

ORIGINAL PAPER

VERIFICATION OF FOLK MEDICINAL POTENTIALITY FOR SOME COMMON PLANTS IN JORDAN

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ABSTRACT:

87 species belonging to 59 genera and 33 plant families were identified and presented in the area of study. The largest 3 families are: *Lamiaceae* (9 aquatic species), *Asteraceae* (7 species), and *Salicaceae* (7 species). The largest genera are *Mentha* (6 species), *Polygonum* (5 species), and *Salix* (5 species). 63 folk medicinal aquatic species (73.3%) have therapeutic similarities with neighbouring countries, while the 24 remaining species (26.7%) haven't such therapeutic similarity. Emerged species (living with close contact with water body) were the most recorded, while amphibious, submerged or floating species were the least.

The folk medicinal importance value of aquatic species recorded was identified according to Friedman parameters. 21 species (24%) have ROP values higher than 50, and therefore; have the highest popularity in folk medicinal potentiality. 26 species (29.9%) have therapeutic effects informed by less than three informants, and therefore, excluded from further consideration. 40 species (46.1%) have ROP values less than 50, and therefore; considered nonpopular medicinal plants.

Keywords: Rank order priority (ROP), relative popular level (RPL), therapeutic effects, ethnobotany, fidelity level (FL), medicinal plants.

INTRODUCTION

Jordan is located between longitudes 53° 40' E and 39°E and between latitudes 29° 30' N and 34° N. Most of the area comprises deserts especially in south eastern and north eastern part in Ma'an, Jafer, Bayir, Azraq, H5 and H4. The area of study is dominated mainly by Saharo-arabian element which has annual precipitation not exceeding 100 mm, this is in addition to Mediterranean (which dominated the southern and the northern heights with annual precipitation of about 400 mm), Irano-turanian and Nubosindian along the Jordan rift valley and the strip from Tafilah to Aqaba region. The western regions that have high altitudes more than 1000m above sea level in Shoubek, Karak and Sharah series which have high annual precipitation, were dominated by certain kind of vegetation similar to those found in northern heights in Ajlun mountains. While *Aretmisia* vegetation is characterizing Irano-turanian element which is extended between Petra to Tafilah (Al-Eisawi, 1982; Bender, 1974; Boulos, 1977; Boulos & El-Eisawi, 1977; Boulos & Lehman, 1977; Zohary, 1973 and Zohary & Feinbrun-Dothan, 1966). The aquatic species are mainly distributed in or around the water resources in Jordan which are very limited, since Jordan is considered from the first ten poorest countries in the world. Jordan and Yarmouk river banks, marshes, swamps, ditches, geothermal springs (like Hammeh, northern Shouneh, Abo Dableh, Afra, Burbaitah), desert oases (like in Azraq, Jafer, Bayer), in addition to the small ponds and springs

distributed in Jordan are the most popular water surfaces that exhibited highly diversified aquatic species exhibited therapeutic effects (Bender, 1974).

It is obvious that plants have been used for medication early in history and the history of this herbal medicine is very old and popular worldwide. Those who practice these methods were called herbalists. The medicinal plants remained widely used in many areas of the world especially southern parts of Jordan even after the recent flourishing of chemistry of plants (phytochemistry). Greek and Egyptians were the most popular and famous nations in this field, who distributed this knowledge through ancient trade ways which influenced the development of the medicinal potentiality of the plants (Adailkan & Gauthaman, 2001 and Stickel *et al.*, 2000).

The therapeutic effects of medicinal plants of Jordan and neighbouring countries were investigated during the recent years. Most of these plants were wild of mediterranean and saharo-arabian elements. They are considered the major natural resource of folk medication by local rural inhabitants and experienced cattle owners during the grazing movements and forage requirements (Karim & Al-Qura'n, 1986, 1988 and Khayyat & Mursi, 1981).

Many botanists and pharmacologists all over the world investigated the medicinal plants species specially used in traditions and folklore to extract the active constituents. The

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proper scientific means and techniques of extractions and identifications to determine finally the therapeutic effects and dosages (Eddouks *et al.*, 2002; Harborn, 1997; Heinrich, 2000; 2002 and Joud *et al.*, 2001).

