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Natural Remedies and Nutraceuticals Used in Ethnoveterinary Practices in Inland Southern Italy

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ABSTRACT

Traditional animal health practices are today only rarely used in Europe, as many natural remedies applied for the treatment of animals have been replaced by modern pharmaceuticals. Modern institutionalized veterinary services tend to cover every aspect of animal health care, and influence most of the veterinary practices carried out by shepherds and farmers. However, in some areas, particularly of the Mediterranean, such traditional practices persist. Few ethnoveterinary studies have been conducted in the Mediterranean. In this survey, we analysed the natural remedies that are still in use or were used until very recently to treat animals in central Lucania (inland southern Italy). Plants constitute the mainstay of the folk-veterinary regimen (about 40 preparations), but there are also a few animal- and mineral-derived preparations. Among them, the veterinary use of *Cistus incanus*, *Colutea arborescens*, *Daphne laureola*, and *Erigeron acer* is reported for the first time. Moreover, the study identified diverse traditional plant nutraceuticals used to improve animal health, as well as the quality of milk and dairy products. An important potential output of this study may be the development of eco-sustainable integrated projects focused on the maintenance of traditional animal breeding and healthcare systems. Pharmacological and toxicological considerations relating to possible applications of the recorded traditional knowledge in modern evidence-based veterinary medicine are also discussed.

Keywords: Basilicata, ethnoveterinary, Italy, Lucania, medicinal plants, traditional knowledge

Abbreviations: TK, traditional knowledge

INTRODUCTION

Ethnoveterinary research, defined as the 'systemic investigation and application of veterinary folk knowledge, theory and practice' (McCorkle, 1986), has been the focus of several studies in the last 20 years (for an exhaustive bibliography, see Martin and colleagues, 2001). Recently, the first on-line ethnoveterinary data bank and an international mailing list have been developed (International Network Prelude, 2002; Ethnoveterinary Mailing List, 2002). On the other hand, interdisciplinary field studies focused on traditional knowledge (TK) related to veterinary practices have rarely been conducted, and most have been focused mainly on the description of animal health

management practices and much less on the bio-scientific and anthropological evaluation of traditional remedies. As a result, ethnoveterinary studies have made few contributions to the search for bio-active plant extracts for treating animals – and even fewer to the development of modern evidence-based veterinary medicine. Exceptions are represented by the work of Adewumni and colleagues (2001) and of Perrucci and colleagues (2001). Clinical studies of veterinary phytotherapeutical preparations are also quite rare (Birrenkott *et al.*, 2000; Nagle *et al.*, 2001; Masika and Afolayan, 2002).

In the meantime, the need for field ethnoveterinary surveys is increasing worldwide, owing both to a broad interest in documenting TK about land and animal management in indigenous and traditional societies, and also to a diffuse wish among farmers to have valid phytotherapeutical substitutes for allopathic pharmaceuticals. For example, phytotherapeuticals may represent important means for improving the quality of meat and dairy products, although no substantial studies have been carried out on their possible side-effects because of their present limited use. Moreover, access to allopathic medicine is not easy in many rural contexts in developing countries. In this context, WHO (2002) cites as strategic goals the rediscovery of traditional medicine and its rational use, in part because of its lower costs and higher accessibility. On the other hand, the focus on organic farming methods and complementary veterinary medicine is important to consumers in industrialized countries, who increasingly demand high-quality animal food products, locally produced and locally marketed.

Systemic ethnoveterinary studies on remedies used in traditional phytotherapeutical practices have been carried out mainly in Africa, Asia and Central America (Sharma and Singh, 1989; Minja, 1994, 1999; Piyadasa, 1994; Davis *et al.*, 1995; Bâ, 1996; Goud and Pullaiah, 1996; Lans and Brown, 1998a,b; Namanda, 1998; Reddy *et al.*, 1998; Abu-Rabia, 1999; De Meneghi and Sanga, 1999; Ertuğ, 1999; Guèye, 1999; Mathias *et al.*, 1999; Hirschkind, 2000; Lans *et al.*, 2000, 2001; Scarpa, 2000; Nfi *et al.*, 2001; Alawa *et al.*, 2002; Ole-Miaron, 2003). In Europe, medicinal plants used in folk veterinary practices have been specifically investigated in only a few field studies (Corrain and Zampini, 1961; Oláh, 1979; Manzi, 1989; Bogdan *et al.*, 1990; Brag and Hansen, 1994; Vučevat-Bajt and Karlović, 1994; Guarrera *et al.*, 1995; Agelet and Vallès, 1999; Blanco *et al.*, 1999; González-Tejero *et al.*, 1999; Viegi *et al.*, 1999; Uncini Manganelli *et al.*, 2001; Waller *et al.*, 2001), while veterinary research concerning historical remedies in Central Europe has been described in a few reviews (Theves, 1994; Zitterl-Eglseer *et al.*, 1999, 2000).

In Italy, only generic ethnobotanical studies have been conducted over the past 40 years, although short appendices containing ethnoveterinary data have sometimes been included. The data found in Italian ethnobotanical literature consist mainly of sporadic notes, collected by interviewing shepherds and farmers in isolated rural areas (Pieroni, 1999).

In the present field study, we assessed the natural remedies traditionally used for animal health management in central Lucania (inland southern Italy). The history of this area has been characterized by Norman (starting from the 11th century AD), Swabian (starting from the 13th century AD) and Spanish Bourbon (ca. the 15th century AD) domination.

Small-scale agricultural and animal breeding activities (sheep, goats, and a local

breed of cattle, *Podolica*) have played a key role in this area for centuries. Many aspects of the local culture are related to breeding of *Podolica* cattle, a very rare and old race that remains in only a few isolated inland areas of Lucania. The *Podolica* breed is a descendent of the *Bos primigenius podolicus*, the very large, long-horned cattle thought to have been domesticated in the Middle East during the 4th century BC. The breed has spread throughout an area that mainly covers the inland territories of southern peninsular Italy (Basilicata, Calabria, Campania, Molise and Apulia). There are about 100 000 head in existence today. One of the outstanding characteristics of this breed is its exceptional ability to adapt to particularly difficult environments. Age at first calving is rather advanced (about 3 years), primarily owing to the breed's harsh habitat, which significantly reduces the available food resources during the hot summer months and thus slows down the growth of younger animals. Nevertheless, these cattle have a long reproductive career, breeding for over 10 years, with an average of 15 months between calvings. For the most part, calvings are spontaneous and are concentrated during the spring, which is also the only period (April–June) when the cows are milked.

