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Reconstructed *materia medica* of the Medieval and Ottoman al-Sham

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Abstract

This article presents the results of a study of the medicinal uses of natural substances in medieval and Ottoman al-Sham (the Levant). It involved a meticulous survey of a wide range of historical sources spanning approximately 1100 years and including medical and pharmacological literature, travelogues, geographical and agricultural literature, dictionaries, archives, the Genizah and other medieval sources. Our main goal was to arrive at a reconstruction of the unwritten *materia medica* of the medieval and Ottoman Levant. Of the many and varied medicinal substances on which we were able to extract information, we were able to identify 286. These are presented according to the following classification: 234 species of plants (81.8%); 27 species of animals (9.5%); 15 kinds of minerals (5.2%) and 10 substances of other or mixed origin (3.5%). Analysis of the data showed that the region under study served as the geographic origin of the majority of the substances, only a minority of the materials was imported. The main reason for this is the geographic location of the Levant as a junction between three continents, as a cultural meeting point and as trade center. Finally, our data revealed that the al-Sham region was an independent source of production and marketing of medicinal substances during the medieval and Ottoman periods.

Keywords: *materia medica*; Medicinal substances; Medieval; Ottoman; al-Sham; Levant

1. Introduction

Throughout human history people have used various materials from nature to cure their illnesses and improve their health. Substances were derived from flora, fauna, and mineral sources located in people's immediate surroundings but also in remote areas. This article systematically reviews the medical materials used during the Middle Ages and Ottoman period in the al-Sham region, according to written sources (Lev, 2002a). The research on which it is based made possible the compilation of a list of substances, which was then divided into different categories according to their components (Tables 1–4). The list facilitates the creation of a broad, reliable database for research of the natural medicinal substances that were available to doctors, pharmacologists, healers, and patients in medieval and Ottoman al-Sham.

Borders in the Middle East have changed in rapid succession throughout history. The Middle East region was ruled by many regimes during the Middle Ages: Umayyid, Abbasid, Fatimid, Ayyubid, Crusader, Mamluk, and Ottoman. Each of these had its own perceptions of borders, so no single definition of the area or its borders can be found. A geographical area, including significant parts of present-day Syria, Lebanon, Israel, and Jordan, used to be called *Bilad al-Sham* by the Arab rulers and scholars of the time (Bacher, 1906). This term, with the above range of borders, was used in earlier works on the vegetation and the agriculture of the area then (Amar, 2000).

The research covered a time span of approximately 1100 years. It started with the onset of the Muslim conquest (638), continued through the rule of the Crusaders (1099–1291), and concluded with the penetration of Western civilization into al-Sham with the attempt at conquest by Napoleon at the end of the 18th century (1799). The 19th century, the last of Ottoman rule, to a certain degree represents a new era, when European visitors and envoys introduced modern medical treatments and substances; accordingly, it was not included in this research (Lev and Amar, forthcoming).

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Table 1
Plants used as medicinal substances in medieval and Ottoman al-Sham

Scientific name	Common name	Main uses	Selective references
Acacia senegal (*arabica*)	Gum Arabic Tree	EY, HS, SI, ID	GN, RM
Achillea sp.	Yarrow	IH, AP	IB, AN, AT, TA
Adiantum capillus-veneris	Venus Hair	ID, AP, SI, SD	IB
Agaricus sp.	Agaric	ID, PA, IH, PE	HV, RM
Agrimonia eupatoria	Common Agrimony	ID, SI, AP, EY	KA, IB
Alhagi maurorum	Camel Thorn	EY, PA, SI	IB
Allium cepa	Onion	SI, HS, ID, SD	IB, HV, GN, AT
Allium porrum	Leek	AP, HS, PA, SD, TE	BY, MA, AS, AN, AT
Allium sativum	Garlic	ID, AP, EY, TE, SD	HV
Aloe vera	Aloe	EY, HS, ID, PA	GN, BN, AT, HV, RM
Aguilaria malaccensis (*agallocha*)	Indian Aloe Tree	TE, HS, ID, PE	GN
Alpinia galanga	Galingale	HS, TE, SI, ID	BN, AT, IT
Alyssum sp.	Gold Basket	SD, AP, SI, ID	IB
Amaranthus blitum	Blite	SI, ID, WB, IH	AS, IB, QA, UM
Amomum cardamomum	Amomum	WB, AP, EY, SI	DI, AN, KA
Amygdalus communis	Common Almond	ID, PA, HS, AP, SD	GN, DI, HV, AT, MU
Anacyclus pyrethrum	Pellitory of Spain	EY, ID, IH, AP, TE	IB, IR
Anagyris foetida	Bean Clover	TE, HS, SI, ID	IB, BY
Anastatica hierochuntica	Rose of Jericho	HS, AP	IB
Anchusa sp.	Borage	ID, SD, EY, TE, PE	IB, RM, DI, GN
Androsace sp.	Androsace	HS, ID, SI	IB
Anthemis sp.	Chamomile	EY, PA, TE, SD, WB	IB, TA, GZ
Antirrhinum majus	Great Snapdragon	AP	UT
Apium graveolens	Wild Celery	ID, SD	HV, RM
Arbutus andrachne	Eastern Strawberry Tree	AP, SI, ID	IB, DI, AN, IW
Aristolochia sp.	Birth Wart	PA, IH, ID, AP, WB, HS, TE	DI, AN, GN, AS
Artemisia dracunculus	Tarragon	EY, ID, TE, AP, SD	IB, BD
Artemisia sp.	Wormwood	PA, WB, SD, ID, TE	IB, BY, GH, AN
Arum sp.	Elephant's Ear	ID, HS	MA, TA, HV, IB
Asparagus officinalis	Asparagus	AS, ID, EY, PA, AP	MU, IW, AT, AN, HV
Asphodelus aestivus (*ramosus*)	Tall Asphodel	WB, ID, HS	NA, IB, AN
Aspidium lonchitis	Serapias	ID, TE, PA, WB, IH	IB, AN
Asplenium onopteris	Black Spleenwort	HS, ID, SI	DI
Astragalus gummifer	Milk Vetch	SD, EY, ID, AP, WB	GN, IB, DI, RM
Astragalus sarcocolla	Sarcocolla	SD, EY, WB, ID	GN, AT
Atriplex halimus	Sea Orach	PA, ID, HS, IH, SD	IB, EH, IS, RA, BY
Avicennia marina (*officinalis*)	White Mangrove	PA, SI	NA, IB
Balanites aegyptiaca	Jericho Balsam	SI, ID, PA, SD	IB, TA
Berberis sp.	Berberry	SI, ID, IH	IB, DI, BD
Beta vulgaris	Beet	ID	IW, KA, IB
Boswellia carteri	Frankincense	HS, EY, PE, ID, SD	BN, AT, HV, FH
Brassica campestris	Bird Rape	PA, SI, EY, HS	IW, KH, QA, UM
Brassica oleracea	Cabbage	HS, AP, ID, SD, WB	MA, IB, MU, UM, QA
Bryonia cretica	Cretan Bryony	HS, ID, SD, PA, PE	IB, AN, KA
Bunium paucifolium	Caraway	PA, SI, ID	IB, AN, HR
Buxus sp.	Box	SI, PA, ID, PE	GH, DI, IB
Caesalpinia sapan	Sappan Wood	WB	GN, VT
Calamintha incana	Basil	ID, SI, WB, AP	IB
Calicotome villosa	Spiny Broom	ID, HS, AP, IH	IB
Cannabis sativa var. indica	Hemp	PE, PA, IH	BD, UT, FH, BY, PE
Capparis spinosa	Common Caper	AP, ID, WB, HS, SD	EH, AT
Carataegus sp.	Azerolier	ID, SI	AT, UM, QA
Carthamus tinctorius	Safflower	ID, AP, WB, HS, SD	NU, QA, LU, EH
Carum carvi	Caraway	PA, SI, ID	IB, IT
Cassia fistula	Purging Cassia	ID, IH, SI, AP, HS	GN, AS, IB, PE, HV
Cassia sp.	Senna	ID, SI, EY, HS, PE	RM, HR
Celtis australis	European Nettle Tree	ID, SI, WB, IH	IB
Ceratonia siliqua	Carob	SI, ID, HS, WB	IW, MU, IS, AS, TA, IB
Cheiranthus cheiri	Wallflower	TE, HS, ID	UM, BD
Chiliadenus iphionoides	Varthemia	ID	IB
Cichorium intybus	Chicory	ID, AP, SD, EY, IH	GH, IB, HV, RM, BD
Cinchona sp.	Peruvian Bark	IH, ID	EH

