Ethnobotanical Survey among the Nubian and South Eastern Tribes of Egypt

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ABSTRACT

This survey was conducted on 4 tribes (Ababda, Bisharia, Nubian and Rashayda) live in the south of the Nile and the Eastern Desert of Egypt with the aim to document and compare the traditional herbal medicines and assess the relationships among these tribes. A total of 180 interviews were conducted with the Bedouins and herb healers. Thirty-nine species belonged to 36 genera and 27 families were employed. Fabaceae and Poaceae and Rutaceae were the species-rich families. The used wild species comprised 43.6%, cultivated species (38.5%) and the imported from herbalist shops (17.9%). The leaves were the most used parts (31%), followed by stems and fruits with about 22% each. Distinct species included *Acacia nilotica* is used in the treatment of dental pain with use value 33.3%, *Cymbopogon schoenanthus* subsp. *proximus* in treatment of both cough or headache with use values 35 and 30.6% and a combination of *Acacia nilotica* with *Lawsonia inermis* in the treatment of sore throat with use value 22.2%. The highest similarity was recorded between Nubian and Rashayda tribes (55.3%) that the Rashayda' nomads utilized the Nubian markets for the winter, and Nubians were supplied with livestock or handicrafts by the nomads. The proximity between Ababda and Bisharia is 46.8% that both tribes are shared land, resources, and even reached a historical homogenous state not only due to land proximity but also through marriage and social relations. Diarrhea and headache were the most popular diseases with 7 different recipes, cough and dental pains with 6 recipes.

Keywords: Eastern Desert; Egypt; Ethnobotany; Herbal medicine; Nomads.

INTRODUCTION

The Eastern desert covers nearly quarter area of the Egyptian land (225,000 km^2). It occupies the area between the Red Sea and the Nile, with about 200 to 500 km width and 1080 km length. The Eastern desert is mountainous arid Sahara, with characterized coastal granite mountain chain run parallel to the Red Sea coast; these mountain chain cut by two groups of transverse wadis, eastern wadis that run towards Red Sea and the western that run towards the Nile valley, **Bubenzer et al. (2020).**

The Eastern desert climate is distinguished from other parts of Egypt as arid desert with winter rain reached 14 mm annually (Climate- data.org). The amount of rain varied from year to another as well along Red Sea coast get lesser to the south and return to be higher in southern part at Ras Banas **(Gamal, 2000).** The average annual temperature in the city of Shalatin is 26.1 °C. These harsh arid climatic conditions resulted frequently cattle death; which contributed in the movement of Bedouin down from the mountains to the modern cities (**Ghazaly 2006).**

The original dwellers of this region related to Beja tribes in Egypt as two general Bedouins tribes; Ababda and Bisharia **(Fig. 1).** Ababda are divided into 5 subtribes Alshemab, Alferganab, alfaragab, Alhasanat and Algameiat. Bisharia are divided into 42 sub-tribes, the most famous are Omirab, Shonirat, Belgab, Oliab, Alhamedorab and Qurilab and work by camel, goats and sheep herding **(Gamal, 2000; Mustafa 2005; Bos-Seldenthuis 2007).**

Ababda and Bisharia dominated the south east part of the Red Sea, however Ababda dominated the same region in addition to Marsa Allam region and few members are located near Esna and Qena on the Nile banks (**Gamal, 2000**). In addition, Rashayda's nomads live near the border between Egypt and Sudan near the Red Sea coast, they have no lineage with the two

previous tribes as they came from the Arabian Peninsula mainly Saudi Arabia after Collapse of Al Rashid governance, they work with trading, camel herding and smuggling, has 11% among Ababda and Bisharia Bedouins in Shalatin & Halaib region in 1993, and they present in two regions near Ras Headriba near the south border and south wadi Sefira. They are closed community in their marriage, do not make ancestry relations with their neighbors. Generally, these tribal people have a weak social status and live an individual existence restricted mainly to their own society (**Mustafa, 2005**).

