuntia ficus-indica*) as a source of bioactive compounds for nutrition, health and disease. *Molecules* (Basel, Switzerland) **2014**, 19(9), 14879–14901. https://doi.org/10.3390/molecules190914879

[14] Prisa, D. *Opuntia ficus-indica* the key plant in climate change: characteristics, cultivation and uses. *GSC Biological and Pharmaceutical Sciences* **2021**, 17(2), 094-105. https://doi.org/10.30574/gscbps.2021.17.2.0333

[15] Madrigal-Santillán, E.; Portillo-Reyes, J.; Madrigal-Bujaidar, E.; Sánchez-Gutiérrez, M.; Izquierdo-Vega, J.A.; Izquierdo-Vega, J.; ... Morales-González, J.A. *Opuntia* spp. in Human Health: A Comprehensive Summary on Its Pharmacological, Therapeutic and Preventive Properties. Part 2. *Plants* **2022**, 11(18), 2333. https://doi.org/10.3390/plants11182333

[16] Kluge, M.; Ting, I. P. Crassulacean acid metabolism: an ecological analysis. *Ecological studies series* **1978**, 30, 209. ISBN 3-540-08979-9.

[17] Stintzing, F.C. and Carle, R. Cactus stems (*Opuntia* spp.): A review on their chemistry, technology, and uses. *Molecular nutrition & food research*, **2005**, *49*(2), pp.175-194.

[18] Yang, L., Lu, M., Carl, S., Mayer, J.A., Cushman, J.C., Tian, E. and Lin, H. Biomass characterization of *Agave* and *Opuntia* as potential biofuel feedstocks. *Biomass and Bioenergy*, **2015**, *76*, pp.43-53.

[19] Cross, P., Mukarakate, C., Nimlos, M., Carpenter, D., Donohoe, B.S., Mayer, J.A., Cushman, J.C., Neupane, B., Miller, G.C. and Adhikari, S. Fast pyrolysis of *Opuntia ficus-indica* (prickly pear) and Grindelia squarrosa (gumweed). *Energy & Fuels*, **2018**, *32*(3), pp.3510-3518.

[20] Adjeroud-Abdellatif, N., Hammoui, Y., Boudria, A., Agab, S., Choulak, F., Leclerc, J.P., Merzouk, B. and Madani, K. Effect of a natural coagulant extract from *Opuntia ficus-indica* cladode on electrocoagulation-electroflotation water treatment process. *International Journal of Environmental Analytical Chemistry*, **2022**, *102*(17), pp.5822-5846.

[21] Diguet, L. Les cactacies utiles du Mexique. Archives DHistoire Naturelle. Societe Nationale d'Acclimatation de France, Paris, **1928**.

[22] Inglese, P.; Mondragon, C.; Nefzaoui, A.; Saenz, C. Crop ecology, cultivation and uses of cactus pear. *Food and Agriculture Organization of the United Nations (FAO)*, **2017**.

[23] Sarri, M.; Boudjelal, A.; Hendel, N.; Sarri, D.; Benkhaled, A. Flora and ethnobotany of medicinal plants in the southeast of the capital of Hodna (Algeria). Arabian Journal of Medicinal and Aromatic *Plants* **2015**, 1(1), 24-30. https://doi.org/10.48347/IMIST.PRSM/ajmap-v1i1.3255