Table 1 (*Continued*)

Scientific name	Common name	Main uses	Selective references
Cinnamomum camphora	Camphor	ID, EY, TE, PA, WB	GN, AT, IT
Cinnamonum zeylanicum (*verum*)	Cinnamon Tree	ID, EY, SD, TE, HS	GN, AT, VT, RM
Cistus ladanifera	Ladanum	HS, ID, SI	IW
Citrullus colocynthis	Bitter Gourd	SI, AP, PA, SD	AS, RM, PE
Citrullus vulgaris	Watermelon	SI, ID, AP	AS, HV, AN, GH, UM
Citrus aurantium	Sour Orange	AP, ID, PE, HS, SD	MU, HV, RM, KA
Citrus limon	Lemon	ID, SI, AP, SD	HV, KH, YA, QA, SU
Citrus medica	Citron	PA, AP, ID, SD, HS	MU, KH, BA, YA
Cocos nucifera	Coconut Palm	EY, HS	BN
Coix lachryma-jobi	Job's Tears	ID, SD, AP, PA	IB
Colchicum sp.	Meadow Saffron	ID, PE, HS, PA, IH	IB
Colocasia esculenta var. antiquorum	Taro	HS, ID, IH, WB	MU, BD, QA, DI, AN
Commiphora myrrha	Myrrh	SD, ID, WB, TE, EY	GN, AS, RM, VT
Commiphora opobalsamum	Balsam	ID, SD, HS, AP, PA, PE, SI	FH
Convolvulus scammonia	Scammony	PA, IH, WB, AP, SD, SI	IT, IB, DI, RM, FH
Corchorus olitorius	Jews Mallow	AP, ID, SD, IH	IW, BA, AS, GN, UM
Corida myxa	Sebesten	SI, IH, ID	GN, FH
Coriandrum sativum	Wild Coriander	HS, PA, IH, ID, AP	IB, NU, AN
Coridothymus capitatus	Headed Thyme	ID, EY, SI	IB, RM
Cornus mas	Cornelian Cherry	ID, HS, PA, IH, AP	IB, AN
Coronopus squamatus	Swine Cress	ID, SI	TA, IB, AN
Corylus avellana	Hazel Nut	PE, SI, AP, ID, EY	QA, SU, BD
Crocus sativus	Saffron	PE, EY, HS, ID, SD	BN, HV, PE, YA
Croton tiglium	Purging Croton	IS, IH, ID	IB, AN
Cucumis dudaim	Apple Cucumber	IS, ID	IB, AN
Cuminum cyminum	Cumin	HS, PA, ID, AP, EY	VT, IB, HV, IS
Curcuma longa	Turmeric	HS, ID, TE, AP	RM
Cuscuta epithymum	Lesser Dodder	IH, ID, PE, SI	IB, TA
Cuscuta sp.	Dodder	HS, ID, IH, PA	IB
Cyclamen persicum	Sow Bread	SD, EY, ID, IH, WB	IB, AN, ER
Cydonia oblonga	Quince	SI, ID, PA	IB, AT, QA, UM, AT
Cyperus papyrus	Paper Reed	TE, ID, SI	AN
Cyperus rotundus	Sedge	HS, AP, ID	IB
Daphne sp.	Mezereon	ID, SI	IB
Daucus carota	Carrot	ID, PA, AP, SI, HS	IB, TA, AN
Dianthus caryophyllus	Carnation	ID, PE, IH	IB, AN, DI
Dittrichia (Inula) sp.	Elecampane	TE, HS, ID, AP, PA	IW, AS, AN, MA, MU
Dorema ammoniacum	Ammoniacum	ID, PA, IH, EY, WB	VT, AN
Doronicum scorpioides	Leopardus Bane	EY, AP, ID, PA, SD	GH, TA, IB, AN
Dryopteris pallida	Male Fern	SI, WB, EY, ID	IB, AN, AT, IT
Ecballium elaterium	Squirting Cucumber	ID, PA, PE, SI, HS	NA, IB, HV
Elaeagnus angustifolia	Oleaster	IH	IB, DI
Elettaria cardamomum	Lesser Cardamom	ID, SD, IH, AP, PE	VT, AT, GN
Equisetum telmateia	Great Horsetail	WB, ID	AN
Eruca sativa	Garden Rocket	HS, ID, SI, PE, SD	HR
Eryngium sp.	Sea Holly Eryngo	HS, PA, WB	NA, IB
Eugenia caryophyllata (*Syzygium aromaticum*)	Cloves	EY, ID, PE, SI, HS	GN, AT, BN, HV, RM
Euphorbia sp.	Milk Wart	WB, PE, HS, ID, SI	IB
Ferula sp.	Ferula	ID, PA, PE, HS, TE	IB, BY, HV
Ficus carica	Fig Tree	IH, SI, ID, AP	AN, HV, MU, GN, AT
Ficus sycomorus	Sycamore Fig	WB, IH, ID, SD, PA	IB, TA, BA, DI
Foeniculum vulgare	Common Fennel	ID, IH, EY, HS, AP	IB, AN, IR
Fraxinus syriaca	Syrian Ash	ID, SI, PA	GH, IB, II
Gardenia sp.	Gardenia	AP, PA, ID, SI	AN
Glaucium corniculatum	Horned Poppy	EY, PA	NA, IB
Glycyrrhiza glabra	Common Liquorice	WB, IH, ID, SD, HS	VT, LU, AN, HV, AT
Gossypium herbaceum	Cotton	ID, HS, WB, HS, SD	HV
Gundelia tournefortii	Gundelia	SI, PE	MU, IB
Gypsophila struthium	Soap Root	PE, HS, ID, SD	AN
Helleborus sp.	Christmas Rose	SD, ID, SI, PA	ER
Hyacinthus orientalis	Wild Hyacinth	ID, SI, AP, ID, HS	AN
Hyssopus officinalis	Hyssop	AP, IH, ID, EY, PA	AS, IB, IR, AN
Ipomoea turpeth	Turbith	EY, ID	BN, HV, RM