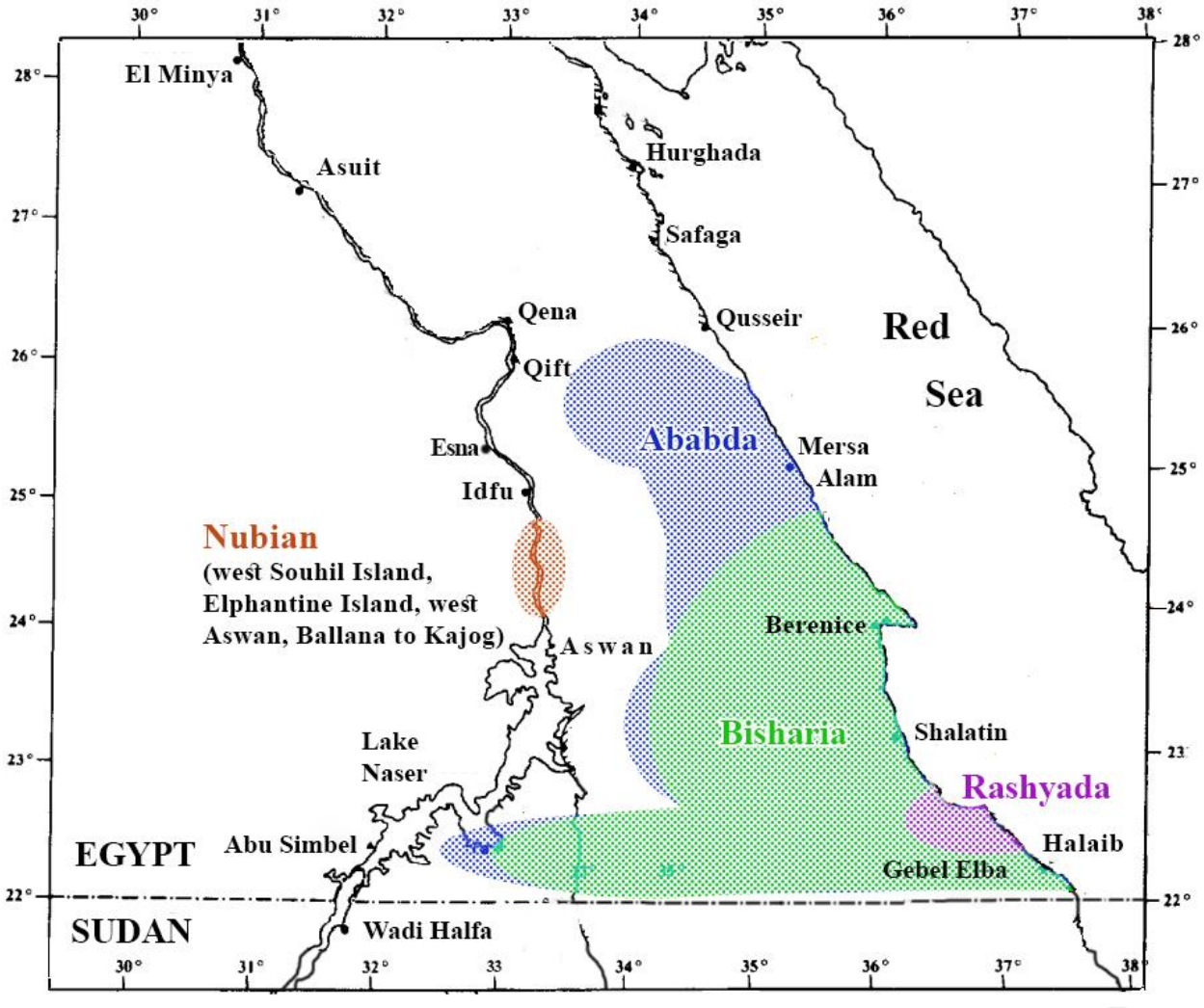

Fig. (1). The location of different studied tribes after the construction of High Dam at Aswan

Nubia geographic region stretches along the Nile for 310 kilometers from Aswan Dam south to the Sudanese Frontiers, south of that lies the Sudanese Nubia. The Nubian people mainly depend on agriculture on the Nile banks. The Nubian culture has more social attributes, and there is substantial collaboration, with members of various families and communities, who own waterwheels, palm trees, farms and livestock. **(Abdel Meguid, 2005).** Nubian people live mainly in the south of the upper Nile in the narrow alluvial wadi which is intensively cultivated, however Ababda and Bisharia live in the vast eastern desert which is extensively arid (**Fernea, 1994; Belal et al. 1998; Badri & Hamed 2000**).

The use of plant resources for medicinal treatment has been conducted since ancient times and may even be considered the genesis of contemporary medicine, **Salmerón-Manzano et al. (2020).** Plant chemicals were and still a major source of medicinal compounds. The tendency in worldwide research has been seen to concentrate rather than to cultivate or domesticate plant species with this shown potential on the hunt for new or active medications or chemicals. It is a fact that all civilizations have created this type of medication, **Gurib-Fakim (2006)** based on the cultivated, wild or native plant species in their own habitat, **Houghton (1995).** There are even authors who claim that this transmitted knowledge is the origin of medicine and pharmacy. Even today, hundreds of higher plants are cultivated worldwide to obtain useful substances in medicine and pharmacy, **Kinghorn & Seo (2020).** The therapeutic properties of plants have been created medicinal drugs made from certain plants with these benefits, **Jones et al. (2006).** The utilization of medicinal plants has been used by about 80% of the world population primarily in the developing countries (**Dubey et al., 2004**). Low-income individuals like farmers, people in tiny remote villages and indigenous populations that do not have access to modern medicine in

developing nations depend on traditional remedies and employ a large number of local plants for the treatment of common ailments, **Elkhouly & Ahmed (2018).** Traditional primary health knowledge has been extensively recognized around the globe in the past several decades. It is believed that 60 % of the world's population is dependent on traditional medicine, mostly plant healthcare, and 80 % of the population in poorer nations. (**Shrestha & Dhillion, 2003**). **Baqar (2001)** elaborated that it is so essential to document such information because it is passed by verbally from one generation to one; thus, is vulnerable to wiped out.

Many studies have been carried out to deal with the ethnobotanical utilization of plant species **(Aly, 2019; Aparicio et al., 2021; Khajoei Nasab & Khosravi, 2014; Khajuria et al., 2021; Maleki & Akhani, 2018; Manas Ranjan Saha, Ritu Rai, Pallab Kar & Sarker, 2015; Mandaville, 2011; Nigussie et al., 2021; Rana et al., 2019; Ribeiro et al., 2010; Salmerón-Manzano et al., 2020)**. **Goodman and Hobbs (1988)** made vital findings as a naturalist and described plants in detail by a particular tribe in the area of study.

The flora of the studied area

Most of the flora of the Eastern Desert belong to the Phytogeographic Region of the Sahara-Sindians (sensu Eig, 1931/32). The main exception is Gebel Elba in the extreme south in the nation of Bisharia, where several Afrotropical plant species reach their northern limits **(Kassas and Zahran, 1971).** The floristic diversity in the region of Bisharia is almost twice as high as in the north and comprises far more species of trees.

