Journal of Ethnopharmacology 182 (2016) 35–49

Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jep

Traditional Arabic Palestinian ethnoveterinary practices in animal health care: A field survey in the West Bank (Palestine)

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ARTICLE INFO

Article history:
Received 12 September 2015
Received in revised form
26 November 2015
Accepted 6 February 2016
Available online 8 February 2016

Keywords:
Ethnoveterinary
Palestine
Medicinal plants
Rank-order priority
Informant consensus factor

ABSTRACT

Background: In Palestine, medicinal plants have continued to play a vital role in fulfilling animal healthcare needs of rural communities. However, these valuable resources are being depleted mainly due to over-harvesting, inappropriate agricultural practices (e.g., over use of herbicides), agricultural expansion, and over-grazing. Therefore, immediate action is required to conserve these resources and document the associated knowledge. The purpose of this study was, thus, to document and analyze information associated with medicinal plants that are used in managing animal health problems in the West Bank, Palestine.

Materials and methods: Ethnobotanical data were collected from Apr 2012 to Feb 2014 mainly using semi-structured interviews with informants sampled using purposive sampling technique and through field observations.

Results: The study revealed the use of 138 medicinal plant species in the West Bank for the treatment of several livestock diseases, of these 75 species representing 70 genera and 33 families were reported by 3 independent informants or above. Classification of the ethnoveterinary plant species cited by three informants or above used in a rank-order priority (ROP) based on their claimed relative healing potential has demonstrated that the following are the plants with the highest efficacy: *Camellia sinenses, Teucrium capitatum*, and *Salvia fruticosa* with ROPs of 97.1, 93.2, and 91.4, respectively, are used primarily to relieve gastric disorders. Gastrointestinal disorders is the disease group in the study area that scored the highest Informant consensus factor (ICF) value (0.90), followed by urinary, and reproductive disorders (0.89).

Conclusion: Our study provided evidence that medicinal plants are still playing important role in the management of livestock diseases, and showed that ethnoveterinary plants used in animal health care in Palestine have been also recorded in human Traditional Arabic Palestinian Herbal Medicine (TAPHM), and demonstrated a strong link between human and veterinary medical practices. This survey has identified a number of important medicinal plants used by the Palestinian farmers of the West Bank area for the treatment of various animal ailments. It provides a baseline for future phytochemical and pharmacological investigations into the beneficial medicinal properties of such plants.

1. Introduction

Traditional ethnoveterinary therapeutics prepared by humans, for the purposes of maintaining or restoring animal health, play a significant role in several regions of the world especially in areas where livestock is a main source of income for rural peoples (Bartha et al., 2015). In contemporary rural Middle East and North Africa Region (MENA), ethnoveterinary medicine (EVM) was practiced as early as 1800 BCE at the time of King Hamurabi of Babylon, who enacted laws on veterinary fees and charged for treating cattle and donkeys (Scillhorn van Veen, 1996). Ethnoveterinary therapeutics often contains ingredients originated from various locations within the environment, including plants, animals and minerals. However, there is a greater interest in ethnoveterinary uses of local plants due to several reasons including (a) EVM often provides cheaper options to allopathic medicine; (b) chemical treatments on animals are suspected of leaving residues in animal products; (c) a number of drugs once thought indispensible to breed animals, such as antibiotics used as growth promoters or used to prevent ailments such as respiratory problems are being phased out; and (d) parasites develop resistance to chemicals worldwide and treatment become inefficacious. These constraints have triggered recent surveys of ethnoveterinary practices around the Mediterranean (e.g., Morocco, Algeria, Spain,

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http://dx.doi.org/10.1016/j.jep.2016.02.005
0378-8741/

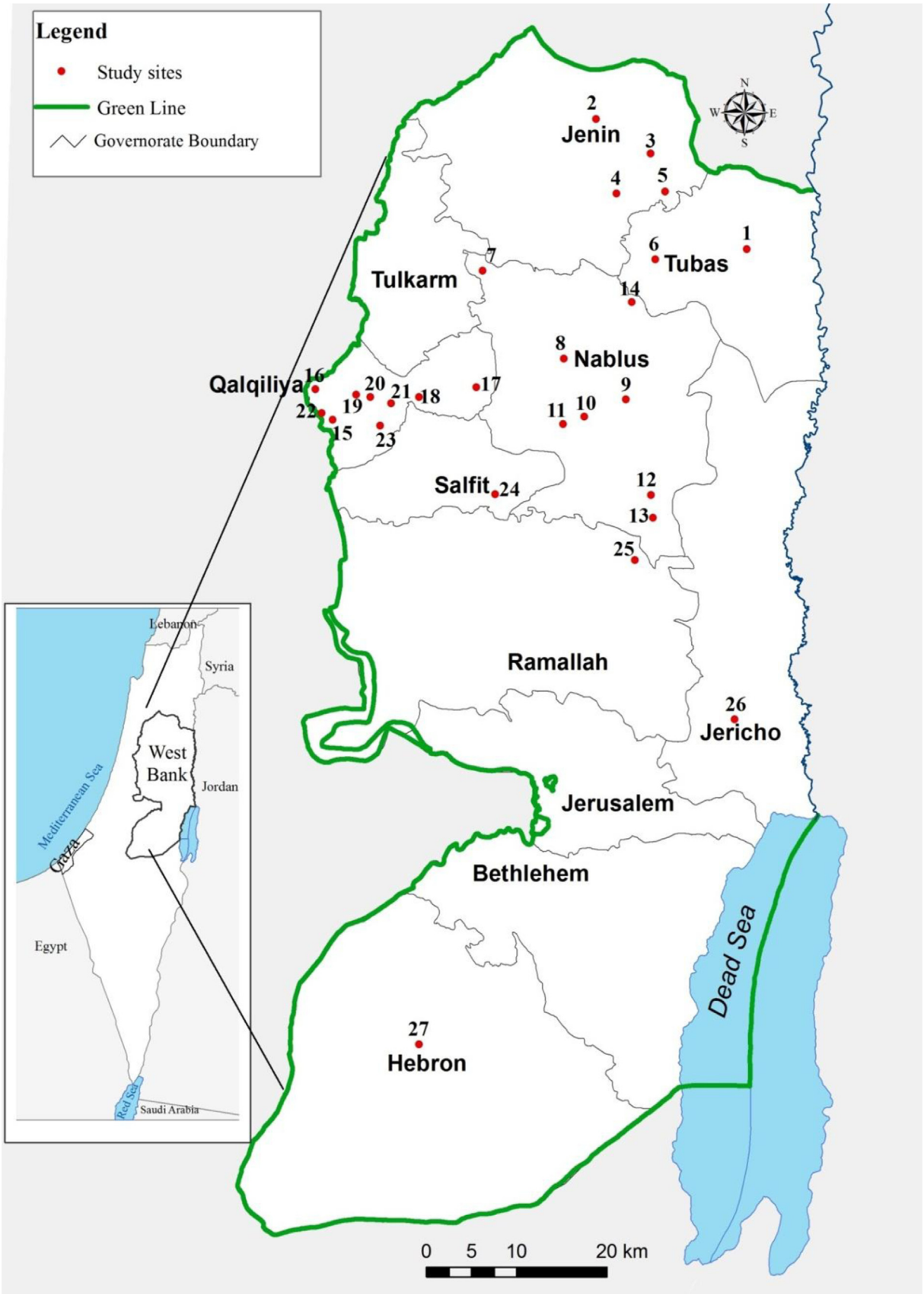

Fig. 1. Map of the West Bank, Palestine showing study sites: 1, Al Malih; 2, Jenin; 3, Jalqamus; 4, Az Zababida; 5, Raba; 6, Tubas; 7, Bizzariya; 8, Nablus; 9, Beit Furik; 10, 'Awarta; 11, Huwwara; 12, Majdal Bani Fadil; 13, Duma; 14, Wadi al Far'a; 15, Ras'Atiya; 16, Qalqiliya; 17, Immatin; 18, Kafr Laqif; 19, An Nabi Elyas; 20, 'Izbat at Tabib; 21, 'Azzun; 22, Habla; 23, Kafr Thulth; 24, Salfit; 25, Al Mughayyir.

Italy, Cyprus, Greece, and Egypt) (Viegi et al., 2003; Pieroni et al., 2006; Bullitta et al., 2007; Landau et al., 2014; Piluzza et al., 2015).

Even though using plants as remedies is the corner-stone of ethnoveterinary medicine, other practices, such as the use of drugs of animal origin and cauterization medicine, in which a hot iron is used for curative purposes (Ghazanfar, 1995), still survive in the Mid-Eastern veterinary treatments.

In Palestine, medicinal plants have continued to play a vital role in fulfilling animal healthcare needs of rural communities. However, the flocks – 946,229 (West Bank 875,269; Gaza 70,960) sheep and goats – in Palestine undergo a process of rapid intensification (Palestine Central Bureau of Statistics, PCBS, 2014). As result of urbanization, and land tenure limitations, the area dedicated to small ruminant grazing is decreasing. Even though the ecological contribution of flocks is recognized and the society is ready to pay for these ecological services, the percentage of small ruminants on pasture is diminishing and the number of active ranchers is decreasing. Ethnoveterinary knowledge, may have thus survived in much less farmers and there is serious concern that all this knowledge, including drug preparation from local plants, could be lost in this generation.

In Palestine, no work has been published encompassing data on ethnoveterinary knowledge associated with medicinal plants and other ethnoveterinary medicines that are used in managing animal health problems in the West Bank, Palestine. We hypothesize that the transmission and implementation of traditional knowledge has declined as a result of the alteration and degradation of the environment, decreasing numbers of herds, and more expanded availability of official medicines and modern pharmaceuticals in several regions of the country. Nevertheless, several farmers in rural areas preserve the old traditions through home practices and oral transmission of knowledge.

The purpose of this study was, thus, to document and analyze information (Traditional Arab Palestinian ethno-veterinary knowledge) associated with medicinal plants that are used in managing animal health problems in the West Bank, Palestine.

2. Materials and methods

2.1. Study area and ethnographic background

An ethnobotanical study was conducted from Apr 2012 to Feb 2014 in different locations in the West Bank, Palestine. Twenty nine locations in six districts (Jenin, Qalqilia, Nablus, and Salfit in the north; and Jericho and Hebron in the south) were selected for inclusion in the study (Fig. 1). The West Bank lies between 29°–30′ and 33°–15 ′ north latitude and between 34°–15′ and 35°–40′ east longitudes, comprising an area of 5900 km^2. The climate of the area is semi-arid Mediterranean climate with mild winter and hot summer. Annual average high temperature is around 21.5 °C (with hottest months July and August being 28.9 °C), and annual average low temperature is around 10.87 °C (with coldest month is January with the average low temperature around 3.9 °C). Average annual rainfall is about 600 mm.

The study area comprises three main plant geographical territories: the Mediterranean Territory, with its natural vegetation dominated by *Quercus calliprinos* and *Pistacia palaestina* trees, is a fertile agricultural area encompassing much of the hilly and semi-coastal central areas within the West Bank; and the Irano-Turanian, and Sudanese-Penetration territories, where annual rainfall ranges from 250 mm in northern and western areas down to barely 50 mm in the southern Valley running along the Syrian-African Rift Valley.

The livestock population in the West Bank, Palestine, was estimated to 26,324 heads of cattle, 583,130 sheep, 221,456 goats, 1486 camels, and 4,411,001 chicken in the year 2013 (PCBS, 2014). At the same time, there were no governmental rural veterinary clinics in the West Bank. Governmental veterinary service was limited to carrying out routine immunization programs targeted at preventing certain livestock infectious diseases.