Table 1 (*Continued*)

Scientific name	Common name	Main uses	Selective references
Iris mesopotamica	Iris Mesopotamian	ID, HS, IH, SD, AP	AN
Jasminum sp.	Jasmine	HS, PA, WB, AP, SD	KH, QA
Juglans regia	Walnut	HS, AP, EY, SD, ID	MU, LU, AN, AT, UT
Juncus acutus	Rush	WB, ID, IH, PE, IH,	AN
Juniperus sp.	Juniper	ID, SD, EY, WB	DI
Kickxia sp.	Toadflax	AP, ID, IH	IB, TA
Laurus nobilis	Laurel	PA, ID, AP, SI, PE	BA, IB
Lavandula sp.	Lavender	IH, ID, SD, SI	VT
Lawsonia inermis {*alba*}	Henna	SD, TE, AP, ID	GN, IB, BD
Leontice leontopetalum	Lion's Leaf	ID, IH, PA, SD, EY	IB
Lepidium sativum	Garden Cress	SD, HS, ID, AP, PA	TA, IB, KA
Lilium candidum	Madonna Lily	HS, SI, IH, ID, SD	IB, HV, RM
Liquidambar orientalis	Oriental Sweet Gum	ID, HS, SI, PA, SD	IB, BY, RA
Lithospermum officinale	Common Gromwell	ID	IB
Luffa cylindrica	Vegetable	SD, WB, ID, EY, PA	IB, AS
Lycoperdon sp.	Deer Balls	SI	NA, IB
Mandragora autumnalis	Autumn Mandrake	AP, SD, PE, HS, ID	MU, AS, BA, IB, AN IR
Matricaria aurea	Chamomile	EY, ID, SD, SI	IB, AT
Melia azedarach	Neem	AP, IH, EY, ID	IW, GH, AN
Melilotus albus	Sweet Clover	AP, HS, ID, IH, EY	MA, IB
Melissa officinalis	Lemon Balm	AP, ID, PE, HS	UM
Mentha sp.	Mint	ID, AP, HS, PA, SD	IB, HV, UM
Momordica balsamina	Balsam Apple	WB	FH
Moringa peregrina	Ben tree	TE, WB, SD, ID, HS	GH, IB, TA, DI, KA
Morus nigra	Mulberry	AP, WB, PA, ID, TE	BY, IB, UM
Myristica fragrans	Nutmeg, Mace	EY, IH, ID, HS, SD	BN, IB, AT, HV, RM
Myrtus communis	Myrtle	SI, HS, AP, TE, SD	AN, MU, QA, BD, SU
Narcissus sp.	Narcissus	SD, ID, PE, AS	QA, UM, BD
Nardostachys jatamansi	Spikenard	SD, HS, ID, AP, EY, WB, SI, PA	BA, AT
Nasturtium officinale	True Water Cress	SD, ID, SI	FH
Nerium oleander	Oleander	SD, AP, TE, HS, PA	GN, IW
Nigella sativa	Black Cumin	HS, ID, SD, AP, TE	HV, NU
Nuphar lutea	Yellow Pond Lily	WB, ID, SD, PA, IH	UT, HR, DI
Ocimum basilicum	Sweet Basil	IH, EY, HS, ID, SD	MU, IB, GZ, RM
Olea europaea	Olive Tree	PA, SD, ID, SI, EY	BA, IB, MU, HV
Orchis sp.	Orchid	ID, HS	IB
Origanum sp.	Marjoram	ID, HS, PA, AP	GN, SU, RM, HV, UM
Paeonia sp.	Coral Peony	ID, SD, PA, PE	IB, DI
Papaver somniferum	Opium, Poppy Head	PA, IH, EY, HS, ID	HV
Parietaria judaica	Wall Pellitory	ID	AS
Pastinaca schekakul	Parsnip	ID, HS	IB
Petroselinum sativum	Parsley	ID, PA, HS, AP	HV
Pimpinella anisum	Anise	ID, SI, EY, AP, HS	GN, RM
Pinus sp.	Pine	ID, HS, SD, EY	MU, IW, GN, UT, HV
Piper sp.	Pepper	PA, EY, SI, IH, TE	GN, AT, VT
Pistacia lentiscus	Lentisk	TE, ID, HS, SI	HV, RM, AT, KA, PE
Pistacia sp.	Pistachio	SI, ID, HS	RA, IS, IB, MA, UM, AT
Plantago sp.	Flea Wort	PA, EY, TE, SI, HS	IB, AN, IR
Polygonatum officinale	Solomon Seal	WB, SD, ID	ER
Portulaca oleracea	Purslane	WB, TE, ID, AP	MA, BD, RM, UM, QA
Prosopis farcta	Mesquite	SI, SD, TE, ID, HS	IB, AN
Prunus (Cerasus) sp.	Cherry	SI, PE, ID	IB, BY, BD, MA, DI, QA
Prunus armeniaca	Apricot	ID, HS, WB, SD	RA, IB, DI, QA, SU, BD
Prunus domestica	Plum	WB, ID, EY, HS, SD	MU, IW, IB, RM, GN
Prunus mahaleb	Perfumed Cherry	ID	AS, RA
Prunus persica	Peach	HS, ID, SD, IH, WB	AS, MA, IB, GZ, HV
Punica granatum	Pomegranate	SI, ID, PA, TE, SD	HV, SU, YA
Pyrus communis	Pear	SI	MU, GN, AT, AN
Pyrus malus (*Malus sylvestris*)	Apple	AP, SI, PA	MU, IS, AT, UM, UT
Quercus sp.	Oak	AP, ID, PA, IH, HS	IB, UT, GN
Quercus sp.	Oak Gall	HS, WB, SD, TE, SI	GN, IB, UT
Raphanus sativus	Radish	ID, HS	KH, IW, EH, HV
Reseda alba	White Mignonette	AP, EY, WB, SI, ID	NA, IB

Table 1 (*Continued*)

