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Plants with medicinal and economic importance in Nabq protectorate, South Sinai, Egypt

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ABSTRACT

One way of dealing with the shortages of food and medicine in underdeveloped nations is through traditional medicine, which primarily uses medicinal herbs, so it is important to conserve these plants. Egypt is one of the countries that have many medically important plants. A field study was conducted to identify some plants of economic and medicinal importance in Nabq protectorate, south Sinai, Egypt. The study revealed that Zygophyllaceae (13.5%), Asteraceae (10.8%), and Fabaceae (8.1%) were the most commonly presented families. With 92% of all species recorded, perennial species had the highest percentage. Saharo–Sindian phytochoria was the most recorded species with 54 %. The whole plant and aerial parts were the most used plant parts (35 % and 30 %, respectively). The most medicinal and economical uses of the recorded species include antioxidant, antimicrobial activity, antibacterial activity, anti-inflammatory activity, antifungal, activities, treatment of respiratory diseases, diarrhea, wounds, abdominal pain, asthma, diabetes, skin diseases, anticancer and antitumor activity, and grazing.

Graphical abstract

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1. Introduction

One of the most serious problems that many countries throughout the world are dealing with the medicine shortage [1, 2]. Plant species with medicinal properties can help reduce the problem of drug shortages. Medicinal herbs are the "backbone" of traditional medicine. Almost 80% of people use drugs made from medicinal plants to treat a variety of diseases around the world [3]. Moreover, medicinal plants can be used to make a wide range of drugs and chemotherapeutic treatments [4]. Plant products were the primary source of pharmaceuticals for a considerable period, and since the dawn of human civilization, natural products with medicinal benefits have been used [5].

Many nations, including China, India, and Japan, have large populations of practitioners of traditional medicine. Traditional remedies account for about 40% of all pharmaceutical use in China. Herbal medicine remedies are more in demand in Japan than conventional pharmaceuticals. Medicinal plants are abundant in Africa as well. Sales of herbal remedies were estimated to have brought in more than US$ 2.5 billion in revenue in the mid-1990s [6]. Eighty percent of people living in underdeveloped countries receive their primary healthcare from traditional medicines, which are mostly made of plants, according to estimates from the World Health Organization [7] (WHO) (1997). Furthermore, at least 25% of medications in the current pharmacopeia are still sourced from plants, and a large number of other medications are synthetic analogs made from plant prototype molecules [8]. The significance of medicinal plants, which hold great promise for the future was highlighted by [6]. Approximately half a million plant species worldwide have undetermined therapeutic and economic worth. According to [9] ,using medicinal herbs as a treatment offers the following advantages: preventative medicine, official medicine support, and synergistic medicine. Medicinal plants can be classified according to their habit, habitat, component employed, and therapeutic importance, apart from the normal botanical classification according to [10]. The oldest type of medicine is derived from medicinal plants and has been employed in folk and traditional medicine for thousands of years [11].

In addition to the active substances that medicinal plants possess, which make them alone an effective treatment for several diseases, or at least they can contribute alongside chemical drugs in the treatment of many illnesses, their recent increased use to manage and prevent the problem of obesity has received great attention [12.13]. Medicinal plants have a promising future as many benefits, medical importance and chemical composition of many plants have been studied in different countries around the world [14]. There is a high level of cooperation between countries in the world from Asia, Africa, and Latin America regarding medicinal plants and the possibility of developing them, which contributes greatly to solving the problem of drug shortage in these countries [15].

Many researchers have been interested in studying and listing medicinal plants found in many regions. In Pakistan, many people treat various illnesses with medicinal herbs and traditional medicine. The effect of herbal teas on treating various diseases was studied in the Moonor Valley in Pakistan [16]. A range of Indian ethno-medicinal plants with pharmacological or therapeutic qualities that can reduce the risk of serious illnesses were concentrated [17]. Many Indian medicinal plants, which are primarily used by the natives for therapeutic purposes, have become widely known and accepted globally (either raw or processed) due to their special advantages, which include great results, negligible or no adverse effects, and accessibility for the general public [18].

Egypt has distinctive aromatic and medicinal plants that the world market is demanding, which may lead to an increase in Egyptian exports and provide hard currency, which contributes to supporting the economy. The potential of numerous Egyptian medicinal plants to treat a wide range of illnesses has been the subject of numerous research [19]. The effect of some medicinal plants as diuretics was investigated [20]. Some medicinal plants are used to treat hepatitis C, which is the most common viral disease in Egypt [21]. A total of 150 native flora with medicinal and economic properties were listed in Wadi Degla, Egypt [22]. In the Wadi El-Gemal protected area in the Eastern Desert of Egypt, 70 species of medicinal plants were recorded [23]. Egypt, especially Sinai Peninsula, has many plants that have medical and economic importance. The traditional use of medicinal plants in Sinai has been the subject of several studies [24-27]. Locals use more than 300 plant species in folk medicine [25]. Many projects have been set up to protect wild medicinal plants in South Sinai to preserve them and protect them from extinction [28].

