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Phytosociological Attributes, Vegetation, Phytogeography, Floristic Analysis and Composition of Vascular Plants in Al-Salqa Wadi Area, Gaza Strip, Palestine

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Abstract

The research was conducted to study the plant diversity, life forms, phytogeographic analysis, and compositional analysis of vascular plants in the Wadi Salqa area. The climate in the study area is semi-arid, and it is located in a transitional zone between the Mediterranean, the Negev, and the Sinai. The results show that the richness of plant species and diversity of habitats in our study area is high compared to other sites in the Mediterranean region. In our study, we recorded 145 plant species along the Wadi Salqa area, belonging to 112 genera and 40 families. The most abundant families were Asteraceae with 21 species (14.5%), Poaceae with 16 species (11%), Fabaceae with 13 species (6.9%), Solanaceae with 8 species (5.5%), Chenopodiaceae with 7 species (4.8%), and Geraniaceae with 6 species (4.1%). The highest proportion of plants recorded in the study area was annual plants with 72.2%, compared to other life forms such as phanerophytes, chamaephytes, hemicryptophytes and cryptophytes with 12.5%, 6.2%, 5.51% and 3.4%, respectively.The studied sitesextend along the Salqa Wadi and plant samples were taken in three types of sites: Wadi Buttom, banks, and open field. The sites included seven study quadrats to study plant communities. Some ecological parameters such as species richness, cover-abundance scale, and frequency were studied. The results of the study showed that the unique plant diversity in our study area may be the result of the influence of a variety of factors such as wastewater, soil moisture, soil salinity, urban effects, adjacent agricultural fields, and solid waste that create diverse environmental conditions for plants. The phytogeographical analysis of the study area showed that 93 species (66.4% of the total recorded species) belong to the Mediterranean region, 48 species to the Irano-Turanian region (34.2%), 22 species to the Saharo-Arabian region (15.7%), and 23 species to the Euro-Siberian region (16.4%).

Keywords: Floristic diversity, Al-Salqa Wadi area, Phytogeographical analysis, Community similarity, Cover-abundance, Frequency, Gaza Strip, Palestine, Phytosociology, Relative frequency.

Introduction

The Mediterranean region is renowned for its exceptional biological diversity. This region is home to a vast array of endemic plant species and numerous relict species, which play a crucial role in maintaining ecosystem stability and productivity (Alhamad, 2006). Biodiversity has become an increasingly important criterion in the design of ecological compensation areas and urban green spaces. The extensive international researches were initiated to test individual parts of the European vegetation checklist taxonomical classification system, biogeographical attributes, structural, ecological properties (Willner et al., 2017; Marceno et al., 2018, 2019; Landucci et al., 2020; Bonari et al., 2021; Kalníkova et al., 2021; Jiroušek et al., 2022;Novak et al., 2023; Peterka et al., 2023; Preislerova et al 2024).

The Mediterranean basin is regarded as the second-largest biodiversity hotspot in the world, it comprises significant terrestrial bio-habitats such as coastal regions, garrigues, pastures, marshes, rainforests, maquis and transitional to spans and desert zones more than thirty states. Also, Mediterranean region comprises more than 25000 vascular plant species worldwide (Di Biase et al., 2021; Lopez-Alvarado & Farris 2022; Bedair et al., 2023 a, b; Bedair et al., 2024).

As part of the Eastern Mediterranean, Palestine constitutes a rich and diverse ecosystem. It serves as a meeting ground for plant species originating from various regions, including Western Europe, Central Asia, and Eastern Africa. This unique geographical location, combined with the abrupt transitions between climatic zones, deserts, and steppes, nurtures the Palestinian biological diversity (Ali-Shtayeh and Jamous, 2018; Qumsiyeh and Al-Sheikh, 2023). The bioclimate and the flora endemic rare of Palestine has been studied (Ighbareyeh et al., 2017). New records for the native flora of the west bank of Palestine and 13 plant species which belong to 8 plantfamilies are hereby reported as new (Al-Sheikh and Qumsiyeh, 2021).
Phytosociological study was conducted in Al-Dawaimah of Palestine to study the plant diversity, revealed that a region rich in many vascular plant (Ighbareyeh et al., 2022). Palestine is home to a remarkable variety of wildlife resources, including an estimated 2,483 species of plants, 470 species of birds, 95 species of mammals, 7 species of amphibians, and 93 species of reptiles (Shmida, 1995).