[24] Ouhaddou, H.; Boubaker, H.; Msanda, F.; El Mousadik, A. An ethnobotanical study of medicinal plants of the Agadir Ida Ou Tanane province (southwest Morocco). *Journal of Applied Biosciences* **2014**, 84, 7707-7722. https://doi.org/10.4314/jab.v84i1.5
[25] Merzouki, A.; Ed-Derfoufi, F.; Mesa, J.M. Contribution to the knowledge of Rifian traditional medicine. II: Folk medicine in Ksar Lakbir district (NW Morocco). *Fitoterapia* **2000**, 71(3), 278-307. https://doi.org/10.1016/S0367-326X(00)00139-8
[26] Hunt, D.R.; Taylor, N.P.; Charles, G. The new cactus lexicon. dh books, Volumes I and II, **2006**. ISBN 9780953813445
[27] Baziz, K. An ethnobotanical survey of spontaneous plants used in traditional medicine in the region of Aures, Algeria. *European Journal of Ecology* **2020**, 6. 2. https://doi.org/10.17161/eurojecol.v6i2.14669
[28] Souilah, N.; Miara, M.D.; Bendif, H.; Medjroubi, K.; Snorek, J. Traditional ethnobotanical knowledge on medicinal plants used by the populations in Central Russikada (Northeastern Algeria). Journal of Herbs, Spices & Medicinal *Plants* **2022**, 28(1), 15-35. https://doi.org/10.1080/10496475.2021.1961180
[29] Miara, M.D.; Bendif, H.; Rebbas, K.; Rabah, B.; Hammou, M.A.; Maggi, F. Medicinal plants and their traditional uses in the highland region of Bordj Bou Arreridj (Northeast Algeria). *Journal of Herbal Medicine* **2019**, 16, 100262. https://doi.org/10.1016/j.hermed.2019.100262
[30] Bendif, H. Ethnobotanical survey of herbal remedies traditionally used in El Hammadia (Southern region of the province of Bordj Bou Arreridj, Algeria). *Algerian journal of Biosciences* **2021**, 2(1), 006-015. http://dx.doi.org/10.5281/zenodo.5045031
[31] Zatout, F.; Benarba, B.; Bouazza, A.; Babali, B.; Bey, N.N.; Morsli, A. Ethnobotanical investigation on medicinal plants used by local populations in Tlemcen National Park (extreme North West Algeria). *Age* (*years*) **2021**, 15(30), 12. https://doi.org/10.5209/mbot.69396
[32] Mechaala, S.; Bouatrous, Y.; Adouane, S. Traditional knowledge and diversity of wild medicinal plants in El Kantara's area (Algerian Sahara gate): An ethnobotany survey. *Acta Ecologica Sinica* **2022**, 42(1), 33-45. https://doi.org/10.1016/j.chnaes.2021.01.007
[33] Bellakhdar, J.; Claisse, R.; Fleurentin, J.; Younos, C. Repertory of standard herbal drugs in the Moroccan pharmacopoea. *Journal of ethnopharmacology* **1991**, 35(2), 123-143. https://doi.org/10.1016/0378-8741(91)90064-K
[34] Fatiha, B.A.; Souad, S.; Ouafae, B.; Jamila, D. Allal, D.; Lahcen, Z. Ethnobotanical study of medicinal plants used in the region of middle oum Rbia (Morocco). *Plant Arch* **2019**, 19(2), 2005-2017. e-ISSN:2581-6063, ISSN:0972-5210
[35] El-Hilaly, J.; Hmammouchi, M.; Lyoussi, B. Ethnobotanical studies and economic evaluation of medicinal plants in Taounate province (Northern Morocco). *Journal of Ethnopharmacology* **2003**, 86(2-3), 149-158. https://doi.org/10.1016/S0378-8741(03)00012-6