This traditional, pastoral economy and the complex cultural influences in the history of this area represent unique frameworks for conducting ethnoscientific studies on what remains of south-Italian folk veterinary traditions. The results of the ethnobiological study may support the discovery of new medicinal plants and also stimulate further phytopharmacological and phytotherapeutic investigations of Mediterranean species. These data could also contribute to the development of small-scale eco-sustainable integrated projects for the cultivation and controlled gathering of medicinal plants, as well as of organic farming and animal breeding systems that could adopt the use of bio-scientific, evidence-based phytotherapeuticals.

MATERIALS AND METHODS

The fieldwork was conducted over a period of 15 weeks, from March to November 2002, among shepherds and cattle breeders in the municipalities of Castelmezzano and Pietrapertosa (ca. 800 and 1200 inhabitants, 850 and 1088 m above sea level, respectively), located in the territory of the Dolomiti Lucane in southern Italy (Figure 1). This area is located in a mountainous region bordering the Basento River Valley in central Lucania, also called Basilicata (Figure 2). Ethnoveterinary information was collected using semi-structured interviews with more than 40 persons who retain TK. Most of the interviewees were more than 60 years old and they were mainly men belonging to families that maintain a strong connection with traditional pastoral activities. Local shepherds and breeders were asked to describe precisely all the veterinary remedies that they knew, including their manner of use and preparation. During the interviews, several fresh plant specimens or dried samples stocked in a small transportable field herbarium were shown to the interviewees. Each non-cultivated botanical species recognized by the villagers as having been used for veterinary aims was collected and identified by the first author.

Information was also recorded concerning other plants traditionally used for animal health and also those relating to dairy production technologies. Reports of materials of

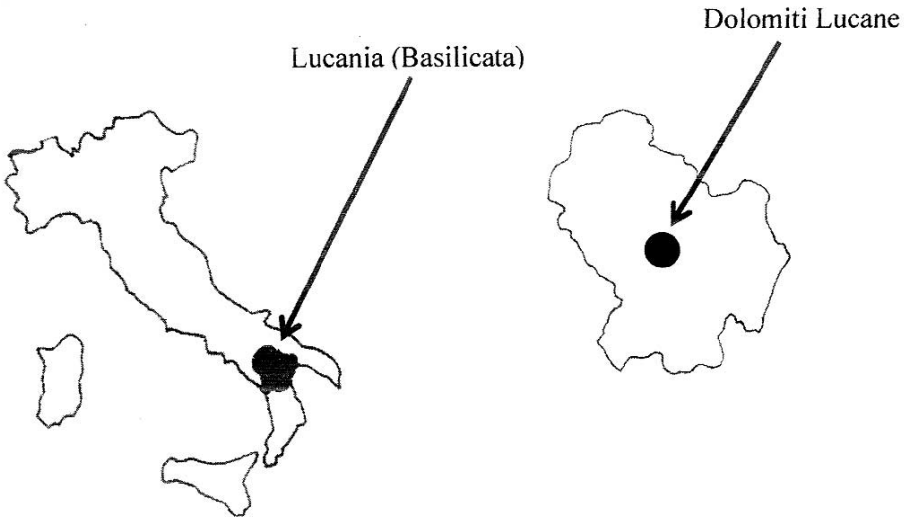

Figure 1. The location of the studied region

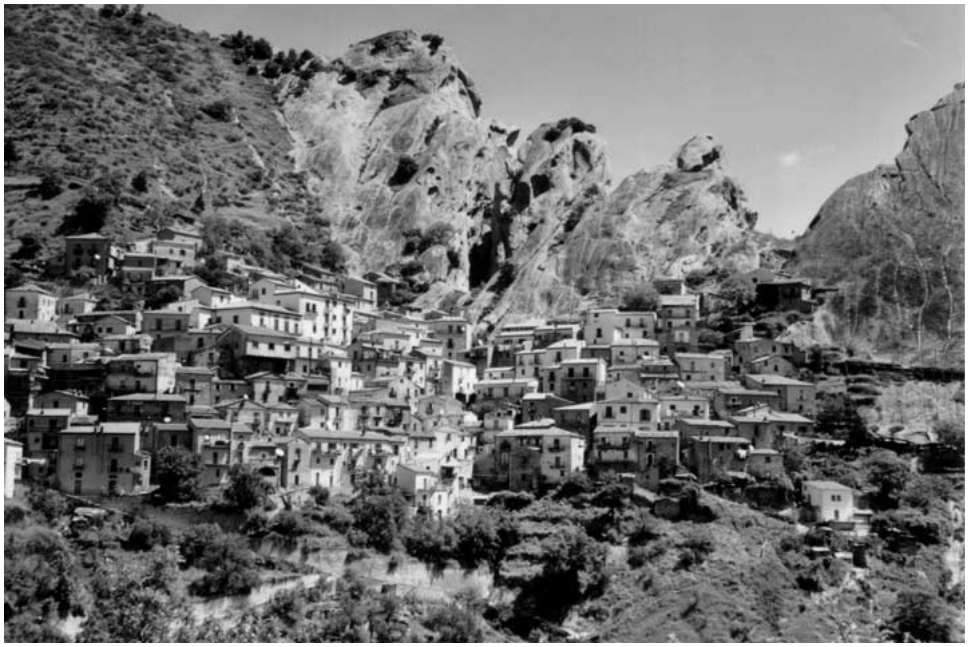

Figure 2. View over the Dolomite Lucane in central Lucania

animals and mineral origin that are used in veterinary treatments were also considered.

In the transcription of the vernacular names of the recorded ethnoveterinary remedies, the neutral centralized vowel ('schwa') of the southern Italian (Calabro-Neapolitanean) dialects has been symbolised by the sign 'ə'. Voucher specimens of non-domesticated medicinal plants, as well as more than 20 hours of tape-recorded interviews, are available at the first author's address.