The climate of Palestine is one of the climates with a moderate temperature. It is considered like other countries overlooking the Mediterranean Sea, and therefore the climate of the West Bank is considered moderately rainy in winter with relatively hot summer weather, where most of the rainfall occurs in the winter and spring months, and snow and hail may fall from time to time, especially in the western and highland regions (ARIJ, 2007).

The hills and mountains of the Middle Eastern region, including historical Palestine, are covered with more than 2,600 plant species, of which over 700 are known for their medicinal or botanical pesticide properties (Ali-Shtayeh et al., 2000).

Regarding the flora of the Gaza Strip, Boulos (1959) recorded 251 plantspecies belonging to 46 families. Madi et al. (2002) studied the coastal sand dunes of Gaza Strip and documented 120 species (51 perennials, 2 biennials, and 67 annuals) belonging to 109 genera and 39 families. Furthermore, Abd Rabou et al. (2008) recorded 70 plant species belonging to 32 families and 25 orders during the spring months of 2004 in Wadi Gaza. Additionally, a survey along the Wadi Gaza area

(2,000 dunams), spanning approximately 9 kilometers from east to west of the Mediterranean Sea, identified 219 plant species belonging to 167 genera and 55 families (Abu Auda et al., 2009a).

The floristic diversity, analysis and composition of vascular plants in the Gaza Strip, there are few previous studies that have indicated floral diversity, taxonomical and ecological results (Boulos, 1959; Madi et al., 2002; Abd Rabou et al., 2008; Abou Auda et al., 2009a; Abou Auda et al., 2009b; Abou Auda, 2010; Abou Auda, 2011; Abou Auda, 2012, Abu Batnain, 2014, Ali-Shtayeh et al., 2022; Abou Auda, 2023, Abou Auda and Ighbareyeh, 2024).

Al-salqa Wadi is an indispensable part of natural life in Gaza Strip, despite of its importance, information is not available about its vegetation, floristic composition, ecological parameters, abundance, density, the life form of species and diversity of flora, therefore this is the first research related to floristic studies of the area. Conservation the natural history of Al-salqa Wadi in Gaza Strip is a lofty and important goal in itself. Our knowledge on the biodiversity of Palestine in general andparticularly in Gaza Strip is still fragmentary and requires in-depth studies to revealall of its components.

Material and Methods

The study area

The study area is situated in the Middle East Mediterranean coast in the south Governorates within Palestine, which cover a small portion of the Gaza Strip, namely Al-salqa Wadi latitude 31 23 59.78 N and longitude 34 20 22.07. Al-salqa Wadi is happening meeting a number of small Wadi that converge near the armistice line on the eastern border of the Gaza Strip, and expire in stream to form a one Wadi which runs along the South-eastern border of the city for a distance 2590 meters and then cut off the town from the neighborhood Bobaa then runs zigzag until it reaches Al-Berka neighborhood in the west (Abu Amra, 2010).

Geographical location

Wadi Al-salqa area is located south-east of Deir al-Balah is bordered to the north of Deir al-Balah and the western side of Salah al-Din Street, the southern side of the Al – karara and the East Green Line.

Climate- Rainfall

The Gaza Strip has a distinct semi-arid climate and is situated in a transitional zone between the temperate Mediterranean climate to the west and north, and the arid Negev and Sinai deserts to the east and south. The Al-Salqa Wadi basin is located in alow rainfall area, receiving between 250-300 mm of precipitation annually, which explains the Matari system spate of the Wadi. The region experiences two well- defined seasons: the wet season from October to March, and the dry season from April to September, with peak rainfall occurring in December and January. Annual average rainfall varies significantly, from over 400 mm per year in the north to about 200 mm per year in the south near Rafah. Since August 1973, daily rainfall data have

been recorded at eight stations in the Gaza Strip, with one station (Station 10, the "Meteorological Station" in Gaza City) having records dating back to 1968 (Abu Batnain, 2014). The highest recorded one-day total rainfall in the Gaza Strip was 138 mm at the Beit Lahia Station on November 29, 1991. While there is a general north-south rainfall pattern, a review of the existing data indicates significant year-to-year variation in rainfall, especially in the middle area of the Gaza Strip, Deir El Balah governorate, near our study area, which receives about 363 mm per year (Abou Auda et al., 2009a). The average daily temperature in the Gaza Strip ranges from 26°C in summer to 12°C in winter. The average daily minimum temperature ranges from 21°C in summer to 9°C in winter, while the maximum temperature ranges from 29°C in summer to 17°C in winter (Abou Auda et al., 2009a).

