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Ethnobotanical Survey Among the Nubian and Southeastern Tribes of Egypt

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ABSTRACT

This survey was undertaken on four tribes (Ababda, Bisharia, Nubian, and Rashayda) living in Egypt's southern Nile Valley and Eastern Desert to chronicle and evaluate traditional herbal treatments, as well as to examine the links between these tribes based on ethnobotanical use. A total of 180 interviews with Bedouins and herbal healers were undertaken, with 45 informants for each tribe, ranging in age from 18 to 85 years. There were 39 species in total, belonging to 36 genera and 27 families. Fabaceae and Poaceae and Rutaceae were the species-rich families. The used wild species comprised 43.6%, cultivated species (38.5%) and the remaining 17.9% were bought from the herbalist shops. The leaves were the most commonly used part (31%), followed by stems and fruits (22% each). Distinct species included *Acacia nilotica*, that is used in the treatment of dental discomfort and has a use-value of 33.3 %, and *Cymbopogon schoenanthus* subsp. *proximus*, that is used in the treatment of cough and headache and has a use-value of 35% and 30.6%, respectively. A combination of *Acacia nilotica* and *Lawsonia inermis*, has a use-value of 22.2 % for the treatment of sore throats. Based on ethnobotanical treatments, the most resemblance was found between the 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, followed by 46.8% between Ababda and Bisharia that both tribes are shared land, resources, and even reached a historical homogeneous state not only due to land proximity but also through marriage and social relations. The most prevalent ailments were diarrhoea and headache, each had seven different recipes, while cough and dental aches had six. This type of research should be encouraged in order to better understand how the common flora might be used in human healthcare.

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

INTRODUCTION

The use of plant resources for the treatment of diseases has been existed since ancient times and may even be considered the genesis of contemporary medicine, (Salmerón-Manzano *et al.*, 2020). Plant chemicals were and are still a major source of medicinal compounds. The tendency in worldwide research has been to concentrate on the hunt for potential or active medications or chemicals rather than to cultivate or domesticate plant species. It is a fact as all civilizations have resulted in the creation of this type of medication (Gurib-Fakim, 2006), based on the cultivated, wild, or native plant species in their 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 and Seo, 2020).

The therapeutic properties of plants have been created with medicinal drugs made from certain plants with these benefits (Jones *et al.*, 2006). The utilization of medicinal plants was about 80% of the world population primarily in developing countries (Dubey *et al.*, 2004). Low-income individuals like farmers, people in 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 and 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 primary healthcare, and 80 % of the population in poorer nations. (Shrestha and Dhillion, 2003). Baqar (2001) elaborated that it is essential to document such information because it is passed on verbally from one generation to another; thus, is vulnerable to being lost.

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

Most of the flora of the Eastern Desert belongs to the Phytogeographic Region of the Saharo-Sindians sensu Eig, 1931/32. The main exception is Gebel Elba in the extreme south, 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.

Nearly a fourth of Egyptian territory is covered by the Eastern desert (225,000 km^2). It occupies an area of around 200 to 500 km wide and 1080 km long between

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the Red Sea and the Nile. The Eastern desert is mountainous arid Sahara characterized by a coastal granite mountain chain running parallel to the Red Sea shore. Two groups of transverse wadis, the eastern wadis that go towards the Red Sea and the western wadis that run towards the Nile valley, cut across this chain (Bubenzer *et al.*, 2020).

The Eastern desert climate differs from the rest of Egypt in that it is arid, with winter rainfall averaging 14 mm per year (Climate-data.org). The amount of rain that falls along the Red Sea coast varies from year to year, with low rainfall in the south and more rainfall in the south at Ras Banas (Gamal, 2000). The average annual temperature at Shalatin, much to the south of the examined area, is 26.1 °C, as shown in Figure 1. These harsh arid climatic conditions resulted in frequent cattle death; which contributed to the Bedouins' migration into the modern cities (Ghazaly, 2006).

The original residents of this region were related to Egyptian Beja tribes as Ababda and Bisharia, two general Bedouin tribes (Fig. 1). Alshemab, Alferganab, Alfaragab, Alhasanat, and Algameiat are the five sub-tribes of Ababda. Bisharia is divided into 42 sub-tribes, the most well-known of which are Omirab, Shonirat, Belgab, Oliab, Alhamedorab, and Qurilab, who rely on camel, goat, and sheep herding for their livelihood (Gamal, 2000; Mustafa, 2005; Bos-Seldenthuis 2007). Ababda and Bisharia dominated the southeastern part of the Red Sea, however, Ababda dominated the same region in addition to the 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 the collapse of the Al Rashid governance. They earn a living by trading, camel herding, and smuggling. They are a closed community in their marriage and do not make ancestry relations with their neighbors. Generally, these tribal people have a weak social status and live individually, and are restricted mainly to their society (Mustafa, 2005).