In a second phase, the data gathered in the field were compared with all the ethnobotanical studies that have been carried out in southern Italy in the past 50 years, in which a few ethnoveterinary quotations occurrred (Barbagallo and Furnari, 1967; Catanzaro, 1970; Barbagallo *et al.*, 1979; Lentini, 1987; Lentini *et al.*, 1988; Lentini and Aleo, 1991; De Feo *et al.*, 1992; De Feo and Senatore, 1993; Amico and Sorge, 1997; Pieroni *et al.*, 2002), as well as with the entire Italian data bank of the ethnoveterinary pharmacopoeia (Pieroni, 1999; Viegi *et al.*, 2001).

RESULTS

It was apparent that knowledge of traditional animal health practices is quickly disappearing in Lucania. Modern pharmaceuticals have substituted for many natural remedies used to cure animals. The institutionalized veterinary system tends to cover every aspect of animal health care and influences nearly all veterinary practices carried out by farmers today. Nevertheless, a few natural ethnoveterinary remedies are still sometimes used by people dedicated to animal breeding (mainly men) in Lucania. In Tables I and II, about 40 phytotherapeuticals are listed that were mentioned by informants during the field study, while in Table III all the ethnoveterinary plants quoted in the ethnobiological Italian literature (28 taxa) are reported for purposes of comparison. Table IV presents the few other natural remedies (from animal or mineral sources) that are used to treat animals in Central Lucania, and Table V reports some 20 folk nutraceuticals. Table VI lists the very few botanical taxa that are used in traditional milk processing and cheese-making.

DISCUSSION

When comparing our data with those reported in the ethnoveterinary literature on southern Italy (Table III) and with the all Italian data on ethnoveterinary practices contained in the national database (Pieroni, 1999; Viegi *et al.*, 2001), a few uncommon veterinary uses for plants can be discerned. Moreover, of about 30 phytotherapeutical remedies recorded, only a few are well known and used in local human ethnomedicine and/or human ethnomedicine in other Italian and Mediterranean regions: *Allium sativum* (garlic), *Cyclamen hederifolium* (cyclamen), *Malva sylvestris* (mallow), *Matricaria recutita* (camomille), *Sorbus domestica* (service tree fruits) and *Vitis vinifera* (grape) fruit juice. The least common uses of plants used as medicines for animals that we recorded are briefly discussed below.

The use of lesser *Calamintha sylvatica* (calaminth) species as an anthelmintic has not been reported previously, although De Simoni and Guarrera (1994) reported a similar

TABLE I
Plants used in ethnoveterinary practices for healing animals in central Lucania

Botanical taxon	Botanical family	Vernacular name (including determinative article)	Status[a]	Part(s) used
Acer monspessulamum L.	Aceraceae	*u occhiènē*	W	Wood
Achillea ligustica all.	Asteraceae	None reported	W	Aerial parts
Allium sativum L.	Alliaceae	*aglio*	C	Bulbs
Anemone hortensis L.	Ranuncolaceae	*ervē da tortorē*	W	Aerial parts
Arum italicum Miller	Aracaceae	*nzanē*	W	Root
Avena sativa L.	Graminae	*avenē/a biamē* [b]	C	Seeds, let germinate in water
Bryonia dioica Jacq.	Cucurbitaceae	*acineddē*	W	Root
Calamintha sylvatica Bromf.	Lamiaceae	*a mentastrē/ a mentē salvaccē*	W	Aerial parts
Cistus incanus L.	Cistaceae	*a rosiddē*	W	Aerial parts
Colutea arborescens L.	Fabaceae	*u masciuddē*	W	Leaves
Cyclamen hederifolium Aiton	Primulaceae	*u acinē terrognē*	W	Tuber
Daphne laureola L.	Thymeliaceae	*a laurettē*	W	Leaves
Ecballium elaterium (L.) A. Rich	Cucurbitaceae	*u cucumariddē*	W	Fruit juice
Fraxinus ornus L.	Oleaceae	*amelejē*	W	Bark
Erigeron acer Bivona	Asteraceae	*a radichē du latrē/ a radēchē pēlmunarē*	W	Root
Lupinus albus L.	Fabaceae	*u lupinē*	C	Seeds
Lycopersicon aesculentum Miller	Solanaceae	*a pommodorē*	C	Aerial parts without fruits (*tramacchiē*)
Malva sylvestris L.	Malvaceae	*a malvē*	W	Aerial parts
Marrubium vulgare L.	Lamiaceae	*a marruggia*	W	Aerial parts

TABLE I (continued)

Botanical taxon	Botanical family	Vernacular name (including determinative article)	Status[a]	Part(s) used
Matricaria recutita L.	Asteraceae	*ancamillē*	W	Flowering tops
Mercurialis annua L.	Euphorbiaceae	*a mercoregliē*	W	Aerial parts
Robinia pseudoacacia L.	Fabaceae	*a spinagaggē*	W	Fruits
Rosmarinum officinalis L.	Lamiaceae	*a spigadossē*	C	Leaves
Salix caprea L.	Salicaceae	*u saliconē*	W	Stems and leaves
Scrophularia canina L.	Scrophulariaceae	*a ruta salvaccē*	W	Aerial parts
Sedum rupestre L.	Crassulaceae	*u maccaroncineē/ u maccoronē di gallinē*	W	Aerial parts
Senecio vulgaris L.	Asteraceae	*u sivonciddeē/ u savoncellē vastardē*	W	Young aerial parts
Sorbus domestica L.	Rosaceae	*a sorvē*	SC	Fruits
Spartium junceum L.	Fabaceae	*a scenestrē*	W	Flowers
Vitis vinifera L.	Vitaceae	*a vitē*	C	Fruit juice, wine and vinegar
Diverse species of wood trees (mainly *Quercus* spp.)	–	–	C/W	Wood (*leunē*)