Plant collection

Several trips to different locations of the region, Al-berka location. Abu fiaad location, Al-mashaala location, Am Al-azban location, Bobaa location and Salah Al- deen location. Samples of various plants species grown wildly were collected **(**Figure1).

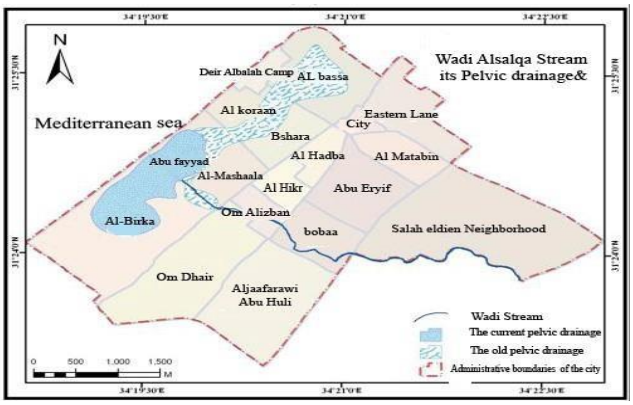

Figure 1: The study Area of Al-salqa Wadi (**Abu Amra 2010).**

Plant identification

After the specimens had been dried by pressing, identification was carried out, the specimens were prepared as herbarium material according to herbarium techniques. Plant specimens are kept at the Laboratory of Biology Department, Faculty of Science, Al-Aqsa University. Identification was carried out according to Tackholm (1974) "Students Flora of Egypt", Zohary (1966 and 1972); Feinbrun– Dothan (1978 and 1986), "Flora Palaestina" and Boulos (1999, 2000 and 2002) " Flora Of Egypt". The identification updated according to Danin (2000) "The Nomenclature News of Flora Palaestina " and Danin (2004) Distribution Atlas of Plants in the Flora Palaestina Area".

Sampling Vegetation

Vegetation analysis started with selection of stands (quadrates) that effectively represent variation in the vegetation where a biotic habitat factor showed discontinuity or marked transition. The surveyed locations (Figure1) extend along Al- salqa Wadi for a distance of about 7 km, the vegetation was sampled at Buttom, Bank and Open Field. Six locations (Figure 1) were found to be satisfactory to represent the vegetation of the area.The locations comprise seven quadrates (each quadrate 10 X 10 m) were chosen in the Wadi to study plant communities as follows:

1. Al Berka Location

Two quadrates were chosen in this location from Open Field (A1), (A2).

2. Abu Fiaad Location

One quadrate was chosen in this location from the Wadi Buttom (B).

3. AL Mashaala Location

One quadrate was chosen in this location from the Wadi Bank (C).

4. Am Alasban location

One quadrate was chosen in this location from the Wadi Bank (D).

5. Bobaa Location

One quadrate was chosen in this location from the Wadi Buttom (E).

6. Salah Aldeen Location

One quadrate was chosen in this location from the Wadi Bank (F).

Species Cover-abundance

The present study employed the quadrate method to accurately assess the vegetation in the area. The researchers carefully selected an appropriate quadrate size of 10 x 10 m2 to ensure that significant numbers of individuals were included, while still allowing for the separation, counting, and measurement of individual plants without duplication or omission. To obtain a comprehensive evaluation, the researchers combined the cover-abundance scale with sociability values, as outlined in the Braun- Blanquet system (1964). This approach allowed them to determine the present percentage of each species based on the number of quadrates in which it was observed.

The researchers determined that seven quadrates were sufficient to adequately represent the vegetation in the study area. Cover was assessed by estimating the vertical projection of plant shoot-area as a percentage of the quadrate area (Mueller- Dombois and Ellenberg 1974).

The Braun-Blanquet scale is a valuable tool for assessing existing environmental perturbations. By comparing the plant coverage values in disturbed areas with those in undisturbed areas having similar species composition, the researchers were able to make gross estimates of the reduction in plant cover due to various disturbances.