The Nubia geographic region stretches along the Nile for 310 km 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 and Hamed 2000).

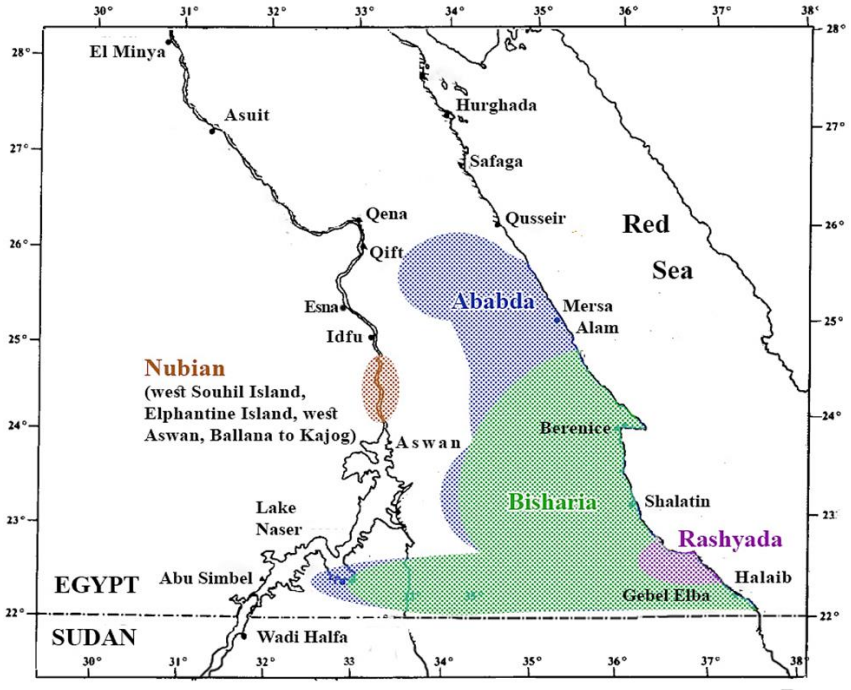

Figure (1): Map showing the location of studied tribes after the construction of the High Dam at Aswan.

Not only at the tribe level, but throughout Egypt, documentation of ethnobotanical pertinent data (plant ingredient, utilisation, descriptions, preparation, tribal attitude, etc.) is insufficient. Furthermore, urbanisation, industrialization, and youth migration to modern cities in and outside Egypt pose dangers to ethnobotanical data for some tribes. Additional threats for the Nubian tribe appeared after the tribal dislocation from their home villages after the construction of the Aswan High Dam. It is very important and urgent to record all ethnobotanical and ethnomedicinal data before they wiped out (El-Darier, 2021). Therefore, the goal of this paper was to collect ethnobotanical data and analyse plant consumption in the ranges of the four tribes

investigated (Ababda, Bisharia, Nubian, and Rashayda) who live in the Nile Valley and the Egyptian Eastern Desert. It also attempts to examine the links between these tribes based on their plant usage.

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 the vernacular Arabic language (sometimes we needed to translate from Beji into Arabic). Herbal market surveys were carried out with herbalists to identify some herbal plants described in the interviews (Bye and Linares, 1983). The methodology of Rana *et al.*, (2019) was used.

The information was gathered mostly through interviews with 180 Bedouins or traditional healers, 45 from each tribe, ranging in age from 18 to 85 years old. Surprisingly, women made up the majority of the informants (119 females, 51 males, 6 herbal shops owners, and 4 local healers). Women were in charge of using the available plant species in their families' therapies, while men had little knowledge of these remedies and relied on their wives. During the period of March (2018) to May (2019), informants were contacted at their houses, tents, or public marketplaces via 4-6 field excursions. Taeckholm (1974), Bailey and Bailey (1976), and Boulos (1977) were used for identification and nomenclature (2009). The database (http://www.theplantlist.org, visited on 27 May 2021) was used to validate plant names, families, and plant authority. The identified plants were listed with their scientific name, family, mode of use, and categorized into: wild, cultivated, or bought from the traditional healers.

Use-value calculation

The relative importance of the species was calculated using the use-value (Phillips *et al.*, 1994) with slight modification as 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.

To investigate the affinity (similarity) among the 4 tribes based on their usage of the plant-based ethnomedicine, the matrix of the use values of the utilized 39 species against the 4 monitored tribes (Table 1) were analysed using the correlate proximity of the program IBM SPSS statistics 25 (1989-2017).