The use of plants in medicine promoted the chemical analysis of medicinal plants for the active chemical constituents to be extracted and later synthesized (Kreb, 2001; Prance, 2001; Rates 2001 and Stickel *et al.*, 2000)). There are many botanical resources to depend upon to compare the ethnobotany in southern Jordan and neighbouring countries, specially Syria, Palestine, and Iraq. This kind of comparison may be helpful to know the degree of similarity between them, which consequently gives the evidence of new records of therapeutic effects not recorded previously.

This study aims to verify the phytomedicinal wealth present in the investigated area depending on some verifying steps to differentiate among the different levels of popularity since the investigated area is unique with high level of species diversity. The inhabitants have intimate relationship with the earth and its natural resources as source of their food and medication. The majority of the people are beduins and rural, oriented and well-experienced in this field of science, which therefore increases the responsibilities for protecting these species from the factors of threatening and endangering. Consequently, this kind of cultural heritage may be reinforced and layed down in the track of scientific measures (Rates, 2001 and Stickel *et al.*, 2000).

MATERIALS AND METHODS

During the period of February 2001- October 2002, field-work investigation was done to formulate the ethnobotanical information and their medicinal verification in the area of study. Interviews with 80 informants was done; 50 men and 30 women from different parts of the area, whose age ranged from 40-70 years, most of the interviewees (60 persons) were more than 60 years old and they belong to families which have a strong linkage with folk medicine since they were beduins and rural inhabitants with long experience. Most of the people were either native borne or had been living in the area for more than 30 years, they were mainly either local healers, herbalists, shepherds, experienced adults or old patients.

During the first phase, preliminary data were collected from the informants through the field work. Experienced people were asked to inform where the medicinal species were located and what were the major therapeutic effects. Structured interviews were then conducted to collect more specific information, which was used to detect the traditional methods of preparation and remediation for each species quoted.

The taxonomic identity of medicinal taxa mentioned by interviewees was confirmed precisely by several methods; either by comparison with the already identified specimens preserved in the herbaria of Jordan universities and Ministry of Agriculture, or fresh plant specimens or dried samples were shown to the interviewees for precise recognition. Questions addressed to the informants were mainly focused on the purpose of plant application, ways of preparation, medicinal plant parts and dosages required.

Each species not recognized by the interviewees was photographed before collection. Flora Palaestina (21) in its four volumes, and the herbaria of research centers in Jordanian universities and Ministry of Agriculture were used for the identification of the specimens collected. Thirteen geographical sites were investigated; they were: (1) Ajlun springs, (2) Araba valley, (3) Dissi and Towisi, (4) Aqaba region, (5) Zarah springs, (6) Azraq, (7) Maa'n, (8) Afra, (9) Tafileh springs (10) Northern Hammeh, (11) Jafer, (12) Bayir, and (13) Burbaitah.

The pharmacological terms used in this study were taken from different pharmacological resources and specialized dictionaries (Karim & Al-Qura'n, 1986; Khayyat & Mursi, 1981; Prance, 2001; Rates, 2001 and Stickel *et al.*, 2000) which dealt mainly with the terms in the field of pharmacognosy relating medicinal and pharmaceutical materials of the plants. The therapeutic effects of the medicinal species were accepted if mentioned by at least 3 informants native to the area of survey and/or have been living in the area for at least 30 years, while those mentioned by less than 3 informants were not accepted, and excluded from further consideration. Three verifying parameters were used to reach this goal; Fidelity Level (FL), Relative Popularity Level (RPL), and Rank Order Priority (ROP), similar to that calculated by Friedman *et al.* (1986).

FL was calculated typically: $(I_p/I_u) \times 100$, where I_p is the number of informants who informed the specific therapeutic effect of the plant, while I_u is the number of informants who informed any therapeutic effect of the plant. Then RPL (calculated as percentage of $I_u/30$) was given a score of 1 if mentioned by at least half the number of informants (15 or more since the highest number of informants of any therapeutic effect is 30), and in this case it was considered "popular", while given less than 1 if mentioned by more than 3 but less than 15, and in this case it was considered as "nonpopular", while the value of less than 3 informants was excluded. ROP was calculated typically as: $FL \times RPL$, ROP value represents the high popularity of the medicinal plants.