This comprehensive methodology, involving the careful selection of quadrate size (Barbour et al., 1987; Cox, 1990)., the integration of cover-abundance and sociability values, and the strategic placement of quadrates, allowed the researchers to obtain a robust and detailed understanding of the vegetation in the study area. The application of the Braun-Blanquet scale further enabled the assessment of the impact of environmental factors on the plant community, providing valuable insights for conservation and management efforts.

Table 1: Braun-Blanquet cover-abundance scale.

Braun-Blanquet scale	Range of cover (%)
5	**75-100**
4	**50-75**
3	**25-50**
2	**5-25**
1	**<5; numerous individuals**
+	**<5; few individuals**
r	**solitary, with small cover**

Species Frequency

Frequency is the percentage of total quadrates containing at least one root individual of a given species. Frequency is most often used to compare plant communities and to detect changes in vegetation composition over time. Frequency is used to describe the distribution of a species in a community. It is often used in conjunction with density or cover estimates and is used to measure trend or condition and can be used to estimate the percentage frequency as follows (Ambshat, 1982):

$$Percentage\ frequency\ = \left(\frac{number\ of\ \text{quadrates}\ in\ which\ a\ species\ is\ present}{total\ number\ of\ \text{quadrates}\ analyzed}\right) \times 100.$$

Results

Floristic analysis

Table 2 presents the flora of the surveyed area. A total of 145 species vascular plant taxa belonging to 112 genera and 40 families were reported.

The best respresented families were the Asteraceae (Compositae) (17 genera and 21 species), Poaceae (Gramineae) (16 genera and 16 species), Fabaceae (9 genera and 13 species), Brassicaceae (9 genera and 10 species), Solanaceae (6 genera and 8 species). On the other hand there are other families were represented only by a few species; Euphorbiaceae (4 genera and 5 species), Caryophllaceae (4genera and 4 species), Labiatae (4 genera and 4 species), Chenopodiaceae (3 genera and 7 species), Boraginaceae and Polygonaceae (3 genera and 3 species), Geraniaceae (2 genera and 6 species), Papaveracear, Rosaceae, Rubiaceae, Malvaceae, Scorphulariaceae and Aizoaceae (2 genera and 2 species), Plantaginaceae and Cyperaceae (1 genera and 3 species), Amaranthaceae, Primulaceae, Cactaceae, Oxalidaceae, Moraceae and Fumariaceae (1 genera and 2 species), Urticaceae (1 genera and 4 species). Finally there are other families were respersented only by one species (Tamaricaceae, Rhamnaceae, Cupressaceae , Asparagaea, Oleacea, causuarinaceae, Portulaceae, Orobanchaceae, Araceae, Palmae, Apiaceae, Lythraceae, and Verbenaceae (Figure 2).

Table 2: Plant species and their life forms in Al-salqa Wadi, Gaza Strip, Palestine. Families and species are arranged alphabetically.