Locals in Saint Catherine in South Sinai use approximately 90 species of medicinal plants in folk medicine [29]. 100 species belonging to 35 plant families were listed in Wadi Feiran, South Sinai, Egypt [30]. Some medicinal were studied [31] and proved their ability as antioxidants, nutritional supplements, and antibacterial plants to fight some harmful bacteria. In Saint Catherine Protected Area, South Sinai, Egypt. The effect of many medicinal plants found in Egypt as a treatment for many disorders such as heart, blood, nervous system, diabetes, skin, and liver disorders was investigated by [32]. Flavonoids and phenols were the primary active ingredients in the majority of the 97 medicinal plants that were studied in Egypt [33]. Their extracts were most commonly utilized against cell lines that resembled colon and breast cancer.

Study area

Nabq protected area is one of the five components of the South Sinai Protected NPA Network. NPA is laying on the southeastern edge of the Sinai Peninsula at the Gulf of Aqaba coastal plain (about 65 km of coastline) and mountains extending between 28°04' N in the south and 28°26' N in the north; and between the Gulf of Aqaba shoreline in the east to about 34°18' E in the west (Fig. 1).

The study area involves wadi and coastal plain systems. NPA includes a variety of landscape features supporting many habitat types and high biodiversity. The coastal area is a wide flat strip composed of recent coarse alluvium deposits having a low slopping angle

toward the sea to the east [34]. It is influenced by episodic floods and/or the subsurface inflow of saline water. NPA has an arid to hyper-arid climate with low average annual rainfall (10 mm/year at the coast and 50 mm/year at the mountains) and a potential evaporation rate of about 4000 mm/year [35, 36]. Only specialized and adapted vegetation can survive these harsh habitats. NPA has high recreational, conservational, and scientific importance, but it is currently being disturbed by human activities.

2. Materials and methods

During the spring of 2023, a total of 47 stands representing the various plant habitats in the Nabq Protectorate were studied to estimate the floristic composition status of medicinal and economic plant species. Five quadrates (quadrate area = 10 m * 10 m = 100 m2) per stand were assessed. The geographical location, including longitude, latitude, and altitude (meter above sea level), in addition to the location name of all stands, has been summarized in table 1 and figure 2. According to Boulos, [37-41]. Plant species in all stands were named and their life span was documented. Life form and floristic categories were recognized [42-44]. Herbarium specimens on vouchers were made by pressed each plant sample between cardboard sheets; cardboard sheets were changed frequently until the plant sample was completely dried. The plant sample was fixed carefully on a herbarium sheet to be preserved in the Department of Botany and Microbiology, Faculty of Science (Girls), Al-Azhar University.

3. Results and discussion

A total of 37 taxa belonging to 23 families and 33 genera were recorded in the Nabq Protected Area (NPA), South Sinai, Egypt (Table 2). Zygophyllaceae, Asteraceae, and Fabaceae were the most common families with five species each (13.5 %), 4 species (10.8 %), and 3 species (8.1 %) of species composition, respectively. Acanthaceae, Apocynaceae, Boraginaceae, Brassicaceae, and Poaceae were presented by 2 species each (5.4 % each). There were 15 families presented by one species (Amaranthaceae, Arecaceae, Capparaceae, Cleomaceae, Cucurbitaceae, Euphorbiaceae, Lamiaceae, Nitrariaceae, Plumbaginaceae, Polygonaceae, Resedaceae, Rosaceae, Salvadoraceae, Tamaricaceae, and Urticaceae) (Table 2, Figure 3). Asteraceae is the most represented plant family in the Egyptian flora (98 genera and 234 species) [45, 39]. Asteraceae was recorded as the most widespread family in many studies concerning Egyptian floras. In Egypt's Eastern Desert, Wadi Hagul, the most representative families of wild were Asteraceae and Zygophyllaceae [46]. Additionally, at Wadi Habib and Wadi Asyouti, Eastern Desert, Egypt Asteraceae were the most common families [47]. The Asteraceae family of plants was the most abundant in South Sinai [48, 49]. Asteraceae was reported as the most common family in Mount Musa in Saint Katherine Protectorate, South Sinai, Egypt [50].

As for the life span, the majority of the recorded species in the study area were perennials with 34 species (92 % of the total reported species), In contrast, three species (8 percent of all recorded species) were considered annuals (Table 2, Figure 4). The higher number of perennial species than annuals could be due to the low rainfall during the field visit season.

Five life forms were recorded in the studied stands; Chamaephytes were the most prevalent life form (18 species) accounted 49 % of all species that were recorded, followed by phanerophytes (9 species = 24 %), hemicryptophytes (7 species = 19 %), therophytes (2 species = 5 %) (*Schouwia purpurea* and *Zygophyllum simplex*) and there was only one species that represented (3 %) (*Panicum turgidum*) (Tables 2 and Figure 5). These results follow the results of [51] who investigated the wild flora of Wadi Al-Assiuty, Eastern Desert, Egypt, and [46] who studied the flora of Wadi Hagul, Eastern Desert, Egypt. It was discovered that chamaephytes were the most prevalent life forms in semi-arid and arid environments [52].