Scientific name	Common name	Main uses	Selective references
Retama raetam	White Broom	HS, ID, PE, EY, SI	AN
Rhamnus sp.	Buckthorn	AP	ER, IB
Rheum sp.	Rhubarb	SI, HS, ID, IH, EY	IB, DI, HV, RM
Rhus coriaria	Tanning Sumach	SI, EY, AP, PA, HS	MU, IS, KH, GN, LU
Ricinus communis	Castor Oil Plant	PA, ID, AP, WB, PE	AN, HV
Rosa sp.	Rose	EY, PA, ID, HS	BN, DI, GN, IB, RM. HV
Rosmarinus officinalis	Rosemary	ID, SI	SU
Rubia tinctorum	Common Madder	PA, HS, TE, ID, SD	AT
Rumex sp.	Sorrel	IS, HS	HV
Ruscus aculeatus	Knee Holly	ID, PA	IB, BD
Ruta sp.	Rue	SD, EY, ID, PE, HS	KH, BU, BD, TN
Saccharum officinarum	Sugar Cane	SI, ID, TE, EY, SD	DE, GN, HV, AN, RM
Salix sp.	Willow	SD, EY, WB, HS	GZ
Salvia sp.	Sage	HS, ID	BU, HV, SU
Sarcopoterium spinosum	Prickly Burnet	HS	NA, BA, IB
Satureja sp.	Savory	ID, EY, SI	IB, RM
Sesamum indicum	Oriental Sesame	WB, HS, ID, SD, TE	TA, HV
Silybum marianum	Holy Thistle	ID, AP	MU, IB, TA, TN
Sisymbrium sp.	Hedge-mustard	SD, ID, IH, HS, WB	IB, TA, BY
Solanum incanum	Dead Sea Apple	AP, HS, PA	NA, IB, AN
Solanum melongena	Eggplant	SI, ID, SD, HS	MU, QA, SU, HV, EH
Solanum nigrum	Black Nightshade	ID, WB, EY, HS, SD	HV
Styrax officinalis	Officinal Storax	SD, ID	IB
Tamarix sp.	Tamarisk	ID, SI, TE, PA AP	IB
Taxus baccata	Common Yew	PE, SI, AP, ID	IW, AN, AS
Terminalia sp.	Myrobalan	SI, PA, HS, ID	GN, AT
Teucrium capitatum	Hulwort	ID, AP, SI	KA
Thapsia garganica	Drias Plant	PE, ID, WB, IH, TE	AN
Thymelaea hirsuta	Sparrow Wart	SI, HS, ID, SD	IB
Tragopogon coelesyriacus	Long Beaked Gout-beard	SI, SD, ID, WB	IB
Tribulus terrestris	Small caltrops	PE, PA, AP, ID	IB
Trigonella foenum-graecum	Fenugreek	ID, SD, SI, AP	IB, NU, QA, BY
Triticum sp.	Wheat	ID, PA, SD, HS	LU, HV
Ulmus minor (*canescens*)	Elm Tree	SD	IB, IW
Urginea maritima	Sea Squil	ID, IH, PE, TE, AP	AN, GN
Urtica sp.	Nettle	ID, AP, SI, WB	HV
Verbascum sp.	Mullein	PA, AP, HS, ID	IB
Vicia ervilia	Bitter Vetch	ID, SD, PA, AP, SI	IB, HV, BY
Vicia faba	Broad Bean	HS, ID, AP, SD	HV
Vigna radiata	Mung Bean	HS, SD, IH, WB, ID	BG, BD, AN, EH
Viola odorata	Sweet Violet	EY, IH, TE, HS, PE	MU, BG, UM, QA, UT
Viscum cruciatum	Oriental Mistletoe	TE, ID, SD, SI, HS	IB
Vitis vinifera	Vine	ID, HS, AP, SI, SD	All sources
Zingiber officinale	Ginger	EY, ID, SI, HS	IT, AT, RM
Ziziphus vulgarus (*jujuba*)	Common Jujube	SD, ID, PA, EY	MU, QA, RM
Ziziphus spina-christi	Christ Thorn Jujube	SI, AP, WB	MU, LU, EH

The substances mentioned by the sources were identified on the basis of the morphology described in the literature, and in comparison with the Jewish Rabbinic literature and historical sources. A unique comparative collection of ancient *materia medica*, containing hundreds of medicinal substances mentioned in the sources, was assembled to help the identification process. These substances were purchased in different traditional markets in Israel, Jordan, Egypt, Turkey, Morocco, India, England, and elsewhere.

Until now, research on the history of medicine has failed to attribute great significance to the al-Sham region as a unique center of medical culture or as playing an important role in the supply of medicinal substances within the region and beyond.

2. Sources

Our reconstruction is based upon a wide variety of written sources such as chronicles, geographical literature, travel accounts, and various commercial and legal documents. They can be divided into several categories. Some sources specifically mention the medicinal sub-

Table 2
Animals and their extracts as a source for medieval and Ottoman medication in al-Sham

Scientific name	Common name	Main uses	Selective references
Angulus sp.	Sea Shell (Tallina)	ID, AP, EY	IB
Apis mellifera	Wax and Honey	ID, AP, HS, IH	GN, BN, UT, HV, RM
Bombyx mori	Silk Worm	IH, ID, HS, IH	AN
Box Taurus	Milk, Cheese	SD, HS, ID, IH	AN, HV
Castor fiber	Common Beaver	EY, AP, ID, SD	BN
Chlamydotis undulata	Bustard	EY, ID, SD	AN
Cimex lectularius	Stinking Bug	ID, IH	BI, AN, HV
Coleoptera sp.	Scarabees	HS	HV
Coralium rubrum	Coral	EY, ID	GN, IT
Echis coloratus	Adder	AP, SD, ID	SU, MA
Equus asinus x Equus caballus	Mule	EY, ID, IH	AN
Equus asinus	Ass	SD, EY, HS	HV
Gallus gallus domesticus	Hen	SD, HS, EY	HV
Helix sp.	Snail	HS, ID, SD, AP	HV
Homo sapiens	Human Urine	SD, ID	HV
Lampyris sp.	Firefly	ID, HS	AN
Leiurus quinquestriatus hebraeus	Yellow Scorpion	HS, ID, SD	HV
Lumbricus sp.	Earthworm	HS, ID, PA, IH	HV
Merops sp.	Bee Eater	SD, PA	AN
Moschus moschiferus	Musk	PA, IH, HS,	AT, GN, AT
Mus musculus	House Mouse	SD, ID	HV
Muscicapa sp./Ficedula sp.	Flycatcher	EY, SD, ID	AN
Pediculus sp.	Louse	ID	HV
Physeter catodon	Sperm Whale	PA, ID	MS
Rana ridibunda	Frog	HS, IH	HV
Triturus vittatus	Triton	HS	IB, UT, AN
Sepia officinale	Cuttle Fish	SD, ID	IB

stances in connection with the al-Sham area. Others describe the use of these substances, their cultivation, or their trade in the region. Several sources refer only to the names and dialectal terms for these substances in the patois of local residents.