NO.	FAMILY	NO.	BOTANICAL NAME	LIFE FORM	VERNACULAR NAME
1-	***Aizoaceae***	**1**	*Carpobrotus edulis* (L.)N.E.Br.	Chamaephyte	أصابع الجارية
		2	*Mesembryanthemum crystallinum* L.	Therophyte	غرول- ثرثبن- طرطير
2-	***Amaranthaceae***	**3**	*Amaranthus blitum* L.	Therophyte	عرف الديك
		4	*Amaranthus spinosus* L.	Therophyte	عرف الديك الشوكي
3-	***Apiaceae***	**5**	*Anethum graveolens* L.	Therophyte	-شبت- عين جرادة
4-	***Araceae***	**6**	*Arisarum vulgare* O .Targ-Tozz	Geophyte	سراج الغولة
5-	***Asparagaceae***	**7**	*Asparagus horridus* L.	Geophyte	هليون- شعيط
6-	***Asteraceae***	**8**	*Artemisia monosperma* Delile	Chamaephte	عاذر -شيح
		9	*Cetaurea hyalolepis* Boiss.	Therophyte	عزيز -هرار شفافي
		10	*Carduus getulus* pomel	Therophyte	حشروف لسان الثور
		11	*Calendula arvensis*(vaill.)L.	Therophyte	مخلب القط - الجمرة
		12	*Cichorium endivia* L.	Therophyte	سريس – هندباء
		13	*Carthamus tenuis* (Boiss.& Blenche)Bornm	Therophyte	قوص
		14	*Crebis aspera* L.	Therophyte	خفية جالسرة
		15	*Erigeron bonariensis* L.	Therophyte	شيخ الربيع
		16	*Echinops philistaeus* Feinbrum & zohary.	Chamaephyte	خشير فلسطيني
		17	*Glebionis coronaria* (L.)Cass.ex Spach	Therophyte	بسروم –اقحوان ذهبي- هندلية- كراع الدجاجة
		18	*Matricaria aurea* (loefl.)Sch.Bip	Therophyte	بابونج ذهبي
		19	*Matricaria recutita* L .	Therophyte	بابونج
		20	*Silybum marianum* (L.)Gaerth.	Therophyte	شوك الغزال- خرنبش الجمال
		21	*Sonchus oleraceus* L.	Therophyte	جعضيض-ا لناعم الكرنبي
		22	*Senecio glaucus* L.	Therophyte	قراعي -صفيرة
		23	*Scolymus hispanicus* L.	Hemicryptophyte	سنارية معمرة- ابو حلبية االسباني
		24	*Scolymus moculatus* L.	Therophyte	شوكة الدار-ابوحليبة البقع
		25	*Senecio vulgaris* L.	Therophyte	زهرة الشيخ –العشبة السالمة
		26	*Verbesina encelioides* (Cav.)Benth & Hook .f. ex Gray .	Therophyte	زوارة الشمس
		27	*Xanthium spinosum* L.	Therophyte	شبيط شوكي
7		**28**	*Xanthium stramarium* L.	Therophyte	شبيط عريض
	Borginaceae	**29**	*Echium angustifolium* Mill.	Chamaephyte	زهرة الدعى
		30	*Hormuzakia aggregate* (Lehm.)Gusuleac	Therophyte	لسان النعجة
8		**31**	*Anchusa aegyptiaca* (L.) DC.	Therophyte	حمحم مصري)شبيط (
	Brassicaceae	**32**	*Brassica tournefortii* Gouan	Therophyte	-قراص - جزيرة
		33	*Cakile maritime* Scop.	Therophyte	رشاد البحر
		34	*Diplotaxis erucoides* (L.)DC.	Therophyte	حويرة- صفيرة
		35	*Eruca vesicaria subsp* .sativa(Mill)Thell.	Therophyte	جرجير – روق-اروهان
		36	*Erucaria rostrata*(Boiss.) A.w. Hill	Therophyte	سليح
		37	*Lobularia arabica* (Boiss.) Muschl.	Therophyte	دهيانة
		38	*Matthiola arborescens*	Therophyte	هندور
		39	*Matthiola livida* (Delile) DC.	Therophyte	هندور
		40	*Sinapis alba* L.	Therophyte	خردل ابيض- رشاد البحر
9		**41**	*Sisymbrium orientale* L.	Therophyte	خردل
	Cactaceae	**42**	*Opuntia ficus-indice*(L.)P.Mill.	Therophyte	تين شوكي-الصبر