[a]C, cultivated; W, wild

[b]This phytonyme is generally used after the plant has been harvested and dried

TABLE II
Other ethnoveterinary uses of plants in central Lucania

Botanical taxon	Animal treated[a]	Preparation	Claimed veterinary use	Similar uses reported also in local folk phytotherapy for humans	Quotation frequency[b]
Acer monspessulamum L.	go	To make a tool (*capēstriddē*) to be inserted in the mouth	Weaning	No	+
Achillea ligustica All.	po	Decoction	Against intestinal parasites	No	+
Allium sativum L.	ca sh	Cold macerate (together with aerial parts of *Calamintha sylvatica*)	Anthelmintic	Yes (only garlic)	++
Anenome hortensis L.	do ca	Fodder (often eaten by the animals themselves)	To heal poisoning	No	+
Arum italicum Miller	eq	Oleolite (in olive oil)	To treat feet inflammations	No	+
Avena sativa L.	ra	Fodder	To induce oestrus	No	+
Bryonia dioica Jacq.	ca	Decoction	To induce partum	No	+
Calamintha sylvatica Bromf.	ca sh	Cold macerate (together with garlic)	Antihelmintic	No	+
Cistus incanus L.	go sh	Thick macerate in wine (obtained boiling for long time the plant with *Colutea arborescens*, *Daphne laureola*, and *Rosmarium officinalis*)	To heal contagious agalactia (*u sitē*, illness causing mastitis, arthritis and eye inflammations in small ruminants), caused by *Mycoplasma agalactiae*	No	+
Colutea arborescens L.	go sh	Thick macerate in wine (obtained after lengthy boiling of the plant together with *Cistus incanus*, *Daphne laureola* and *Rosmarinus officinalis*, in wine)	To cure contagious agalactia	No	+

Table II (continued)

Botanical taxon	Animal treated[a]	Preparation	Claimed veterinary use	Similar uses reported also in local folk phytotherapy for humans	Quotation frequency[b]
Cyclamen hederifolium Aiton	eq	Cut and applied topically	Against warts	Yes	++
Daphne laureola L.	go sh	Thick macerate in wine (obtained after lengthy boiling of the plant together with *Cistus incanus*, *Colutea arborescens* and *Rosmarinus officinalis*, in wine)	To cure contagious agalactia	No	+
Ecballium elaterium (L.) A. Rich.	ca go sh	Topical application	Antiseptic for purulent wounds	No	+
Fraxinus ornus L.	po	Macerate in cold water	To cure diverse infections	No	+++
Erigeron acer Bivona	sw	Implanted into the skin of the ear	To diagnose and cure swine erysipelas (caused by *Erysipelothrix rhusiopathiae*)	No	+
	sh go ca	Implanted into diverse districts	To heal respiratory troubles; to heal feet inflammations	No	+
Lupinus albus L.	go eq	Decoction, external washing	Against lice	No	+
Lycopersicon aesculentum Miller	ca go sh	Decoction	Laxative; to expel placenta; purgative against intestinal diseases due to dietary changes in spring	No	+++
Malva sylvestris L.	sh ca go	Decoction	To expel placenta, post-partum purgative (together with *Matricaria recutita*); laxative	No; Yes	+++
Marrubium vulgare L.	sw	Put in the animals' housing	To prevent skin parasites	No	+

Table II (continued)

Botanical taxon	Animal treated[a]	Preparation	Claimed veterinary use	Similar uses reported also in local folk phytotherapy for humans	Quotation frequency[b]
Matricaria recutita L.	ca sh	Decoction	Digestive; post-partum depurative (together with *Malva sylvestris*)	Yes; No	+++
Mercurialis annua L.	ca sh go	Decoction	To expel the placenta; post-partum purgative; laxative	No	++
Robinia pseudoacacia L	po	Decoction	To heal respiratory illnesses	No	+
Rosmarinum officinalis L.	go sh	Thick macerate in wine (obtained after lengthy boiling of the plant together with *Cistus incanus*, *Colutea arborescens* and *Daphne laureola*)	To cure contagious agalactia	No	+
Salix caprea L.	eq	Fodder	Against intestinal parasites	No	++
Scrophularia canina L.	po	Macerate in cold water	Purgative	No	++
Sedum rupestre L.	go sh	Decoction	Post-partum purgative	No	+
Senecio vulgaris L.	ca go sh	Beaten with iron tools (sometimes together with *Spartium junceum* flowers), then topically applied with urine and salt	Against snake bite	No	++
Sorbus domestica L.	ca go sh	Eaten raw; decoction	Anti-diarrhoea	Yes	++
Spartium junceum L.	ca go sh	Beaten with iron tools (together with *Senecio vulgaris*), then topically applied with urine and salt	Against snake bite	No	+

Table II (continued)

Botanical taxon	Animal treated[a]	Preparation	Claimed veterinary use	Similar uses reported also in local folk phytotherapy for humans	Quotation frequency[b]
Vitis vinifera L.	ca sh go	Boiled and concentrated juice (*vine cutte*: drink)	Laxative	Yes	++
	ca go sh	Wine: drink	Milk production stimulating anti-tussive; post-partum depurative; reconstituent for young animals	No	++
	go sh	Vinegar: drink with sulphur	To prevent epidemic diseases	No	+
	eq	Vinegar: applied locally with salt in washes	Antiseptic after having cut the gingival regions, or in vaginal washes after an abortion	No	++
Diverse species of wood trees mainly *Quercus* spp.)	ca eq sh	Burned as coal (*u carbonē*), in external application with olive oil	To heal skin inflammations, against wounds as an antiseptic	No	+
	ns	Burned as ashes (*a cenerē*) for external application	To heal snake bites	No	+
	sw	Placed in area inhabited by the animals	To prevent infectious diseases	No	+

[a]Animals treated: ca, cattle; do, dogs; eq, equids; go, goats; ns, none specified; po, poultry; ra, rabbits; sh, sheep; sw, swine

[b]Quotation frequency (based on the number spontaneously mentioned): +, quoted by less than 10% of the informants; ++, quoted by more than 10% and less than 40% of the informants; +++, quoted by more than 40% of the informants

TABLE III
Plants quoted in the ethnobiological scientific literature as used in ethnoveterinary practices in southern Italy