The recognized species were divided into three categories based on phytogeography: mono-regional, bi-regional, and pluri-regional. Of the total number of species recorded, 23 species (or 62% of the total) were monoregional with different affinities. Three primary phytochoria comprise the monoregional species that have been identified; Saharo–Sindian species (20 species forming 54 % of recorded species), Sudano–Zambesian species (two species forming 5 % of recorded species), and Mediterranean species was represented by a single species (*Sarcopoterium spinosum*). Ten species, or 27% of all reported species, were representative of the bi-regional geoelements. Saharo–Sindian–Sudano–Zambesian regions were represented by 8 species (22 %). Irano–Turanian–Saharo–Sindian regions were represented by two species (5 %).

Pluriregional geo-elements (Mediterranean–Irano–Turanian–Saharo–Sindian) were represented by four species forming 11 % of all species (Tables 2 and 3, Figures 6 and 7). The increase in Saharo–Sindian species is a good reflection and indicator of desert environmental conditions [53].

A total of 37 taxa belonging to 23 families and 33 genera that have economic and medicinal value were recorded in Nabq Protectorate, South Sinai, Egypt (Table 4). Concerning which part (s) of the plant has/have economic and medicinal importance, the whole plant is the most important part in 13 species (35 %), followed by aerial parts with 11 (30 %) species, leaves with 9 species (24 %) and fruit with 4 species (11%) (Table 4, Fig. 8).

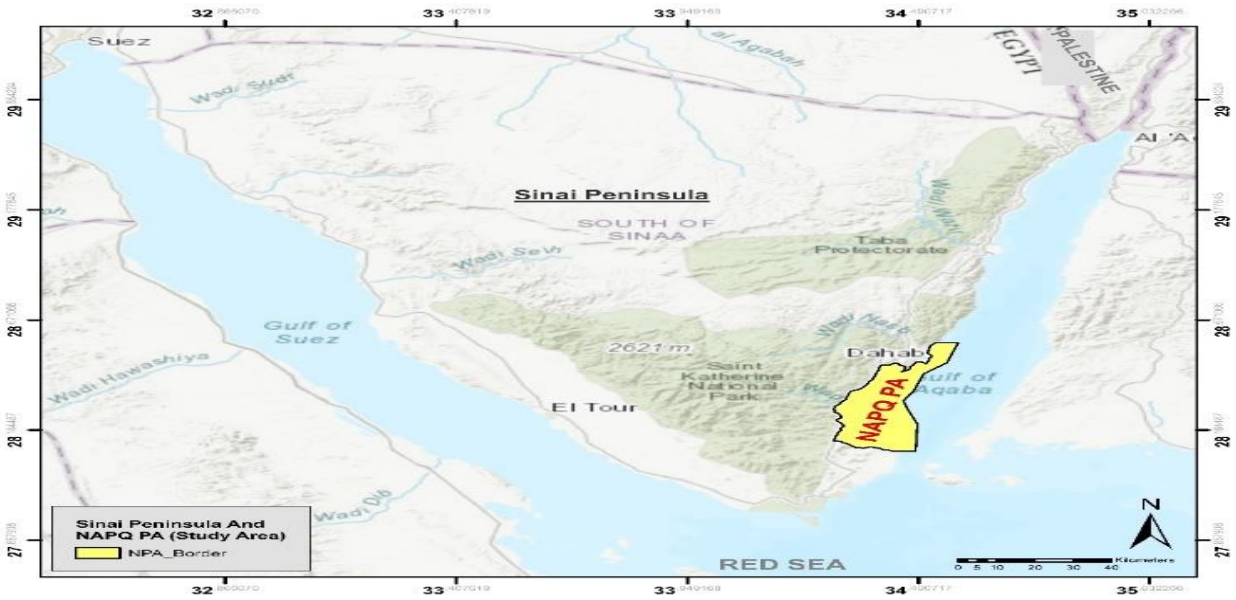

Figure. 1. Location map showing NPA, South Sinai, Egypt.