2.2. Ethnobotanical data collection

Ethnobotanical surveys were conducted in all four seasons. Participatory rural appraisal (PRA) approaches were adopted during fieldwork. Informed consent was obtained prior to conducting the surveys. Ethnobotanical data were collected with snow-ball technique in semi-structured interviews in Arabic and all researchers adhered to the ethical guidelines of the International Society of Ethnobiology (2006). A total of 268 informants (218 males and 50 females), ranging from 20 to 75 years old and including farmers, shepherds, housewives and herbalists familiar with livestock problems and use of conventional recipes, were interviewed and their responses recorded in detail. Peer-recommendations from community members, elderly people and knowledgeable inhabitants helped in nominating the informants who participated in the study. Informed consent was obtained from each informant who participated in this study after explaining the purpose of the study and assuring them of the most responsible judicial use in the resulting information before the start of interviews.

During interviews, details concerning common ailments of domesticated animals, ingredients to traditional therapies (coming from plant, animal, and mineral origin) as well as local healing methods were recorded. Informants were followed into the local agro-ecosystem surrounding villages in order to show and gather the cited wild and cultivated plants. Regarding the cited plant taxa, data concerning the following topics were collected: local name(s), frequency, habitat, used part, preparation, category and way of use, treated ailments and animals with local name(s). Interviews were documented with photos of plants and their habitat as well as the final therapeutic products. Taxonomic identification of the collected plant samples was carried out with the help of Flora Palaestina (Feinbrun-Dothan, 1978–1986; Zohary, 1966–1972), The Plant List, (http://www.theplantlist.org/) and by one of the authors (MSA-S, botanist). Voucher specimens of the cited plants were prepared and deposited at the BERC Herbarium- Nablus.

2.3. Data analysis

Ethnoveterinary data on medicinal plants used in the Palestinian West Bank Districts were entered in an excel spreadsheet and organized for statistical analysis. Descriptive statistics was applied to compute the number and percentage of species, genera and families of ethnoveterinary medicinal plants, plant parts used, modes of remedy preparation and routes of administration (Table 1). Responses regarding socioeconomic conditions were coded and entered into SPSS for Windows, version 16, for statistical analysis. Multivariate analysis and 2×2 contingency tables were used to compare groups. Chi-square and Fisher exact tests were used to test for significant differences between groups. An a priori level of significance was set at 0.05.

The collected ethnobotanical data were analyzed and various indices were determined following the relevant standard methods (Martin, 1995; Alexiades, 1996; Heinrich et al., 1998; Friedman et al., 1986; Ali-Shtayeh et al., 2000), to identify the most-preferred medicinal plant species to treat the most frequently reported disease type in the area.

2.3.1. Rank-order priority and relative healing potential

To allow the classification of plants used in a rank-order

Table 1
List of ethno-veterinary medicinal plants cited in descending order of their rank-order priority (ROP: scientific name (family); English name; local name (Arabic); parts used; ethnoveterinary uses; mode of preparation; mode of use; animal treated; quotation frequency; fidelity level (FL); rank priority level (RPL), and rank-order priority (ROP) (the number of each species corresponds to its position in Fig. 2).

No.	Scientific name (Family) Voucher numbers	English name	Arabic Name	Parts used*	Ethno-veterinary use(s)**	Mode of preparation	Mode of use	Animal (s) treated	Citation[a]	Quotation frequency (No. of informant primary use)	FL	RPL	ROP
5	*Camellia sinenses* (L.) Kuntze (Theaceae) BERC-BX-C0617	Tea	شاي	LE	**Diarrhea**, flatulence, cleaning the uterus, eye diseases	• A decoction is prepared from the plant (250 gm/L of water), add to the drinking water twice a day, lemon can be added • One drop of the decoction is applied into the eye	Oral	Sheep, goats, cows	N,J,Q, S,JE,H	68(66)	97.1	1	97.1
4	*Teucrium capitatum L.* (*Teucrium polium* L.) (Lamiaceae) BERC-BX-C0167	Cat Thyme	جعدة الصبيان	AP	Diarrhea, **colic**, bleeding, scabies, flatulence	• A decoction is prepared from the plant. Add to the drinking water. • Crushed leaves are applied to the skin as a poultice	Oral Dermal	Sheep, cows, goats	N,J,Q, S,JE,H	73(68)	93.2	1	93.2
2	*Salvia fruticosa* Mill. (Lamiaceae) BERC-BX-C0006	White Sage, Common Sage	مريمية	AP	Appetizer, cleaning the uterus, **colic**, flatulence, poisoning, cold, diarrhea, satiety	• A decoction is prepared from the plant; add to the drinking water for 3 days.	Oral	Sheep, cows, goats, rabbits	N,J,Q, S,JE,H	81(74)	91.4	1	91.4
3	*Hordeum vulgare* L. (Poaceae) BERC-BX-C0620	Barley	شعير	SE	During giving birth, **cleaning the uterus,** Galactagogue, flatulence constipation, appetizer	• Boil 2 kg of the seeds in 6 L of water; add filtrate to the animal drinking water. • Seeds are mixed with vinegar and used for scabies	Oral	Sheep, cows, goats	N,J,Q, S,JE	79(65)	82.3	1	82.3
1	*Trigonella berythea* Boiss. and Blanche *(T. foenum- graecum* L.) (Fabaceae) BERC-BX-C0119	Fenugreek Seed, Beiruth Fenugreek	حلبة	SE	Galactagogue, colic, diarrhea, flatulence, nourishment, **post-partum inflammation**, udder infection	• A decoction is prepared from the seeds and added to the animal drinking water, or apply to the affected organ	Oral Dermal	Sheep, cows, horses, goats	N,J,Q, S,JE	100(74)	74.0	1	74
10	*Cuminum cyminum L.* (Apiaceae) BERC-BX-C0608	Cumin	كمون	SE, AP	**Colic**, flatulence, galactagogue, appetizer,	• Seeds are grinded and added to the animal feed • Boil a cup of the seeds in 5 cups of water, filtrate and add to the animal drinking water • Aerial parts are added to the animal feed	Oral	Sheep, cows, donkeys, goats	N,J,Q	33(28)	84.8	0.83	70.2
13	*Solanum nigrum* L. (Solanaceae) BERC-BX-C0623	Black Nightshade	سموة، عنب الديب	FR, LE	Dimples, **scabies**, injuries	• Mix 100 gm of leaves with olive oil, heat, apply as poultice to the affected area • Fruits are crushed and added to the affected part	Dermal	Sheep, cows, goats horses	N,J,Q, JE,H	23(22)	95.7	0.73	69.7
21	*Quercus calliprinos* L. (Fagaceae) BERC-BX-C0016	Kermes Oak	سنديان، بلوط	LE, FR	Flatulence, appetizer, **colic**, diarrhea, galactagogue	• Fruits covers are boiled in water, and added to the drinking water • Fruits are crushed mixed with phyllarea and sarcopoterium leaves, and added to the animal feed • A decoction is prepared from the leaves, and added to the animal drinking water	Oral	Sheep, cows, goats	N,J,Q, S,H	15(15)	100.0	0.65	65.4
22	*Mentha spicita* L. (Lamiaceae) BERC-BX-C0116	Peppermint	نعنع	LE	Laxative, flatulence, **diuretic**, fever, flea repellent, sore throat	• Boil either leaves or Aerial parts in water. Use in drinking water for animals when needed	Oral	Sheep, cows and donkeys	N,Q	14(14)	100.0	0.64	64.2
36	*Citrus Sinensis* (L.) Osbeck (Rutaceae) BERC-BX-C0618	Sweet Orange – Tree	برتقال	FL	**Colic**, appetizer, diarrhea	• Flowers are soaked in water, and added to the drinking water of the animal	Oral	Sheep, cows. Donkeys	N,J,Q	8(8)	100.0	0.58	58.0
35	*Vicia faba* L. (Fabaceae) BERC-BX-C0094	Broadbean	فول	FR	**Galactagogue**, nourishment	• Added to the feed of the animal either fresh or dried	Oral	Sheep, cows,	**N,** Q	8(8)	100.0	0.58	58.0

								horses					
40	*Cydonia vulgaris* Pers. (Rosaceae) BERC-BX-C0115	Quince – Tree	سفرجل	LE. RO	**Injuries, snake and scorpion bites**, increase immunity	• Roots are crushed, boiled and applied to the place of infection. • An infusion is prepared from the leaves, add to the drinking water	Dermal	Sheep, cows	N,J,Q, S	7(7)	100.0	0.57	56.8
44	*Punica granatum* L. (Punicaceae) BERC-BX-C0070	Pomegrante	رمان، جلنار	LE, FR	**Diarrhea**	• Boil leaves in water, and add to drinking water • Add the fruits skin to the animal feed	Oral	Sheep, cows, goats	N,J,Q	6(6)	100.0	0.56	56.2
46	*Ficus carica* L. (Moraceae) BERC-BX-C0048	Fig Tree	تين	LE, Latex	**Ulcers**, insects bites, constipation, nourishment	• Extract the milky secretions from stems and leaves, add to the affected area. • Leaves are dried and added to the animal feed	Dermal Oral	Sheep, cows	N,Q	5(5)	100.0	0.56	55.6
47	*Oxalis pes-caprae* L. (Oxalidaceae) BERC-BX-C0265	Wood Sorrel	حمصيص	LE	**Digestive system**	• Leaves are boiled in water	Oral	Sheep, cows, goats	J	5(5)	100.0	0.56	55.6
48	*Saccharum officinarum* L. (Poaceae) BERC-BX-C0622	Suger-Cane	قصب السكر	ST	**colic**, coughing	• Stem is soaked in water, squeezes, add to drinking water	Oral	Sheep, bees cows, goats	J	5(5)	100.0	0.56	55.6
7	*Ceratonia siliqua* L. (Fabaceae) BERC-ST-C31	Carob	خروب	FR, LE	**Nourishment**, anthelmintic, scabies, eye inflammation, cleaning uterus, delay in giving birth, diarrhea	• Fruits are boiled in water, and added to the drinking water of the animal • Leaves or fruits are crushed soaked in water, boiled for 4 hours and applied on the affected part • Added to the feed of the animal	Oral Eye Dermal	Cats, dogs, cows, goats, sheep	N, J,Q, S,JE	42(25)	59.5	0.91	54.4
54	*Anchusa aegyptiaca* (L.) DC. (Boraginaceae) BERC-ST-C18	Eagyptian Alkanet	حمحم مصري، شبيط	LE	**Ulcers**	• Leaves are boiled in water	Oral	Sheep, cows	N, S,JE	4(4)	100.0	0.54	54.3
57	*Capsella bursa-pastoris* (L.)DC. (Brassicaceae) BERC-BX-C0004	Mother's Heart	جراب الراعي	AP	**Diarrhea**	• A decoction is prepared from the plant, add to the drinking water of the animal	Oral	Sheep, cows	N	4(4)	100.0	0.54	54.3
56	*Ferula communis* L. (Apiaceae) BERC-BX-C0171	Giant Fennel	كلخ، حلتيت، زلوع	T	Trauma, **flatulence**	• A decoction is prepared, add 120 ml to the drinking water of the animal 3 times daily	oral	Sheep, cows, goats	J,Q	4(4)	100.0	0.54	54.3
58	*Myristica fragrans* Houtt. (Myristicaceae) BERC-BX-C0324	Mace, Nutmeg	جوزة الطيب	AP	Appetizer, **constipation**	• Aerial parts are boiled in water, add 200 ml to the animal drinking water	Oral	Sheep, cows, goats	Q,S	4(4)	100.0	0.54	54.3
55	*Myrtus communis* L. (Myrtaceae) BERC-BX-C0051	Common Myrtle	ريحان، آس، مرسين	LE, FL	Diarrhea, **ulcers**	• Add to the feed of diuretic animal. Crushed leaves and flowers are applied on the skin.	Oral Dermal	Cows	N,Q	4(4)	100.0	0.54	54.3
59	*Paronychia argentea* Lam. (Caryophyllaceae) BERC-BX-C0009	Silvery Whitlow-Wart	رجل الحمام	AP	**Urine retention**	• Boil 250 gm in water, filtrate and add to the drinking water.	Oral	Sheep	N,J	4(4)	100.0	0.54	54.3
15	*Anisum vulgare* L. (Apiaceae) BERC-BX-C0616	Anise	ينسون	SE, FL	**Flatulence**, muscle relaxant, pneumonia, constipation intestinal diseases, for the newborn who drink amnion during childbirth	• 1/2 kg of the seeds (flowers can be added) are boiled in 5 Liters of water, and given to animal according to its size and type • Boil 250 gm of the seeds in a liter of water , coriander can be added, add to drinking water, or seeds can be added to the feed of animals	Oral	Sheep, cows, donkeys	N,Q,S, JE,H	23(17)	73.9	0.73	53.8
14	*Crataegus aronia* (L.) Bosc. ex DC. (Rosaceae) BERC-BX-C0059	Hawthorn	زعرور شائك	LE, FR. FL	Urine retention, **inflammation**, coccidia, constipation, pregnancy poisoning	• A decoction is prepared from the plant, filtrate and add to the drinking water	Oral	Sheep, goats, cows	N,J,Q, S,JE	23(17)	73.9	0.73	53.8
73	*Ammi majus* L. (Apiaceae) BERC-ST-C384	Pick Tooth	خلة	LE, FR	**Urinary tract infection**	• Leaves and fruits are boiled in water, add to the drinking water twice a day	Oral	Sheep, cows, goats	J	3(3)	100.0	0.53	53.1
63	*Anthemis tinctoria* L. (Lamiaceae) BERC-BX-C0279	Dyer's Chamomile	أقحوان أصفر، بهار	LE, FL	**Skin ulcers**, scabies	• Leaves are crushed, squeezed, filtrated and applied on affected area • Flowers are immersed in olive oil in a closed	Dermal	Sheep	N,Q	3(3)	100.0	0.53	53.1