[36] De Natale, A.; Pollio, A.. A forgotten collection: the Libyan ethnobotanical exhibits (1912-14) by A. Trotter at the Museum O. Comes at the University Federico II in Naples, Italy. *Journal of Ethnobiology and Ethnomedicine* **2012**, 8(1), 1-19. https://doi.org/10.1186/1746-4269-8-4
[37] Idm'hand, E.; Msanda, F.; Cherifi, K. Ethnobotanical study and biodiversity of medicinal plants used in the Tarfaya Province, Morocco. *Acta Ecologica Sinica* **2020**, 40(2), 134-144. https://doi.org/10.1016/j.chnaes.2020.01.002
[38] Jouad, H.; Haloui, M.; Rhiouani, H.; El Hilaly, J.; Eddouks, M. Ethnobotanical survey of medicinal plants used for the treatment of diabetes, cardiac and renal diseases in the North centre region of Morocco (Fez–Boulemane). *Journal of Ethnopharmacology* **2001**, 77(2-3), 175-182. https://doi.org/10.1016/S0378-8741(01)00289-6
[39] Tahraoui, A.; El-Hilaly, J.; Israili, Z.H.; Lyoussi, B. Ethnopharmacological survey of plants used in the traditional treatment of hypertension and diabetes in south-eastern Morocco (Errachidia province). *Journal of ethnopharmacology* **2007**, 110(1), 105-117. https://doi.org/10.1016/j.jep.2006.09.011
[40] Berraaouan, A.; Abderrahim, Z.; Hassane, M.; Abdelkhaleq, L.; Mohammed, A.; Mohamed, B. Evaluation of protective effect of cactus pear seed oil (*Opuntia ficus-indica* L. MILL.) against alloxan-induced diabetes in mice. *Asian Pacific Journal of Tropical Medicine* **2015**, 8(7), 532-537. https://doi.org/10.1016/j.apjtm.2015.06.013
[41] Frati, A.C.; Jimenez, E.; Ariza, R.C. Hypoglycemic Effect of *Opuntia ficus indica* in Non-insulin-Dependent Diabetes Mellitus Patients. *Phytother. Res.* **1990**, *4*, 195–197. https://doi.org/10.1002/ptr.2650040507
[42] Lyoussi, B.; Bakour, M; Cherkaoui-Tangi, K; El-Hilaly, J; Hano, C. Ethnobotanical Survey and Pharmacological Screening of Medicinal Plants Used as Antihypertensive in Sefrou Province (Middle-North of Morocco): Benefits and Challenges. *Frontiers in Bioscience-Scholar* **2023**, 15(1), 4. https://doi.org/10.31083/j.fbs1501004
[43] Ammor, K.; Mahjoubi, F; Bousta, D; Chaqroune, A. Ethnopharmacological survey of medicinal plants used in the traditional treatment of kidney stones realized in Fez-Morocco. *Ethnobotany Research and Applications* **2020**, 19, 1-12. http://dx.doi.org/10.32859/era.19.50.1-12
[44] Chakit, M.; El Hessni, A.; Mesfioui, A. Ethnobotanical Study of Plants Used for the Treatment of Urolithiasis in Morocco. *Pharmacognosy Journal* **2022**, 14(5). https://doi.org/10.5530/pj.2022.14.133
[45] Ben salah, M.; Barhoumi, T.; Abderraba, M. Ethnobotanical study of medicinal plant in Djerba island, Tunisia. Arabian *Journal of Medicinal and Aromatic Plants* **2019**, 5(2), 67-97. https://doi.org/10.48347/IMIST.PRSM/ajmap-v5i2.16487
[46] Wannes, W.A.; Tounsi, M.S. Tunisian Nephroprotective Plants: A Review. *Journal of Exploratory Research in Pharmacology* **2022**, 8(1), 74-91. https//doi.org/ 10.14218/JERP.2022.00031
[47] Mouhaddach, A.; El-hadi, A.; Taghzouti, K.; Bendaou, M.; Hassikou, R. Assessment of *Opuntia ficus-indica* in vivo following ethnobotanical survey: confirmation of its analgesic activity. *Phytotherapie* **2018**, 16(S1), S191-S196. https://doi.org/10.3166/phyto-2019-0144