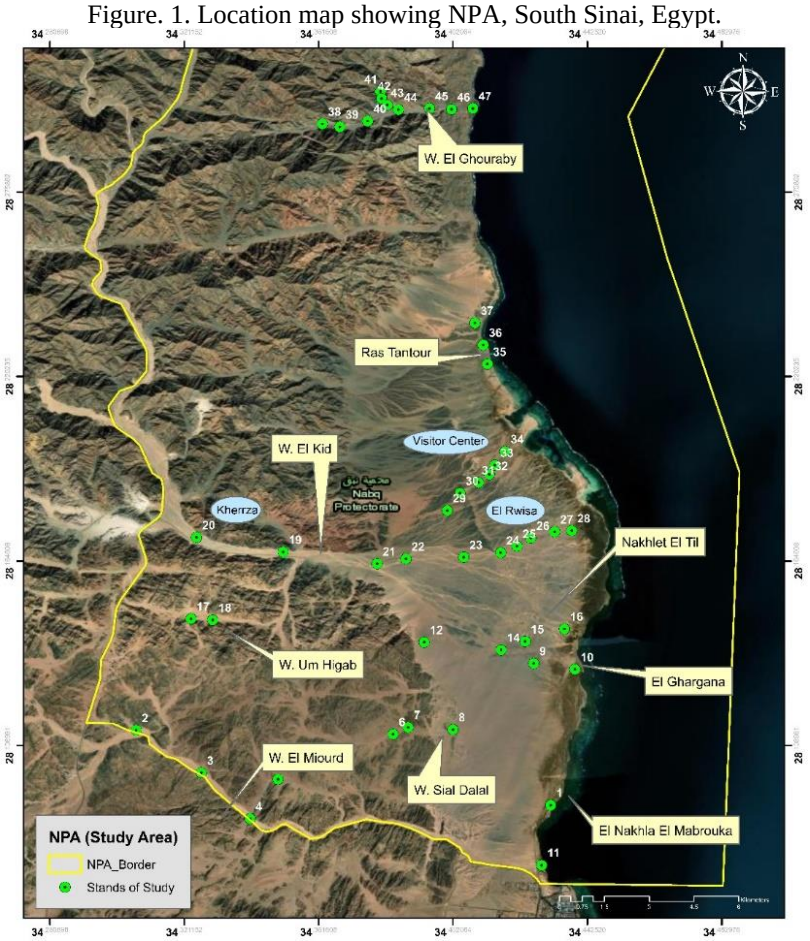

Figure 2. Location map of the Nabq Protectorate's studied stands

Table 1. Global Positioning System coordinates and location name of the studied stands in Nabq Protectorate

Location name	Stand No.	Latitude	Longitude	Altitude (meter)
El Nakhla El Mabrouka	1	28.091	34.4315	9
Wadi El Miourd	2	28.1136	34.30668	201
	3	28.1008	34.32633	169
	4	28.0869	34.34099	139
Wadi Sial Dlal	5	28.0988	34.34941	189

Location name	Stand No.	Latitude	Longitude	Altitude (meter)
	6	28.1124	34.38408	126
	7	28.1144	34.38859	116
	8	28.1138	34.40209	81
	9	28.1337	34.4264	20
El Ghargana	10	28.1319	34.43879	13
	11	28.0729	34.42879	12
	12	28.1401	34.39342	72
	13	28.8138	34.40283	50
Nakhlat El Tal	14	28.1378	34.41658	24
	15	28.1404	34.42382	21
	16	28.1441	34.43564	14
Wadi Um Hegab	17	28.1472	34.32321	280
	18	28.1468	34.32973	260
	19	28.1673	34.35096	118
	20	28.1718	34.32487	143
Wadi El Kid(Khereza)	21	28.1638	34.37924	82
	22	28.1652	34.38792	70
	23	28.1658	34.40534	51
	24	28.1671	34.41643	34
	25	28.1691	34.42134	23
Wadi El Kid (El Rwiesa)	26	28.1716	34.42548	26
	27	28.1734	34.43269	20
	28	28.1738	34.43782	14
	29	28.1798	34.40037	49
	30	28.1851	34.4042	44
	31	28.1883	34.40973	35
Wadi El Kid Visitor center	32	28.1908	34.413	28
	33	28.1935	34.41467	22
	34	28.1977	34.41772	18
	35	28.224	34.41246	11
Ras Tantour	36	28.2298	34.41119	10
	37	28.2364	34.40868	19
	38	28.2964	34.36278	231
	39	28.2955	34.36803	204
	40	28.2973	34.37638	164
	41	28.3062	34.38025	243
	42	28.3041	34.38058	198
Wadi El Ghoraby	43	28.3022	34.38233	167
	44	28.3008	34.38566	113
	45	28.3011	34.39503	77
	46	28.3009	34.40165	47
	47	28.3011	34.40807	16

Table 2: Species list for the Nabq Protectorate, South Sinai, Egypt during spring, 2023. The species referred to their families, and life span; Annual=Ann, Perennial=Per., life forms; Therophyte=Th, Hemicryptophyte=Hem, Chamaephyte=Cha, Phanerophyte=Ph, Geophyte=Geo. Phyto–geographical affinities; IR=Irano–Turanian, M=Mediterranean, SI=Saharo–Sindian, SZ=Sudano–Zambesian. Arabic names are listed