Table 1 (*continued*)

No.	Scientific name (Family) Voucher numbers	English name	Arabic Name	Parts used*	Ethno-veterinary use(s)**	Mode of preparation	Mode of use	Animal (s) treated	Citation[a]	Quotation frequency (No. of informant primary use)	FL	RPL	ROP
			الصباغين			bottle and placed the sun for two weeks. Apply on affected area twice a day							
68	*Cassia senna* L. (Fabaceae) BERC-BX-C0607	Senna	سنمكة، عشرق	LE	**Constipation**	• A decoction is prepared from the plant, add to the drinking water	Oral	Sheep	N,Q	3(3)	100.0	0.53	53.1
67	*Cupressus sempervirens* L. (Cupressaceae) BERC-BX-C0619	Cypress	سرو	FR LE	**Diarrhea**	• Boil ½ kg in 2 L of water, Add to the animal drinking water	Oral	Sheep, goats	N,J,Q	3(3)	100.0	0.53	53.1
72	*Eruca sativa* Miller (Brassicaceae) BERC-ST-C124	Garden Rocket	جرجير	LE, SE	**Increase fertility**	• Added to the animal feed • Seeds are added to the birds feed	Oral	Birds	N,J	3(3)	100.0	0.53	53.1
62	*Ficus sycomorus* L. (Moraceae) BERC-ST-C260	Sycamore	جميز	ST, FR, LE	**Skin diseases diarrhea**	• The stems are crushed filtered and add the filtrated to the affected area • Add to the feed of the animal	Dermal Oral	Sheep, cows, goats, horses	Q	3(3)	100.0	0.53	53.1
66	*Glycine max* L. (Merr.) (Fabaceae) BERC-BX-C0609	Soy Bean	فول الصويا	SE	**Feedlot**	• Added to the feed of the animal, 2 kg of the seeds to each 10 kg of animal feed	Oral	Sheep, cows	N,Q	3(3)	100.0	0.53	53.1
71	*Lawsonia inermis* L. (Lythraceae) BERC-BX-C0308	Henna	حناء، تمر حنة	LE	Trauma, ulcers, **postpartum inflammation**	• Soak in hot water, and apply to the affected area	Dermal	Sheep, cows, goats	N,J	3(3)	100.0	0.53	53.1
64	*Lycopersicon esculentum* Mill. (Solanaceae) BERC-BX-C0610	Tomato	بندورة	FR	**Bees and snake bites**	• The fruits are cut into pieces and added to the affected area	Dermal	Cows	N	3(3)	100.0	0.53	53.1
69	*Phillyrea latifolia* L. (Oleaceae) BERC-BX-C0621	Lance-Leaved Phillyrea	زرود، برزة	LE	**Appetizer**	• Mix with oak and thorny burnet leaves. Add to the animal feed	Oral	Sheep	Q	3(3)	100.0	0.53	53.1
70	*Pyrus malus* L.(Rosaceae) BERC-BX-C0611	Apple	تفاح	FR	**Pregnancy poisoning**	• The fruits is prepared as Jam, mixed with milk and given to animal	Oral	Sheep, horses	N,Q	3(3)	100.0	0.53	53.1
65	*Thymelaea hirsute* L. (Thymelaeaceae) BERC-BX-C0512	Shaggy Sparrow-Wort	متنان	LE	**Cold**	• Leaves are cooked and applied around the neck	Dermal	Sheep, cows, goats	H	3(3)	100	0.53	53.1
6	*Varthemia iphionoides* (Boiss and Blanche) Brullo (Asteraceae) BERC-BX-C0135	Goldy-Locks	كتيلة، صفيرة	AP	Colic, scabies **diarrhea**, fever, flatulence, pregnancy poisoning, udder infections	• Boil in water, add to the drinking water, or apply to the infected Udders • Crushed leaves are applied to the skin as a poultice	Oral, Dermal	Sheep, cows, goats	N,J,Q, JE,H	61(32)	52.5	1	52.5
24	*Psidium guajava* L. (Myrtaceae) BERC-BX-C0195	Guava	جوافا	LE, FR	Colic, inflammation, ulcers, **pneumonia**	• Leaves are boiled for ½ hour, filtrated and added to the animal drinking water • Leaves are crushed and applied to the affected area as poultice • Added to the animal feed	Oral Dermal	Sheep, cows, goats	J,Q,S	11(9)	81.8	0.62	50.5
9	*Ricinus communis* L. (Euphorbiaceae) BERC-BX-C0132	Castor Beans	خروع	SE	Anthelmintic, flatulence, diuretic, udder infection	• Mix 10 ml of castor oil with olive oil, give to the animal one time. Or apply to the affected area	Oral Dermal	Cows, sheep, goats	N, Q,S, JE	39(22)	56.4	0.89	50.1
12	*Artemisia inculata* Delile (=*A. herba-alba* Asso) (Asteraceae) BERC-BX-C0606	White Wormwood	شيح	AP	After delivery, constipation relaxant for bee, **ulcers**	• A decoction is prepared from the plants, filtrate, add to the drinking water • Burn 30gm of the plant and allow bees to inhale it by exposing the bee cells to the smoke • Add 250 gm of the leaves to olive oil, heat, apply as poultices on the affected area	Oral Nose Dermal	Sheep, cows, bees, goats	**N**,J,Q, S,JE,H	26(17)	65.4	0.77	50.0
27	*Urginea maritima* (L.) Baker (Liliaceae) BERC-	Squill	بوصلان، خولصان،	LE, TU	Skin diseases, diarrhea, **scabies**	• A decoction is prepared from the leaves, add to the drinking water	Oral, Dermal	Sheep, cows, goats	N,J,Q, JE	10(8)	80.0	0.60	48.4

	BX-C0277		غوصلان			• Tubers are crushed and added as poultice on affected area • The roots are crushed and added to the affected area as poultice 2-3 times daily							
45	*Trifolium alexandrinum* L. (Fabaceae) BERC-ST-C302	Egyptian Clover	برسيم	AP, SE, LE	**Nourishment**, inflammation, during delivery	• Add to the animal feed	Oral	Sheep, cows	N,Q,H	6(5)	83.3	0.56	46.8
32	*Zingiber officinale* Rose. (Zingiberaceae) BERC-BX-C0614	Ginger	زنجبيل	RO	**Ulcers wounds**, respiratory system, colic	• The roots is grinded and applied as a poultices • The roots are grinded , boiled with water, and added to the drinking water	Dermal Oral	Sheep, goats, cows	N,J,Q	9(7)	77.8	0.59	46.1
19	*Eucalyptus camaldulensis* Dehn. (Myrtaceae) BERC-BX-C0039	Red River Gum	كينا، كافور	LE	**Fever and malaria**, flatulence, bees anaesthetization diarrhea, scabies, inflammation	• Leaves are either soaked or boiled in water, filtrate and add to the animal drinking water • For bees, leaves are burned and bees are exposed to the smoke	Oral	Sheep, cows, goats, bees	N,J,Q, S	16(11)	68.8	0.67	45.8
18	*Matricaria aurea* (L.) Sch. Bip. (Lamiaceae) BERC-ST-C89	Golden Cotula	بابونج	AP	Flatulence, colic, coughing, **relieve pain**, diarrhea	• Boil 1 gm of the plant I 1 L of water, filter and add to the drinking water of the animal	Oral	Sheep, cows, goats	N,J,Q, JE	18(12)	66.7	0.68	45.3
50	*Cichorium pumilum* Jacq. (Asteraceae) BERC-ST-C76	Dwarf Chicory	هندباء	AP	Coughing, **diarrhea**	• Add to the feed of the animal • Leaves are boiled, 250 ml of the filtrate is added to the drinking water for 3 days	Oral	Sheep, cows, rabbits	N,JE	5(4)	80.0	0.56	44.4
49	*Coridothymus capitatus* (L.) Reichb. (Lamiaceae) BERC-BX-C0245	Capitate Thyme	زعتر فارسي	LE	**Respiratory system**	• Boil 50 gm in one liter of water, add to drinking water	Oral	Sheep, cows, goats	N,JE	4(4)	80.0	0.56	44.4
20	*Petroselinum crispum* Hill. (Apiaceae) BERC-BX-C0198	Parsley	بقدونس	AP	Appetizer, **urine retention**, constipation, inflammation	• Added to the animal feed, • A decoction is prepared and added to the drinking water	Oral	Sheep, cows,goats, rabbits, donkeys	N,J,Q	16(10)	62.5	0.67	41.7
41	*Alkanna orientales* (L.) Boiss. (Boraginaceae) BERC-BX-C0304	Yellow Alkanet	هواء جوي الشرق	RO	Bruises, arthritis pain, **udder** infections	• 25 gm of roots are grinded, are boiled in 100 ml olive oil. Apply to the affected place as ointment	Dermal	Sheep, cows	**N,J**	7(5)	71.4	0.57	40.6
33	*Pistacia lentiscus* L. (Anacardiaceae) BERC-BX-C0143	Lentisk, Mastic Tree	سريس، بطم، مصطكي	AP	Cold, **flatulence** appetizer, diarrhea, increase animal fertility	• A decoction is prepared from the plant, add to drinking water • The plant is added to the animal feed • Soak in water for 18 hours, filtrate, and add to drinking water	Oral	Sheep, cows, goats, donkeys	N,J,Q, S	9(6)	66.7	0.59	39.5
25	*Rosmarinus officinalis* L. (Lamiaceae) BERC-BX-C0018	Rosemary	اكليل الجبل، حصالبان	LE	Animal fertility, **arthritis**, inflammation, constipation	• A decoction is prepared by adding the plant to boiled water, Add 80 ml to the drinking water of the animal 3 times a day	Oral	Sheep, cows, goats	N,J,JE	11(7)	63.6	0.62	39.3
23	*Citrus limon* (L.) Burm. fil (Rutaceae) BERC-BX-C0122	Lime, Limon Tree	ليمون	FR	Coccidia, diarrhea, **rashes** mouth inflammation,	• Crush the garlic and mix with suitable amount of lemon. Add to the animal feed • mix 100 gm of sesame seeds with 50 ml of lemon juice, apply to the affected animal • Mix Lemon juice with table salt, apply to the affected area	Oral Dermal	Sheep, cows, goats	N,Q,S	12(7)	58.3	0.63	36.7
28	*Achillea fragrantissima* Forssk. (Asteraceae) BERC-BX-C0604	Yarrow	بعيشران، قيصوم، أخيليا	AP, FR	Constipation, gumboro, **cauterize**	• An infusion is prepared from the plant, and added to the animal feed twice a day • Fruits are crushed and added to animal feed	Oral	Chicken, donkeys, horses	N,JE,H	10(6)	60.0	0.60	36.3
30	*Citrullus colocynthis* (L.) Schrader (Cucurbitaceae) BERC-BX-C0314	Colocynth	حنظل، العلقم، التفاح المر	FR, SE	Constipation, scabies, **postpartum inflammation**	• The seeds are dried, grinded and boiled in water (5 gm/600 ml water). Add to the drinking water • Oil is extracted from the seeds and added to the affected area	Oral Dermal	Sheep, cows, goats, chicken	N,J,Q	10(6)	60.0	0.60	36.3
37	*Coriandrum sativum* L. (Apiaceae) BERC-BX-C0299	Coriander	كزبرة	SE, LE	**Appetizer**, Flatulence, constipation, inflammation	• Seeds are crushed and boiled in water. Add to the animal feed • Aerial parts are boiled and added to the animal drinking water	Oral	Sheep, cows, goats	**N,J**,Q	8(5)	62.5	0.58	36.3
31	*Dittrichia viscosa* (L.) W. Greuter *(Inula viscosa* (L.) Ait.) (Asteraceae)	Inula	عرق الطيون	LE, RO	Expectorant, appetizer, flatulence, **postpartum inflammation**	• A decoction is prepared the leaves, filtrate, add to the drinking water • Roots are boiled in water until it become viscous	Oral Dermal	Sheep, cows, goats, donkeys	N,J,Q, S,JE	10(6)	60.0	0.60	36.3