[48] Barbera, G.; Inglese, P.; Carimi, F. The reflowering of prickly pear *Opuntia ficus indica* (L.) Miller: influence of removal time and cladode load on yield and fruit ripening. *Advances in horticultural science [rivista dell'ortofloroftutticoltura italiana]* ***1991***, 5 (N. 2), (1991), 1000-1004. https://doi.org/10.1400/14008
[49] Inglese, P.; Costanza, P.; Gugliuzza, G.; Inglese, G.; Liguori, G. Influence of within-tree and environmental factors on fruit quality of cactus pear (*Opuntia ficus-indica*) in Italy. *Fruits* **2010**, 65(3), 179-189. https://doi.org/10.1051/fruits/2010012
[50] Leonti, M.; Casu, L.; Sanna, F.; Bonsignore, L. A comparison of medicinal plant use in Sardinia and Sicily—De Materia Medica revisited? *Journal of ethnopharmacology* **2009**, 121(2), 255-267. https://doi.org/10.1016/j.jep.2008.10.027
[51] Kiesling, R. Origen, domesticación y distribución de *Opuntia ficus-indica. Journal of the Professional Association for Cactus Development* **1998**, 3, 50-60.
[52] Callen, E.O. Analysis of the Tehuacan coprolites. *The prehistory of the Tehuacan Valley* **1967**, 1, 261-289.
[53] Ostolaza, C. Cactus y etnobotánica. *Quepo* **1994**, 8, 79-86.
[54] Pitrè G. Medicina popolare siciliana, parte 1. Barbèra ed. **1949**, pp 458.
[55] Signorini, M.A.; Piredda, M.; Bruschi, P. Plants and traditional knowledge: An ethnobotanical investigation on Monte Ortobene (Nuoro, Sardinia). *Journal of Ethnobiology and Ethnomedicine* **2009**, 5(1), 1-14. https://doi.org/10.1186/1746-4269-5-6
[56] Estrada, E.; Villarreal, J.A.; Cantú, C.; Cabral, I.; Scott, L., Yen, C. Ethnobotany in the Cumbres de Monterrey National Park, Nuevo León, México. *Journal of Ethnobiology and Ethnomedicine* **2007**, 3, 1-8. https://doi.org/10.1186/1746-4269-3-8
[57] Basile, F.; Foti, V.T. Economic features of cactus pear production in Italy. In III International Congress on Cactus Pear and Cochineal 438, **1996** (pp. 139-150). https://doi.org/10.17660/ActaHortic.1997.438.19
[58] Salerno, G.; Guarrera, P.M. I fitonimi popolari di Castel San Lorenzo (SA, Parco del Cilento e Vallo di Diano). *Inf. Bot. Ital*, **2015,** *47*, 3-14.
[59] Portale della Flora di Roma. 2024 https://dryades.units.it/Roma/index.php?procedure=taxon_page&id=346&num=6311 (accessed on 2024 November 14).
[60] Basile, F. Economic aspects of Italian cactus pear production and market. *Journal of the Professional Association for Cactus Development* **2001**, 4, 31-46. https://doi.org/10.56890/jpacd.v4i.153
[61] Inglese, P.; Basile, F.; Schirra, M. Cactus pear fruit production. *Cacti: Biology and uses* **2002**, 163-183. https://doi.org/10.1525/california/9780520231573.003.0010
[62] Licata, M.; Tuttolomondo, T.; Leto, C.; Virga, G.; Bonsangue, G.; Cammalleri, I.; ... La Bella, S. A survey of wild plant species for food use in Sicily (Italy)–results of a 3-year study in four regional parks. *Journal of ethnobiology and ethnomedicine* **2016**, 12, 1-24. https://doi.org/10.1186/s13002-015-0074-7