Botanical taxon	Botanical family	Status[a]	Part(s) used[b]	Preparation	Animals treated[c]	Ethnoveterinary use	References
Agave americana L.	Agavaceae	C	ju	External topical application	ns	Against bruises	Barbagallo *et al.*, 1979
Agrimonia eupatoria L.	Rosaceae	W	ap	Infusion in external application	ns	Against male reproductive problems	Catanzaro, 1970
Allium cepa L.	Alliaceae	C	bu	Cut and externally	ca eq	Against wounds; as an antiseptic in hoof damages	Amico and Sorge 1997
Anagallis arvensis L.	Primulaceae	W	le	Infusion as eye lotion	ns	Against eye inflammations	Barbagallo *et al.*, 1979
Artemisia arborescens L.	Asteraceae	W	ap	Decoction	ns	To heal internal disorders	Barbagallo *et al.*, 1979
Asphodelus microcarpus Salz. et Viv.	Asphodelaceae	W	tu	Ground and mixed with honey in external application	eq	Against wounds	Amico and Sorge, 1997
Atractylis gummifera L.	Asteraceae	W	ro	Infusion in compresses	ns	Against parasitoses	Lentini *et al.*, 1988
Clematis vitalba L.	Ranuncolaceae	W	ns	ns	ns	To heal viral infections	Barbagallo *et al.*, 1979
Convolvulus arvensis L.	Convovulaceae	W	ap	Fodder	ra	Nutraceutical	Lentini *et al.*, 1988
Cynodon dactylon (L.) Pers.	Graminae	W	rh	Fodder	sh	To heal intestinal inflammations; diuretic	Catanzaro, 1968; Lentini *et al.*, 1988
Ecballium elaterium (L.) A. Rich.	Cucurbitaceae	W	fr	Fodder; juice in external applications	eg; ca	Purgative; against wounds as an antiseptic	Lentini and Aleo, 1991; Pieroni et al., 2002
Erica arborea L.	Ericaceae	W	st	ns	ns	Sedative	De Feo *et al.*, 1992; De Feo and Senatore, 1993

TABLE III (continued)

Botanical taxon	Botanical family	Status[a]	Part(s) used[b]	Preparation	Animals treated[c]	Ethnoveterinary use	References
Eucalyptus spp.	Myrtaceae	W	le	Decoction in external application	ns	Against bruises	Amico and Sorge, 1997
Euphorbia ceratocarpa Ten.	Euphorbiaeceae	W	la	External application	ns	To heal abscesses and pains	Barbagallo *et al.*, 1979
Euphorbia helioscopia L.	Euphorbiaceae	W	la	External application	ns	To heal abscesses and pains; against warts	Barbagallo and Funari, 1967; Barbagallo *et al.*, 1979
Euphorbia rigida Bieb.	Euphorbiaceae	W	la	External application	ns	To eliminate necrosis	Barbagallo *et al.*, 1979
Ferula communis L.	Apiaceae	W	fl	Burned, in inhalations implanted in the ear or in the breast	eq	Anti-tussive	Catanzaro, 1970 Leporatti and Pavesi, 1989
Helleborus bocconei Ten.	Ranuncolaceae	W	ro	Direct application on the tooth	sw; ns	To heal lung infections; against toothaches	Lentini and Raimondo, 1990
Hypericum perforatum L.	Hypericaceae	W	ap	Decoction in external application	ns	Against wounds	Lentini and Aleo, 1991
Marrubium incanum Desr. and *M. vulgare* L.	Lamiaceae	W	ap	Decoction in external washes	ca eq	Against foot and mouth disease	Pieroni *et al.*, 2002
Mercurialis annua L.	Euphorbiaceae	W	ap	Decoction	ca	Laxative	Pieroni *et al.*, 2002
Origanum heracleoticum L.	Lamiaceae	W	ft	Fumigation on hot coals	eq	Anti-tussive	Pieroni *et al.*, 2002
Parietaria diffusa Mert. et Koch	Urticaceae	W	ap	Decoction, in fumigation	sh	To heal disorders of the respiratory tract	Lentini *et al.*, 1988

TABLE III (continued)

Botanical taxon	Botanical family	Status[a]	Part(s) used[b]	Preparation	Animals treated[c]	Ethnoveterinary use	References
Urginea maritima (L.) Baker	Liliaceae s.l.	W	bu	Olive oil macerate (with sulphur) in external application	ns	Against dermatitis	Lentini, 1987
Urtica membranacea Poiret	Urticaceae	W	ap	Fodder	po	Nutraceutical	Lentini *et al.*, 1988
Vitus vinifera L.	Vitaceae	C	fr	Concentrated fruit juice obtained after long cooking; as beverage	eq	Laxative	A. Pieroni, personal data
Zea mais L.	Graminae	C	se	Fodder	sh	Nutraceutical and stimulated milk production	A. Pieroni, personal data

[a]C, cultivated; W, wild

[b]ap, aerial parts; bu, bulbs; fl, flowers; ft, flowering tops; ju, juice; la, latex; le, leaves; ns, none specified; rh, rhizomes; ro, roots; se, seeds; st, stems; tu, tubers

[c]ca, cattle; do, dogs; eq, equids; po, poultry; sh, sheep; sw, swine

TABLE IV
Other natural remedies used in ethnoveterinary practices for healing animals in central Lucania

Remedy	Vernacular name (including determinative article)	Animal treated[a]	Preparation	Claimed veterinary use
Copper sulphate	*u vetriolē*	sh	Solution, external washes (sometimes with salt)	Against foot and mouth disease; against limping/sprains; against wounds
Human urine	*a urinē*	co sh eq	Topically applied together with *Spartium junceum* flowers and *Senecio vulgaris* aerial parts	Against snake bite
Goat gall bladder	*u felē da crapa*	co eq sh	Topically applied	To heal insect stings
Pig fat (hung at room temperature and left to go rancid for several weeks)	*a sunzē fracidē*	co eq sh	Topically applied	Anti-inflammatory
Salt	*u salē*	eq	Applied locally with vinegar	Antiseptic, after having cut the gingival regions
		sh	Solution, in external washes (sometimes with copper sulphate)	Against foot and mouth disease; against wounds
		co go sh	Topically applied together with *Spartium junceum* flowers and *Senecio vulgaris* aerial parts	Against snake bite
Sulphur	*u zolfo*	do sw	Mixed with olive oil and topically applied	To heal scabies
		go sh	Mixed with white wine	To prevent epidemic diseases
Swine gall bladder	*u felē du purchē*	co go sh	Dried, than olive oil macerate	To heal insect stings
Warm water	*acqua cauda*	sh go	Topically applied on the breast	Milk production stimulating