Table 1 (*continued*)

No.	Scientific name (Family) Voucher numbers	English name	Arabic Name	Parts used*	Ethno-veterinary use(s)**	Mode of preparation	Mode of use	Animal (s) treated	Citation[a]	Quotation frequency (No. of informant primary use)	FL	RPL	ROP
	BERC-BX-C0032					• Apply as poultices on affected area							
29	*Foeniculum vulgare* Miller (Apiaceae) BERC-BX-C0030	Fennel	شومر	SE, AP	**Flatulence**, pneumonia, arthritis, urinary tract system	• Boil 250grm in 1 L of water, add to the animal drinking water, or add to the feed of the animal.	Oral	Sheep, goats, cows, horses	N,J,Q,	10(6)	60.0	0.60	36.3
75	*Vicia sativa* L. (Fabaceae) BERC-BX-C0462	Common vetch	بيقيا	LE, SE	Inflammation, **galactagogue**, nourishment	• The seeds are soaked in hot water (250 gm: 1 L of water), or can be added to the feed of the animal	Oral	Sheep, cows	N,Q	3(2)	66.7	0.53	35.4
74	*Ziziphus spina-christi* (L.) Desf. (Rhamnaceae) BERC-BX-C0186	Christ's Thorn Jujube, Nabk	سدر، نبق، دوم	LE	Diarrhea, **nourishment**, **anthelmintic**, inflammation, carbuncles	• A decoction is prepared from the leaves, filtered and applied to the animal drinking water, • Leaf paste is topically applied	Oral Dermal	Sheep, Cows, goats	N,JE	3(2)	66.7	0.53	35.4
8	*Olea europaea* L. (Oleaceae) BERC-BX-C0086	Olives	زيتون	TW, FR	Eye diseases anthelmintic bone fractures bruises nourishment **injuries, scabies** flatulence colic, diarrhea	• Twigs are grinded and mixed with saliva, use 2-3 drops in the eye daily • Mix 10 ml of castor oil with olive oil, give to the animal one time • Olive oil soap is mixed with egg and applied to the broken organ until recovery • Oil is applied on affected area, or leaves are boiled, filtrated and applied on affected area • Dried leaves are added to the animal feed • Mix olive oil with wheat bran or table salt, apply one time daily and separate the animal from the others, or olive oil is mixed with grinded corn seeds, and applied to the infected area. • Oil is dispersed over bread and fed to animals • Mix oil with water and administrated orally 3 times for diarrhea	Eye Oral Dermal	Sheep, cows, goats, horses, donkeys, rabbits	N,J,Q, S,JE	42(16)	38.1	0.91	34.8
51	*Sesamum indicum* L. (Pedaliaceae) BERC-BX-C0612	Sesame	سمسم	SE	Mouth inflammation **digestive** system diseases	• Tahina is applied on affected animal tongue • mix 100 gm of sesame seeds with 50 ml of lemon juice, apply to the affected animal • Added to the feed of the animal	Dermal, Oral	Sheep, cows, goats	N,J	5(3)	60.0	0.56	33.3
34	*Zea mays* L. (Poaceae) BERC-BX-C0624	Zea, Corn	ذرة	SE	**Galactagogue**, scabies, **food supplement**	• Added to the animal feed • Olive oil is mixed with grinded corn seeds, and applied to the infected area	Oral	Sheep, cows	N,J,Q	9(5)	55.6	0.59	32.9
42	*Urtica pilulifera* L. (Urticaceae) BERC-ST-C411	Roman Nettle	قريص، أنجر	SE, LE, AP	Nourishment galactagogue, inflammation, nose infection, diarrhea, **udder inflation and hardness**	• Added to the animal feed • Grind the dried seeds and use for inhalation • A decoction is prepared from the plant, add to the drinking water • Bring the plant together as a package and hits the animal udder	Oral Nasal	Sheep, cows, goats chicken	N,J,Q	7(4)	57.1	0.57	32.5
17	*Majorana syriaca* (L.) Rafin. (Lamiaceae) BERC-BX-C0026	Wild Thyme	زعتر بري، سعتر	AP	Flatulence, bites, **inflammation**, cold, appetizer	• Boil in water, filtrate and add to the animal drinking water	Oral	Sheep, cows, goats	N,J,Q, S,JE	21(9)	42.9	0.70	30.2
38	*Nigella ciliaris* DC. (Ranunculaceae) BERC-BX-C0548	Nigella, Black Cumin	حبة البركة، قزحة	SE	Nourishment, increase fertility, inflammation, **scabies bites**	• Mix the seeds with the animal feed every 6 months (3%). • Seeds are crushed, and the oil is mixed with vinegar and applied on affected area once a day	Oral Dermal	Sheep, goats, camels, cows, horses	N,J	8(4)	50.0	0.58	29.0
39	*Peganum harmala* L. (Zygophyllaceae) BERC-BX-C0181	Harmala, Syrian Rue	حرمل، حرمليان	SE, TW	**Nervous system, animal fertility,** fever	• An infusion is prepared from the seeds, and added to the drinking water of the animal for nervous system.	Oral Nasal	Sheep	N,J,JE	8(4)	50.0	0.58	29.0

						• The twigs are burned and the animal is allowed to inhale the smoke.							
11	*Allium sativum* L. (Liliaceae) BERC-BX-C0605	Garlic	ثوم	CL	**Coccidian**, scabies, skin ailments, cold, anthementic, injuries in eye, constipation, food poisoning	• Crush the garlic gloves and mix with suitable amount of lemon. Add to the animal feed • The gloves are crushed mixed with olive oil and lemon juice and applied to the affected place 3 times daily, • Cloves are crushed, mixed with yoghurt and added to the feed of the animal • Add to the feed of the animal, for chicken the cloves are squeezed and added to the drinking water	Oral Dermal	Sheep, cows, goats Chicken. Pigeons	N,J,Q, S,H	31(11)	35.5	0.80	28.5
26	*Triticum aestivum* L. (Poaceae) BERC-BX-C0226	Wheat	قمح	SE	**Bone fractures**, galactagogue, looseness in the muscles and skeleton	• Knead half a kilo of bran with egg albumen and peeled soap, spread on a piece of fabric and put around the broken part • The seeds are soaked in water, and added to the animal feed • Seeds are boiled in water, and added to the drinking water of the animal	Dermal Oral	Sheep, cows, goats	N,J,Q	11(5)	45.5	0.62	28.1
61	*Gagea chlorantha* (Bieb.) Schult. fil.(Liliaceae) BERC-BX-C0359	Gagea	زعيتمان، بطيط دمشق	AP	**Appetizer**, **intestinal poisoning**	• Boil 50 gm in 1 L of water, add to drinking water of the animal	Oral	Sheep, goats	Q,S,JE	4(2)	50.0	0.54	27.2
60	*Opuntia ficus-indica* (L.) Mill. (Cactaceae) BERC-BX-C0055	Prickly-Pear	صبر، تين شوكي	CLA	**Skin diseases and burns**, **appetizer**, colic	• Cladodes are crushed, use the succulents on the affected area • Cut cladodes and add to the feed of the animal	Dermal Oral	Sheep, cows, rabbits	N,J	4(2)	50.0	0.54	27.2
43	*Ruta chalepensis* L. (Rutaceae) BERC-ST-C363	Rue	فيجن	FL, SE, LE, TW	Galactagogue arthritis, back pain, scabies, skin injuries, udder infection	• A decoction is prepared from the plant, add to the drinking water • Grinding the leaves and twigs and mix with olive oil, apply on the affected area as a poultice	Oral Dermal	Sheep, cows	N,J,Q	7(3)	42.9	0.57	24.3
52	*Malva sylvestris* L. (Malvaceae) BERC-BX-C0003	Common Mallow	خبيزة	LE, FL	galactagogue, **scabies**, **coughing**, cold	• A decoction is prepared from the leaves. Apply to the affected area once a day • A decoction is prepared from the flowers, add to the drinking water of the animal • Add to the animal feed	Dermal Oral	Sheep, cows	N,	5(2)	40.0	0.56	22.2
53	*Vicia ervilia* (L.) Willd. (Fabaceae) BERC-BX-C0613	Ervil, Bitter vitch	كرسنة	SE	**Galactagogue**, nourishment, postpartum inflammation	• Added to the feed of the animal, • Seeds are boiled and added to the feed of the animal	Oral	Sheep, goats, cows	N,Q	5(2)	40.0	0.56	22.2
16	*Allium cepa* L. (Liliaceae) BERC-BX-C0615	Onions	بصل	BU, SE	**Anthelmintic**, flatulence, sprain foot, pneumonia	• Add to the animal feed • The bulb is toasted, crushed and applied as poultice to the place of infection • 100 gm of seeds are boiled in 1 L of water and added to the drinking water of the animal for 3 days	Oral Dermal	Sheep, cows, goats, Chickens, Pigeons	N,J,Q, S,JE,H	22(6)	27.3	0.72	19.5

* Fruits, FR; Flower, FL; Leaves, LE; Root, RO; Areal parts, AP; Seeds, SE; Tubers, TU; Clove, CL; Cladode, CLA; Bulb, BU; Twigs, TW
** Primary use underlined.
[a] Nablus, N; Jenin, J; Qalqilia, Q; Salfit, S; Jericho, JE; Hebron, H.

priority (ROP) based on their claimed relative effectiveness, the ethnobotanical data were analyzed and the ROP index was determined following the relevant standard methods outlined in Friedman et al. (1986); Alexiades (1996), and Ali-Shtayeh et al. (2000).