No.	Species name	Family	Life form	Life span	Chorology	Arabic name
1	*Blepharis edulis* (Forssk.) Pers.	Acanthaceae	Hem.	Per.	SI	شوك الضب المهدب
2	*Avicennia marina* (Forssk.) Vierh.	Acanthaceae	Ph.	Per.	SI	الشوري - المانجروف
3	*Aerva javanica* (Burm.f.) Juss. ex Schult.	Amaranthaceae	Cha.	Per.	SI	شجرة الغزال - عارة - يارا
4	*Pergularia tomentosa* L.	Apocynaceae	Cha.	Per.	SI	غلقة - ام اللبن - لبن الحمارة
5	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae	Ph.	Per.	SZ	عشار - عشر
6	*Phoenix dactylifera* L.	Arecaceae	Ph.	Per.	SI	نخيل البلح
7	*Iphiona scabra* (Forssk.) Asch. & Schweinf.	Asteraceae	Cha.	Per.	SI	دفرة الحمار
8	*Pulicaria incisa* (Lam.) DC.	Asteraceae	Hem.	Per.	SI	ريل - شاي جبل
9	*Echinops glaberrimus* DC.	Asteraceae	Hem.	Per.	SI	خشير
10	*Iphiona mucronata* (Forssk.) Asch. & Schweinf	Asteraceae	Cha.	Per.	SI	ضفرة - دفيرة
11	*Heliotropium arbainense* Fresen.	Boraginaceae	Cha.	Per.	SI	عطنة - غبيرة
12	*Tricodesma africanum* (L.)R. Br.	Boraginaceae	Cha.	Ann.	SI+SZ	تخان ريب - هميم - هريش
13	*Zilla spinosa* (L.) Prrantl in Engl. & Prantl.	Brassicaceae	Cha.	Per.	SI	زله - سلة - بسلة
14	*Schouwia purpurea* (Forssk.) Schweinf	Brassicaceae	Th.	Ann.	SI	ماهد - بقل - مهد
15	*Capparis spinosa* L.	Capparaceae	Cha.	Per.	M+IT+SI	لصف - ورد الجبل
16	*Cleome droserifolia* (Forssk.) Delile.	Cleomaceae	Cha.	Per.	IT+SI	السموه
17	*Citrullus colocynthis* (L.) Schrad.	Cucurbitaceae	Hem.	Per.	M+IT+SI	حنظل - حنضل
18	*Chrozophora oblongifolia* (Delile) A.Juss. ex Spreng.	Euphorbiaceae	Cha.	Per.	SZ	غبيرة - صباغ - لابيد
19	*Vachellia tortilis* Subsp. *tortilis* (Savi) Brenan.	Fabaceae	Ph.	Per.	SI+SZ	سيال - طلح
20	*Indigofera arabica* Jaub. & Spach	Fabaceae	Cha.	Per.	SI	شجرة النيلة
21	*Senna alexandrina* Mill.	Fabaceae	Cha.	Per.	SI	سنامكي - العشرق
22	*Lavandula pubescens* Decne.	Lamiaceae	Cha.	Per.	SI+SZ	عطان - عطن
23	*Nitraria retusa* (Forssk.) Asch.	Nitrariaceae	Ph.	Per.	SI	غرقد
24	*Limonium axillare* Forssk.	Plumbaginaceae	Hem.	Per.	SI	عويذران - شليل
25	*Panicum turgidum* Forssk.	Poaceae	Geo.	Per.	SI+SZ	ثمام - ثمان
26	*Stipagrostis acutiflora* (Trin. & Rupr.) De Winte	Poaceae	Hem.	Per.	M+IT+SI	سبل أبوالحصين- أبوركب - جبا
27	*Calligonum comosum* L'Hér.	Polygonaceae	Ph.	Per.	IT+SI	أرطى
28	*Ochradenus baccatus* Delile.	Resedaceae	Ph.	Per.	SI	جرضي - قرضي - جرثي
29	*Sarcopoterium spinosum* (L.) Spach	Rosaceae	Cha.	Per.	M	النتش -البلان الشوكي
30	*Salvadora persica* L.	Salvadoraceae	Ph.	Per.	SI+SZ	اراك - سواك
31	*Tamarix nilotica* (Ehrenb.) Bunge	Tamaricaceae	Ph.	Per.	SI+SZ	عبل - طرفة
32	*Forsskaolea tenacissima* L.	Urticaceae	Hem.	Per.	SI+SZ	لصيف - لصيق
33	*Zygophyllum album* L.	Zygophyllaceae	Cha.	Per.	M+IT+SI	رطريط - بوال

No.	Species name	Family	Life form	Life span	Chorology	Arabic name
34	*Zygophyllum coccineum* L.	Zygophyllaceae	Cha.	Per.	SI	قلم - بلبال - رطريط
35	*Zygophyllum arabicum* (L.)	Zygophyllaceae	Cha.	Per.	SI	حلاوة الجمل - ورقة - شبرق
36	*Zygophyllum molle* (Delile) Christenh. & Byng	Zygophyllaceae	Cha.	Per.	SI	الشكاعة الناعمة - ورقة
37	*Zygophyllum simplex* L	Zygophyllaceae	Th.	Ann.	SI+SZ	قرمل - جرمل