Table 3
Minerals used in medicine in medieval and Ottoman medication in al-Sham

Name	Main uses	Selective references
Alum	PA, HS, EY, SD	HR, AT, VT, IT
Arsenic sulfide	ID, SD, HS	GN, AT, HV, TA
Asphalt	EY, SD, IH	KH, TA, GN, IB, AN, FH
Cidaris sp. (Jews' Stone)	ID, SD	BI, IB, AN
Earth (Clay) sp.	SD, AP	IB, UT, AN
Galena	EY	GN
Hematite	SD, SI	TA, AN, MU
Iron	ID, SI, IH	AN
Lead	EY, HS, SD	TA
Pyrite	EY, DS	TA
Salt (Halite)	PA, ID, AP	MU, GN, TA
Sulfur	ID, SD, AP	MU, TA, GN, HV
Thermal (mineral) water	ID	ID, KH, BU, ES, MU
Vitriol sp.	HS, ID, SD	RA, TA, HV
Zinc	EY, HS	TA, GN, BN, HV

Among the many physicians who specifically mention the use of medicinal substances in the al-Sham region we cite the 10th-century Jerusalem physician al-Tamimi (al-Tamimi), Benevenutus, an eye doctor of the Crusader period who mentions many 'Jerusalemite' medicines in his book (Wood, 1929), and the scholar al-Idrisi (died 1165) (al-Idrisi, 1995). Of the many authors of medical books in the period of Ayyubid rule, we single out 'Abd al-Latif al-Baghdadi (1162–1231) (al-Baghdadi, 1965), Rashid al-Din Ibn Suri (1178–1242), and the Andalusian flora specialist Abu'l-'Abbas an-Nabati (died 1239), who visited our region, and was quoted by his distin-

Table 4
Materials of other origin, in use in medieval and Ottoman medication in al-Sham

Name	Main uses	Selective references
Balsam of Jerusalem	SD, ID, PA	FH
Cruciferae oil	ID, HS	GH, KH
Flower water	IH, ID, AP	RM
Garum (Muri)	AP, SI	MU
Katran (Cedar Tar)	IH, AP, HS, ID, PA	IB, IW, BI, RA
Manna	ID, PA	MU, TA
Mumie	ID, HS, AP	AN, FH
Potash (Kali)	HS, AP	MU, TA, GN, LU
Soap	SD, ID, AP	AN
Treacle (Theriac)	ID, AP	MU, TA, MA

guished pupil Ibn al-Baytar (died 1248), active in al-Sham in the services of the Ayubbid rulers (Ibn al-Baytar, 1874, 1989). Among the chemistry books, we note the one by al-Kindi (Levey, 1966). Unique also is a book by Dawud al-Antaki (died 1599), which describes approximately 70 medicinal substances in the al-Sham region (al-Antaki, 1935). A few Jewish physicians practiced medicine in 16th- and 17th-century al-Sham, among them Rabbi Refael Mordecai Malki (Benajahu, 1985), of Italian origin, in Jerusalem and Rabbi Hayyim Vital in the city of Safed (Benajahu, 1987). Typical of the medieval Islamic culture is further more a wide-ranging agricultural literature (*katab al-falaha*) describing farming implements, working methods, irrigation, planting of fruit trees, vegetables, spices, medical plants, etc. Some writings contain references to the crops of al-Sham. Among these, for example, we find books written in Spain by Ibn al-Khair al-Ashbili (11–12th century) (al-Ashbili, 1990). Especially important is *The Book of Nabatean Agriculture*, written in the early 10th century by Ibn Wahshiya (Ibn Wahshiya, 1993–1995).

From the Middle Ages and the Ottoman periods come hundreds of European travelogues (PPTS, 1890–1896). Those covering the al-Sham region contain important historical and scientific pieces of information, including, for example, references to spices and medical plants that grew in the region or were sold at the local markets. Such information becomes more abundant from the 13th century onwards and a great many details can be found in the writings of Burchard (13th century) (Laurent, 1864) and Suriano (15th century) (Bellorini et al., 1949). Information is found also in the writings of the Swedish botanist Frederick Hasselquist (1722–1752) (Hasselquist, 1886) and the French Franciscan monk Eugin Roger (17th century), whose book contains some data on medicinal uses of plants in the Holy Land (Roger, 1664).

The writing of travelogues also developed as a specific domain in Muslim literature, under the influence of Classical Greek–Roman literature, starting from the 10th century. This literature is usually arranged according to the different regions of the world, and the information on medical substances appears sporadically. Among the authors we may mention al-Muqaddasi (10th century) (al-Muqaddasi, 1906), Yaqut (13th century) (Yaqut, 1870), al-'Uthmani (14th century) (Lewis, 1953) and al-Dimashqi (14th century) (al-Dimashqi, 1923). Usually included in this category are Muslim travel accounts, such as those of al-Mas'udi (10th century) (al-Mas'udi, 1861–1877), Nasir-al-Khusraw (11th century) (Nasir-i Khusraw, 1861), and Ibn Batuta (14th century) (Ibn Battuta, 1854). Several works were commissioned by the rulers during the Mamluk period, including historical chronicles (Ibn Iyas, 1985; al-Maqrizi, 1911–1927) and a manual for secretaries, the latter a kind of encyclopedic handbook for the use of those in government service. This literature yields a wealth of condensed material on a variety of different subjects, including agricultural products, medical substances, and perfumes. The authors most significant for information on the medical substances of al-Sham are al-Nuwayri (14th century) (al-Nuwayri, 1924), al-'Umari (died 1349) (al-'Umari, 1985), Qalqashandi (1355–1418) (al-Qalqashandi, 1913–1919), and al-Ghazzi (15–16th century) (Hamarneh, 1978). Especially important for this period is al-Badri (15th century), who devotes most of his writings to the description of the plants of the al-Sham region and their uses (al-Badri, 1980). A historical study of Mamluk Jerusalem contains some medical information as well (Lutfi, 1985).

As commerce took up such a central place in the Muslim world, it naturally generated a wide-ranging literature containing much information about production and marketing of numerous types of merchandise, including of course medicinal substances used in al-Sham. For example, a miscellany of literature was written under the name *hisba*, offering guidelines for the *muhtasib*, the market overseer, and dealing with such topics as honesty in commercial transactions, supervision of weights and measures, prices, prevention of imitations of medicinal substances, etc. (al-Karshi, 1938). Moreover, as Italian commerce expanded in the Mediterranean, guidebooks appeared for merchants in Europe as well, among them one written in approximately 1340 by Pegolotti, a member of a Florentine banking family (Pegolotti, 1936). Eliyahu Ashtor (Ashtor, 1976, 1982, 1986) and other (Arbel, 1988) have pointed up the unique value of Italian archives, especially those of Venice (Nuovo Archivio Veneto) but also private ones. These have turned out to contain a wealth of detailed information on the trade in spices and medicinal substances to and from al-Sham, including references to the prices of various types of substances, the methods used to transport them, and the amount of taxes levied on them.