RESULTS

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 different kinds of treatments (Table 1). From the floristic point of view, the traced and identified species belonged to 36 genera and 27 families. Among these genera, *Acacia*, *Citrus*, and *Cymbopogon* were represented by 2 species each, namely: *Acacia nilotica* (L.) Willd. ex Delile and *Acacia seyal* Delile; *Citrus* limon (L.) Osbeck and *Citrus sinensis* (L.) Osbeck, *Cymbopogon citratus* (DC.) Stapf and *Cymbopogon schoenanthus* subsp. *proximus* (Hochst. ex A. Rich.) Maire and 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, 4 families, Apocynaceae, Arecaceae, Lythraceae, and Myrtaceae that were represented by 2 species each. The remaining families were represented by one species each (Table 1). The recorded species are categorized into 17 wild species, approximately 43.6% of the total number of species given a superscript letter (^{w}) in Table (1), that were collected from the vicinity of the desert, canyons, shaded mountain slopes and wadi bottoms; 15 cultivated species (^{c}) accounted for 38.5%, and 7 bought (^{b}) from the traditional healers (Attarin) accounted for 17.9% of the total number of recorded species.

The collected field data from the studied tribes revealed that these species were used in the 72 treatments. One can classify the different ethnomedicinal treatments (recipes) or utilization of these species into 3 main categories. The first category contains 4 recipes that were used by all 4 tribes, of course with different use values, *Acacia nilotica* was used in the treatment of dental pain with a use value of 33.3%, *Cymbopogon schoenanthus* subsp. *proximus* in the 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 21 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 by each tribe, it was found that Nubian and Rashayda tribes have the highest and more or less equal 49 and 48 recipes respectively, Bisharia shows the least with 35 and Ababda had 41 recipes (Table 1).

Tribal affinity concerning their usage of the plant-based ethnomedicine

The affinity or similarity of the four tribes was evaluated based on their use of plant species as ethnomedicinal treatments. Table (2) revealed that the largest degree of resemblance was found between the Nubian and Rashayda tribes (55.3%), followed by a relatively considerable degree of similarity between the Ababda and Bisharia tribes (46.8%). Bisharia and Rashayda have the least similarity to Nubian and Rashayda, with 13.4 percent and 15.6 %, respectively. The people of the different tribes may show affinities to use more than one recipe for a definite treatment, as shown in Figure (2). Diarrhea and headache show the highest

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 the south of the Nile and Eastern Desert of Egypt showing taxon names (species and family), usage method. (+) combination between 2 plants, PP= part used of the plants, PP: B = Bulb, G = Gum from the stem, Fr = Fruit, Fl= flower, L = Leaves, R= rhizome, S = Seed, St = Stem), mode of usage, different type of treatments (25), Resources of plant species: c = Cultivated, b = bought from the traditional healers, 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.

Treatment†	Species Name	Family	PP	Usage Method	Investigated Tribes				T	UV	Nm
					Ab	Bi	Nu	Ra			
Skin Abscess	[c]*Allium cepa* L. + [c]*Lepidium sativum* L.	Amaryllidaceae Brassicaceae	L + S	Paste of onion leaves + crushed seeds of the garden cress	0.0	0.0	6.7	35.6	19.0	10.6	2.0
	[w]*Solenostemma argel* (Delile) Hayne	Apocynaceae	St, L	Paste with warm water + drink	28.9	33.3	0.0	0.0	28.0	15.6	2.0
[1]Asthenia	[c]*Sesamum indicum* L.	Pedaliaceae	S	Paste of crushed seeds as ointment	20.0	4.4	0.0	93.3	53.0	29.4	3.0
	[w]*Solenostemma argel*	Apocynaceae	St, L	the decoction of leaves and stem as drink	0.0	33.3	0.0	22.2	25.0	13.9	2.0
	[i]*Nigella sativa* L.	Ranunculaceae	S	Tea based from seeds or seed oil are used as droplets.	13.3	0.0	6.7	0.0	9.0	5.0	2.0
	[b]*Zingiber officinale* Roscoe	Zingiberaceae	R	drink with white honey	0.0	4.4	6.7	0.0	5.0	2.8	2.0
Anemia	[c]*Phoenix dactylifera* L.	Arecaceae	Fr	Ripen fruits are eaten or soaked in milk	0.0	95.6	0.0	17.8	51.0	28.3	2.0
Bone fractures	[c]*Triticum* sp.	Poaceae	Fr	Paste	15.6	0.0	13.3	62.2	41.0	22.8	3.0
	[c]*Triticum sp.*+[n]*Acacia nilotica* (L.) Willd. ex Delile	Poaceae Fabaceae	Fr	Paste	0.0	0.0	11.1	22.2	15.0	8.3	2.0
[2]Chest diseases	[c]*Olea europaea* L.	Oleaceae	S	Rubbing with the oil	0.0	0.0	22.2	6.7	13.0	7.2	2.0
Cough	[w]*Cymbopogon schoenanthus* subsp *.proximus* (Hochst. ex A.Rich.) Maire & Weiller	Poaceae	St, L	Drink	24.4	33.3	20.0	62.2	63.0	35.0	4.0
	[w]*Solenostemma argel*	Apocynaceae	St, L	Drink	73.3	0.0	26.7	55.6	70.0	38.9	3.0
	[b]*Boswellia sacra* Flueck.	Burseraceae	G	Gum, soaked in hot water and drink	31.1	17.8	33.3	0.0	37.0	20.6	3.0
	[c]*Psidium guajava* L.	Myrtaceae	L	Leaves, soaked in hot water and drink	22.2	0.0	93.3	0.0	52.0	28.9	2.0
	[w]*Capparis spinosa* L.	Capparaceae	Fr	Decoction of ripen fruits or the fruit bulb is cooked as pudding	51.1	55.6	0.0	0.0	48.0	26.7	2.0
	[c]*Hibiscus sabdariffa* L.	Malvaceae	Fl	soaked or boiled drink	20.0	0.0	0.0	15.6	16.0	8.9	2.0