Documentations of the ethnobotanical relevant data (plant ingredient, utilization, descriptions, preparation, tribal attitude, etc.) are lacking not only at the tribal level but extends to

the whole Egypt. In addition to the threats facing the ethnobotanical data for some tribes due to urbanization expansion, modernization and youth migration to the modern cities in and out Egypt. And additional threats for the Nubian tribe appeared after the tribal dislocation from their home-villages after the construction of Aswan High Dam.

This paper aimed to document the ethnobotanical related data and compare the plant utilization in the ranges of the studied four Bedouin tribes (Ababda, Bisharia, Nubian and Rashayda) inhabiting the southern part of the Nile and the Egyptian Eastern Desert. Also, it tries to assess the relationships among these tribes on the basis of their uses to the ethnomedicinal plants.

MATERIALS AND METHODS

Several strategies have been employed for collecting ethnobotanical data (**Briggs 1986, Crane and Angrosino 1992, Johns** and **Kimanani 1990**) and interview techniques according to **Briggs (1986), Crane and Angrosino (1992)**. Interviews were mostly done in vernacular Arabic language (sometimes we need translation from Beji into Arabic). Herbs market surveys were carried out with herbalists to identify some herbs described in the interviews as those described by **Bye and Linares (1983).** Moreover, we take in consideration the methodology of **Rana et al. (2019)** who developed trade-related plant information with some new techniques in Western Himalayan ethnobotanical knowledge.

We worked with Bedouins and travelled with and collected the information on the use of wild plants and built floral collections. These data were collected mostly through interviews of 180 informants of the Bedouins or herb healers (45 informants for each tribe) within different age group of 18 – 85 years. This data has helped us to assess the trend towards the transfer of

ethnobotanical knowledge among age groups. This study also included interviews with traditional skilled healers using plants. Details concerning site of plant collection, local names, utilized plant components, ethnobotanical use and manner of use of plants collected were documented. Voucher plant specimens were deposited in Cairo University Herbarium (CAI). The systematic order and nomenclature follow **Taeckholm (1974)** and **Boulos (2009)**. Validation of plant names, family, and plant authority was carried out using the database (http://www.theplantlist.org)

The identified plants were listed with its scientific name, family, mode of using, and categorizing (wild or cultivated), sometimes the plants were imported.

Use value

The relative importance of the species was calculated using the use value which is a quantitative tool **(Phillips et al., 1994)** with slight modification that the resultant is multiplied by 100 to give a percentage: $UV = \Sigma U/n*100$

where (U) is the number of plants cited by each informant for a given species and (n) is the total number of informants (45) for each tribe. Also, the total use value for all informants (180) was calculated.

RESULTS

1- Taxonomic identity of the traced species:

Thirty-nine species are commonly used by at least two of the investigated 4 tribes (Ababda, Bisharia, Rashayda and Nubian) as ethnomedicinal plants for the treatment of their diseases (Table 1). From the floristic point of view, the traced and identified species belonged to 36 genera and

27 Angiospermae families. Among these genera, three were (*Acacia*, *Citrus* and *Cymbopogon*) were represented by 2 species each, namely: *Acacia nilotica* (L.) Willd. ex Delile and *Acacia seyal* Delile; *Citrus aurantiifolia* (Christm.) Swingle and *Citrus sinensis* (L.) Osbeck, *Cymbopogon citratus* (DC.) Stapf and *Cymbopogon schoenanthus* subsp. *proximus* (Hochst. ex A. Rich.) Maire & Weiller. At the family level, seven families were represented by more than one species. Fabaceae and Poaceae were represented by 4 species each; while, Rutaceae was represented by 3 species. In addition to 4 families, Apocynaceae, Arecaceae, Lythraceae and Myrtaceae that were represented by 2 species. The remaining families were represented by one species each (Table 1).

The collected species from the vicinity of the desert, canyons, shaded mountain slopes and wadi bottoms comprise the main bulk and known as wild species (17) about 43.6% of the total number of species, given a superscript letter (^{w}) in Table (1), cultivated species (^{c}) count for 15 species (38.5%) and the imported (^{i}) (bought) from herbalist shops (Attarin) count for 7 species (17.9%).

The collected field data from the studied tribes revealed that these species were used in the treatment of 72 diseases. One can classify the different ethnomedicinal treatments (recipes) or utilization of these species into 3 main categories. The first category contains 4 recipes that are used by the -all- the 4 tribes, of course with different use values, *Acacia nilotica* is used in the treatment of dental pain with use value 33.3%, *Cymbopogon schoenanthus* subsp. *proximus* in treatment of either cough or headache with use values 35 and 30.6%; respectively, and a combination of *Acacia nilotica* with *Lawsonia inermis* in the treatment of sore throat with use value 22.2%. The second category contained twenty-one recipes that are used by 3 of the 4 tribes and the remaining 37 are used by 2 of the 4 tribes only.

According to the total number of recipes used in each tribe, it was found that Nubian and Rashayda tribes are the highest and more or less equal 49 and 48 recipes respectively, Bisharia shows the least 35 and Ababda were 41 recipes (Table 1).

Table (1) List of the recorded 39 ethnomedicinal plant species used by the 4 tribes (Ababda = Ab, Bisharia = Bi, Nubian = Nu, Rashayda = Ra) living in south of the Nile and Eastern Desert of Egypt showing taxon names (species and family), (+) combination between 2 plants, parts of the plants used (PU: B = Bulb, G = Gum from stem, Fr = Fruit, FL= flower, L = Leaves, S = Seed, St = Stem), mode of usage, different type of diseases (25), Resources of plant species: ^{c} = Cultivated, ^{i} = imported, ^{w} = wild, T = Total number of informants and the use value of each treatment (recipe) UV= T/180%. Figures under the tribes represent the use value in each tribe, Number of tribes = Nm.