Many of the recognized species of medicinal plants in the Nabq Protectorate have more than one use. In this study, the most medicinal and economical uses of the recorded species were antioxidant and antimicrobial activity (7 species each = 18.9 %), antibacterial and anti-inflammatory activity (5 species each = 13.5 %), antifungal activities (3 species each = 8.1 %), species used for the treatment of respiratory diseases (3 species each = 8.1 %) and species used for the treatment of diarrhea (3 species each = 8.1 %), species used for the treatment of wounds (2 species each = 5.4 %), species used for grazing (2 species each = 5.4 %), species used for the treatment of abdominal pain (2 species each = 5.4 %), species used for the treatment of asthma (2 species each = 5.4 %), species used for the treatment of diabetes (2 species each = 5.4 %) , anti-cancer and anti-tumor activity (2 species each = 5.4 %), species used for the treatment of skin diseases (2 species each = 5.4 %). species used for the treatment of gastrointestinal disorders (2 species each = 5.4 %), species used for the treatment of respiratory diseases (3 species each = 8.1 %) species used for the treatment of toothache (2 species each = 5.4 %), *Tricodesma africanum* species used for the , mouth ulcers and chest congestion, [54]. *Citrullus colocynthis* species used for the treatment of mastitis, joint discomfort, bronchitis, jaundice, common cold, and cough [55]. *Vachellia tortilis* species have antiparasitic and ntiproliferativ activity, and are used for the treatment of hepatitis and burns. [56]. *Blepharis edulis* species is used for treating lung, liver diseases, and spleen disorders [56]. *Iphiona scabra* species have antiplatelet aggregation and hypotensive effects [57]. *Aerva javanica* species is used for the treatment of snake and insect bites [56]. *Phoenix dactylifera* species are used as demulcent, laxative, diuretic, antitussive, and restorative properties, Oozing, laxative agent and genitourinary illnesses [58, 59]. *Pulicaria incise* has antibiofilm a hypoglycemic, and an antispasmodic effect and used for the treatment of heart diseases and as an ingredient of perfume, atonic [60]. *Zilla spinosa* species used to treat conditions including kidney stones and gall bladder stones and has antirheumatic effect [61, 62]. *Capparis spinosa* species used for the treatment of Joint, rheumatism [54]. *Panicum turgidum* species used as edible food [63]. *Senna alexandrina* species used to treat loss constipation, increased bowel movement, bacterial, viral, fungal long-term infections, water-borne disorders, typhoid, joints, tendons ligaments and bone, pneumonia, and leukemia [64]. *Lavandula pubescens* species used as Essential oil [65]. *Limonium axillare* species used for treat depression [66]. *Stipagrostis acutiflora* species used for food production [67]. *Calligonum comosum* species has antinociceptive, antipyretic and gastroprotective effects [68]. *Ochradenus baccatus* species is used for the treatment of Back pain and fistula [69]. *Salvadora persica* has anticonvulsant, sedative, analgesic hypolipidemic and antiosteoporosis effect [70]. For splenic edema, young branches and leaves of *Tamarix nilotica* are cooked, bark is used as a lotion [71, 59]. *Forsskaolea tenacissima* has antispasmodic and antipyretic effect [72]. *Zygophyllum album species* has anti-rheumatic, anti-gout, antihyperlipidemic effects [23]. *Zygophyllum arabicum* species used for therapy Smallpox, vertigo, cooling agents in stomatitis, hematological, neurological, inflammatory, and endocrinological reactions in the body, as well as sore mouth [73]. *Zygophyllum simplex* species used for the treatment of eye disorders and worm killing [54].

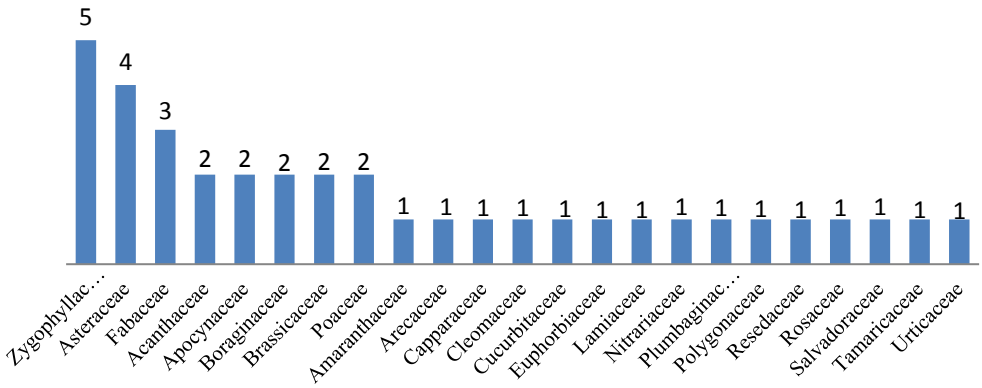

Figure 3. Graphical representation of angiosperm families according to the numbers of the species collected from Nabq Protectorate, South Sinai, Egypt.

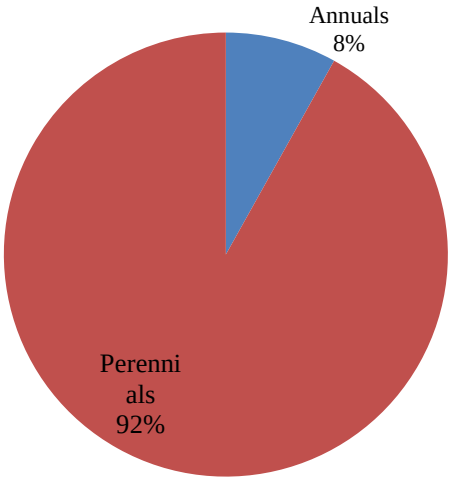

Figure 4. Plant species life spans in Nabq Protectorate, South Sinai, Egypt.

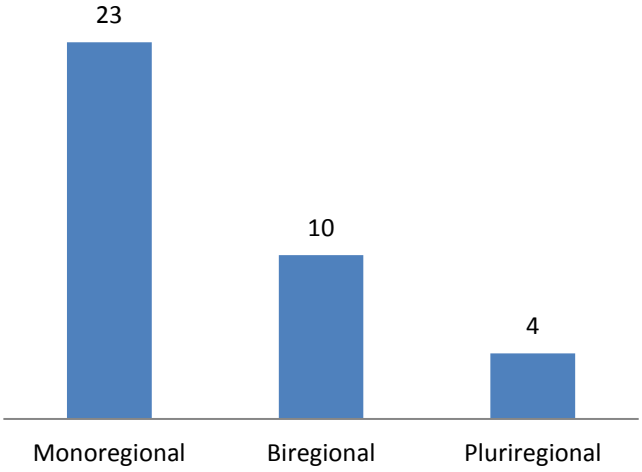

Fig. 6. Main floristic groups for species recorded in Nabq Protectorate, South Sinai, Egypt.