Table (1): Continued

Diabetes	[w]*Balanites aegyptiaca* (L.) Delile	Zygophyllaceae	Fr	Soaked or boiled drink	66.7	0.0	6.7	17.8	41.0	22.8	3.0
	[c]*Lupinus albus* L.	Fabaceae	S	Seeds are crushed or eaten after being soaked	0.0	0.0	40	46.7	39.0	21.7	2.0
	[w]*Cymbopogon schoenanthus* subsp. *proximus*	Poaceae	St, L	Soaked in hot water and taken on an empty stomach	40.0	0.0	0.0	15.6	25.0	13.9	2.0
Diarrhea	[w]*Acacia nilotica*	Fabaceae	Fr	soaked then drink	22.2	26.7	6.7	0.0	25.0	13.9	3.0
	[b]*Coffea arabica* L.+ [c]*Citrus limon* (L.) Osbeck	Rubiaceae + Rutaceae	S+ Fr	Squeeze of one lemon on a small spoonful of grinded coffee	0.0	53.3	0.0	15.6	31.0	17.2	2.0
	[w]*Cymbopogon schoenanthus* subsp. *proximus*	Poaceae	St, L	drink on an empty stomach	40.0	22.2	0.0	0.0	28.0	15.6	2.0
	[c]*Trigonella foenum-graecum* L.	Fabaceae	S	drink or eaten	0.0	0.0	13.3	20.0	15.0	8.3	2.0
	[c]*Oryza sativa* L.	Poaceae	Fr	cooked and eaten or drink the rice washing water	0.0	0.0	13.3	15.6	13.0	7.2	2.0
	[w]*Convolvulus hystrix* Vahl	Convolvulaceae	St, L	boil and drink	6.7	15.6	0.0	0.0	10.0	5.6	2.0
	[c]*Punica granatum* L.	Lythraceae	Fr	use boiled the peel as a drink	0.0	8.9	13.3	0.0	10.0	5.6	2.0
[3]**Eye diseases**	[w]*Aloe vera* (L.) Burm.f.	Cuctaceae	L	Latex is used as eye droplets or the latex is mixed with water, leave to dry then apply to the eye or around	6.7	2.2	0.0	22.2	14.0	7.8	3.0
	[w]*Lawsonia inermis* L.	Lythraceae	L	fresh leaves on the eye	40.0	0.0	6.7	0.0	21.0	11.7	2.0
Favus	[w]*Ricinus communis* L.	Euphorbiaceae	S	Rrubbing with oil	0.0	0.0	53.3	15.6	31.0	17.2	2.0
	[w]*Lawsonia inermis* L.	Lythraceae	L	Paste	0.0	42.2	13.3	0.0	25.0	13.9	2.0
Flu	[w]*Acacia seyal* Delile	Fabaceae	St	Smelling of the smoke of burn wood	2.2	4.4	0.0	11.1	8.0	4.4	3.0
	[b]*Cymbopogon citratus* (DC.) Stapf	Poaceae	St +L	Drink	0.0	0.0	17.8	2.2	9.0	5.0	2.0
[4]**Hair care**	[c]*Olea europaea* L.	Oleaceae	S	rubbing with oil	0.0	4.4	26.7	46.7	35.0	19.4	3.0
	[w]*Lawsonia inermis* L.	Lythraceae	L	paste of its powder	0.0	0.0	40.0	53.3	42.0	23.3	2.0
	[w]*Ricinus communis* L.	Euphorbiaceae	S	rubbing with oil	44.4	0.0	20.0	0.0	29.0	16.1	2.0
Hypertension	[c]*Hibiscus sabdariffa* L.	Malvaceae	Fl	Drink	0.0	6.7	80.0	77.8	74.0	41.1	3.0
	[w]*Hyphaene thebaica* (L.) Mart.	Arecaceae	Fr	Drink	6.7	4.4	84.4	0.0	43.0	23.9	3.0