Disease	Species Name	PU	Mode of Usage	Family	Ab	Bi	Nu	Ra	T	UV	Nm
Abscess	[c]*Allium cepa* L.+ [c]*Lepidium sativum* L.	B + S	paste of onion leaves with crushed seeds of the garden cress	Amaryllidaceae + Brassicaceae	0	0	6.7	35.6	19	10.6	2
	[w]*Solenostemma argel* (Delile) Hayne	St, L	paste with warm water + drink	Apocynaceae	28.9	33.3	0	0	28	15.6	2
Activation	[c]*Sesamum indicum* L.	S	paste of crushed seeds as ointment	Pedaliaceae	20	4.4	0	93.3	53	29.4	3
	[w]*Solenostemma argel*	St, L	the decoction of leaves and stem as drink	Apocynaceae	0	33.3	0	22.2	25	13.9	2
	[i]*Nigella sativa* L.	S	seeds used in making tea or the seed oil is used as droplet	Ranunculaceae	13.3	0	6.7	0	9	5	2
	[i]*Zingiber officinale* Roscoe	R	drink with white honey	Zingiberaceae	0	4.4	6.7	0	5	2.8	2
Anemia	[c]*Phoenix dactylifera* L.	Fr	ripen fruits are eaten or soaked in milk	Arecaceae	0	95.6	0	17.8	51	28.3	2
Broken organs	[c]*Triticum sp.*	Fr	paste	Poaceae	15.6	0	13.3	62.2	41	22.8	3
	[c]*Triticum sp.*+[n]*Acacia nilotica* (L.) Willd. ex Delile	Fr	paste	Poaceae + Fabaceae	0	0	11.1	22.2	15	8.3	2
Chest diseases	[c]*Olea europaea* L.	S	rubbing with the oil	Oleaceae	0	0	22.2	6.7	13	7.2	2
Cough	[w]*Cymbopogon schoenanthus* subsp. *proximus* (Hochst. ex A.Rich.) Maire & Weiller	St, L	drink	Poaceae	24.4	33.3	20	62.2	63	35	**4**
	[w]*Solenostemma argel*	St, L	drink	Apocynaceae	73.3	0	26.7	55.6	70	38.9	3
	[i]*Boswellia sacra* Flueck.	G	gum soaked in hot water and drink	Burseraceae	31.1	17.8	33.3	0	37	20.6	3
	[c]*Psidium guajava* L.	L	leaves are soaked in hot water and drink	Myrtaceae	22.2	0	93.3	0	52	28.9	2
	[w]*Capparis spinosa* L.	Fr	decoction of ripen fruits or the fruit bulb is cooked as pudding	Capparaceae	51.1	55.6	0	0	48	26.7	2
	[c]*Hibiscus sabdariffa* L.	Fl	soaked or drink	Malvaceae	20	0	0	15.6	16	8.9	2

Disease	Species Name	PU	Mode of Usage	Family	Ab	Bi	Nu	Ra	T	UV	Nm
Diabetes	[w]*Balanites aegyptiaca* (L.) Delile	Fr	soaked or drink	Zygophyllaceae	66.7	0	6.7	17.8	41	22.8	3
	[c]*Lupinus albus* L.	S	seeds are crushed or eaten after being soaked	Fabaceae	0	0	40	46.7	39	21.7	2
	[w]*Cymbopogon schoenanthus* subsp. *proximus*	St, L	soaked in hot water and taken on an empty stomach	Poaceae	40	0	0	15.6	25	13.9	2
Diarrhea	[w]*Acacia nilotica*	Fr	fruits are soaked then drink	Fabaceae	22.2	26.7	6.7	0	25	13.9	3
	[i]*Coffea arabica* L.+ [c]*Citrus aurantiifolia* (Christm.) Swingle	S+Fr	Squeeze of one lemon on a small spoonful of grinded coffee	Rubiaceae + Rutaceae	0	53.3	0	15.6	31	17.2	2
	[w]*Cymbopogon schoenanthus* subsp. *proximus*	St, L	drink on an empty stomach	Poaceae	40	22.2	0	0	28	15.6	2
	[c]*Trigonella foenum-graecum* L.	S	drink or eaten	Fabaceae	0	0	13.3	20	15	8.3	2
	[c]*Oryza sativa* L.	Fr	cooked and eaten or drink the rice washing water	Poaceae	0	0	13.3	15.6	13	7.2	2
	[w]*Convolvulus hystrix* Vahl	St, L	biol and drink	Convolvulaceae	6.7	15.6	0	0	10	5.6	2
	[c]*Punica granatum* L.	Fr	use boiled the peel as a drink	Lythraceae	0	8.9	13.3	0	10	5.6	2
Eye	[w]*Aloe vera* (L.) Burm.f.	L	latex is used as eye droplets or mix the latex with water, leave to dry then apply to the eye or around	Cuctaceae	6.7	2.2	0	22.2	14	7.8	3
	[w]*Lawsonia inermis* L.	L	fresh leaves on the eye	Lythraceae	40	0	6.7	0	21	11.7	2
Favus	[w]*Ricinus communis* L.	S	rubbing with oil	Euphorbiaceae	0	0	53.3	15.6	31	17.2	2
	[w]*Lawsonia inermis* L.	L	paste	Lythraceae	0	42.2	13.3	0	25	13.9	2
Flu	[w]*Acacia seyal* Delile	St	Smelling of the smoke of burn wood	Fabaceae	2.2	4.4	0	11.1	8	4.4	3
	[i]*Cymbopogon citratus* (DC.) Stapf	St +L	drink	Poaceae	0	0	17.8	2.2	9	5	2
Hair care	[c]*Olea europaea* L.	S	rubbing with oil	Oleaceae	0	4.4	26.7	46.7	35	19.4	3
	[w]*Lawsonia inermis* L.	L	paste of its powder	Lythraceae	0	0	40	53.3	42	23.3	2