RESULTS

87 native medicinal species were mentioned by 80 informants interviewed in this study, 26 species (29.9%) were mentioned by less than 3 informants, and so excluded

Verification of folk medicinal potentiality for some common plants in Jordan

Table 1: List of some common plants with relative to their number of informants, major therapeutic effects, FL, RPL, ROP, I_u, and I_p values, administration, and record place.

Plant No.	Plant species	Family	I _u	FL	RPL	ROP	Major therapeutic effects	I _p	Admin.& reco. place
1	<i>Alternanthera sessilis</i> (L.)D.C.	Amaranthaceae	12	0.30	0.40	12.00	Cough healing, astringent	4+4	Int.4,8
2	<i>Anagyris foetida</i> L.	Papilionaceae	05	0.40	0.17	06.80	Antineuralgic	2	Ext.9,11
3	<i>Apium graveolens</i> L.	Apiaceae	10	0.70	0.33	23.10	Carminative, antispasmodic	7+7	Eaten7,9
4	<i>Apium nodiflorum</i> (L.) Lag	Apiaceae	14	0.71	0.47	33.40	Carminative, antispasmodic	10+10	Eaten1,4
5	<i>Atropa belladonna</i> L.	Solanaceae	15	0.80	1.0	80.00	Narcotic, antispasmodic	12+12	Ext.2,3
6	<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	10	0.80	0.33	26.40	For mania and epilepsy	8+8	Ext.6,8
7	<i>Boerhavia repens</i> L.	Nyctaginaceae	05	0.40	0.33	13.20	Astringent in diarrhea	2+2	Ext.5,10
8	<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	02	0.27	0.07	01.90	Astringent, carminative	1+1	Ext.12,13
9	<i>Cercis siliquastrum</i> L.	Papilionaceae	02	0.23	0.07	01.75	Demulcent, cardiac tonic	1+1	Int.13,15
10	<i>Cistus creticus</i> L.	Cistaceae	02	0.25	0.07	10.00	Carminative, anthelmintic	1+1	Ext.4,7
11	<i>Commicarpus africanus</i> (Lour.) Dandy	Nyctaginaceae	02	0.38	0.07	38.00	Antispasmodic	1+1	Ext.3,6
12	<i>Commicarpus verticillatus</i> (Poir.) Standl.	Nyctaginaceae	02	0.36	0.07	36.00	Antispasmodic	2+2	Ext.1,2
13	<i>Corchorus olitorius</i> L.	Tiliaceae	02	0.50	0.06	03	Demulcent, nutritive	1+1	Eaten3,6
14	<i>Corchorus trolocularis</i> L.	Tiliaceae	01	1.00	0.03	03	Demulcent, nutritive	1+1	Eaten3,6
15	<i>Cynanchum acutum</i> L.	Asclepiadaceae	03	0.67	0.10	6.70	Astringent	2	Int.5,6
16	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	02	0.50	0.07	3.50	Antispasmodic	1	Ext.4,6
17	<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	05	0.40	0.17	6.80	Emmenagogue	2	Int.3,6
18	<i>Epilobium hirsutum</i> L.	Onagraceae	16	0.31	1.00	3.10	Hypertensive	5	Int.or Ext.3