Table (1): Continued

	[w]*Cymbopogon schoenanthus* subsp. *proximus*	Poaceae	L, St	Vapor inhale or drink	51.1	11.1	13.3	46.7	55.0	30.6	4.0
	[w]*Solenostemma argel*	Apocynaceae	L	Paste with hot water or drink	26.7	6.7	0.0	62.2	43.0	23.9	3.0
	[w]*Lawsonia inermis* L.	Lythraceae	L	rubbing with oil	24.4	0.0	46.7	62.2	60.0	33.3	3.0
Headache	[w]*Acacia nilotica* + [w]*Solenostemma argel*	Fabaceae + Apocynaceae	Fr + St, L	Paste with hot warm water	28.9	88.9	6.7	0.0	56.0	31.1	3.0
	[b]*Camellia sinensis* (L.) Kuntze	Theaceae	L	Paste with hot warm hot water	0.0	0.0	66.7	46.7	51.0	28.3	2.0
	[c]*Citrus limon*	Rutaceae	Fr	Drink or apply the fruit on the head	0.0	0.0	26.7	15.6	19.0	10.6	2.0
	[b]*Coffea arabica* L.	Rubiaceae	S	Drink	0.0	0.0	6.7	20.0	12.0	6.7	2.0
Kidney	[w]*Haplophyllum tuberculatum* (Forssk.) Juss.	Rutaceae	St, L	Drink for kidney stones and kidney problems	22.2	28.9	0.0	0.0	23.0	12.8	2.0
	[w]*Solenostemma argel*	Apocynaceae	St, L	Drink	11.1	0.0	0.0	22.2	15.0	8.3	2.0
[5]Possessed persons	[w]*Ziziphus spina-christi* (L.) Desf.	Rhamnaceae	L	Shower with the leaves that have been boiled	15.6	11.1	0.0	42.2	31.0	17.2	3.0
	[b]*Nigella sativa* L.	Ranunculaceae	S	incense	0.0	0.0	44.4	22.2	30.0	16.7	2.0
Mumps	[w]*Calotropis procera (*Aiton) Dryand.	Apocynaceae	St, L	latex as oinment	11.1	0.0	6.7	0.0	8.0	4.4	2.0
Contraception	[w]*Artemisia herba-alba* Asso	Asteraceae	St	Drink	24.4	2.2	0.0	44.4	32.0	17.8	3.0
	[w]*Cymbopogon schoenanthus* subsp.*proximus*	Poaceae	St, L	Drink	4.4	0.0	0.0	2.2	3.0	1.7	2.0
Rheumatoid arthritis	[w]*Citrullus colocynthis* (L.) Schrad.	Cucurbitaceae	Fr	External use after warming in hot sand and rubing with the cutting fruits on knee	44.4	0.0	13.3	31.1	40.0	22.2	3.0
	[c]*Sesamum indicum* L.	Pedaliaceae	S	Rub with the oil	0.0	0.0	6.7	77.8	38	21.1	2.0
	[c]*Citrus sinensis* (L.) Osbeck	Rutaceae	Fr	Rub with the fruit	0.0	0.0	15.6	6.7	10	5.6	2.0
[6]Skin care	[w]*Lawsonia inermis* L.	Lythraceae	L	Paste with warm water	0.0	11.1	6.7	0.0	8.0	4.4	2.0
	[w]*Lawsonia inermis* L.+ [w]*Acacia nilotica*	Lythraceae + Fabaceae	L+ Fr	paste on the neck	11.1	6.7	26.7	44.4	40.0	22.2	4.0
Sore throat	[w]*Solenostemma argel*	Apocynaceae	L, St	gargling with the soaked leaves and stem	53.3	100.0	20.0	0.0	78.0	43.3	3.0
	[b]*Zingiber officinale* Roscoe	Zingiberaceae	R	root powder in hot water as a drink	0.0	0.0	73.3	11.1	38.0	21.1	2.0
	[c]*Carum carvi* L.	Apiaceae	Fr	Fruit extract in hot water and drink	0.0	0.0	17.8	4.4	10.0	5.6	2.0