Disease	Species Name	PU	Mode of Usage	Family	Ab	Bi	Nu	Ra	T	UV	Nm
	[w]*Ricinus communis* L.	S	rubbing with oil	Euphorbiaceae	44.4	0	20	0	29	16.1	2
Headache	[w]*Cymbopogon schoenanthus* subsp. *proximus*	L, St	vapor inhale or drink	Poaceae	51.1	11.1	13.3	46.7	55	30.6	**4**
	[w]*Solenostemma argel*	L	paste with hot water or drink	Apocynaceae	26.7	6.7	0	62.2	43	23.9	3
	[w]*Lawsonia inermis* L.	L	rubbing with oil	Lythraceae	24.4	0	46.7	62.2	60	33.3	3
	[w]*Acacia nilotica* + [w]*Solenostemma argel*	Fr + St, L	paste with hot warm water	Fabaceae + Apocynaceae	28.9	88.9	6.7	0	56	31.1	3
	[i]*Camellia sinensis* (L.) Kuntze	L	paste with hot warm hot water	Theaceae	0	0	66.7	46.7	51	28.3	2
	[c]*Citrus aurantifolia* (Christm.) Swingle	Fr	drink or apply the fruit on the head	Rutaceae	0	0	26.7	15.6	19	10.6	2
	[i]*Coffea arabica* L.	S	drink	Rubiaceae	0	0	6.7	20	12	6.7	2
Hypertension	[c]*Hibiscus sabdariffa* L.	Fl	drink	Malvaceae	0	6.7	80.0	77.8	74	41.1	3
	[w]*Hyphaene thebaica* (L.) Mart.	Fr	drink	Arecaceae	6.7	4.4	84.4	0	43	23.9	3
Kidney	[w]*Haplophyllum tuberculatum* (Forssk.) Juss.	St, L	drink for kidney stones and kidney problems	Rutaceae	22.2	28.9	0	0	23	12.8	2
	[w]*Solenostemma argel*	St, L	drink	Apocynaceae	11.1	0	0	22.2	15	8.3	2
Magic	[w]*Ziziphus spina-christi* (L.) Desf.	L	take a shower with its boiled leaves	Rhamnaceae	15.6	11.1	0	42.2	31	17.2	3
	[i]*Nigella sativa* L.	S	incense	Ranunculaceae	0	0	44.4	22.2	30	16.7	2
Mumps	[w]*Calotropis procera* (Aiton) Dryand.	St, L	latex as oinment	Apocynaceae	11.1	0	6.7	0	8	4.4	2
Pregnant avoidant	[w]*Artemisia herba-alba* Asso	St	drink	Asteraceae	24.4	2.2	0	44.4	32	17.8	3
	[w]*Cymbopogon schoenanthus* subsp. *proximus*	St, L	drink	Poaceae	4.4	0	0	2.2	3	1.7	2
Rheumatoid arthritis	[w]*Citrullus colocynthis* (L.) Schrad.	Fr	warm in hot sand and rub with the cutting fruits on knee	Cucurbitaceae	44.4	0	13.3	31.1	40	22.2	3
	[c]*Sesamum indicum* L.	S	rub with the oil	Pedaliaceae	0	0	6.7	77.8	38	21.1	2

Disease	Species Name	PU	Mode of Usage	Family	Ab	Bi	Nu	Ra	T	UV	Nm
	[c]*Citrus sinensis* (L.) Osbeck	Fr	rub with the fruit	Rutaceae	0	0	15.6	6.7	10	5.6	2
Skin care	[w]*Lawsonia inermis* L.	L	paste with warm water	Lythraceae	0	11.1	6.7	0	8	4.4	2
Sore throat	[w]*Lawsonia inermis* L. + [w]*Acacia nilotica*	L+ Fr	paste on the neck	Lythraceae + Fabaceae	11.1	6.7	26.7	44.4	40	22.2	**4**
	[w]*Solenostemma argel*	L, St	gargling with the soaked leaves and stem	Apocynaceae	53.3	100	20	0	78	43.3	3
	[i]*Zingiber officinale* Roscoe	R	root powder in hot water as a drink	Zingiberaceae	0	0	73.3	11.1	38	21.1	2
	[c]*Carum carvi* L.	Fr	fruit soaked in hot water and drink	Apiaceae	0	0	17.8	4.4	10	5.6	2
Stomachache	[w]*Solenostemma argel*	L, St	drink or dried, crushed then swallowed	Apocynaceae	22.2	73.3	0	0	43	23.9	2
Dental pains	[w]*Acacia nilotica*	Fr	rinsing the mouth with soaked fruits or sucking the fruits or brushing the teeth	Fabaceae	13.3	77.8	26.7	15.6	60	33.3	**4**
	[i]*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Fl	rinsing the mouth with soaked flower buds or crushing the dried ones and applying to the pain	Myrtaceae	8.9	0	95.6	93.3	89	49.4	3
	[w]*Salvadora persica* L.	St	soaking in cold water, rinsing or brushing the teeth	Salvadoraceae	37.8	44.4	0	15.6	44	24.4	3
	[w]*Haplophyllum tuberculatum* (Forssk.) A. Juss	L, St	crushing and apply to the teeth or smoking like cigarettes	Rutaceae	33.3	35.6	0	0	31	17.2	2
	[c]*Allium cepa* L.	B	Rashayda: vapor on hot knife while Nubian: paste on the pain area	Amaryllidaceae	0	0	26.7	20	21	11.7	2
	[i]*Zingiber officinale*	R	boil with hot water then drink or gargling	Zingiberaceae	0	0	13.3	15.6	13	7.2	2