Towards this end, the fidelity level (FL) of each plant was determined as follows, FL is the percentage of plant specimens that the interviewees claim to use for the same particular purpose (primary use): $FL=(Ip/Iu)\times 100$.

Where Ip is the number of informants who independently suggested the use of a species for treating a particular purpose; and Iu is the total number of informants who mentioned the plant for any use.

This index was used to determine the relative healing potential of reported ethnoveterinary plants. In order to differentiate the healing potential of plants with similar FL values, but known to several informants, a correlation index (coefficient) was calculated as follows. The plants were divided into 'popular' and 'unpopular' groups. Popular plants are those which were cited by more than half of the maximum number of informants (for plants reported by three independent informants or above) who reported a plant for any medical use (i.e., >50 informants in this study; see also Table 1). The remaining plants were designated unpopular. A coordinate system was utilized in which the *X* axis corresponds to the number of informants citing a plant for any medical use, while the *Y*-axis corresponds to the number of different uses reported for each plant (Fig. 2). For plants with a low relative popularity level (RPL), a linear increase was assumed, namely, a greater number of informants cited the plant for any use, hence a greater average number of uses per species. On the other hand, for popular plants a horizontal line (Fig. 2) was assumed namely, the average number of uses per plant is independent of the number of informants who know the species; hence, the average number of uses of a popular plant does not increase with the increased number of informants who cite the plant for any medical use. For popular plants, the RPL was arbitrarily selected to equal unity (i.e. equals 1).

For plants within the unpopular group, the RPL is less than 1. RPL values may be calculated for each specific plant in accordance with its position on the graph (Fig. 2). The rank-order priority (ROP) or the corrected FL of the plants were derived from FL values, by multiplying FL values by RPL values ($ROP=FL\times RPL$).

2.3.2. Cultural importance index (CI)

For quantitative analysis of the data, each plant species mentioned by an informant within one use category was counted as a "use report" (UR). To estimate the relative significance of each species in addition to indicating their frequency of citation, the cultural importance index (CI) and mean cultural importance values for each plant family (mCIF) were calculated based on previously described methods (Tardío and Pardo-de-Santayana, 2008). The CI values for each species were calculated for each locality using the following formula:

$$CI=\Sigma(UR_i/N)$$

where UR_i, use reports in each use-category and N, total number of survey participants in that locality.

Moreover, we calculated the mean cultural importance index of plant families (mCIF), on the basis of their cultural importance index (CI). To calculate the mCIF, CI values of all reported species within a family were added. Regression analysis was performed upon comparison of mCIF with the number of species in each respective family (Fig. 3).

Informant consensus on the reported cures for a given group of aliments was calculated as an informant consensus factor (ICF) (Heinrich et al., 1998). All of the quoted veterinary diseases were grouped into ten categories, which included: gastro-intestinal disorders, urinary/retention, dermatological, ecto- and endoparasites, fever/cold/respiratory diseases, reproductive disorders, musculo/skeletal disorders, galactagogue remedies, external injuries, bleeding and poisoning and others (ophthalmic, sensorial),. As previously reported (Heinrich et al., 1998), we used the following formula, with nur: number of use citations in each category and nt: number of species used:

$ICF=[(nur-nt)/(nur-1)]$Collected data were compared with previously conducted ethnoveterinary studies carried out in surrounding areas (Abbas et al., 2002; Viegi et al., 2003; Pieroni et al., 2006; Boukraa et al., 2010; Akerreta et al., 2010; Alyemeni et al., 2010; González et al., 2011; Carrio et al., 2012; Benitez et al., 2012; Landau et al., 2014).

3. Results and discussion

3.1. Demographics

Table 2 summarizes the demographic characteristics of the participants. Of the 268 farmers interviewed, 50 were females (18.7%) and 218 were males (81.3%). The majority of the interviewees were above 40 years of age (n=180, 69.5%). Approximately 21.6% (n=55) had high school degrees, 20.1% (n=51) achieved university degree level, and 58.3% (n=148) were illiterate or had a primary educational level.

3.1.1. Factors associated with ethnoveterinary medicines use among participants

Of the 268 participants, 55.2% (n=148) used herbal medicines for the treatment of diseases of their animals. The relationship between ethnoveterinary medicines use and respondents' demographic status is shown in Table 2. Ethnoveterinary medicines users were more likely to be >40 years old (66.2%), to be male (81.8%), and to have lower education level ($<$university degree) (82.4%). This can be due to the fact that younger more educated generation had little knowledge about the ethnovetrinary medicine while the elder farmers generally know much more about the traditional knowledge to treat the ailments of their animals (Yirga and Zerabruk, 2011). Furthermore, interviewees with university degrees in this study came from rural farmers families where members of the family, especially males, participate in agricultural activities including raising animals, and thus they have acquired their knowledge about ethnovetrinary medicine mainly through their related families.

A statistically significant association was identified between the users and non-users of ethnoveterinary medicines in place of residence (Salfit > Hebron > Qalqilia > Jericho > Nablus > Jenin) ($p=0.025$), having agriculture related profession ($p=0.043$). No statistically significant association was identified between the users and non-users of ethnoveterinary medicines with respect to age ($p=0.121$), gender ($p=0.491$), and educational level ($p=0.184$). The basic reasons behind this could be that most of the ethnoveterinary plants are more easily available and accessible in mainly rural with more diverse rich vegetation (e.g., Salfit) as compared to mainly urban areas with less diverse vegetation (e.g., Jericho in this study) (Giday and Teklehaymanot, 2013).

3.2. Taxonomic diversity of the species

A total of 138 plant species belonging to 127 genera and 58 families, were reported in the current study for the treatment of 63 different health and production problems in animals. Of these plants, 75 species representing 70 genera and 33 families were

reported by 3 independent informants or above, and 64 species were reported by <3 informants and therefore were excluded from further discussions (Table 1). The most frequently represented families were Fabaceae (n=8 plants), Apiaceae (n=7), Asteraceae (n=7), and Lamiaceae (n=6). The frequency of distribution of the remaining plants among different families was 1–4 species (Fig. 3). Our results are in agreement with those of Landau et al. (2014) and Carrio et al. (2012) who also found recipes with plants of the Asteraceae, and Lamiaceae were among the most frequently cited families. The Apiaceae, Asteraceae, and Lamiaceae are at the same time large families and typically abundant in the Mediterranean areas.

When the plants quoted from Palestine in the current study are compared with those quoted in neighboring Israel (Landau et al., 2014), it became clear that about 71.4% of the plants (35 species) were common to both Israel, including the occupied Syrian Golan Heights, and Palestine. However, much higher number of plants (138 species) was quoted in Palestine than in Israel (49 species). On the other hand, fourteen plant species which were quoted in Israel mainly from the occupied Syrian Golan Heights, Upper Galilee and the Negev desert (Bedouins), were not quoted in Palestine, probably due to cultural differences as these plants are known to be among the normal flora of the study area (Ali-Shtayeh et al., 2014).

3.3. Most versatile and used veterinary plants

Considering the frequency of citations, the most frequently used plant species against veterinary ailments included: *Trigonella berythea* (100 informants who reported the use of plant, 68.5% of users), *Salvia fruticosa* (81, 55.5%), *Hordeum vulgare* (79, 54.1%), *Teucrium capitatum* (73, 50%), *Camellia sinenses* (*68*, 46.6%), and *Varthemia iphionoides* (*61*, 41.8%) (Table 1). When plants quoted in Palestine in this study are compared with those used in ethnoveterinary medicine in eight of the surrounding Mediterranean countries (Egypt, Cyprus, Greece, Italy, Algeria, Morocco, Israel, and Spain), 67 plant species were found to be common between Palestine and these countries, while 71 species were recorded in Palestine only (Abbas et al., 2002; Viegi et al., 2003; Pieroni et al., 2006; Boukraa et al., 2010; Akerreta et al., 2010; Alyemeni et al., 2010; González et al., 2011; Carrio et al., 2012; Benitez et al., 2012; Landau et al., 2014). However, when the six plants most quoted in this study are compared with the six plants most quoted in seven of the surrounding Mediterranean countries (Egypt, Cyprus, Greece, Italy, Algeria, Morocco, and Spain) it became clear that Palestine possesses a different group of six species is the most popular, showing no similarities with other countries. According to that data we hypothesize that there is no common cultural heritage in the selected countries regarding the ethnoveterinary plants with Palestine (Pieroni et al., 2006; Piluzza et al., 2015).

Based on the diversity conditions treated by plants in each family, the Asteraceae and Apiaceae families were found to have the broadest application with 7 recipes (taxa) for the treatment of 16 veterinary conditions (7/16), followed by Lamiaceae (6/14), Liliaceae (4/14), and Poaceae (4/9).

3.3.1. Plant parts used, their preparations and applications

Regarding the plant parts used, leaves were the most frequently used parts of the cited taxa (32.4%) followed by aerial parts (18.9%); seeds (18%); fruits (14.4%); flower (6.3%); roots (3.6%); stem (3.6%); and others (2.7%) (Fig. 4). Our results are in agreement with other similar ethnovetrinary studies (Carrio et al., 2012; Akerreta et al., 2010; Benitez et al., 2012; González et al., 2011), as well as with other studies from human ethnopharmacological works (Ali-Shtayeh et al., 2011; Ali-Shtayeh et al., 2013) where leaves and aerial parts were at the top of list of plant part analysis.

Methods of preparation of the therapeutic materials sometimes varied from individual to individual (e.g., the same plant material for the same ailment could be prepared in different ways, depending upon the preferences of different healers). A list of 140 ethnoveterinary remedy preparations is presented in Table 1. The large majority of recipes were prepared from single plants (78%) rather than mixtures. In most cases, water was the solvent employed in preparation of the remedy. Besides plants and water, some other materials were also commonly incorporated in the preparations: salt, milk, oil, eggs and yoghurt. The most common therapeutic formulations fall into ten main categories, the most popular of which were decoction (35%), pastes (19%), and raw (18%). However, in this study no differences were found in the forms of preparation and administration between ethnoveterinary and human medicine practices (Akerreta et al., 2010, Ali-Shtayeh et al., 2013). The main sources of plants in this study were buying from the market (37.5%), gathering from natural shrub land (30.4%), and imported (20.2%).

3.3.2. Ethnoveterinary plant uses

Total number of ailments treated by the plants=63. We identified 10 major disease categories or ailment groups (Table 3). Highest number of plants were used for the treatment of gastrointestinal disorders (n=63), followed by reproductive problems (n=31), dermatological conditions (n=26), fever, cold, and respiratory diseases (n=24), ecto- and endo-parasitic problems (n=20), galactagogue (n=10), external injuries, bleeding and poisoning (n=10), musculo-skeletal problems (n=8), urinary retention (n=7), and ophthalmic and sensorial ailments (5). Gastrointestinal disorders are the most encountered health problems in animals and this might explain the high number of plants used in our study and other similar studies (Benitez et al., 2012; Martinez and Lujan, 2011).