		43	*Opuntia stricta var.dillenii* (Ker-Gawl.) L.Benson.	Therophyte	**تين شوكي بريشاري**
10	***Caryophyllaceae***	**44**	*Paronychia argenta* Lam.	Hemicryptophyte	**رجل الحمامة**
		45	*Polycarbon succulentum* (Delile) j.Gay	Therophyte	**ريحة**
		46	*Silene Colorata* Poir.	Therophyte	**السيلين الملون**
		47	*Spergularia bocconei* (scheele)Graebn.	Therophyte	**ام ثريب**
11	***Casuarinaceae***	**48**	*Casuaina glauca sieber ex spreng.*	Tree	**كازورينا**
12	***Chenopodiaceae***	**49**	*Atriplex halimus* L.	Phanerophyte shrub	**قطف بحري**
		50	*Atriplex semibaccata* R. Br.	Chamaephyte	**قطف**
		51	*Chenopodium chenopodioides* (L.)Aelen	Therophyte	**رمرام**
		52	*Chenopodium murale* L.	Therophyte	**زريح- رمرام**
		53	*Chenopodium polyspermum* L.	Therophyte	**رمرام**
		54	*Chenopodium vulvaria* L.	Therophyte	**رمرام كريه الرائحة**
		55	*Salsola kali* L.	Therophyte	**شنان**
13	***Cupressaceae***	**56**	*Cupressus sempervirens* L.	Tree	**سرو**
14	***Cyperaceae***	**57**	*Cypreus alternifolius* L.	Geophyte	**السعد المظلي**
		58	*Cypreus rotundus* L.	Geophyte	**سعد الحمار- السعد الكروي**
		59	*Cypreus laevigatus* L.	Hemicryptophyte	**السعد**
15	***Euphorbiaceae***	**60**	*Chrozophora* (L.)A.Juss.	Therophyte	**دوارالشمس النيلى**
		61	*Euphorbia peplus* L.	Therophyte	**حليبنا**
		62	*Euphorbia terracina* L.	Therophyte	**لبينة**
		63	*Mercurialis annua* L.	Therophyte	**حلبوب**
		64	*Ricinus communis* L.	Phanerophyte shrub	**خروع**
16	***Fabaceae***	**65**	*Acacia farnesiana* (L.) willd	Tree	**سنط - الفتنة**
		66	*Acacia saligna* (Labill.)Wendl	Tree	**سيالة – سنط استرالي**
		67	*Alhagi graecorum* Boiss.	Hemicryptophyte	**عاذول**
		68	*Lotus glaber* Mill.	Chamaephyte	**لوتس جلبر**
		69	*Lotus cytisoides* L.	Chamaephyte	**لوتس سيتسرويدس**
		70	*Medicago littoralis* Loisel.	Therophyte	**برسيم حجازي**
		71	*Medicago polymorpha* L.	Therophyte	**قرطة عديدة الشكال**
		72	*Medicago truncatula* Gaertn.	Therophyte	**قرذيش**
		73	*Melilotus sulcatus* Desf.	Therophyte	**حندقوق محزز**
		74	*Onobrychis crista*-galli(l-)lam.	Therophyte	**خريسه راس الديك**
		75	*Trifolium bullatum* Boiss.& tlausskn.	Therophyte	**برسيم هبش**
		76	*Trigonells arabica* Delile.	Therophyte	**حندقوق**
		77	*Vicia sativa* L.	Therophyte	**بيقة- فول رومى**
17	***Fumariaceae***	**78**	*Fumaria capreolata* L.	Therophyte	**ريزالدجاج المتسلق**
		79	*Fumaria parviflora* lam .	Therophyte	**الشامترج- بقلة الحمك**
18	***Geraniaceae***	**80**	*Erodium touchyanum* Delile	Therophyte	**ابرة العجوزالصحراوية**
		81	*Erodium laciniatum* (Cav.)Willd.	Therophyte	**ابرة العجوز- حمباز**
		82	*Erodium malacoides* (L.)L'Her.ex *Ait*.	Therophyte	**ابرة العجوز الخبازية**
		83	*Erodium ciconium*(L.)L'Her.ex Ait.	Therophyte	**ابرة العجوز**
		84	*Erodium moschatum*(L.)L'Her.ex Ait.	Therophyte	**ابرة العجوز المسكية**
		85	*Geranium rotundifolium* L.	Therophyte	**ابرة الراعي- بمان**