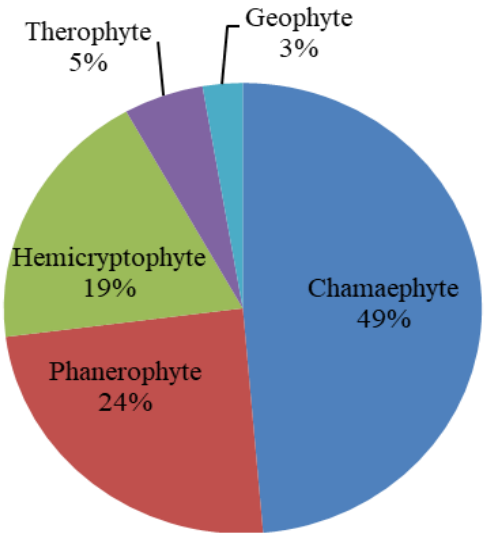

Figure 5. Life form of plant species in Nabq Protectorate, South Sinai, Egypt.

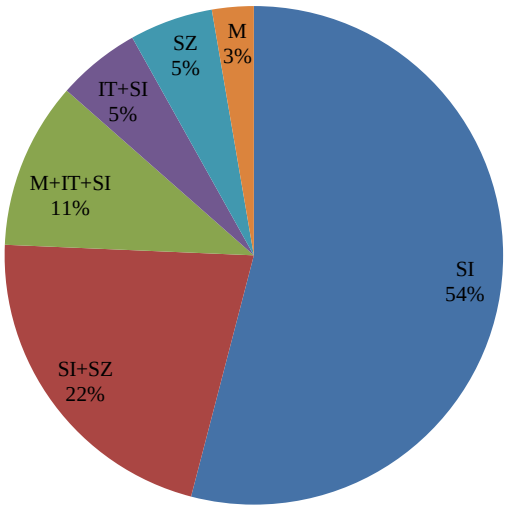

Figure 7. Floristic categories of recorded species in Nabq Protectorate, South Sinai, Egypt. (IR=Irano–Turanian, M=Mediterranean, SI=Saharo–Sindian, SZ=Sudano–Zambesian).

Table 3. The number of species and their percentages that fall into the major floristic groupings. Geographical and phyto-affinities; IR = Irano–Turanian, M = Mediterranean, SI=Saharo–Sindian, SZ=Sudano–Zambesian

Phytochoria	Number of species	Percentage (%)
Mono-regional		
SI	20	54
SZ	2	5
M	1	3
Sub total	23	62
Bi-regional		
SI+SZ	8	22
IT+SI	2	5
Sub total	10	27
Pluri-regional		
M+IT+SI	4	11
Total	37	100

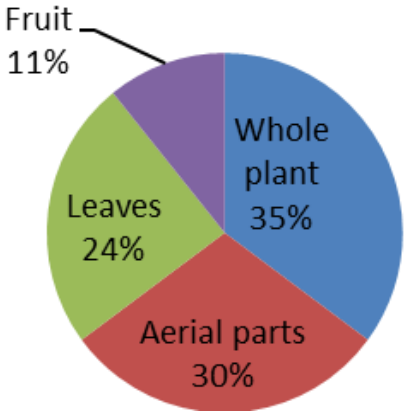

Figure 8. Used parts of medicinal and economic plant species recorded in Nabq Protectorate, South Sinai, Egypt.

Table 4. Economic and medicinal uses of the recorded species in Nabq Protectorate, South Sinai, Egypt

Species	Part used	Economic and medicinal uses	References
Blepharis edulis (Forssk.) Pers.	Whole plant	Treating lung, liver diseases, and spleen disorders	[54]
Avicennia marina (Forssk.) Vierh.	Whole plant	Antidiabetic, anticancer and antimicrobial	[74]
Aerva javanica (Burm.f.) Juss. ex Schult.	Whole plant	Toothache, snake, and insect's bites	[56]
Pergularia tomentosa L.	Whole plant	Skin diseases	[69]
Calotropis procera (Aiton) W.T.Aiton	Whole plant	Respiratory system and antibacterial	[56]
Phoenix dactylifera L.	Fruit pulp, Sap gum	Possess expectorant, demulcent, laxative, diuretic, antitussive, and restorative properties. Oozing, laxative agents, genitourinary illnesses, and diarrhea	[58,59]
Iphiona scabra (Forssk.) Asch & Schweinf.	Whole plant	Anti-platelet aggregation, anti-inflammatory, and hypotensive effects	[57]

Table (4) : Cont.