Informant consensus factor (ICF) was also calculated for each ailment group to estimate level of agreement among informants in the selection of plants against a given disease category, and therefore assess the perceived efficacy of medicinal plants, with those plants that are supposed to be effective in curing diseases having elevated ICF levels (Teklehaymanot and Giday, 2007). The highest ICF values were recorded for gastrointestinal disorders (0.90), followed by urinary, and reproductive disorders (0.89), galactagogue (0.83), and dermatological problems (0.82) (Table 3).

Some plants used in poultry have also been reported (Table 1). Three plants representing 3 families were used for the treatment of gumbora, to increase egg production, and as anthelmintic.

3.4. Cultural importance of the species

The cultural importance index (CI) of species is useful for estimating the significance of certain plants to a given culture and takes into account not only the spread of the use (number of informants) for each species, but also its versatility, i.e. the diversity of its uses (Albuquerque et al., 2005). Based on medicinal applications Table 4 presents Cultural Importance Index (CI) of the relevant species in the study area in descending order by mean value (mCI). Fig. 5 lists, in order of importance, the sixteen most culturally important species in Palestine (West Bank) according to the mCI, and their CI values in each locality (district): *T. berythea, T. capitatum, H. vulgare, C. sinenses, V. iphionoides, S. fruticosa, Artemisia inculata, Ceratonia siliqua, Olea europaea, Allium sativum, Anisum vulgare, Ricinus communis*, *Crataegus aronia, Majorana syriaca, Allium cepa,* and *Matricaria aurea.*

It is clear that within the different study localities the plant species with highest CI values show large similarity. As it is also expected, most recipes encompass very widespread and most

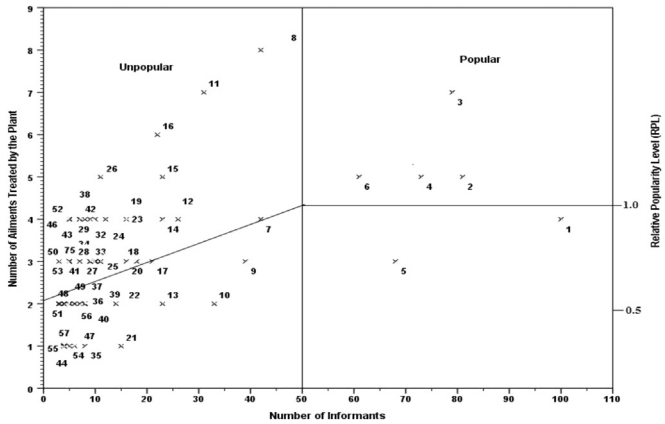

Fig. 2. Relationship between number of informants who cited a particular plant and the number of its uses. Solid crosses and numbers represent the species as they appear in Table 1.

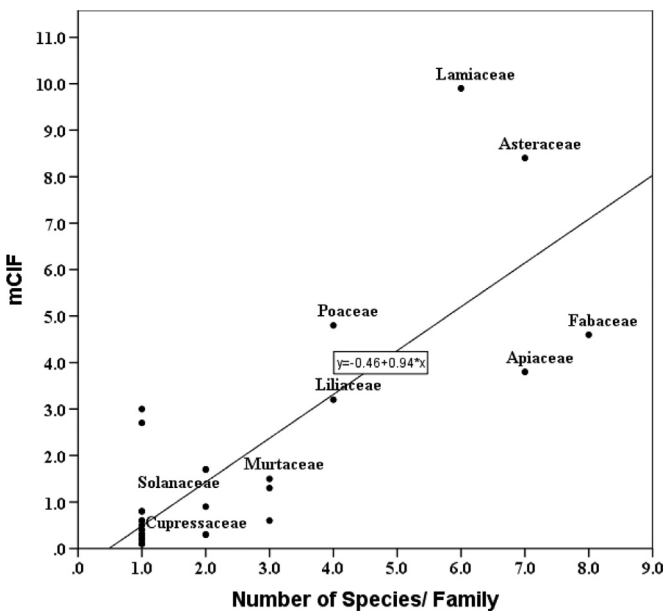

Fig. 3. Regression of the culture importance of the family (mCIF) on the number of species in the family.

deeply rooted plants in the Palestinian traditional culture and ethnobotany, e.g., *T. capitatum*, *M. syriaca*, *S. fruticosa*, *C. siliqua,* and *Olea europea.* In the Nablus, Jenin, and Qalqilia areas, the mean cultural importance values of ethnoveterinary botanicals were considerably higher than those in the other areas (Fig. 5). The differences may be due to the likelihood that in these areas the erosion of traditional knowledge on ethnoveterinary plants is taking place more slowly.

3.4.1. Cultural importance of the families (mCIF)

A comparison between the most culturally important ethnoveterinary botanical families in the different communities in the study area is presented in Fig. 3. The data were expressed as mean cultural importance of the families (mCIF) and the total number of quoted taxa of each family. The number of species reported here strongly correlated with the mean cultural importance of the families (R^2=0.6552).

Of the families reported, Lamiaceae (mCIF=9.9, number of species=6), and Asteraceae (8.4, 7) were the most culturally important families quoted as ethnoveterinary therapeutics in the different localities of the study area, followed by Poaceae (4.8, 4), Fabaceae (4.6, 8), Apiaceae (3.8, 7), and Liliaceae (3.2, 4) (Fig. 3). However, only the Lamiaceae attains a significantly higher figure for cultural importance than that expected for the number of species. This fact remarks the high significance of the plants adaptation to different environments and hence their wide distribution and abundance in most of the survey areas. Other families showed lower mCIF values and quoted number of species (0.1-3, 1-3) in the different localities (Table 3). Our results are therefore in agreement with those of Pieroni et al. (2006), who also found Lamiaceae, Asteraceae, Fabaceae, Apiaceae, and Liliaceae to be among the five families with the greater number of representative ethnoveterinary plants in the Mediterranean countries they studied. These are known to be big families with many representatives in the Mediterranean area and worldwide and some of which are common plants (Moerman et al., 1999). Hence our results confirm that people tend to use preferably the plants that are easily available to them. These results are in agreement with those of Bonet and Vallès (2002), Bonet et al. (1999); Johns et al. (1990), and Stepp and Moerman (2001), which affirmed that the more common a plant (family or species) is in an area, the greater is the probability of its popular use. The relatively common use of Asteraceae and Lamiaceae may be attributed to their phytochemical features; i.e., being rich in sesquiterpene lactones in case of Asteraceae or essential oils as in Lamiaceae (Pieroni et al., 2006).

Table 2
Socio-demographic data of the farmers participating in the study (n=268) and those using herbs to treat animals diseases (n=148).

Variable	Cam users				*P* value*
	Yes		No		
	n	%	n	%	
Age (n=259)[a]					0.121
20–40	49	62.00	30	38.00	
41–60	69	57.50	51	42.50	
> 60	27	45.00	33	55.00	
Gender (n=268)					0.491
Male	121	55.50	97	44.50	
Female	27	54.60	23	46.00	
Education (n=254)[a]					0.184
Illiterate	40	64.50	22	35.50	
Primary	43	50.00	43	50.00	
Secondary	34	61.80	21	38.20	
College	25	49.00	26	51.00	
Residence (n=260)[a]					0.025
Hebron	7	70.00	3	30.00	
Jenin	12	24.00	38	76.00	
Jericho	12	60.00	8	40.00	
Nablus	47	58.80	33	41.30	
Qalqilia	55	67.10	27	32.90	
Salfit	13	72.20	5	27.80	
Profession (n=260)[a]					0.043
Agriculture related	77	62.10	47	37.90	
Non-related	69	50.70	67	49.30	
Herbs use past (n=268)					0.005
Yes	135	59.20	93	40.80	
No	13	32.50	27	67.50	

* p Value was determined by chi-square.
[a] Numbers do not add up to the total population size, as some data were missing.

3.5. Classification of the plants used in a rank-order priority based on their claimed relative healing potential

A preference ranking technique was employed to differentiate the healing potential of plants used in the study area for animal health care based on informants' personal preference or

perception. Towards this end, the fidelity level FL and the rank-order-priority ROP were calculated (Table 1 and Fig. 2).

For plants which were cited by more than half of the maximum number of informants (for plants reported by three independent informants or above) who reported a plant for any medical use (i.e., >50 informants in this study; see also Table 1), the number of uses per plant increases linearly with the increase in the number of informants (Fig. 2; $y=0.9415x-0.4495$; $R^2=0.6552$). On the other hand, the average number of uses for plants cited by 51 informants or more does not increase with the increased number of informants. All plants cited by 50 or fewer informants (69 species) are therefore classified as unpopular, whereas those mentioned by 51 informants or more (5 species) are classified as popular. The dividing line between the popular and unpopular groups occurs at the point where the average number of uses per plant ceases to increase with further increase in the number of informants.

Although the healing efficacy of each plant can be expressed by its FL (Table 1), plants with different FL values may be properly ranked by calculating the RPL (derived from Fig. 2) and used as a correction factor to adjust the FL values. Of the 74 species, 40 attained ROP values above 50 (54.1%) probably due to the increasing popularity of ethnoveterinary medicine used by the Palestinian population. *C. sinenses* (Theaceae), *T. capitatum*, and *S. fruticosa* (Lamiaceae) with ROPs of 97.1, 93.2, and 91.4, respectively, are used to relieve gastric disorders. *H. vulgare* (Poaceae) and *T. berythea* (Fabaceae), with ROPs of 82.3 and 74, respectively, are used to relieve postpartum conditions. *Cuminum cyminum* (Apiaceae), with ROP of 70.2, *Solanum nigrum* (Solanaceae), with ROP of 69.7, and *Quercus calliprinos* (Fagaceae), with ROP of 65.4, are used to relieve colic, skin infections, and colic, respectively.

Thirty nine of the 75 plant species cited by the informants are primarily used to relieve gastro-intestinal ailments, of these, the following species were most widely used: *T. capitatum* (ROP=93.2), *S. fruticosa* (91.4), and *C. sinenses* (97.1), 11 species were used primarily for reproductive system of these *T. berythea* (74), *H. vulgare* (82.3), and *C. aronia* (53.8), while 10 plants were primarily used for dermatological, *Myrtus communis* (54.3), *Ficus carica* (55.6), and *Anchusa aegyptiaca* (54.3) and 8 plants were primarily used for ecto- and endo-parasites *Solanum nigrum* (69.7), *A. sativum* (28.5) and *Nigella ciliaris* (29). Seven plants were primarily used for fever, cold, respiratory diseases, of these: *Thymelaea hirsute* (53.1), *Psidium guajava* (50.5), and *Eucalyptus camaldulensis* (45.8) were most widely used.

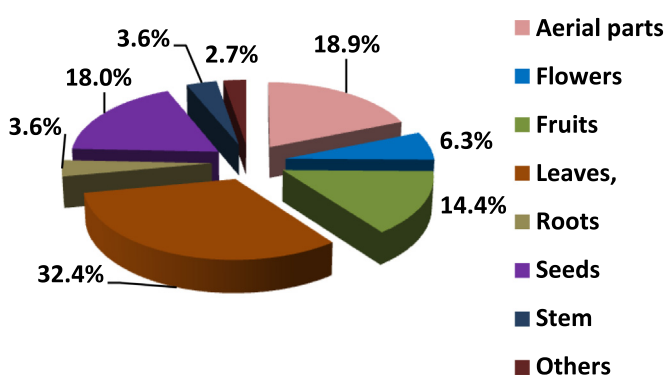

Fig. 4. Plant parts used.