Other archives, often dealing with a wide range of subjects, are important for the realistic, authentic, and reliable data they enable us to extinct from their documents. These contain the names of agricultural products and medicinal substances, usually in reference to troubles with taxation on such goods or appearing in the description of various rights granted to European settlers in the area. In this category we include all documents dating from the Crusader period (Beugnot, 1841–1843), among them archives of military institutions (Delaville le Roulx, 1894–1906) and the Church (Bresc-Bautier, 1984). Another category, again, contains legal documents discovered in Waqf (Muslim pious endowments) archives, some of which were only discovered in recent years (al-Asali, 1983–1989; Little, 1984).

A different type of source material has come to us through the Cairo Genizah, which includes a variety of literary materials mostly pertaining to the Jewish community, documents reflecting the activities of the Beit Din (religious court) of the Fustat (ancient Cairo) community, and private correspondence. Especially important for our study are 11th century Jewish commercial documents, which were studied and published by S.D. Goitein (Goitein, 1967–1988, 1980) and M. Gil (Gil, 1983). They contain a wealth of information about the trade in medicinal substances and their use in our area, and in Mediterranean society as a whole (Isaacs, 1994).

2.1. Miscellaneous

Within this grouping are included sources that, while not explicitly mentioning medicinal substances in connection with the al-Sham region, contain valuable information on various substances and the way they were used, something added routinely in medieval culture. Within this type of literature one finds general medical and chemistry books, such as those of Ibn Masawaih (Levey, 1961), al-Razi (865–925) (al-Razi, 1967–1968), Ibn Sina (980–1037) (Ibn Sina, 1877), al-Biruni (973–1048) (Said and Elahie, 1973), Maimonides (1138–1204) (Ben Maimon, 1942), and Kohen al-Attar al-Israili (13th century) (Kohen, 1940).

In this category is also included literature reflecting the growth of the field of medicine in the Middle Ages and early Ottoman period because of the names and synonyms of medicinal substances it contains. This literature can also help us identify medicinal substances and their names in the various dialects spoken by the people of the period. As one substance often had different names and its identification varied from place to place, dictionaries included here become essential for anyone studying medicine. From these dictionaries too we learn that the origin of some of the plant-derived medications was the al-Sham area. Among authors of dictionaries we cite here only the important ones: al-Ghafiqi (12th century) (Meyerhof and Sobhy, 1932–1940), Ibn-Rushd (1126–1198) (Ibn Rushd, 1939), Maimonides (Ben Maimon, 1940), and the North African dictionary entitled *Tuhfat al-Ahbab* (Renaud and Colin, 1934). To identify plants we also utilized medieval Jewish sources, including Hebrew dictionary literature and scripture commentary, especially those that mention the al-Sham region, for instance, Rabbi Tanhum of Jerusalem (13th century) (Tanhum Hayrushalmi, 1961) and Rabbi Estori ha-Parchi of the 14th century, who migrated from Spain to the Land of Israel, where he settled (Estori ha-Parchi, 1897–1899).

3. Findings

The data are arranged in four tables according to origin of substance whereby each table presents basic information such as scientific name, common name, main medicinal uses, and selective references. Abbreviations of sources (references) and diseases are listed first.

3.1. Sources

AN Daud al-Antaki (al-Antaki, 1935)
AS Ibn al-Khair al-Ashbili (al-Ashbili, 1990)
AT Les Assises, Acre taxes (Beugnot, 1841–1843)
BA Baghdadi (al-Baghdadi, 1965)
BD al-Badri (al-Badri, 1980)
BN Benvenutus (Wood, 1929)
BU Burchard (Laurent, 1864)
BY Biruni (Said and Elahie, 1973)
DE De Laville (Delaville le Roulx, 1894–1906)
DI Dimashqi (al-Dimashqi, 1923)
EH Estori ha-Parchi (Estori ha-Parchi, 1897–1899)
ER Eugin Roger (Roger, 1664)
FH Frederick Hasslquist (Hasselquist, 1886)
GH al-Ghafiqi (Meyerhof and Sobhy, 1932–1940)
GN Genizah (Gil, 1983; Goitein, 1967–1988, 1980; Isaacs, 1994)
GZ al-Ghazzi (b)
HR Haram Documents (al-Asali, 1983–1989; Little, 1984)
HV Hayyim Vital (Benajahu, 1987)
IB Ibn al-Baytar (Ibn al-Baytar, 1874, 1989)
IR Ibn Rushd (Ibn Rushd, 1939)
IS Ibn Sina (Ibn Sina, 1877)
IT Italian Trade (Arbel, 1988; Ashtor, 1976, 1982, 1986)
IW Ibn Wahsiyya (Ibn Wahshiya, 1993–1995)
KA Kohen al-'Attar (Kohen, 1940)
KH Nasir al-Khusraw (Nasir-i Khusraw, 1861)
LU Lutfi (Lutfi, 1985)
MA Maimonides (Ben Maimon, 1940, 1942)
MS Mas'udi (al-Mas'udi, 1861–1877)
MU Muqaddasi (al-Muqaddasi, 1906)
NA Abu'l-'Abbas an-Nabati (in Ibn al-Baytar, 1874)
NU al-Nuwayri (al-Nuwayri, 1924)
PE Pegolotti (Pegolotti, 1936)
QA al-Qalqashandi (al-Qalqashandi, 1913–1919)
RA al-Razi (al-Razi, 1967–1968)
RM Rafael Malki (Benajahu, 1985)
SU Suriano (Bellorini et al., 1949)
TA al-Tamimi (al-Tamimi)
TN Tanhum Hayrushalmi (Tanhum Hayrushalmi, 1961)
UM al-'Umari (al-'Umari, 1988–1989)
UT 'Uthmani (Lewis, 1953)

VT Venetian Taxes (Nuovo Archivio Veneto)
YA Yaqut (Yaqut, 1870)

3.2. Diseases

AP Animals bites and poisons
EY Eye diseases
HS Hemorrhoids and sexual diseases
ID Internal diseases
IH Inflammations and heat
PA Pains
PE Psychiatric and epilepsy
SD Skin diseases
SI Stomach and intestine
TE Teeth
WB Wounds and burns

3.3. Plants

We were able to trace a total of 234 plants used in medicine in medieval al-Sham. Among them are wild plants, cultivated plants and spices, and occasionally even poisonous plants. The plants are presented in Table 1.

3.4. Animals

The majority of the 27 substances of animal's origin traced in the sources refer to animal extracts or organs used as medication. In certain cases, especially with insects, the whole body was used, and in others it could be the animal's ashes or even its excrements. The animals and some data on their uses are presented in Table 2.