19	<i>Eupatorium cannabinum</i> L.	Asteraceae	12	0.33	0.40	13.20	Narcotic, diuretic	4+4	Ext.6,7
20	<i>Euphorbia exigua</i> L.	Euphorbiaceae	15	0.80	1.00	80.0	Anthelmintic, antirheumatic	12+12	Ext.6,7
21	<i>Gisekia pharnacioides</i> L.	Molluginaceae	03	0.33	0.10	3.30	Laxative, analgesic	1+1	Eaten 6,7
22	<i>Glinus lotoides</i> L.	Molluginaceae	02	0.50	0.06	3.00	Laxative, analgesic	1+1	Int.8,10
23	<i>Glycyrrhiza glabra</i> L.	Papilionaceae	18	0.89	1.00	89.0	Hypertensive, antitussive	16+16	Eaten 3,6
24	<i>Grewia tenax</i> (Forssk) Fiori.	Tiliaceae	01	1.00	0.03	3.00	Demulcent, cardiac tonic	1+1	Eaten5,6
25	<i>Grewia villosa</i> Willd	Tiliaceae	02	0.50	0.07	3.50	Demulcent, cardiac tonic	1+1	Eaten3,6
26	<i>Heliotropium supinum</i> L.	Boraginaceae	17	0.71	1.0	71.0	Expectorant	12	Ext.or Int.8
27	<i>Inula crithmoides</i> L.	Asteraceae	18	0.83	1.0	83.0	Cholagogue, emmenagogue	15+15	Ext.5,6
28	<i>Inula graveolens</i> (L.) Desf.	Asteraceae	17	0.76	1.0	76.0	Anthelmintic, expectorant	13+13	Ext.3,6
29	<i>Inula viscosa</i> (L.) Aiton	Asteraceae	17	0.82	1.0	82.0	Anthelmintic, expectorant	14+14	Ext.12,15
30	<i>Jasminum fruticans</i> L.	Oleaceae	02	0.50	0.07	3.50	Sedative, analgesic	1+1	Ext.4,5
31	<i>Laurus nobilis</i> L.	Lauraceae	14	0.57	0.47	26.80	Antirheumatic, antispasmodic	8+8	Eaten3,6
32	<i>Lavandula coronopifolia</i> Lam.	Lamiaceae	16	0.75	1.0	75.0	Antirheumatic, antispasmodic	12+12	Int.4,6
33	<i>Lavandula pubescens</i> Decne	Lamiaceae	15	0.27	1.0	27.0	Antiscabies, antirheumatic	4+4	Int.4,6
34	<i>Lippia nodiflora</i> (L.) Rich.	Boraginaceae	02	0.50	0.07	3.50	Laxative, for gout pain	1+1	Int.11,14
35	<i>Ludwigia stolonifer</i> (Guill. et perr.) Raven.	Asteraceae	02	0.50	0.07	3.50	Analgesic, sedative	1+1	Int or Ext.4,7
36	<i>Lycium europaeum</i> L.	Solanaceae	10	0.70	0.33	23.10	Antispasmodic	7	Int.or Ext.6
37	<i>Lycopus europaeum</i> L.	Lamiaceae	11	0.54	0.37	19.99	Febrifuge, astringent	6 + 6	Int.or Ext.6
38	<i>Lythrum hyssopifolia</i> L.	Lythraceae	02	0.50	0.07	3.50	Haemorrhoides, internal bleeding	1+1	Ext.6,12
39	<i>Lythrum junceum</i> Banks et Sol.	Lythraceae	01	1.00	0.03	3.00	Haemorrhoides, internal bleeding	1+1	Ext.8,13
40	<i>Lythrum salicaria</i> L.	Lythraceae	02	0.50	0.07	3.50	Haemorrhoides, internal bleeding	1+1	Ext.12,15
41	<i>Mentha aquatica</i> L.	Lamiaceae	15	0.73	1.0	73.0	Relieves flatulence, antispasmodic	11 + 11	Eaten4,7