[a]co, cattle; do, dogs; eq, equids; go, goats; po, poultry; sh, sheep; sw, swine

TABLE V
Plant nutraceuticals used in ethnoveterinary practices as fodder for improving animal health or animal performance in central Lucania

Botanical taxon	Botanical family	Vernacular name (including determinative article)	Status[a]	Part(s) used	Animal (claimed properties)[b]
Arctium lappa L.	Asteraceae	*a pazzolē*	W	Leaves	Rabbits
Avena fatua L.	Graminae	*a venegliē*	W	Aerial parts	Cattle and dogs
Avena sativa L.	Graminae	*a biamē*	C	Seeds	Swine
Cicer arietinum L.	Fabaceae	*u cecerē*	C	Dried seeds	Swine (2 months before the animal is butchered, to confer a special pink colour to the meat)
Colutea raborescens L.	Fabaceae	*u masciuddē*	W	Aerial parts	Rabbits
Cornus mas L.	Cornaceae	*u curnalē*	W	Fruits	Turkeys
Crataegus monogyna Jacq.	Rosaceae	*a ceraseddē/ u scarrapollicē*	W	Fruits	Turkeys
Cynara scolymus L.	Asteraceae	*a carciofē*	C	Leaves	Rabbits
Hordeum vulgare L.	Graminae	*urscē*	C	Seeds	Swine
Ilex aquifolium L.	Aquifoliaceae	*u fruscē*	W	Upper leaves	Small goats[em]
Malus sylvestris Mill.	Rosaceae	*a meleddē agristē*	W	Fruits	Goats and swine
Papaver rhoeas L	Papaveraceae	*a paparinē*	W	Young shoots	Poultry
Parietaria diffusa M. et K.	Urticaceae	*ervē vjntē*	W	Aerial parts	Cattle and dogs
Pyrus pyraster Burgsd.	Rosaceae	*a pruscēnē*	W	Fruits	Hen and swine
Olea europaea L.	Oleaceae	*a ulivē*	W	Leaves	Small goats[em]
Quercus spp.	Fagaceae	*a cerzē*	W	Fruits (liannē)	Swine, sheep and turkeys
Rhamnus alaternus L.	Rhamanaceae	*alitern ē*	W	Leaves	Small goats[em]
Robinia pseudoacacia L.	Fabaceae	*a spinagaggē*	W	Leaves	Rabbits

TABLE V (continued)

Botanical taxon	Botanical family	Vernacular name (including determinative article)	Status[a]	Part(s) used	Animal (claimed properties)
Rosa canina L.	Rosaceae	*u scaddapoddicē* *u saccopaglīē*	W	Young arial parts Pseudofruits	Cattle and horses Turkeys
Rumex spp.	Polygonaceae	–	W	Seeds	Birds
Ruscus aculetaus L.	Liliaceae s.l.	*u fruscitiddē*	W	Young aerial parts	Cattle[em]
Sedum rupestre L.	Crassulaceae	*u maccaroncinē/* *u maccoronē di gallinē*	W	Aerial parts	Poultry
Spartium junceum L.	Fabaceae	*a scenēstrē*	W	Blossoms	Goats
Stellaria media (L.) Vill.	Caryophyllaceae	*a murscēddinē* *a murscēglinē*	W	Aerial parts	Poultry and swine
Trigonella foenum-graecum L.	Fabaceae	*a dragonellē*	C	Seeds Aerial parts	Pigeons Sheep and goats (during pregnancy)
Triticum dicoccon (Schrank.) Thell.	Graminae	*avenē americanē*	C	Seeds	Poultry
Urtica dioica L.	Urticaceae	*ardighē*	W	Aerial parts	Small turkeys, (hen, to increase the production of eggs)
Vicia faba L.	Fabaceae	*a favē*	C	Seeds	Goat and sheep
Vicia sativa L.	Fabaceae	*a vezzē*	C	Aerial parts	Cattle and sheep
Viscum album L.	Loranthaceae	*a frascognē*	W	Fruits	Birds
Zea mais L.	Graminae	*grandignē*	C	Seeds	Swine

[a]C, cultivated; W, wild

[em]emergency fodder during winter

TABLE VI
Plants involved in traditional milk and dairy technology in central Lucania

Botanical taxon	Botanical family	Vernacular name (including determinative article)	Status[a]	Part(s) used	Traditional use or belief
Conium maculatum L.	Apiaceae	*a cicutē/ arcimesē*	W	Aerial parts	To be avoided by animals that produce milk as dairy products become very bitter
Ficus carica L.	Moraceae	*a fichē*	W	Latex	To be used as vegetable 'rennet'
Galium aparine L.	Rubiaceae	*aculatorē salvaccē*	W	Aerial parts	To filter milk
Pteridium aquilinum (L.) Kuhn.	Hypolepidaceae	*a felcē*	W	Aerial parts	To filter milk
Marrubium vulgare L.	Lamiaceae	*a marruggē*	W	Aerial parts	To be avoided by animals that produce milk
Spartium junceum L.	Fabaceae	*a scenestrē*	W	Wood	To be burned while boiling milk for producing *ricotta* as it gives a special flavour
Ruscus aculeatus L.	Rubiaceae	*u pungētopē*	W	Aerial parts	To filter milk
Trigonella foenum-graecum L.	Fabaceae	*a dragonellē*	C	Aerial parts	To be avoided by animals that produce milk as, even if it is able to increase the quantity of milk produced, it has a very negative effect on its flavour and on the flavour of derived dairy products
Thymus pulegioides L.	Lamiaceae	*u sarrapuddē*	W	Aerial parts	Dipped in milk with rennet while making cheese as a means of adding aroma

[a]C, cultivated; W, wild

veterinary use for *Calamintha nepeta* in Central Italy. The chemical composition of the essential oil from this species has been investigated exhaustively, and isomenthone and *cis*-piperitone oxide represent its major components (Hidalgo *et al.*, 2002; Kitic *et al.*, 2002), whereas an extract from its aerial parts has shown anti-fungal and anti-microbial activity (Flamini *et al.*, 1999; Hidalgo *et al.*, 2002). Clinical studies have never been carried out on the efficacy of *Calamintha* ssp. as vermifuge, but are highly desirable because, if they confirm the activity ascribed in the TK that we recorded by the shepherds, they could promote a profitable use in many Italian areas for this very common species, which is also very much used in rural Central Italy in the local cuisine because of its aromatic properties.