Table (1): Continued

Stomachache	[w]*Solenostemma argel*	Apocynaceae	L, St	Drink or dried, crushed then swallowed	22.2	73.3	0.0	0.0	43.0	23.9	2.0
	[w]*Acacia nilotica*	Fabaceae	Fr	Rinsing the mouth with soaked fruits or sucking the fruits or brushing the teeth	13.3	77.8	26.7	15.6	60.0	33.3	4.0
	[b]*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Myrtaceae	Fl	Rinsing the mouth with soaked flower buds or crushing the dried ones and applying to the pain	8.9	0.0	95.6	93.3	89.0	49.4	3.0
Dental pains	[w]*Salvadora persica* L.	Salvadoraceae	St	soaking in cold water, rinsing or brushing the teeth	37.8	44.4	0.0	15.6	44.0	24.4	3.0
	[w]*Haplophyllum tuberculatum* (Forssk.) A. Juss	Rutaceae	L, St	crushing and apply to the teeth or smoking like cigarettes	33.3	35.6	0.0	0.0	31.0	17.2	2.0
	[c]*Allium cepa* L.	Amaryllidaceae	B	Rashayda: vapor on hot knife while Nubian: paste on the pain area	0.0	0.0	26.7	20.0	21.0	11.7	2.0
	[b]*Zingiber officinale*	Zingiberaceae	R	boil with hot water then drink or gargling	0.0	0.0	13.3	15.6	13.0	7.2	2.0
Vitiligo & Gecko	[w]*Citrullus colocynthis* (L.) Schrad.	Cucurbitaceae	Fr	3-4 kg of crushed fruits boiled in a metallic container then use the tar released droplets through pores in the container	13.3	35.6	0.0	0.0	22.0	12.2	2.0
	[b]*Nigella sativa* L.	Ranunculaceae	S	Oil for rubbing	0.0	0.0	33.3	8.9	19.0	10.6	2.0
	[w]*Acacia nilotica*	Fabaceae	Fr	Crushed fruits used as paste with salt	0.0	2.2	0.0	15.6	8.0	4.4	2.0
Wounds' healing (cuts)	[w]*Acacia nilotica*	Fabaceae	Fr	Surface applying the crushed fruits	26.7	17.8	6.7	0.0	23.0	12.8	3.0
	[b]*Coffea arabica* L.	Rubiaceae	S	Applying the crushed fruits	48.9	0.0	66.7	0.0	52.0	28.9	2.0
	[b]*Camellia sinensis*	Theaceae	L	Spreading a dry fine powder on wound or paste with hot water	0.0	0.0	26.7	33.3	27.0	15.0	2.0
Total number of recipes for each tribe					**41**	**35**	**49**	**48**			

[†1]Asthenia includes treatment of weakness and dizziness; [2]Chest diseases include apnea, asthma, bronchitis and pneumonia; [3]Eye diseases include conjunctivitis, keratitis and scleritis; [4]Hair care includes alopecia, hair fragmentation and hair loss; [5]Possessed persons, a person completely controlled by an evil spirit; [6]Skin care includes eczema, psoriasis and xeroderma.

where they have 7 different recipes, cough and dental pains followed with 6 different recipes. On the contrary, 5 treatments namely, anemia, chest disease (apnea, asthma, bronchitis, and pneumonia), mumps, skincare (eczema, psoriasis, and xeroderma), and stomachache have only one recipe each.

The plant parts used in ethnomedicinal preparations

The investigated ethnomedicinal preparations showed that the usage of leaves were the highest (31%), followed by stems and fruits with about 22% each. Gums, bulbs, roots, and flowers had the least ingredients ranging between 1-3 % (Fig. 3).

Distinct species

The species that are commonly used by the different tribes for three or more ethnomedicinal treatments are termed distinct species. The stems and leaves of *Solenostemma argel*, which were used in 7 treatments, namely abscess, asthenia, cough, headache, kidney, sore throat, and stomachache. The informants indicated that 100% of 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 treatment of cough. The leguminous fruits of *Acacia nilotica* played an important role in 6 treatments, bone fractures, diarrhea, headache, sore throat, dental pains, vitiligo and 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 6 treatments (eye, baldness, hair care, headache, skincare, 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 headaches. Bisharia recorded 42.2% in the treatment of baldness while Ababda recorded 40% in the treatment of eye problems as external use.

Table (2): The similarity of the utilization of plant species as ethnomedicinal treatments among the four tribes.

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

The drink prepared from the soaked stems and leaves of *Cymbopogon schoenanthus* subsp. *proximus* was highly recommended in 5 treatments (cough, diabetes, diarrhea, headache, and contraception). Rash-ayda recorded the highest value (62.2%) for cough treatment. Meanwhile, Ababda recorded 51.1% for treatment of headache, while, Bisharia and Nubian recorded 33.3% and 20% for cough treatment, respectively.