Forty two of the plants mentioned by 3 independent informants and above having ROP>50, of these plants 50% are gathered from natural shrub lands, 42.9% are cultivated, while 7.1% are imported. Wild ethno-veterinary medicinal plants are facing threats in their natural habitats from various human activities including over-harvesting, inappropriate agricultural practices (e.g., over use of herbicides), agricultural expansion, and overgrazing. However, very few economic plant species (e.g., *S. fruticosa*) are now cultivated and marketed by some farmers. This shows that acquisition of economic benefits from species might promote local people's interest in conservation and maintenance of such locally important and threatened species (Ali-Shtayeh et al., 2008).

3.6. Comparison between ethnoveterinarian and human medicinal plant uses

Comparison of ethno-veterinarian with human medicinal plants shows that a large number of the ethno-veterinary plant reports share commonalities with the folk medical practices used in traditional ethnomedicine for humans in the study area. Nearly all of the recorded veterinary plants used in animal health care in this study (with the exception of *Vicia sativa*) have also been recorded in human Traditional Arabic Palestinian Herbal Medicine (TAPHM) in the same area (Ali-Shtayeh and Jamous, 2006, 2008; Ali-Shtayeh et al., 2008, 2013, 2014, 2015). This similarity does not appear only of the plants employed but of their claimed properties as well. For example, the following plants have been reported to be used to treat similar human and animal ailments: *A. sativum,* for inflammation; *C. cyminum* and *T. berythea* to stimulate milk production; *M. syriaca* to relieve pain and common cold; *O. europaea* for cases of bone fractures; *S. fruticosa* for postpartum recovery and abdominal pain; and *Zingiber officinale* for abdominal pain (Ali-Shtayeh and Jamous, 2006, 2008; Ali-Shtayeh et al., 2015). This overlap may be a reflection on how ethno-veterinary remedies may be a result of intense transfers of local knowledge between the folk veterinary and the ethnomedical domains. Also, the similarities between veterinary and human medicinal plant uses in the studied areas, suggests a strong link between human and veterinary medical practices showing the strict coincidence not only of the plant employed but of its claimed properties as well (Moerman et al., 1999; Pieroni et al., 2006; Bullitta et al., 2007).

Table 3
ICF values of traditional medicinal plants for treating livestock ailments in Palestine.

No.	Disease category	Species	% All species	Use citations	% All use citations	ICF	No. of ailments
1	Gastro-intestinal	63	85.14%	624	126.8%	0.90	11
2	Urinary/retention	7	9.46%	58	11.8%	0.89	3
3	Reproductive	31	41.89%	279	56.7%	0.89	8
4	Galactagogue	10	13.51%	54	11.0%	0.83	1
5	Dermatological	26	35.14%	143	29.1%	0.82	6
6	External injuries, bleeding and poisoning	10	13.51%	44	8.9%	0.79	9
7	Fever, cold, respiratory diseases	24	32.43%	106	21.5%	0.78	8
8	Ecto- and endo-parasitic	20	27.03%	83	16.9%	0.77	8
9	Musculo-skeletal	8	10.81%	29	5.9%	0.75	5
10	Others (Ophthalmic, sensorial)	5	6.76%	17	3.5%	0.75	4

Table 4
Cultural importance index (CI) of the relevant species in the different localities of the study area in descending order by mean value (mCI).

Latin name	Nablus	Jenin	Qalqilia	Salfit	Jericho	Hebron	mCI
Trigonella berythea	1.64	1.08	0.75	0.38	–	–	0.64
Teucrium capitatum	0.74	0.5	0.36	0.38	1.1	0.7	0.63
Hordeum vulgare	1.21	0.83	1.02	0.15	0.2	–	0.56
Camellia sinenses	0.83	0.42	0.44	0.54	0.3	0.4	0.50
Varthemia iphionoides	0.64	1	0.16	–	0.8	0.3	0.49
Salvia fruticosa	0.47	0.42	0.71	0.62	0.2	0.3	0.44
Artemisia inculata	0.15	0.33	–	0.08	0.8	1.1	0.42
Ceratonia siliqua	0.19	0.58	0.62	0.23	0.1	–	0.28
Olea europaea.	0.45	0.33	0.44	0.38	0.1	–	0.28
Allium sativum	0.21	0.83	0.27	0.15	–	0.1	0.27
Anisum vulgare	0.36	–	0.16	0.08	0.2	0.3	0.18
Ricinus communis	0.36	–	0.45	0.15	0.1	–	0.18
Crataegus aronia	0.21	0.08	0.07	0.54	0.1	–	0.17
Origanum syriacum	0.13	0.5	0.11	0.15	0.1	–	0.16
Allium cepa	0.13	0.17	0.2	0.15	0.2	0.1	0.16
Matricaria aurea	0.15	0.33	0.22	–	0.3	–	0.16
Quercus calliprinos	0.04	0.33	0.11	0.08	–	0.3	0.14
Citrullus colocynthis	0.04	0.75	0.04	–	–	–	0.14
Dittrichia viscosa	0.02	0.5	0.04	0.15	0.1	–	0.13
Cuminum cyminum	0.26	0.33	0.2	–	–	–	0.13
Petroselinum sativum	0.32	0.42	0.02	–	–	–	0.13
Alkanna orientales	0.02	0.67	–	–	–	–	0.11
Urginea maritima	0.09	0.33	0.02	–	0.3	–	0.11
Achillea fragrantissima	0.04	–	–	–	0.5	0.1	0.11
Peganum harmala	0.02	0.33	–	–	0.3	–	0.10
Zingiber officinale	0.04	0.42	0.11	–	–	–	0.09
Triticum aestivum	0.02	0.42	0.13	–	–	–	0.09
Foeniculum vulgare	0.06	0.42	0.07	–	–	–	0.09
Psidium guajava	–	0.25	0.18	0.08	–	–	0.08
Rosmarinus officinalis	0.09	0.33	–	–	0.1	–	0.08
Nigella ciliaris	0.13	0.33	–	–	–	–	0.08
Cydonia vulgaris	0.09	–	0.07	0.08	0.1	0.1	0.08
Eucalyptus camaldulensis	0.04	0.08	0.24	0.08	–	–	0.07
Pistacia lentiscus	0.02	0.25	0.09	0.08	–	–	0.07
Oxalis pes-caprae	–	0.42	–	–	–	–	0.07
Citrus limon	0.13	–	0.11	0.15	–	–	0.07
Cichorium pumilum	0.04	–	–	–	0.3	–	0.06
Ruta chalepensis	0.09	0.17	0.05	–	–	–	0.05
Lycopersicon esculentum	0.06	–	0.02	0.08	–	0.1	0.05
Ficus carica	0.15	–	0.15	–	–	–	0.05
Sesamum indicum	0.04	0.25	–	–	–	–	0.05
Paronychia argentea	0.02	0.25	–	–	–	–	0.05
Gagea chlorantha	–	–	0.02	0.08	0.2	–	0.04
Trifolium alexandrinum	0.04	–	0.07	–	–	0.1	0.04
Solanum nigrum	–	0.25	–	–	–	–	0.04
Ammi majus	–	0.25	–	–	–	–	0.04
Coriandrum sativum	0.06	0.08	0.09	–	–	–	0.04
Zea mays	0.11	0.08	0.04	–	–	–	0.04
Mentha spicita	0.16	–	0.06	–	–	–	0.04
Opuntia ficus-indica	0.04	0.17	–	–	–	–	0.03
Ferula communis	–	0.17	0.04	–	–	–	0.03
Anchusa aegyptiaca	0.04	–	–	0.08	0.1	–	0.03
Myrtus communis	0.09	–	0.11	–	–	–	0.03
Lawsonia inermis	0.02	0.17	–	–	–	–	0.03
Eruca sativa	0.02	0.17	–	–	–	–	0.03
Citrus Sinensis	0.09	0.08	0.02	–	–	–	0.03
Punica granatum	0.04	0.08	0.05	–	–	–	0.03
Vicia faba	0.06	–	0.11	–	–	–	0.03
Coridothymus capitatus	0.09	–	–	–	0.1	–	0.03
Myristica fragrans	–	–	0.09	0.08	–	–	0.03
Malva sylvestris	0.15	–	–	–	–	–	0.02
Ziziphus spina-christi	0.06	–	–	–	0.1	–	0.02
Saccharum officinarum	–	0.14	–	–	–	–	0.02
Cupressus sempervirens	0.02	0.08	0.02	–	–	–	0.02
Vicia ervilia	0.09	–	0.04	–	–	–	0.02
Urtica pilulifera	0.06	0.02	0.01	–	–	–	0.02
Capsella bursa-pastoris	0.09	–	–	–	–	–	0.01
Glycine max	0.04	–	0.02	–	–	–	0.01
Vicia sativa	0.04	–	0.02	–	–	–	0.01
Cassia senna	0.02	–	0.04	–	–	–	0.01
Pyrus malus	0.02	–	0.04	–	–	–	0.01
Anthemis tinctoria	0.02	–	0.04	–	–	–	0.01
Phillyrea latifolia	–	–	0.05	–	–	–	0.01
Ficus sycomorus	–	–	0.05	–	–	–	0.01

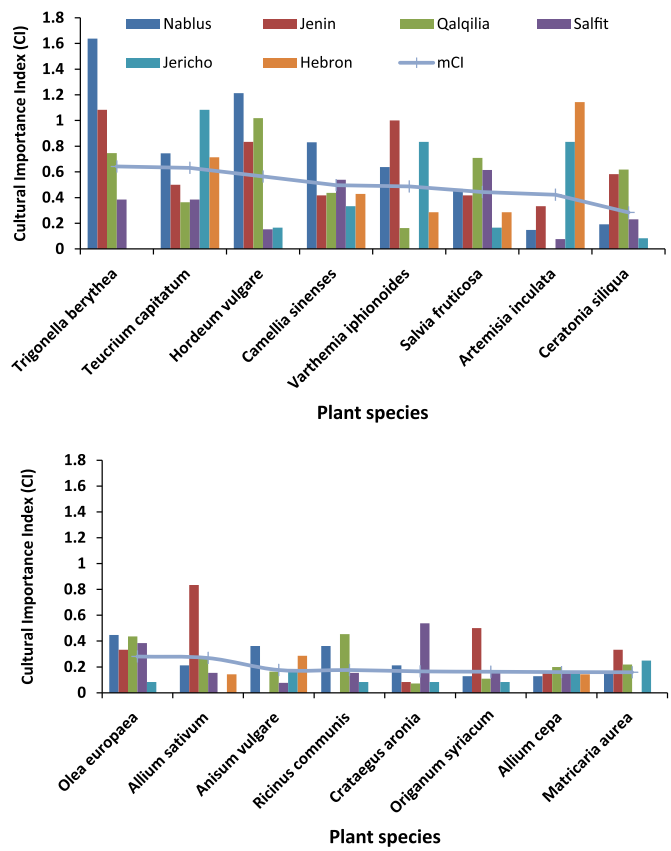

Fig. 5. Cultural importance index (CI) of the 16 most relevant species in the study area in descending order by mean value (mCI).

Ethnoveterinary practices are thought to have followed two main evolutionary pathways: one based on self-medication in animals, and the other related to human folk medicine (Huffman, 2003). However, the relationship between human and veterinary practices has been complex and mutual (Pieroni et al., 2006). As it is expected, indigenous people do not use all wild plants present in their environment but only a small part of the local flora. What makes the difference is the cultural decision that is behind each group of gathered plants (Rivera et al., 2006).