42	<i>Mentha graveolens</i> Ehrh.	Lamiaceae	16	0.75	1.0	75.0	Relieves flatulence, antispasmodic	12 + 12	Eaten5,6
43	<i>Mentha longifolia</i> (L.) Hudson	Lamiaceae	14	0.64	0.47	64.0	Relieves flatulence, antispasmodic	9 + 9	Eaten3,6
44	<i>Mentha piperita</i> L.	Lamiaceae	16	0.31	1.0	31.0	Relieves flatulence, antispasmodic	5 + 5	Eaten4,7
45	<i>Mentha pulegium</i> L.	Lamiaceae	16	0.38	1.0	38.0	Relieves flatulence, antispasmodic	6 + 6	Eaten5,6
46	<i>Mentha spicata</i> L.	Lamiaceae	16	0.31	1.0	31.0	Relieves flatulence, antispasmodic	5 + 5	Eaten3,6
47	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	11	0.45	0.37	45.0	For healing of wounds and abscesses	5 + 5	Ext.orInt.5
48	<i>Myosotis discolor</i> Pers.	Boraginaceae	02	0.50	1.0	50.0	Cough healing, astringent	1+1	Ext.8
49	<i>Myriophyllum spicatum</i> L.	Haloragaceae	02	0.50	0.07	3.50	Diuretic	1	Int..2
50	<i>Nasturtium officinale</i> R.Br.	Cruciferae	17	0.53	1.00	53.0	Vermifuge, diuretic	9+9	Ext.6,12
51	<i>Nerium oleander</i> L.	Apocynaceae	18	0.11	1.00	11.0	Cardiac tonic	2	Eaten2,6
52	<i>Nuphar lutea</i> (L.) Siebth & Sm.	Nymphaeaceae	03	0.33	0.10	3.30	Vermifuge	1	Ext.13,15
53	<i>Oxystelma alpini</i> Decne	Asclepiadaceae	02	0.50	0.07	3.50	Antipyretic	1	Int.6
54	<i>P. latanus orientalis</i> L.	Platanaceae	11	0.45	0.37	16.65	For ophthalmia, antirheumatic	5+5	Int.4,14
55	<i>Polygonum acuminatum</i> Kenth	Polygonaceae	14	0.21	0.47	9.87	Anti-inflammatory, astringent	3+3	Ext.5,6
56	<i>Polygonum arenastrum</i> Bor.	Polygonaceae	12	0.30	0.40	12.0	Anti-inflammatory, astringent	4+4	Eaten7,15
57	<i>Polygonum equisetiforme</i> sibth et sm	Polygonaceae	02	0.50	0.07	3.50	Anti-inflammatory, astringent	1+1	Eaten(9,11
58	<i>Polygonum persicaria</i> L.	Polygonaceae	13	0.46	0.43	19.78	Anti-inflammatory, astringent	6+6	Eaten4,7
59	<i>Polygonum salicifolium</i> Brouss.ex willd	Polygonaceae	13	0.46	0.43	19.78	Anti – inflammatory, astringent	6+6	Eaten6,10
60	<i>Populus euphratica</i> Oliver	Salicaceae	17	0.53	1.0	53.0	Febrifuge, diuretic	9+9	Eaten7,12
61	<i>Populus nigra</i> L.	Salicaceae	16	0.81	1.0	81.0	Febrifuge, diuretic	13+13	Int.3,5
62	<i>Potentilla reptans</i> L.	Rosaceae	03	0.33	0.10	33.0	Antidysenteric, antidiarrheal	1+1	Int.2,7
63	<i>Pulicaria dysenterica</i> (L.) Bernh.	Asteraceae	02	0.50	0.07	3.50	Astringent	1	Ext.5,8