Disease	Species Name	PU	Mode of Usage	Family	Ab	Bi	Nu	Ra	T	UV	Nm
Vitiligo & Gecko	[w]*Citrullus colocynthis* (L.) Schrad.	Fr	3-4 kg of crushed fruits boiled in a metallic container then use the tar released droplets through pores in the container	Cucurbitaceae	13.3	35.6	0	0	22	12.2	2
	[i]*Nigella sativa* L.	S	oil for rubbing	Ranunculaceae	0	0	33.3	8.9	19	10.6	2
	[w]*Acacia nilotica*	Fr	crushed fruits used as paste with salt	Fabaceae	0	2.2	0	15.6	8	4.4	2
Wounds' healing	[w]*Acacia nilotica*	Fr	applying the crushed fruits	Fabaceae	26.7	17.8	6.7	0	23	12.8	3
	[i]*Coffea arabica* L.	S	applying the crushed fruits	Rubiaceae	48.9	0	66.7	0	52	28.9	2
	[i]*Camellia sinensis*	L	dry fine powder on wound or paste with hot water	Theaceae	0	0	26.7	33.3	27	15	2
each tribe	Total number of treatments (recipes) for				41	35	49	48			

2- Tribal affinity in relation to their usage of the plant-based ethnomedicine:

In a trial to understand the similarity in the utilization of plant species as ethnomedicinal treatments among the 4 tribes. Table (2) elaborates that the highest similarity was recorded between Nubian and Rashayda tribes (55.3%), again this similarity is relatively significant between Ababda and Bisharia (46.8%). On the other hand, the least similarity was recorded with Bisharia in relation to Nubian, and Rashayda that recorded 13.4% and 15.6% respectively.

Table (2). The similarity in disease treatments between the 4 tribes

	Ababda	Bisharia	Nubian	Rashayda
Ababda	100			
Bisharia	**46.8**	100		
Nubian	31.7	**13.4**	100	
Rashayda	38.7	**15.6**	**55.3**	100

The people of the different tribes may show affinities to use more than one recipe or treatment for a definite disease, this can be shown in figure (2). Diarrhea and headache show the highest where they have 7 different recipes, cough and dental pains followed with 6 different recipes. On the contrary, 5 diseases namely, Anemia, chest disease, Mumps, skin care and stomachache have only one recipe each.

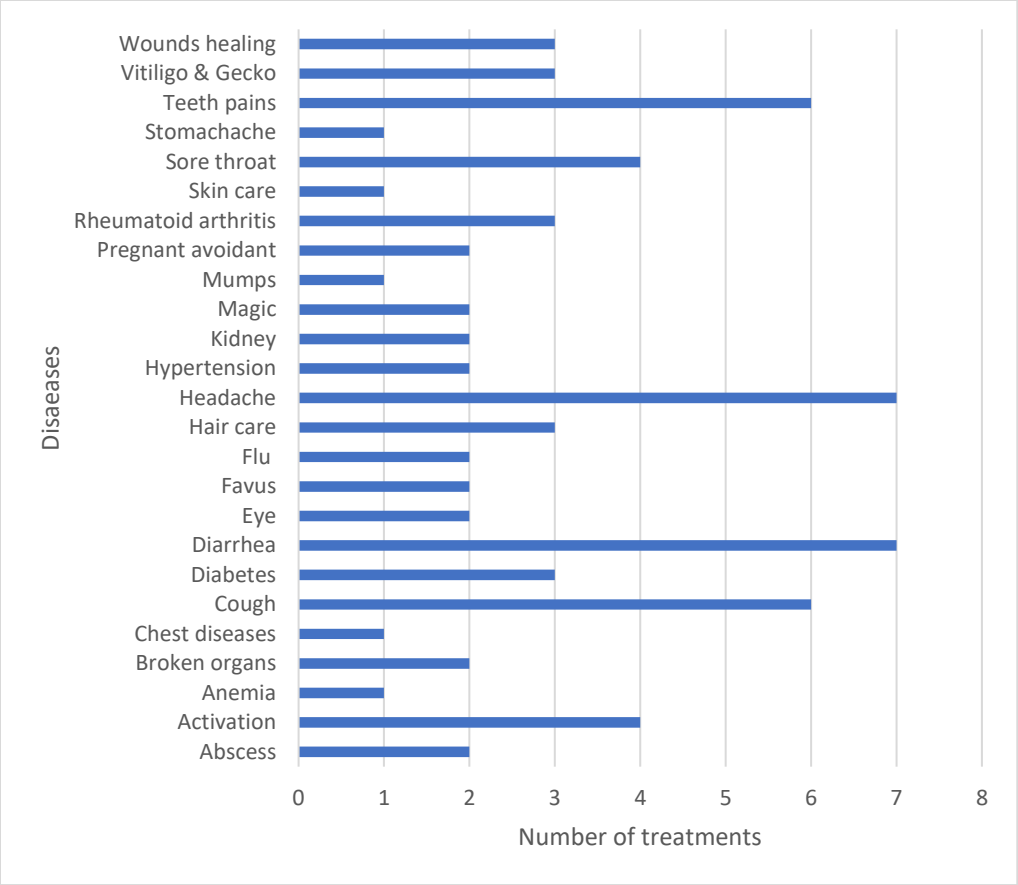

Figure (2). Shows the number of treatments for each of the 25 diseases used by the 4 tribes

3- The used plant parts in ethnomedicinal stuff:

The investigated ethnomedicinal stuff showed that the leaves were the highest (31%), followed by stems and fruits with about 22% each. Gums, bulbs, roots and flowers were the least ingradients ranging between less than 1% to 3%, Figure (3).