[63] Arcidiacono, S.; Costa, R.; Marletta, G.; Pavone, P.; Napoli, M. Usi popolari delle piante selvatiche nel territorio di Villarosa (EN–Sicilia Centrale). *Quaderni di Botanica Ambientale e Applicata* **2010**, 1, 95-118.
[64] Lentini, F.; Venza, F. Wild food plants of popular use in Sicily. *Journal of Ethnobiology and Ethnomedicine* **2007**, 3, 1-12. https://doi.org/10.1186/1746-4269-3-15
[65] Patti M.; Musarella C.M.; Spampinato G. Ethnobotanical Knowledge in Calabria (Southern Italy): a summary review. *Heliyon* **2024**, UNDER REVIEW.
[66] Ballero, M.; Poli, F.; Sacchetti, G.; Loi, M.C. Ethnobotanical research in the territory of Fluminimaggiore (south-western Sardinia). *Fitoterapia* **2001**, 72(7), 788-801. https://doi.org/10.1016/S0367-326X(01)00334-3
[67] Savo, V.; La Rocca, A.; Caneva, G.; Rapallo, F; Cornara, L. Plants used in artisanal fisheries on the Western Mediterranean coasts of Italy. *Journal of Ethnobiology and Ethnomedicine* **2013**, 9, 1-14. https://doi.org/10.1186/1746-4269-9-9
[68] Catanzaro, F. Piante officinali dell'Isola di Pantelleria. *Webbia* **1968**, 23(1), 135-148.
[69] Galt, A.H.; Galt, J.W; Peasant use of some wild plants on the island of Pantelleria, Sicily. *Economic Botany* **1978**, 20-26.
[70] Passalacqua, N.G.; Guarrera, P.M.; De Fine, G. Contribution to the knowledge of the folk plant medicine in Calabria region (Southern Italy). *Fitoterapia* **2007**, 78(1), 52-68. https://doi.org/10.1016/j.fitote.2006.07.005
[71] Guarrera, P.M. Le piante nelle tradizioni popolari della Sicilia. *Erbor. Domani* **2009**, 46, 46-55.
[72] Lentini, F.; Di Martino, A.; Amenta, R. Contributo alla conoscenza della flora popolare dell'isola di Ustica. *Quaderni Botanica Ambientale Applicata* **1994**, 5, 47-54.
[73] Amico, F.P.; Sorce, E.G. Medicinal plants and phytotherapy in Mussomeli area (Caltanissetta, Sicily, Italy). *Fitoterapia* **1997**, 68(2), 143-159.
[74] Arcidiacono, S.; Napoli, M.; Pavone, P. Piante selvatiche utilizzate nella medicina e nella veterinaria popolari nel territorio di Bronte (Catania). *Quaderni di Botanica Ambientale Applicata* **1999**, 10, 105-18.
[75] Barbagallo, C.; Longhitano, N.; Meli, R. Contributo alla flora del versante ovest dell'Etna con osservazioni sulle piante officinali. *Cooperativa Universitaria Libraria Catanese* **1979**.
[76] Catanzaro, F. Le piante officinali del territorio di Bivona (Ag) nella tradizione popolare. *Fitoterapia* **1970**, 2, 66-83.
[77] Tavilla, G.; Crisafulli, A.; Ranno, V.; Picone, R.M.; Redouan, F.Z.; del Galdo, G.G. First contribution to the ethnobotanical knowledge in the Peloritani Mounts (NE Sicily), *Research Journal of Ecology and Environmental Sciences* **2022,** 1-34. https://doi.org/10.31586/rjees.2022.201
[78] Andrade, C.T.S.; Marques, J.G.W.; Zappi, D.C. Utilização medicinal de cactáceas por sertanejos baianos. *Revista Brasileira de Plantas Medicinais* **2006**, 8(3), 36-42.
[79] Pitrè, G. Medicina popolare siciliana (Vol. 19). C. Clausen, **1896**.