The seeds used in making a tea-like drink or the seed oil of Nigella sativa were used in the treatment of asthenia, possessed persons, vitiligo anl gecko. The informants indicated that 44.4% of Nubian and 22.2% of Rashayda used this species in the treatment of possessed persons. Only 13.3% of Ababda used it in the asthenia, while Bisharia did not mention the using of this plant.

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

The drink made from *Zingiber officinale* was used in 3 treatments (asthenia, sore throat, and dental pain or toothache). Nubian recorded 73.3% for the treatment of sore throat, Rashayda recorded 15.6% for the treatment of dental pain, Bisharia recorded 4.4% for the treatment of asthenia while Ababda had no record for this species.

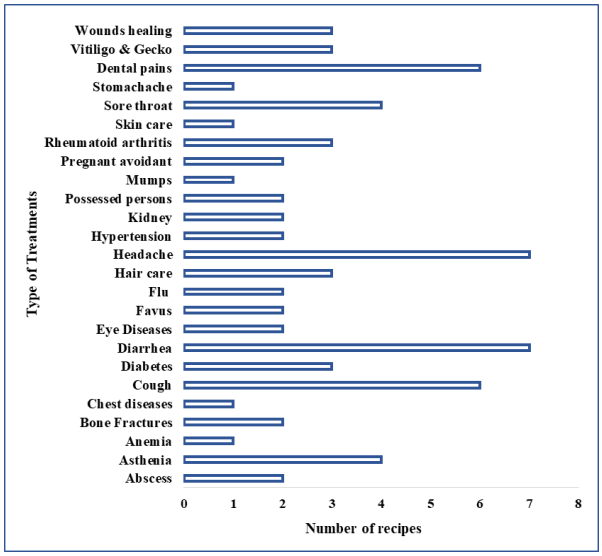

Figure (2): The number of recipes for the 25 treatments used by the 4 tribes.

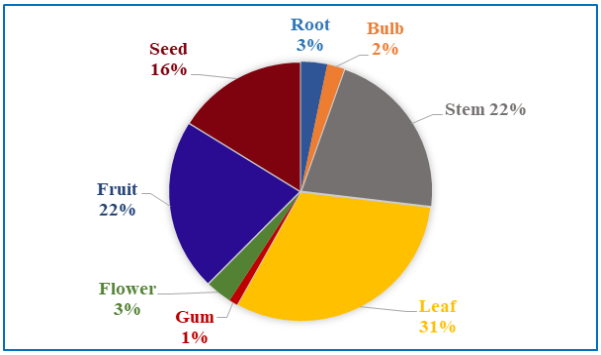

Figure (3): The percentage of the plant parts used in ethnomedicinal preparations

Distinctive tribal use values

The records indicated that some tribes showed tendency to ustilize definite recipes with relatively high

use values than other tribes. Five species had recorded use values more than 93% in definite tribe. *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 asthenia.

DISCUSSION

The Egyptian Eastern Desert has 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 ethnobotanical treatments by the 4 tribes. Serag (2008) indicated that the Sedentarization life had become 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 pure nomads and are still occupying remote areas. This explains the very few numbers of treatments that are used by the 4 tribes. On the other hand, Ababda and Bisharia tribes have social bonds amongst themselves, which extend beyond the borders between Egypt and Sudan. Both tribes share 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, Moustafa, 1998; Ali *et al.,* 2000). This explains the reason for the relatively high similarity in the utilization of ethnomedicinal treatments that recorded 46.8%.

Unexpectedly, the similarity between Nubian and Rashayda showed the highest similarity (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. Before 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 Nubian's shoreline and the Wadi of Hadien (eastern desert). The shorelines were used for grazing in the summer months, and then the Bedouins would return in the winter season (October-May) to their various wells in Abrak and Shalateen, taking with them what they needed of medicinal plants. 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 in Bisharia and Ababda tribes was the lowest, which reflects the changes in the altitude of these related tribes over time, where some families moved to villages outside the mountains, for a better lifestyle (Gamal, 2000; Mustafa, 2005; Bos-Seldenthuis 2007).

The study revealed that a single disease was treated by several plant species meaning that, in some cases, more than one plant was active for some ailments treatment (Hussain *et al.,* 2021). On the other hand, several recipes were used to treat a single disease that reflected the prevalence and severity of this disease among the different tribes due to the harsh environment and their prevailing habits.