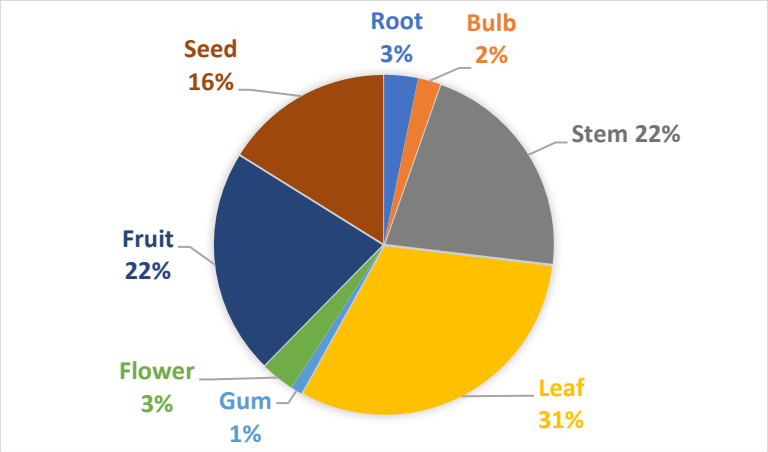

Figure (3). The used plant parts in ethnomedicinal stuff

4- Distinct species

These species are frequently or commonly used by the different tribes for 3 or more different ethnomedical treatments. This list includes:

The stems and leaves of *Solenostemma argel*, were used in the treatment of 7 diseases, abscess, activation, cough, headache, kidney, sore throat and stomachache. The informants indicated that 100% Bisharia use this species in the treatment of sore throat while 73.3% of Ababda used it in the treatment of stomachache, Rashayda recorded 62.2% in the treatment of headache and Nubian recorded 26.7% in the treatments of cough.

The legimenous fruits of *Acacia nilotica*, played important role in the treatments of 6 diseases, broken organs, diarrhea, headache, sore throat, dental pains and vitiligo & gecko. About 89% of Bisharia used the crushed fruits in combination with *Solenostemma argel* in the treatment of headache. Other tribes recorded relatively lower values, Rashayda (sore throat, 44.4%), Ababda (headache, 28.9%) and Nubian (sore throat, 26.7%).

The fresh leaves or the paste of the leaves of *Lawsonia inermis* , were used in the treatment of 6 diseases (eye, favus, hair care, headache, skin care and sore throat). The records indicated that 62.2% of Rashayda and 46.7% of Nubian used the soaked leaves as a paste in the treatment of headache. Bisharia recorded 42.2% in the treatment of favus while Ababda recorded 40% in the treatment of eye problems as external use.

The drink prepared from the soaked stems and leaves of *Cymbopogon schoenanthus* subsp. *proximus* was very important in the treatment of 5 diseases (cough, diabetes, diarrhea, headache and pregnant avoidant). Rashayda recorded the highest value (62.2%) in the treatment of cough. Ababda recorded 51.1% in the treatment of headache, whereas Bisharia and Nubian recorded 33.3% and 20% respectively in cough treatment.

The seeds used in making tea-like drink or the seed-oil of *Nigella sativa* were used in the treatment of activation (tonic), magic, vitiligo & gecko. The informants indicated that 44.4% of Nubian and 22.2% of Rashayda used this species in the treatment of magic. Only 13.3% of Ababda used it in the activation, while, Bisharia did not make use of this plant.

The crushing or drink made of the seeds of *Coffea arabica*, played important role in the treatment of 3 diseases (diarrhea, headache and wounds healing). About 67% of Nubian, 53.3% of Bisharai and 48.9% of Ababda used the paste made of this species in the wound healing. The highest value of using this species as a drink in the treatment of headache by Rashayda was 20%.

The drink made of *Zingiber officinale* was used in the treatment of 3 diseases (activation, sore throat and dental pains). Nubian recorded 73.3% in the treatment of sore throat, Rashayda recorded 15.6% in the treatment of dental pain, Bisharia recorded 4.4% in the treatment of activation while Ababda has no record for this species.

5- Distinctive tribal species

Some species showed distinctive uses in each tribe. Five species recorded more than 93% in the treatment of definite diseases within one or more tribes. *Solenostemma argel* was used by 100% of Bisharia in the treatment of sore throat, *Syzygium aromaticum* was used by 95.6% and 93.3% of Nubian and Rashayda ; respectively in the treatment of dental pain, *Phoenix dactylifera* was used by 95.5% of Bisharia in the treatment of anemia, *Psidium guajava* and *Sesamum indicum* were used by 93.3% of Nubian and Rashayda in the treatment of cough and activation.

DISCUSSION

The Egyptian Eastern Desert has a depauperate vegetation; with large barren areas (**Kassas and Zahran, 1962, 1965, 1971**). This may indicate the low number of ethnomedicinal plants (18 species) used from the flora of the area in the treatment of diseases by the 4 tribes.