[80] Lentini F.; Aleo M.; Amenta R. L'uso popolare delle piante nelle isole Egadi (Sicilia). *Acta Phytoterapeutica*, **1997**, 4,2: 88-94.
[81] Caneva, G.; Pontrandolfi, M.A.; Fascetti, S. *Le piante alimentari spontanee della Basilicata*. Consiglio regionale di Basilicata, Uffico Stampa, 1997.
[82] Bianchi A.; Gallifuoco G. Farmacopea popolare del Gargano. Natural 1, 2004, Maggio, pag. 54-66.
[83] Frigino, A.; Sacchetti, G.; Bruni, A.; Poli, F. Preparati fitoterapici vulnerari in uso nel Salento. *Informatore Botanico Italiano*, **1999**, 31, 190-192.
[84] De Feo, V.; Ambrosio, C.; Senatore, F. Traditional phytotherapy in Caserta province, Campania, southern Italy. 1992. 337-349.
[85] De Feo, V.; Aquino, R.; Menghini, A.; Ramundo, E.; Senatore, F. Traditional phytotherapy in the peninsula sorrentina, Campania, southern Italy. *Journal of Ethnopharmacology*, **1992**, 36(2), 113-125.
[86] De Feo, V.; Senatore, F. Medicinal plants and phytotherapy in the Amalfitan coast. *Salerno province, Campania, Southern Italy. Journal of Ethnopharmacology*, **1993**, *39*, 39.
[87] Guarrera P.M. Le piante del Lazio nell'uso terapeutico, alimentare, domestico, religioso e magico: etnobotanica laziale e della media penisola italiana a confronto. Regione Lazio, Assessorato alla cultura e Dipartimento di Biologia Vegetale Università "La Sapienza". Tip. Tipar, Roma, 1994.
[88] Atzei A.D.; Orrù L.; Putzolu F.; Rozzo G.; Usala T. Le piante nelle terapie tradizionali. Sardegna sud-occidentale. Stef, Cagliari, 1994.
[89] Ballero, M.; Bruni, A.; Sacchetti, G.; Mossa, L.; Poli, F. Indagine etnofarmacobotanica del territorio di Arzana (Sardegna orientale). *Annali di Botanica*, **1994**, 52(11), 489-500.
[90] Bruni, A.; Ballero, M.; Poli, F. Quantitative ethnopharmacological study of the Campidano Valley and Urzulei district, Sardinia, Italy. *Journal of Ethnopharmacology*, **1997**, 57(2), 97-124.
[91] Palmese, M.T.; Manganelli, R.E.U.; Tomei, P.E. An ethno-pharmacobotanical survey in the Sarrabus district (south-east Sardinia). *Fitoterapia*, **2001,** 72(6), 619-643.
[92] Lentini, F.; Catanzaro, F.; Aleo, M. Indagini etnobotaniche in Sicilia. III. L'uso tradizionale delle piante nel territorio di Mazara del Vallo (Trapani). *Atti Accad Sci Lett Arti Palermo*, **1988,** 1-29.
[93] Lentini F.; Giani S.; Amenta R. L'uso popolare delle piante nelle isole Eolie (Sicilia). *Acta Technologia et Legis Medicamenti*, **1995,** 6 (3): 351-355.
[94] Lentini F.; Aleo M.; Amenta R. L'uso popolare delle piante nelle isole Egadi (Sicilia) *Acta Phytoterapeutica*, **1997,** 4,2: 88-94.
[95] Mattalia, G.; Sõukand, R.; Corvo, P.; Pieroni, A. Blended divergences: Local food and medicinal plant uses among Arbëreshë, Occitans, and autochthonous Calabrians living in Calabria, Southern Italy. *Plant Biosystems* **2020**, 154(5), 615-626. https://doi.org/10.1080/11263504.2019.1651786
[96] Mattalia, G.; Corvo, P.; Pieroni, A. The virtues of being peripheral, recreational, and transnational: local wild food and medicinal plant knowledge in selected remote municipalities of Calabria, Southern Italy. *Ethnobotany Research and Applications* **2020**, 19, 1-20. https://dx.doi.org/10.32859/ERA.19.40.1-15
[97] Biscotti, N.; Bonsanto, D.; Laghetti, G. Ethnobotanical Study on Traditional Use of Local Fruit Varieties in Gargano National Park (Apulia, Italy). 2021, Preprint, under review. https://doi.org/10.21203/rs.3.rs-440235/v1
[98] Musarella, C.M.; Patti, M.; Laface, V.L.A.; Spampinato, G. An overview of ethnobotanical knowledge for the enhancement of typical plant food and the development of a local economy: the case of Calabria region (Southern Italy). *Vegetos* **2024**, 1-12. https://doi.org/10.1007/s42535-024-00975-4
[99] Patti, M.; Musarella C.M.; Laface V.L.A; Spampinato, G. Ethnobotanical survey in the Graecanic Area of Calabria (Southern Italy): a treasure chest of biodiversity and traditions at risk of extinction. **2024**. *Journal of Ethnopharmacology*. Under Review.
[100] Di Novella, R.; Di Novella, N.; De Martino, L.; Mancini, E.; De Feo, V. Traditional plant use in the national park of Cilento and Vallo Di Diano, Campania, Southern, Italy. *Journal of ethnopharmacology* **2013**, 145(1), 328-342. https://doi.org/10.1016/j.jep.2012.10.065
[101] Menale, B.; De Castro, O.; Cascone, C.; Muoio, R. Ethnobotanical investigation on medicinal plants in the Vesuvio National Park (Campania, southern Italy). *Journal of ethnopharmacology* **2016**, 192, 320-349. https://doi.org/10.1016/j.jep.2016.07.049
[102] De Natale, A.; Menale, B.; Di Lecce, S.; Pollio, A. An ethnobotanical survey of wild edible plants of Campania (Italy). *Bulletin of Regional Natural History (BORNH)* **2020**, 1(1), 2021. https://doi.org/10.6092/2724-4393/7584
[103] Maruca, G.; Spampinato, G.; Turiano, D.; Laghetti, G.; Musarella, C.M. Ethnobotanical notes about medicinal and useful plants of the Reventino Massif tradition (Calabria region, Southern Italy). *Genetic Resources and Crop Evolution* **2019**, 66, 1027-1040. https://doi.org/10.1007/s10722-019-00768-8
[104] Musarella, C. M.; Paglianiti, I.; Cano-Ortiz, A.; Spampinato, G. Indagine etnobotanica nel territorio del Poro e delle Preserre calabresi (Vibo Valentia, S-Italia). *Atti della Società Toscana di Scienze Naturali, Memorie, Serie B* **2019**, 126, 13-28. https://doi.org/10.2424/ASTSN.M.2018.17
[105] Patti, M.; Musarella, C.M.; Postiglione, S.M.; Papalia, F.; Falcone, M.C.; Mammone, G.; ... Spampinato, G. Ethnobotanical studies on the Tyrrhenian side of the Aspromonte Massif (Calabria, Southern Italy). *Plant Biosystems* **2024**, *158*(3), 545-562. https://doi.org/10.1080/11263504.2024.2336601