4. Conclusions

The data we have presented here shows the rich tradition in ethnoveterinary herbal medicine in Palestine. Nearly all of the recorded veterinary plants used in animal health care in this study

have also been recorded in human Traditional Arabic Palestinian Herbal Medicine (TAPHM) in the same area. This similarity between ethno-veterinary and human remedies in the studied areas, suggests a strong link between human and veterinary medical practices showing the strict coincidence not only of the plant employed but of its claimed properties as well. In this ethnobotanical study, documenting the medicinal plants and associated indigenous knowledge can be used for conservation and sustainable use of medicinal plants in the area and for validation of these plant preparations for veterinary treatment. This study can help scientists identify for further research those plants whose medicinal properties may be useful in the development of new drugs. This survey has identified a number of important medicinal plants used by the Palestinian farmers of the West Bank area for the treatment of various animal ailments. It provides a baseline for future phytochemical and pharmacological investigations into the beneficial medicinal properties of such plants.

Acknowledgments

Authors are grateful to Mr. Issa Zboun, Applied Research Institute, Beithlehem, Palestine, for help with map preparation.

References

Abbas, B., Al-Qarawi, A.A., Hawas, A., 2002. The ethno-veterinary knowledge and practice of traditional healers in Qassim region, Saudi Arabia. J. Arid Environ. 50, 367–379.
Akerreta, S., Calvob, M.I., Caveroa, R.Y., 2010. Ethnoveterinary knowledge in Navarra (Iberian Peninsula). J. Ethnopharmacol. 130, 369–378.
Albuquerque, U.P., Andrade, L.H.C., Silva, A.C.O., 2005. Use of plant resources in a seasonal dry forest (Northeastern Brazil). Acta Bot. Bras. 19, 27–38.
Alexiades, M., 1996. Collecting ethnobotanical data. An introduction to basic concepts and techniques. In: Alexiades, M., Sheldon, J.W. (Eds.), Selected Guideline for Ethnobotanical Research: A Field Manual. The New York Botanical Garden, Bronx, New York, pp. 53–94.
Ali-Shtayeh, M.S., Yaniv, Z., Mahajna, J., 2000. Ethnobotanical survey in the Palestinian area: a classification of the healing potential of medicinal plants. J. Ethnopharmacol. 73, 221–232.
Ali-Shtayeh, M.S., Jamous, R.M., 2006. Ethnobotany of Palestinian herbal medicine in the northern West Bank and Gaza Strip: review and comprehensive field study. Biodivers. Environ. Sci. Stud. Ser. 4, 1–122 (in Arabic).
Ali-Shtayeh, M.S., Jamous, R.M., 2008a. Traditional Arabic Palestinian Herbal Medicine, TAPHM. Biodiversity and Environmental Research Center, BERC, Til, Nablus, Palestine (in Arabic).
Ali-Shtayeh, M.S., Jamous, R.M., et al., 2008b. Traditional knowledge of wild edible plants used in Palestine (Northern West Bank): a comparative study. J. Ethnobiol. Ethnomed. 4, 13.
Ali-Shtayeh, M.S., Jamous, Rana, M., Jamous, Rania, M., 2015. Plants used during pregnancy, childbirth, postpartum and infant healthcare in Palestine. Complement. Ther. Clin. Pract. 21 (2015), 84–93. http://dx.doi.org/10.1016/j.ctcp.2015.03.004.
Ali-Shtayeh, MS., Jamous Rana, M., Jamous Rania, M., 2011. Herbal preparation use by patients suffering from cancer in Palestine. Complement. Ther. Clin. Pract 17, 235–240.
Ali-Shtayeh, M.S., Jamous, Rana, M., Jamous, Rania, M., Salameh, Y.N., 2013. Complementary and alternative medicine (CAM) use among hypertensive patients in Palestine. Complement. Ther.Clin. Pract. 19, 256–263.
Ali-Shtayeh, M.S., Jamous, R.M., Abu-Zeitoun, S.Y., 2014. BERC 2014 “National List of Medicinal Plants in Palestine- West Bank and Gaza Strip. Biodiversity & Environmental Research Center-BERC, Til, Nablus (Palestine).
Alyemeni, M.N., Sher, H., Wijaya, L., 2010. Some observations on Saudi medicinal plants of veterinary importance. J. Med. Plants Res. 4, 2298–2304.
Bartha, S., Quave, C.L., Balogh, L., Papp, N., 2015. Ethnoveterinary practices of Covasna County, Transylvania, Romania. J. Ethnobiol. Ethnomed. 11, 35.
Benitez, G., Gonzalez-Tejerob, M.R., Molero-Mesab, J., 2012. Knowledge of ethnoveterinary medicine in the Province of Granada, Andalusia, Spain. J. Ethnopharmacol. 139, 429–439.
Bonet, M.À., Parada, M., Selga, A., Vallès, J., 1999. Studies on pharmaceutical ethnobotany in the regions of L' Alt Emporda' and Les Guilleries (Catalonia, Iberian peninsula). J. Ethnopharmacol. 68, 145–168.
Bonet, M.A., Vallès, J., 2002. Use of non-crop food vascular plants in Montseny biosphere reserve (Catalonia, Iberian Peninsula). Int. J. Food Sci. Nutr. 53 (3), 225–248.
Boukraa, L., Benbarek, H., Benhanifia, M., 2010. Herbal medicines for animal health in the Middle East and North Africa (MENA) Region. In: Katerere, David R., Luseba, Dibungi (Eds.), Ethnoveterinary Botanical Medicine: Herbal Medicines for Animal Health. CRC Press, Taylor and Francis Goupe, LLC, Boca Raton, FL, USA.
Bullitta, S., Piluzza, G., Viegi, L., 2007. Plant resources used for traditional ethnoveterenary phytotherapy in Sardinia. Genet. Resour. Crop Evol. 54, 1447–1464.
Carrio, E., Rigat, M., Garnatje, T., Mayans, M., Parada, M., Valles, J., 2012. Plant ethnoveterinary practices in two Pyrenean territories of Catalonia (Iberian Peninsula) and in two areas of the Balearic Islands and comparison with ethnobotanical uses in human medicine. Evid.-Based Complement. Altern. Med. 2012, 22. http://dx.doi.org/10.1155/2012/896295.
Feinbrun-Dothan, N., 1978&;1986. Flora Palestrina Vol. III–IV. The Israel Academy of Science and Humanities, Jerusalem.
Friedman, J., Yaniv, Z., Dafni, A., Palewitch, D., 1986. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of An ethnopharmacological field survey among Bedouins in the Negev desert, Israel. J. Ethnopharmacol. 16, 275–287.
Ghazanfar, S.A., 1995. Wasm: a traditional method of healing by cauterization. J. Ethnopharmacol. 47, 125–128.
Giday, M., Teklehaymanot, T., 2013. Ethnobotanical study of plant used in management of livestock health problems by Afar people of Ada'ar District, Afar Regional State, Ethiopia. J. Ethnobiol. Ethnomed. 9, 18.
González, J.A., Barriuso, M.G., Amich, F., 2011. Ethnoveterinary medicine in the Arribes del Duero, western Spain. Vet. Res. Commun. 35 (5), 283–310.
Heinrich, M., Ankli, A., Frei, B., Weimann, C., Sticher, O., 1998. Medicinal plants in Mexico: healers' consensus and cultural importance. Soc. Sci. Med. 47, 1859–1871.
Huffman, M.A., 2003. Animal self-medication and ethno-medicine: exploration and exploitation of the medicinal properties of plants. Proc. Nutr. Soc. 62, 371–381.
International Society of Ethnobiology, 2006. International Society of Ethnobiology Code of Ethics (with 2008 additions). 〈http://ethnobiology.net/code-of-ethics/〉.
Johns, T., Kokwaro, J.O., Kimanani, E.K., 1990. Herbal remedies of the Luo of Siaya District, Kenya: establishing quantitative criteria for consensus. Econ. Bot. 44, 369–381.
Landau, S.Y., Muklada, H., Abu-Rabia, A., Kaadan, S., Azaizeh, H., 2014. Traditional Arab ethno-veterinary practices in small ruminant breeding in Israel. Small Rumin. Res. . http://dx.doi.org/10.1016/j.smallrumres.2014.01.004
Martinez, G.J., Lujan, M.C., 2011. Medicinal plants used for traditional veterinary in the Sierras de Cordoba (Argentina): an ethnobotanical comparison with human medicinal uses. J. Ethnobiol. Ethnomed. 7, 23.
Martin, G.J., 1995. Ethnobotany: A Methods Manual. Chapman and Hall, London, UK.
Moerman, E.D., Pemberton, R.W., Kiefer, D., Berlin, B., 1999. A comparative analysis of five medicinal flora. J. Ethnobiol. 19, 49–70.
Palestinian Central Bureau of Statistics, 2014. Livestock Survey, 2013. Main Results. Ramalla, Palestine (in Arabic).
Pieroni, A., Giusati, M.E., de Pasquale, C., Lenzarini, C., Censorii, E., Gonzales-Tejero, M.R., Sanchez-Rojas, C.P., Ramiro-Gutierrez, J.M., Skoula, M., Johnson, C., Sarpaki, A., Della, A., Paraskeva-Hadjichambi, D., Hadjichambis, A., Hmamouchi, M., El-Johri, S., El-Demerdash, M., El-Zayat, M., Al-Shahaby, O., Houmani, Z., Scherazed, M., 2006. Circum Mediterranean cultural heritage and medicinal plant uses in traditional animal healthcare: a field survey in eight selected areas within the RUBIA project. J. Ethnobiol. Ethnomed. 24, 2–16.
Piluzza, G., Virdis, S., Serralutzu, F., Bullitta, S., 2015. Uses of plants, animal and mineral substances in Mediterranean ethno-veterinary practices for the care of small ruminants. J. Ethnopharmacol. 168, 87–99.
Rivera, D., Obn, C., Heinrich, M., Inocencio, C., Verde, A., Fajardo, J., 2006. Gathered Mediterranean food plants ethnobotanical investigations and historical development. In: Heinrich, M., Müller, W.E., Galli, C. (Eds.), Mediterranean Food Plants and Nutraceuticals 59. Forum of Nutrition, Basel Karger, pp. 18–74.
Scillhorn van Veen, T., 1996. Sense or nonsense? Traditional methods of animal disease prevention and control in African savannah. In: McCorkle, C.M., Mathias, E., Veen, Schillhorn van (Eds.), Ethnoveterinary Research and Development. Intermediate Technology Publications, London, p. 338.
Stepp, J.R., Moerman, D.E., 2001. The importance of weeds in ethnopharmacology. J. Ethnopharmacol. 75, 19–23.
Tardío, J., Pardo-de-Santayana, M., 2008. Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Econ. Bot. 62, 24–39.
Teklehaymanot, T., Giday, M., 2007. Ethnobotanical study of medicinal plants used by people in Zegie Peninsula. Northwestern Ethiopia. J. Ethnobiol. Ethnomed. 3, 12.
The Plant List. 〈http://www.theplantlist.org/〉 (accessed 08.09.14).
Viegi, L., Pieroni, A., Guarrera, P.M., Vangelisti, R., 2003. A review of plants used in folk veterinary medicine in Italy as basis for a databank. J. Ethnopharmacol. 89, 221–244.
Yirga, G., Zerabruk, S., 2011. Traditional knowledge of medicinal plants in Gindeberet district, Western Ethiopia. S. Afr. J. Bot. 2011. http://dx.doi.org/10.1016/j.sajb.
Zohary, M., 1966&;1972. Flora Palaestina, Vol I–III. The Israel Academy of Science and Humanities, Jerusalem.