Serag (2008) indicated that the Sedentarization life was became a common behavior of the Ababda, Rashayda and Bisharia tribes. Some are well known for the herding and trading of camels between Egypt and Sudan while others are pure nomads are still occupying remote areas. This may give us the reason for the very few numbers of treatment (4) that are used by the -all- 4 tribes. On the other hand, Ababda and Bisharia tribes have in-between social bonds, which extend beyond the borders between Egypt and Sudan. Both tribes are shared land, resources, and even opportunities offered recently by the government. They also have reached a historical homogenous state not only due to land proximity but also through marriage and social relations **(Briggs et al. 1993, Ali et al. 2000, Moustafa, 1998).** This gives us the reason that the proximity of the

utilization of ethnomedicinal treatments show high similarity in-between these 2 tribes that recorded 46.8%.

Unexpectedly, the similarity between Nubian and Rashayda showed the highest proximity (55.6%) among all tribes. This could be explained on the basis that the Aswan High Dam and the resultant Lake Naser have varied impacts upon the Eastern Desert people. For some of the nomads, the impact has been more positive than others. Prior to the inundation that created the lake, the nomads' subsistence patterns were fairly stable and were based upon the maintenance of a "seasonal and oscillating migratory pattern". This pattern usually consisted of movement between the Nubians shoreline and Wadi of Hadien (eastern desert). The shorelines were used for grazing in summer months, after which the nomads returned to their various wells of Abrak, Shalatin for the winter months of October through May, taking with them their supply of herbs. The association the nomads had with the Nubians was generally pleasant and mutually beneficial, the Rashayda' nomads utilized the Nubian markets for the winter, and Nubians were supplied with livestock or handicrafts by the nomads (**Fahim, 2015).**

The total number of ethnomedicinal treatments for the Bisharia and Ababda tribes was lowest, this reflects the changes in attitude of these related tribes over time, where some families moved to villages outside the mountains, for better life style **(Gamal, 2000; Mustafa, 2005; Bos-Seldenthuis 2007).**

The study of main therapeutic indications for medicinal plants has been shown by **Bellakhdar et al. (1991)** presented a clearly defined picture of health concerns. In our case, the most frequent diseases that people of these 4 tribes are suffering are diarrhea and headache with 7 recipes followed by cough and dental pains 6 different recipes. Our field observations, reflecting

that the harsh climatic aspects and the drinking water (direct underground) may be responsible for diseases like diarrhea and headache.

The results indicated the dominance of using the leaves, stems and fruits (31, 22 and 22%; respectively) over other plant organs in the treatment of diseases. These results are similar to other investigations (**Giday et al 2009, Ugulu et al 2009, Abbasi et al 2013, Bhat et al 2015, Ullah et al 2013, Sadeghi & Mohamed 2014, Araya et al 2015, Guler et al 2015).** Easy availability of leaves with their higher metabolite contents can be the reason for their preference (**Ghorbani 2005; Weckerle et al 2006).**

Three out of the 7 distinct species are imported and the people of the 4 tribes bought them from the herb market for their known benefits. The ethnomedicinal utilization of them are recorded in many previous works. *Coffea arabica* (**AbouZid & Mohamed, 2011)**, *Nigella sativa* **(Tiwari et al., 2004; AbouZid & Mohamed, 2011; Mandaville, 2011; Abouri et al., 2012; Islam et al., 2020)** and *Zingiber officinale* **(Davison & Frank, 1935; Tiwari et al., 2004; AbouZid & Mohamed, 2011; Abouri et al., 2012; Islam et al., 2020; Nigussie et al., 2021; Aparicio et al., 2021)**. In addition to the cultivated *Lawsonia inermis* **(Mandaville, 2011; Islam et al., 2020; Nigussie et al., 2021)**

The other three species are wild include *Acacia nilotica* that is scattered in an open vegetation in the main channel of wadis as indicated by **Boulos (2008).** Its utilization as ethnomedicinal plant is cited by many authors (**Bandeira et al., 2001; Tiwari et al., 2004; Mandaville, 2011; Andersen et al., 2014; Islam et al., 2020).** *Solenostemma argel* that recorded the highest usage and is used in the treatment of 7 different diseases among the 4 tribes is cited by many authors for its benefits in the treatment of gastro-intestinal cramps, purgative properties or kidney diseases **(Osborn, 1968*;* AbouZid & Mohamed, 2011; Goodman & Hobbs, 1988).**

Cymbopogon schoenanthus subsp. *proximus* recorded to be used for rheumatism remedies or for lung diseases (**Mandaville, 2011)**.

Another 4 species that are used by one or more tribes with use values more than 90% include 3 cultivated plants. *Phoenix dactylifera* was recorded in the treatment of anemia in Bisharia with use value 95.6%, is documented by many authors for its benefit in the treatment of tiredness, childhood enuresis and arrhythmia and colds (**Abouri et al., 2012**). *Sesamum indicum* was used in the activation of 93.3% of Rashayda, this plant was recorded by **Abouri et al. (2012)** for spasmolytic and aromatic uses . *Psidium guajava* is used by Bisharia in the treatment of cough. This is similar to what documented by other authors **AbouZid & Mohamed (2011)** and **Aparicio et al. (2021),** while **Islam et al. (2020)** documented its usage for the treatment of diarrhea, dysentery and cholera. *Syzygium aromaticum* was used by Nubian and Rashayda with use values 95.6% and 93.3% respectively in the treatment of dental pain while **Islam et al. (2020)** recorded it in the treatment of stomach upset, chills and impotence and **Davison & Frank** (1935) as antiseptic, anti-inflammatory and dental pain.

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