The uncommon uses of the green aerial parts (leaves and stems) of *Lycopersicon aesculentum* (tomatoes), of *Mercurialis annua* (mercury), and of *Sedum rupestre* (crooked yellow stonecrop) as purgatives (the term that probably represents the Western medical translation of what local people refer to as an intestinal 'depurative' effect) represent new records of veterinary plants in the scientific literature. However, their clinical veterinary use should be considered carefully because of the difficulty of defining a safe dosage *per se*. All of these plants are in fact toxic: *Lycopersicon* leaves contain the steroid alkaloid tomatine (Hänsel *et al.*, 1999), while *Mercurialis* ssp. are well known in the toxicological veterinary data (see, for example, Furler, 1999). At high doses, this last botanical taxon is capable of producing haemolysis and irreversible liver and neurological damage, especially in cattle. This is due to mercurialine or methylamine, while saponins are responsible for the laxative and diuretic action (Roth *et al.*, 1994). *Sedum* species (*S. acre*) are known to act as mucosal irritants because they contain piperidin alkaloids (Roth *et al.*, 1994).

The external uses of the caustic fruit juice of *Ecballium elaterium* (squirting cucumber) against wounds and of the tubers of *Cyclamen hederifolium* against warts also need to be better evaluated in clinical studies for eventual application in primary animal health care.

The bark of *Fraxinus ornus* (manna ash tree) and the aerial parts of *Scrophularia canina* (figwort) are still used for various poultry maladies. *Fraxinus* bark contains compounds belonging to the groups of hydroxycoumarins, secoiridoid glucosides, phenylethanoids and flavonoids (Kostova, 2001), and biological studies have revealed significant antimicrobial, antioxidative, prevention of photodynamic damage, wound healing, anti-inflammatory, immunomodulatory and antiviral activities in humans (Kostova, 2001, and references therein). Iridoids have been isolated from *S. canina* (Berdini *et al.*, 1991), but no pharmacological data are available in the literature. However, there are so far no studies that support the use of *Fraxinus ornus* in veterinary medicine in relation to poultry or other animals.

The use of the roots of a particular species of *Erigeron acer* (hawkweed), implanted into the skin of the ear to diagnose and heal swine erysipelis as caused by *Erysipelothrix rhusiopathiae*, is very peculiar and has never before been reported. This pathogenic microorganism can infect a wide variety (over 50 species) of animals, including vertebrates and non-vertebrates. This use of *E. acer*, which is similar to that of the roots of *Helleborus* species, which are widely used for the same purpose in central and northern Italy (Pieroni, 1999) and in Romania (Bogdan *et al.*, 1990), should be better

investigated. This species was also well known in Central European folklore for its efficacy against witchcraft while, in Sudeten-Silesia, *E. acer* was given to cattle to protect them against 'bad spirits' and the plant was put on hot coals as a good omen while the udder was smoked before being eaten (Marzell, 1943). The ritual symbolism related to this plant is still evident in the vernacular name that we recorded ('root of the crook'), and in other Italian vernacular names used for other *Erigeron* species (*cua de lu'*, 'wolf's cue', or *panas de volp*, 'fox bread'; Penzig, 1924), and may partly explain the permanence of a folk use in the very specific traditional treatment of erysipelas. Despite its interesting folk and veterinary use, *E. acer* has never been phytochemically or pharmacologically studied, whereas a few recent studies on other *Erigeron* species have demonstrated their molluscicidal and antifungal properties (*E. speciosus*, Meepagala *et al.*, 2002), and their ability to protect the vascular endothelium (*E. breviscapus*, Zhu *et al.*, 1999).

The use of a concentrated enolate of *Cistus incanus* (rockrose), *Colutea arborescens* (bladder senna), *Daphne laureola* (spurge laurel) and *Rosmarinum officinalis* (rosemary) to heal contagious agalactia (caused by the mycoplasma *Mycoplasma agalactiae*) is very interesting because the use of three of these species (the exception being rosemary) has not previously been reported in the ethnoveterinary literature.

Whereas the uses of *Allium sativum* as a vermifuge, of *Malva sylvestris* as a laxative, of *Matricaria recutita* as a post-partum depurative, and of *Sorbus domestica* fruits as astringents are common both in folk and in modern Western evidence-based phytotherapy (Schilcher and Kammerer, 2000), the medicinal use of *Spartium junceum* (Spanish broom) flowers and of the aerial parts of *Senecio vulgaris* (groundsel) to heal snake bite cannot be explained by existing ethnopharmacological studies. Practical experiences consolidated over centuries have frequently merged with symbolic cosmologies in folk medical and veterinary practices. The means by which the plant contributes to the process of healing from snake bites could perhaps be considered from this perspective, as it evidenced from other regions of Italy, where *Spartium* is thought to be active against the 'evil eye' (Pieroni and Giusti, 2002).

What is the origin of traditional veterinary knowledge? We suggest that ethnoveterinary practices have probably followed two main evolutionary pathways, one in relation to local folk medicine, another in relation to the zoopharmacognosy of domesticated and semi-domesticated animals. We found that local folk medicine and veterinary practices overlap for some plant species (e.g. *Allium sativum*, *Cyclamen hederifolium*, and *Sorbus domestica*, see Tables I and II). It is noteworthy, in this context, that toxic species (*Colutea arborescens*, *Daphne laureola*, *Ecballium elaterium*, and *Mercurialis annua*) are still used for veterinary practices, while their use in human folk medicine has been historically abandoned or never occurred. The general perception that animals tolerate phytotoxicity better than humans possibly means that the latter receive the benefits of historical trial-and-error experimentation with phytotherapeuticals that have occurred on the former, at least in relation to those species of plants that have a high dose-related toxicity.