64	<i>Ranunculus aquatilis</i> L.	Ranunculaceae	02	0.50	0.07	3.50	Diuretic	1	Ext.7,10
65	<i>Rubus sanguineus</i> Friv.	Rosaceae	16	0.19	1.00	19.0	Emmenagogue	3	Ext.7,9
66	<i>Ruppia maritima</i> L.	Ruppiaceae	03	0.67	0.10	6.70	Antispasmodic	2	Eaten2,4
67	<i>Salix acmophylla</i> Boiss	Salicaceae	17	0.65	1.00	65.0	Antiseptic, antipyretic	11+11	Eaten6,10
68	<i>Salix alba</i> L.	Salicaceae	18	0.56	1.00	56.0	Antiseptic, antipyretic	10+10	Eaten2,13
69	<i>Salix babylonica</i> Boiss	Salicaceae	17	0.53	1.00	53.0	Antiseptic, antipyretic	9+9	Eaten1,5
70	<i>Salix fragilis</i> L.	Salicaceae	17	0.59	1.00	59.0	Antiseptic, antipyretic	10+10	Eaten2,9
71	<i>Salix triandra</i> L.	Salicaceae	17	0.71	1.00	71.0	Antiseptic, antipyretic	12+12	Eaten5,15
72	<i>Sambucus nigra</i> L.	Caprifoliaceae	10	0.40	0.33	13.2	Purgative, diuretic	4+4	Eaten6,10
73	<i>Samolus yelerandi</i> L.	Primulaceae	02	0.50	0.07	3.50	Vermifuge	1	Int.6,11
74	<i>Sonchus maritimus</i> L.	Asteraceae	14	0.43	0.47	20.2	Antiseptic	6	Ext.7,12
75	<i>Tamarix amplexicaulis</i> Ehrenb.	Tamaricaceae	03	0.33	0.03	0.99	Antirheumatic, astringent	1+1	Int 4,5
76	<i>Tamarix aphylla</i> (L.) Karst.	Tamaricaceae	07	0.43	0.23	9.90	Antirheumatic, astringent	3+3	Int.14
77	<i>Tamarix arvensis</i> zohary	Tamaricaceae	12	0.25	0.40	0.10	Antirheumatic, astringent	3+3	Int.13
78	<i>Tamarix jordanis</i> Boiss	Tamaricaceae	10	0.20	0.33	6.60	Antirheumatic, astringent	2+2	Ext.7,9
79	<i>Tamarix Palaestina</i> Bertol.	Tamaricaceae	08	0.25	0.27	6.75	Antirheumatic, astringent	2+2	Ext.(4,13
80	<i>Trifolium fragiferum</i> L.	Papilionaceae	02	0.50	0.07	3.50	Diuretic	1	Int.12,15
81	<i>Verbena officinalis</i> L.	Verbenaceae	15	0.60	1.0	60.0	Cholagogue, emmenagogue	9+9	Int.1,2
82	<i>Verbena supine</i> L.	Verbenaceae	14	0.36	0.47	16.92	Cholagogue, emmenagogue	5+5	Int.5
83	<i>Veronica anagallis – aquatica</i> L.	Scrophulariaceae	06	0.50	0.20	0.10	Antispasmodic	3	Ext.6
84	<i>Vinca herbacea</i> waldst.	Apocynaceae	10	0.60	0.33	19.80	Antirheumatic	6	Ext.4,7
85	<i>Vinca rosea</i> L.	Apocynaceae	10	0.40	0.33	13.2	Antirheumatic	4	Ext.5,14
86	<i>Vites angus-castus</i> L.	Verbenaceae	16	0.31	1.0	31.0	For colic and gastric disturbances	5	Int.6
87	<i>Withania somnifera</i> (L.) Dunel.	Solanaceae	17	0.71	1.0	71.0	Vermifuge	12	Ext.7,10