The study of main therapeutic indications for medicinal plants has been shown by Bellakhdar *et al.,* (1991) who presented a clearly defined picture of health concerns. In our case, the most frequent diseases that people of these four tribes are suffering are diarrhea and headache with 7 recipes followed by cough and dental pains with 6 different recipes. Our field observations were 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; Mahmoud and Gairola 2013; Ullah *et al.,* 2013; Sadeghi and Mohamed 2014; Bhat *et al.,* 2015; 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 these species from the herb market for their known benefits. The ethnomedicinal utilization of the species is recorded in many previous works. *Coffea arabica* (AbouZid and Mohamed, 2011), Nigella sativa (Tiwari *et al.,* 2004; AbouZid and Mohamed, 2011; Mandaville, 2011; Abouri *et al.,* 2012; Islam *et al.,* 2020) and Zingiber officinale (Davison & Frank, 1935; Tiwari *et al.,* 2004; AbouZid and 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 that are wild include *Acacia nilotica* that is scattered open vegetation in the main channel of wadis as indicated by Boulos (2008). Its utilization as an 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 gastrointestinal cramps, purgative properties, or kidney diseases (Osborn, 1968; Goodman and Hobbs, 1988; AbouZid and Mohamed, 2011). *Cymbopogon schoenanthus* subsp. *proximus* recorded to be used for rheumatism remedies or lung diseases (Mandaville, 2011).

Another four species that are used by one or more tribes with use values of more than 90% include 3 cultivated plants. *Phoenix dactylifera* was recorded for anemia treatment in Bisharia with a use-value of 95.6%, which 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 asthenia 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 was documented by other authors Abouzid & Mohamed (2011) and Aparicio *et al.*, (2021), while Islam *et al.*, (2020) docu-mented 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 and Frank (1935) as antiseptic, anti-inflammatory and dental pain. The high use values of some species by the different tribes were significantly reflecting the indigenous inhabitants believe in the utilization of these recipes for different ailments and naturally the efficacy of these treatments.

CONCLUSION

The data collected has served in determining the trend in the transfer of ethnobotanical knowledge among age groups. The location of plant collection, ethnobotanical usage, and the manner of their use were all documented. This study found that women, particularly elders, had a wealth of knowledge about traditional herbal use. Furthermore, it is necessary to preserve indigenous knowledge of traditional ethnobotany since growing urbanisation, industrial development, and the migration of nomads to modern cities, pose a threat to ethnobotany and ethnomedicine knowledge. This gathered information also shed a light on the possibility for the common flora to be used in human healthcare. Because such information is passed down from generation to generation informally, it is critical to document it. In addition, various actions must be taken to protect the natural flora in order to avoid their exploitation.

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استخدام النبات كعلاج بين النوبيين والقبائل الجنوبية الشرقية في مصر

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الملخص العربـــــي

تم إجراء هذا المسح على 4 قبائل (العبابدة ، بشارية ، النوبيين ، الرشايدة) الذين يقطنون جنوب النيل والصحراء الشرقية الجنوبية لمصر بهدف توثيق ومقارنة الأدوية العشبية التقليدية وتقييم العلاقات بين هذه القبائل. تم إجراء 180 مقابلة مع البدو ومعالجي الأعشاب. تم رصد 39 نوعًا نباتيا ينتمون إلى 36 جنسًا في 27 عائلة. كانت الفصيلة البقولية و النجيلية و البرتقالية من العائلات الغنية بالأنواع. وتشكل الأنواع البرية المستخدمة 43.6٪ والأنواع المزروعة (38.5٪) والمستوردة من محلات الأعشاب (17.9٪). كانت الأوراق أكثر الأجزاء استخدامًا (31٪) ، تليها السيقان والثمار بحوالي 22٪ لكل منهما. الأنواع المتميزة تشمل *Acacia nilotica* التي تستخدم في علاج آلام الأسنان بقيمة استخدام 33.3٪، *Cymbopogon schoenanthus* subsp. *proximus* في علاج كل من السعال أو الصداع بقيم استخدام 35 و 30.6٪ على التوالي ومزيج من *Acacia nilotica* مع *Lawsonia inermis* في علاج التهاب الحلق بقيمة استخدام 22.2٪. تم تسجيل أعلى تشابه بين قبائل النوبة والرشايدة (55.3٪) والعبابدة والبشرية (46.8٪) لأن كلا القبيلتين يتشاركون المكان والمصادر المتاحة مع تجانس تاريخي بينهم ليس فقط بنسبة المكان ولكن من خلال التزاوج فيما بينهم والعلاقات الاجتماعية بينهم.. كان الإسهال والصداع أكثر الأمراض شيوعاً والدليل وجود 7 وصفات علاجية مختلفة لكل منهما وكذلك السعال وآلام الأسنان مع 6 وصفات علاجية مختلفة.