Indeed, the cultural dimensions of ethnoveterinary practices are much more complex than simply 'humans choosing plants to heal animals', and the relationships of ethnoveterinary practices with local human folk medicine on one hand, and with

bovine zoopharmacognosy on the other, are a fruitful area for research into these complexities. Although it is difficult to distinguish pharmacological versus nutritional adaptations made by animals, there is some evidence that they deal with and take advantage of plant allelochemicals that have an apparent medicinal effect in a feeding context (Janzen, 1978; Glander, 1982; Wrangham and Waterman, 1983; Johns, 1990). Feeding strategies in primates often seem to select plant species for control of intestinal parasites (Garber and Kitrom, 1997; Huffman *et al.*, 1997; Huffman, 2002), and there is even a field report of bears rubbing fungicidal species onto their fur (Etkin, 1994).

We can thus argue that some species used in traditional veterinary practices are plants that animals consume for the self-healing of specific afflictions. It was reported by our informants that lactating animals should be prevented from consuming hemlock (*Conium maculatum*), white horehound (*Marrubium vulgare*) or fenugreek (*Trigonella foenum-graecum*) owing to the bitter taste these will impart to the milk following ingestion. It is much more probable that this information became common knowledge in Lucania through deduction by observing the effects of cattle feeding on the plants, rather than from deliberate trial-and-error feeding experiments. During the domestication process, humans have progressively taken care of animals' food and health needs, probably including the feeding to stabled animals of plant alleochemicals typically consumed while grazing.

Most of the plants that were reported during the field work as being used in animal health in Tables I and II, and from the literature in Table III, are species associated with pastures, meadows, uncultivated land and other feeding habitats of cattle, such as the *Podolica* breed in this case study, and/or with habitats of ruderal species (which grow in soils very rich in organic humus). As human dietary and medicinal uses of plants lie along a continuum (Etkin and Ross, 1982, 1991), so veterinary practices are often a cultural device, in which it is difficult to neatly distinguish between the animals' own practices and those that are imposed on them by their human managers. If the aerial parts of *Anemone hortensis*, reported to be fed to animals together with fodder, are also eaten by the animals themselves to overcome poisoning, then the practices of feeding animals with oak (*Avena sativa*, to induce oestrus), goat willow (*Salix caprea*, to cure anal parasites), and Bermuda grass (*Cynodon dactylon*, to heal intestinal inflammations; Catanzaro, 1968), or *Ecballium elaterium* (as a purgative, Lentini and Aleo, 1991) has probably been learned by observing the feeding behaviour of the animals themselves. Ethological field work dealing with self-medicating feeding habits and behaviour, particularly of semi-domesticated local races, might provide interesting insights into the issue and also increase the number of case studies that test hypotheses about the evolution of ethnoveterinary practices.

With regard to the animal and mineral remedies, the very common use of pig fat that has been cured for several weeks merits special mention. This is applied to both humans and animals as an emollient and skin anti-inflammatory. So, in animals, does the use of goats' gall bladders to heal inflammations due to insect bites. These cases represent animal-derived remedies used to cure animals, which are very rare (Ertuğ, 1999).

Since modern Western pharmaceuticals have often replaced the use of traditional veterinary medicine, more local heritage is retained with respect to practices that are more distant from the medical field and instead have to do with animal management.

An example of these practices is represented by natural nutraceuticals that are used to improve the health of the animals and/or their performance (such as milk or egg production). In 1989, the Foundation for Innovation in Medicine used the term'nutraceuticals' for the first time to cover 'substances that may be considered a food or part of a food, and provide medical or health benefits, including the prevention and treatment of diseases' (Hardy, 2000). Nutraceuticals, such as glucosamine or antioxidants such as vitamin E and β-carotene, as well as selenium, ω-3-fatty acids and safflower oil, are already used with animals to obtain systemic beneficial effects and to improve the skin health of pets (Bauer, 2001).

In our field study, about 30 botanical taxa were considered by local people to be specific nutraceuticals and are given to the animals as fodder (sometimes along with other feed), especially during the summer and winter, with the aforementioned purposes; in other words, these materials are different from the mixtures of herbs that are generally collected at random in the field and given as normal feed to the animals, or even from those that the animals spontaneously graze during the spring and autumn.

The evaluation of these species, within the context of a local integrated project oriented towards sustainable land and animal management, should be considered carefully. All of the species quoted are very common, and sometimes the use of this vegetable material as fodder is the by-product of a primary agricultural or landscape management use – for example, feeding the aerial parts of red poppy (*Papaver rhoes*) and nettle (*Urtica dioica*). The young aerial parts of both plants are generally gathered by women, who process them in the local traditional cuisine, and also at other times to manage and maintain 'clean' ecological spaces around wheat fields (red poppy) or in the neighbourhood of the household (nettle).

A final interesting dimension of veterinary TK, that has been recorded, concerns plants used to improve the quality of milk and of dairy products. Only in this field could we discover 'know-how' that is equally shared between female and male members of the communities, or is even more prevalent among women.

The use of latex from the fig tree (*Ficus carica*) as 'vegetable rennet' and also the use of certain materials for filtering milk (*Galium aparine*), goosegradd, or *Pteridium aquilinum*, bracken) before processing were common in other Mediterranean areas. However, the tradition of adding branches of dried *Thymus pulegioides* (wild thyme), a plant that is reported sometimes to be eaten by the animals themselves, to rennet to give cheese a characteristic aroma, or the specific use of *Spartium junceum* wood when heating whey to make ricotta (a typical Italian dairy product made by heating the whey that is a by-product of cheese-making) may represent interesting inputs that could be evaluated for local speciality dairy products.

An important potential long-term output of this study, and of other studies like it, could be the development of eco-sustainable projects with the primary goals of re-evaluating TK and sustaining traditional agricultural and animal breeding systems. This could also permit the controlled use, perhaps supervised by local veterinary services, of suitable phytotherapeuticals and plant extracts derived from plants that could add value to some traditional food and dairy specialities.

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