FL : Fidelity level , ROP : Rank – order priority, RPL : Relative popularity level, I : Number of informants for any effect, I : Number of informants for specific effect, Ext. :External, Int. :Internal, Admin. : Administration, Reco : Record.

from further consideration, while 33 species (38%) were mentioned by 3 informants or more but less than 15, and therefore considered as nonpopular medicinal plants, but 23 species (32.1%) were considered as popular medicinal plants since they were mentioned by 15 or more informants (for more details see table 1).

Many of the medicinal species have no similarity in their medicinal uses and therapeutic effects with those recorded in the neighbouring countries specially Iraq and Palestine. These plants included 63 species (72.4%) while 24 species (27.6%) have such similarities, therefore the second group is considered as newly recorded medicinal uses and therapeutic effects.

The medicinal species recorded were belonging to 59 genera and 33 families, 41 species were well-known wild, while 46 species were investigated and photographed in the field. 21 species (24%) have ROP values of 50 or more which represented the highest rank order priority among medicinal species investigated (see table 1).

DISCUSSION

The highly ranked medicinal plants with ROP values of 50 or more were represented by only 21 species (24%) in this study despite their medicinal uses, internal or external uses, and therapeutic effects that were reflected in the last columns in table 1 into many different categories:

- (1) Medicinal plants useful as expectorant, astringent, muscular relaxant of uterus and arteries, carminative, antispasmodic, antiepileptic, for impotency, narcotic, antipyretic, diaphoretic, cathartic, hypnotic, analgesic, antineuralgic, antiarthritis, antirheumatic, and antitussive: *Atropa belladonna* L. (ROP 80), *Lavandula coronopifolia* Lam.(ROP 75), *Mentha aquatica* L.(ROP 73), *Mentha graveolens* Ehrb.(ROP 76), *Mentha longifolia* (L.)Hudson (ROP 64), *Myosotis discolor* Pers.(ROP 50), *Salix acmophyla* Boiss (ROP 65), *Salix triandra* L.(ROP 71) and *Withania somnifera* (L.) Dunel (ROP 71).
- (2) Medicinal plants useful as anilithic, for intestinal colic, for gastric disturbances, antidycentric, cholagogue, emmenagogue, antiseptic and renal calculi: *Inula crithmoides* L.(ROP 83), *Salix acmophyla* Boiss (ROP 65), *Salix alba* L.(ROP 56), *Salix babylonica* Boiss (ROP 53), and *Verbena officinalis* L.(ROP 60).
- (3) Medicinal plants useful in skin diseases, antiscabies, anti-inflammatory: *Euphorbia exigua* L.(ROP 80), *Glycyrrhiza glabra* L.(ROP 89), and *Inula viscose*(L.)Aiton(ROP 82).
- (4) Medicinal plants useful as aphrodisiac, diuretic and cardiac tonic: *Glycyrrhiza glabra* L.(ROP 89),

Nasturtium officinale (ROP 53), and *Populus euphratica* Oliver(ROP 53).

- (5) Medicinal plants useful as hypoglycemic and antidiabetic, for haemorrhoides, for internal bleeding, relieves flatulence, vermifuge, and purgative: *Heliotropium supinum* L. (ROP 71), *Inula graveolens* (L.)Desf.(ROP 76), *Inula viscose* (L.) Aiton (ROP 82), *Mentha aquatica* L.(ROP 73), *Mentha graveolens* Ehreb (ROP 75), *Nasturtium officinale* R.Br.(ROP 53), *Populus euphratica* Oliver (ROP 53), *Populus nigra* L.(ROP 81), and *Withania somnifera* (L.)Dunel (ROP 71).

CONCLUSIONS

It is obvious from the above data, that Jordan has exhibited highly diversified medicinal species (87 species belonging to 59 genera and 33 families), which were confirmed by three or more informants. This diversity refers to the fact that it has at least four main phytogeographical elements which includes the lowest point in their altitude under sea level in Dead sea area (-400 m) and the highest point in Sharah series (1440m). This high diversity is, in part, due to the type of people inhabited of this area and interviewed, most of them were beduins and rural inhabitants have long experience in folk medicine as local healers, herbalists, shephards, and well-experienced persons.

This plant wealth requires that researchers pay attention to this natural resource to be protected from the threatening and endangering factors especially rare and endemic species. The ethnobotanical survey of folk medicinal aquatic plants in Jordan is considered as clear evidence for the intimate interconnected integration between the local people and earth natural resources, which support the return to the earth and discovering the cultural and traditional symbolism for this manifestation in form of sustainable development. This study opens the doors widely to the scientific approach to approve the validity of folk medicine are improve the pharmaceutical industries based on natural resources. This challenge needs further investigations to recognize the active constituents found in each species.

It is obvious that the number of medicinal plants verified by calculating FL, RPL, and finally ROP as three main popularity levels in Jordan is relatively high, and this conclusion is contrary to that found by Friedman *et al* (1988) among Bedouins in the Negev desert. Friedman found only eight medicinal species that have ROP values above 50 (12.7%), while in this study 21 medicinal species were found that have ROP values above 50 (24%), and this is because the kind of people in the southern part of Jordan still have higher linkage with folk medicine and natural resources.

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