3.5. Minerals

We were able to identify 15 materials of mineral origin (Table 3). The use of such substances for medicine is well known throughout history. It reached its zenith among the Arabs during the medieval period (Hamarneh, 1980).

3.6. Substances of other origin

Ten medicinal substances that do not meet the strict criteria applied in the previous three sections are presented in Table 4. These substances were processed animal or plant, or substances whose origin was mixed or not clear-cut.

4. Discussion

4.1. Reliability

The identified medicinal substances listed in this article reflect the inventory of important medicinal substances in the al-Sham region during the period under study. This impression is confirmed by the wealth of references to each item mentioned. The great majority of the materials feature in more than one source. A few materials that were not identified are mentioned in one or two sources only and do not appear here.

The inventory of substances as compiled in this study corroborates the distribution of substances as found in other lists of medicinal substances covering different periods and cultures (Lev, 2002a). The overwhelming majority (81.8%) of substances that served as simple drugs or as a base for complex drugs derived from plants (see Table 5). The proportion of materials derived from animals and animal organs is small (9.5%), while minerals represent an even smaller proportion (5.2%), either because only a few were found in nature or because great caution was exercised in the application of minerals and chemical substances uncommon in daily use.

4.2. Data analysis

4.2.1. Plants

A botanical analysis revealed the following plant families as making the largest contribution to the inventory of medicinal plants: Liliaceae, Compositae, Labiatae, and Umbelliferae. Similarly, we could establish a list of plant species whose medicinal use in the region had been uncertain or unknown previously. These include: common agrimony (*Agrimonia eupatoria*), deer balls (Lycoperdon sp.), christmas rose (Helleborus sp.), common gromwell (*Lithospermum officinale*), gardenia (Gardenia sp.), Job's tears (*Coix lachryma-jobi*), Solomon seal (*Polygonatum officinale*), common yew (*Taxus baccata*), dodder (Cuscuta sp.), great snapdragon (*Antirrhinum majus*), Balsam Apple (*Momordica balsamina*), small caltrops (*Tribulus terrestris*), great horsetail (*Equisetum telmateia*), and the drias plant (*Thapsia gargenica*).

Table 5
Medicinal substances, identified according to group of origin

Origin	Number	Percentage
Plants	234	81.8
Animals	27	9.5
Minerals	15	5.2
Others	10	3.5
Sum	286	100

An analysis of the geographic origin of medical plants used in the al-Sham region showed that 90.5% of these originated within the area itself. The explanation may well be that the region constituted a crossroads for different phytogeographic zones; most of the plants are Mediterranean in origin.

Several plants traced in the sources were used in keeping with an ancient medical theory which in the late Middle Ages was called the 'doctrine of signature'. Plants such as lemon balm (*Melissa officinalis*), coral peony (Paeonia sp.), tanning sumach (*Rhus coriaria*), common gromwell, great snapdragon, horned poppy (*Glaucium corniculatum*), spiny broom (*Calicotome villosa*), southern maidenhair fern (*Adiantum capillus-veneris*) and wild dog rose (*Rosa canina*) were used to treat symptoms and diseases whose color, shape, or effects were viewed as being very similar to that of these plants themselves (Lev, forthcoming a).

4.2.2. Animals

The animals traced in the sources can be divided into groups according to their availability (Lev, 2000).

4.2.2.1. Common animals. Domesticated animals, such as cattle (*Bos taurus*) and chickens (*Gallus galus domesticus*), pests, such as lice (Pediculus sp.) and stinking bug (*Cimex lectularius*), and others, such as the earthworm (Lumbricus sp.) and the firefly (Lampyris sp.). The use of these animals, their organs, and products is explained by the fact that they were directly available, which guaranteed fresh supplies at low cost.

4.2.2.2. Wild animals. For example, the poisonous snake adder (*Echis coloratus*), the amphibious triton (*Triturus vittatus*), and the common beaver (*Castor fiber*). As these animals were caught mainly during periods of non-hibernation, they were naturally quite expensive.

4.2.2.3. Exotic animals. Species such as musk (*Moschus moschiferus*) and coral (*Coralium rubrum*). These animals were found in remote regions. Trade in them was often monopolistic, and usually relied on imports from distant lands.

4.2.3. Minerals

We were able to trace 15 substances of mineral origin in the historical sources. It appears that most of these medicinal substances were mined and produced in the al-Sham area. The majority of these were geologically related to the Red Sea Rift; the remainder were found primarily in the northern part of Israel (Lev, 2001).

4.2.3.1. Geographic origin of the medicinal substances. Whether found in natural form (minerals), as part of the fauna of our region (animals), in the natural flora (wild plants) or the domesticated flora (agricultural plants), there is no doubt that the region under study served as the geographic origin of the majority (88.1%) of the medical substances (286) used in the al-Sham region.

A minority of the substances (34) are entirely imported materials, and for a significant portion of these the area served as a commercial way station, primarily from East (Asia) to West (Europe). Of the 27 animals serving a medical function, only two were not found in our region and had been imported.

4.2.3.2. Imported medical substances. The majority (67) of cultivated plants used in medicine grew in the al-Sham area, while only a minority (22) had to be imported (Lev, forthcoming b).

The large number of medical materials whose origin proved to be in our region corroborates its importance as a regional center for the marketing of medical materials in various periods. This, of course, is in addition to the character of the region as an area of commerce and transit for these materials.

4.2.3.3. Effect of geographic location on the composition of the materia medica inventory. The Levant's geographic location influenced the inventory of substances in two significant ways. One is the abundant fauna and flora found in the region, arising from its location at the junction of three continents, its diverse topography, its varying regional climates, and the presence of the Red Sea Rift, contributed to the wealth of the inventory of medicinal substances.

The second is the Levant's geographic position. As the meeting place of cultures and trade routes from the dawn of history, many and diverse medicinal substances were introduced into the region through direct trade by virtue of the area's role as a link between east and west, and then also through conquest by neighboring and distant peoples. Among the imported substances, we may indicate the following:

- spices, including clove (*Eugenia caryophyllata*), ginger (*Zingiber officinale*), pepper (Piper sp.) and cinnamon (*Cinnamomum zeylanicum*), brought primarily from the lands of eastern Asia;
- plants of a distinctive medicinal nature, such as yarrow (Achillea sp.), aloe (*Aloe vera*), myrobalan (Terminalia sp.) purging cassia (*Cassia fistula*), and turbith (*Ipomoea turpethum*);
- gums, resins, and incense, including balsam (*Commiphora opobalsamum*), frankincense (*Boswellia carteri*), and myrrh (*Commiphora myrrha*).