Pulicaria incisa (Lam.) DC.	Aerial parts	Antibacterial, antibiofilm, antioxidant, heart diseases, ingredient of perfume, atonic, a hypoglycemic, and an antispasmodic	[60]
Echinops glaberrimus DC.	Leaves	Pain, inflammation, and respiratory diseases	[75]
Iphiona mucronata (Forssk.) Asch. & Schweinf	Aerial parts	Antimicrobial and antitumor	[76]
Heliotropium arbainense Fresen.	Aerial parts	Antimicrobial activity	[77]
Tricodesma africanum (L.)R. Br	Leaves	Abdominal pain, mouth ulcers, and chest congestion	[54]
Zilla spinosa (L.) Prrantl in Engl. & Prantl.	Aerial parts	Grazing plants, treatment of gall bladder and kidney stones and/or ailments, antifungal, anticancer, and antirheumatic	[61,62]
Schouwia purpurea (Forssk.) Schweinf	Leaves	Antimicrobial activity	[78]
Capparis spinosa L.	Leaves	Joint, rheumatism, and abdominal pain	[54]
Cleome droserifolia (Forssk.) Delile.	Leaves	Urinary tract pains, diabetes, and wounds	[23]
Citrullus colocynthis (L.) Schrad.	Aerial parts	Anti-leprosy, common cold, cough, asthma, bronchitis, jaundice, joint pain, cancer, toothache, wound, mastitis, and in gastrointestinal disorders such as indigestion, pain and different microbial infection	[55]
Chrozophora oblongifolia (Delile) A.Juss. ex Spreng.	Leaves	Gastrointestinal tract problems	[79]
Vachellia tortilis Subsp. *tortilis* (Savi) Brenan.	leaves, flowers	Diabetes, asthma, hepatitis and burns antibacterial, antifungal, antiparasitic, antioxidant, antiproliferative, and anti-inflammatory effects	[80]
Indigofera arabica Jaub. & Spach	Whole plant	Gastrointestinal disorders, inflammatory conditions, pain, skin ailments, and respiratory	[81]

Table (4) : Cont.

Senna alexandrina Mill.	Leaves	Loss of constipation, increased bowel movement, water borne diseases, typhoid, joint, tendon, ligmaents and bone, pneumonia, reducing fever, bacterial, viral, fungal long term, infections, leukemia.	[64]
Lavandula pubescens Decne.	Aerial parts	Essential oil, antibacterial and antioxidant	[65]

*Nitraria retusa (*Forssk.) Asch.	Fruit	Urinary tract pains	[82]
Limonium axillare (Forssk.) kuntze	Whole plant	Treat depression, diarrhea, antioxidant, anti-bacterial, antifungal and antidiabetic.	[66]
Panicum turgidum Forssk.	Aerial parts	Edible food, grazing plants and wound-dressing, antidiabetic	[63]
Stipagrostis acutiflora (Trin. & Rupr.) De Winte	Whole plant	Food production	[67]
Calligonum comosum L'Hér.	Aerial parts	Anti-inflammatory, antinociceptive, antipyretic, gastroprotective, antibacterial and antioxidant	[68]
Ochradenus baccatus Delile.	Whole plant	Back pain and fistula	[69]
Sarcopoterium spinosum (L.) Spach	Fruit	Anti-Inflammatory	[83]
Salvadora persica L.	Whole plant	Antimicrobial, antioxidant, antiulcer, anticonvulsant, sedative, analgesic, anti-inflammatory, hypoglycemic, hypolipidemic, antiosteoporosis, and antitumor activities	[70]
Tamarix nilotica (Ehrenb.) Bunge	Aerial parts	Antibacterial, carminative, astringent sudorific, ulcer, expectorant, aphrodisiac, relieves headaches and reduces inflammation. leaves and young branches are cooked for spleen edema, bark is used as a lotion	[71, 59]
Forsskaolea tenacissima L.	Aerial parts	Anti-inflammatory, antispasmodic, anti-diabetic and antipyretic	[72]

Table (4): Cont.

Zygophyllum album L.	Whole plant	Antioxidant, antidiabetic, antimicrobial, anti-tumor, anti-rheumatic, anti-gout, antihyperlipidemic and anti-inflammatory effects	[84]
Zygophyllum coccineum L.	Fruit	Anthelmintic and diuretic	[23]
Zygophyllum arabicum (L.)	Whole plant	Sore mouth, smallpox, hematological, neurological, inflammatory, endocrinological, cooling agent in stomatitis, vertigo, and endothermic reaction in the body	[73]
Zygophyllum molle (Delile) Christenh. & Byng	Aerial parts	Anti- microbial and antioxidant	[85]
Zygophyllum simplex L.	Leaves	Eye disorders and worm killing	[54].

4. Conclusion and Recommendations

In the Nabq Protectorate in South Sinai, Egypt, thirty-seven species of economic and medicinal plants were recorded. Zygophyllaceae, Asteraceae, and Fabaceae were the most common families. Perennial species recorded the highest percentage at 92 % of all species recorded. The most recorded species were Saharo-Sindian phytochoria. The whole plant and aerial parts were the most used plant parts. Egypt, especially the Sinai region, holds many medicinal and economic plants that can be an ideal solution to fill the shortage of medicine. In addition, these plants can be grown on a large scale using modern techniques such as plant tissue culture and the surplus can be exported abroad to support the Egyptian economy.

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