[106] Barone, R. Le Piante Della Medicina Popolare Nel Territorio Di Falconara E San Lucido: Calabria. *Webbia*, **1963,** *17*(2), 329-357.
[107] Leporatti, M.L.; Pavesi, A. Usi nuovi, rari o interessanti di piante officinali di alcune zone della Calabria. *Webbia*, **1989**, *43*(2), 269-289. https://doi.org/10.1080/00837792.1989.10670455
[108] Mautone, M.; De Martino, L.; De Feo, V. Ethnobotanical research in Cava de'Tirreni area, Southern Italy. *Journal of ethnobiology and ethnomedicine* **2019**, 15(1), 1-21. https://doi.org/10.1186/s13002-019-0330-3
[109] De Feo, V.; Aquino, R.; Menghini, A.; Ramundo, E.; Senatore, F. Traditional phytotherapy in the peninsula sorrentina, Campania, southern Italy. *Journal of Ethnopharmacology*, **1992**, *36*(2), 113-125. https://doi.org/ 10.1016/0378-8741(92)90010-o
[110] Salerno, G.; Guarrera, P.M. Ricerche etnobotaniche nel Parco Nazionale del Cilento e Vallo di Diano: il territorio di Castel San Lorenzo (Campania, Salerno). *Informatore Botanico Italiano* **2008**, 40(2), 165-181.
[111] Gentile, C.; Spampinato, G.; Patti, M.; Laface, V.L.A.; Musarella, C.M. Contribution to the ethnobotanical knowledge of Serre Calabre (Southern Italy). *Research Journal of Ecology and Environmental Sciences* **2022**, 35-55. https://doi.org/10.31586/rjees.2022.389
[112] Tagarelli, G.; Tagarelli, A.; Piro, A. Folk medicine used to heal malaria in Calabria (southern Italy). *Journal of ethnobiology and ethnomedicine* **2010**, 6, 1-16. https://doi.org/10.1186/1746-4269-6-27
[113] Chiavoni M.; Raffo E.S. Ricerca etnobotanica nella provincia di Grosseto. Ist. Tecn. Agrario Statale «Leopoldo I di Lorena», Grosseto. Progetto giovani 94. Tip. La Stampa, Grosseto, 1994, 52 pp.
[114] Manganelli, R.U.; Tomei, P.E. Ethnopharmacobotanical studies of the Tuscan Archipelago. *Journal of Ethnopharmacology*, **1999**, 65(3), 181-202.
[115] Guarrera P. Ricerche etnobotaniche nelle province di Macerata e di Ancona, *Rivista Italiana E.P.P.O.S.*, **1981**, 63, 2:99-108; 63,4: 220-228.
[116] Maccioni S.; Tomei P.E.; Rizzo A. L'uso medicinale delle specie vegetali selvatiche e coltivate nella tradizione popolare della bassa Val di Magra, "Memorie dell'Accademia Lunigianese di Scienze 'Giovanni Capellini'", Scienze storie e morali, LXIV-LXV: 389-435, 1994-1995.
[117] Maccioni, S.; Flamini, G.; Cioni, P.L.; Guazzi, E.; Monti, G. Ricerche etnobotaniche in Liguria. L'estremo Ponente. *Informatore Botanico Italiano,* **2000**, 31, 177-180.
[118] BIONAP (2021) MUCOSAVE™FG. https://mucosave.bionap.com (accessed on 2024 November 14).