Also imported to the area were minerals such as arsenic sulfide, zinc, and alum, and animals such as musk (*Moschus moschiferus*), beaver (*Castor fiber*), and Mumies. Within the region itself, a number of sub-areas

were prominent as centers for the discovery, collection, and production of natural medicinal substances:

1) The Dead Sea Valley and the Jordan Valley. These parts contain deposits of asphalt, sulfur, and salt; plants of Sudanese origin, such as Jericho balsam (*Balanites aegyptiaca*), ben tree (*Moringa peregrina*), Dead Sea apple (*Solanum incanum*), sebesten (*Cordia myxa*), gum arabic (*Acacia senegal)*; and unique animals, such as adder.
2) Mount Lebanon and its adjacent coastal region, known in the writings of the late Middle Ages as an important source of medicinal plants, for example, peony and great snapdragon; and as a source for indigenous medicinal substances, such as different types of earth (clay) (Lev, 2002b) and triton, which were exported to nearby lands (Lev, 2001).
3) The Jerusalem area, which served as a center of production and trade for significant medicinal materials (97 substances were identified in the sources with reference to this city) (Lev, 1999). When we think of the paucity of natural resources in the city, this fact supports the suspicion that authors in the Middle Ages often cited a certain plant as growing in Jerusalem, or a specific formula as having been discovered in the city, to exploit the sanctity of Jerusalem as a marketing tool, or to increase a medicine's therapeutic value in the eyes of the patient (Amar and Lev, 2000).

4.2.3.4. al-Sham and its role in the production and distribution of materia medica. One can easily regard al-Sham as an independent source of production and marketing of medical substances. Therefore, we presume that even during periods of war or cessation of trade the area's population apparently did not suffer from a dearth of medicinal substances. As we saw, the overwhelming majority of medical substances (88.1%) are of local origin. These substances were available because they grew as wild plants, were used in local agriculture, were part of the natural fauna, and were mined in the region. Most of the wild plants in the list continue to be used in popular healing to this day, while only a minority, are utilized in the production of modern medicines. Of the minerals that were locally processed and used in medicine we can list asphalt, earth (clay), Cidaris sp. (Jew's stone), types of salt, thermal (mineral) water (hot springs), sulfur and iron. Some of these materials were exported to neighboring lands. Among the medicinal substances exported were: coral species, adder, soap, scammony (*Convolvulus scammonia*), treacle (theriac), and balsam of Jerusalem.

Substances were also available incidentally or through direct import, as the region served as a way station on the east–west trade route. Imported medicinal substances were presumably more expensive, and during economic recessions or reduced trade, these materials were no doubt harder to obtain.

The wealth of known medicinal substances, and the detailed citations in the medical literature about the special significance and origin of many medicinal substances in the area of al-Sham, leads to the conclusion that a practical and knowledgeable 'al-Shami' medical tradition indeed existed in our region. The research revealed that this tradition was characterized by a unique regional pre-Islamic heritage and a wealth of local medicinal substances, which either grew wild, were cultivated domestically, or were imported by traders. This medical tradition, we suggest, was not detached from those of the neighboring regions or countries. From our research the impression arises that this medical tradition was molded in the 10th century (al-Tamimi), developed in the 11th and 12th centuries (Ibn al-Quff) (Hamarneh, 1991) reached its peak in the 13–16th centuries (Ibn al-Baytar, Dawud al-Antaki), and later declined, parallel to the twilight of the Ottoman Empire (17–19th centuries).

4.2.3.5. Islamic contribution to the materia medica. Muslim medicine was receptive to and incorporated knowledge accumulated by other and earlier cultures, from Greece to India. At its peak it became the most significant and most advanced medicine in the medieval world, a conclusion already reached by modern scholars and reflected in our list. This contains a new group of materials whose source is in countries such as Arabia, India, Persia, etc. These materials include purging cassia, and other types of cassia, clove, sugarcane (*Saccharum officinarum*), nutmeg (*Myristica fragrans*), rhubarb (Rheum sp.), manna and kali. These substances were introduced into the al-Sham region, and later into Europe, following the Muslim conquest.

4.2.3.6. Christian (Western) contribution. When the crusaders ruled part of the region, between the 11th and the 13th centuries they appear to have taken advantage of the advanced state of Muslim medicine and of the range of medical substances used by Muslim physicians, some of which they helped import to Europe (foe example, scammony and sugarcane). They do not themselves seem to have contributed much to the inventory of medical substances.

5. Conclusions

Through the analysis of a range of historical source spanning approximately 1100 years, the findings of our study can be said to contribute to the reconstruction of the *materia medica* of medieval and Ottoman al-Sham in three main areas, namely materials, diseases, and knowledge.

5.1. Materials

The research has presented for the first time a significant amount of information on the medical uses in our region of insects, including firefly, scarabees (Coleoptera sp.), silkworm (*Bombyx mori*), louse, stinking bug (*Cimex lectularius*); invertebrates, such as snail (Helix sp.); arthropods, such as scorpion (*Leiurus quinquestriatus hebraeus*); marine organisms, including coral, cuttle fish (*Sepia officinale*) and sea shell (Angulus sp.); amphibians, such as triton and frog (*Rana ridibunda*). In addition, the use of fowl such as flycatcher (Muscicapa sp. or Ficedula sp.) and bee-eater (Merops sp.) was described here for the first time. These data were presented along with information about the use of known animals and animal parts, such as adder, urine, beaver testicles, musk glands, chicken eggs and bee honey (*Apis mellifera*).

5.2. Diseases

A closer look at the historical sources reveals the types of diseases contracted by the people of the area during the period covered by the research, as well as the causes of these diseases. Some of the diseases were infectious, contracted due to poor hygiene; others were related to poor nutrition; still others were linked to living conditions and climate (heat, cold, humidity, dust). From the literature of the period, we learn that a range of diseases struck both the poor and the upper class (for example, eye diseases), while often diseases were typical of specific socioeconomic strata. The poor appear to have suffered more from infectious diseases (intestinal, etc.), bites, and stings, while the wealthy experienced more stomach ailments (due to the abundance of rich and refined food), impotence, and intentional poisoning and thus were more preoccupied with psychological problems, aging, and bodily aesthetics.

5.3. Knowledge

Another outcome of our research is the finding that nearly all of the natural medicinal substances used in the Middle Ages continue to be used in popular healing among various Jewish communities and among ethnic minorities in Israel and in neighboring countries. This points, we believe, to an interesting process that has taken place in the Middle East over the last 200 years. That is, modern European medical methods were introduced into the area by educated doctors and pharmacologists, who imported Western medications and invented others according to new formulas. Simultaneously, traditional medical information grounded in Arab medicine of the Middle Ages were gradually transferred to local healers, merchants of medicines, and the general public. Healing methods, medicinal substances, and medical literature that had been at the focus of traditional Muslim medicine for over a 1000 years became, in the 19th and 20th centuries, the exclusive domain of the lower strata and of traditional medicine (Lev and Amar, 2000). Support for this conclusion can be found today in shops selling fragrances and medicines in the markets in Jerusalem, Egypt, Jordan, and Syria, and in the homes of folk healers in Israel. What is more, the latter not only maintain the use of the substances set forth in this study but also continue to consult the medical texts originally written in the Middle Ages.

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