19	***Labiate***	**86**	*Lamium amplexicaule* L.	Therophyte	**لم المكة –اذن الفار**
		87	*Marrbium vulgare* L.	Therophyte	**سموه-زؤوم**
20	***Lythraceae***	**88**	*Punica granatum* L.	Tree	**رمان**
21	***Malvaceae***	**89**	*Malva parviflora* L.	Therophyte	**خبيزة**
		90	*Abelmoschus esculentus* (L.) Moench	Therophyte	**بامية**
22	***Moraceae***	**91**	*Ficus carica* L.	Tree	**تين**
		92	*Ficus Sycomorus* L.	Tree	**جميز**
23	***Oleaceae***	**93**	*Olea europaea* L.	Tree	**الزيتون**
24	***Orobanchaceae***	**94**	*Orobanche cernua* Loefl .	Parasite	**هالوك**
25	***Oxalidaceae***	**95**	*Oxalis pes-caprae* L.	Geophyte	**حميضة- عرق اللبون-حماض الماعز**
		96	*Oxalis corniculata* L.	Therophyte	**حميض**
26	***Papaveraceae***	**97**	*Papaver humile* Fedde	Therophyte	**قريعية-حنون عرايس**
		98	*Papaver umbonatum* Boiss.	Therophyte	**خشخاش**
27	***Plantaginaceae***	**99**	*Plantago coronopus* L.	Therophyte	**ودنة-عشبة البراغيث**
		100	*Plantago afra* L.	Therophyte	**قطنة**
		101	*Plantago lagopus* L.	Therophyte	**لسان الحمل- رجل الدرنب**
28	***Palmae***	**102**	*Phoenix dactylifera* L.	Tree	**نخيل البلح**
29	***Poaceae***	**103**	*Aegilops bicornis* (Forssk.)Jaub.& spach.	Therophyte	**دوسر**
		104	*Arundo donax* L.	Phanerophyte shrub	**بوص فارسى**
		105	*Avena wiestii* steud .	Therophyte	**زمير**
		106	*Bromus rigidus* Roth	Therophyte	**السيبوس- الزغلفة القاسية**
		107	*Cenchrus echinatus* L.	Therophyte	**شنرس الثيلانس**
		108	*Crypsis schoenoides* (L.) lam.	Therophyte	**بقق قصير**
		109	*Cutandia dichotoma* (Forssk.) Trab.	Therophyte	**خافور ثنائي الورق**
		110	*Cynodon dactylon*(L.)Pers.	Chamaephyte	**نجيل بلدى-النجم**
		111	*Elytrigia juncea*(L.)Nevs K.	Hemicryptophyte	**التريجيا جانسا**
		112	*Hordeum glaucum* Steud .	Therophyte	**شعر الدب**
		113	*Lolium rigidum* Gaudin	Therophyte	**زوان قاسى- المدهون**
		114	*Phalaris paradoxa* L.	Therophyte	**شعير الفار الغريب-زوان**
		115	*Poa annua* L.	Therophyte	**الكلنية السنوية**
		116	*Polypogon monspeliensis*(L.)Desf.	Therophyte	**شعر الفار**
		117	*Triticum aestivum* L.		**القمح**
		118	*Rostraria pumila* (Desf.)Tzvelev	Therophyte	**روستاريا بوميل**
30	***Polygonaceae***	**119**	*Emex spinosa* (L.)Campd.	Therophyte	**جزر ابو على**

		120	*Polygonum equisetiforme* Sm.	Hemicryptophyte	**زِضاب**
		121	*Rumex pictus* forssk.	Therophyte	**حماسيس-فستق العشرة**
31	***Portulaceae***	**122**	*Portulaca oleracea* L.	Therophyte	**الرجلة- بقيلة -فرفحين**
32	***Primulaceae***	**123**	*Anagallis arvensis* L.	Therophyte	**عين الجمل- عين القط**
		124	*Anagallis Feomina* Mill	Therophyte	**جارود صغير**
33	***Rhamnaceae***	**125**	*Ziziphus spina*-christi (l.) Desf.	Tree	**نبق –دوم - السدر**
34	***Rosaceae***	**126**	*Rubus sanctus* Schreb.	Phanerophyte shrub	**التوت االسود**
		127	*Prunus amygdalus* Stokes	Phanerophyte shrub	**اللوز**
35	***Rubiaceae***	**128**	*Crcianella latifolia* L.	Therophyte	**غاليون**
		129	*Galium aparine* L.	Therophyte	**دحديلة الصقة**
36	***Scrophulariaceae***	**130**	*Verbascum sinuatum* L.	Hemicryptophyte	**لبيد-عورور متعرج**
		131	*Veronica persica* Poir .	Therophyte	**زهرة الحواشي الفارسية**
37	***Solanaceae***	**132**	*Datura innoxia* miller	Therophyte	**داتورة – بقم**
		133	*Datura stramonium* L.	Therophyte	**نفير- داتورة**
		134	*Lycium schweinfurthii*	Phanerophyte shrub	**عوسج**
		135	*Lycopersicon esculentum*	Therophyte	**بندورة**
		136	*Nicotiana glauca* Graham	Tree	**دخان شجيرى- المصاص**
		137	*Solanum elaegnifolium* Cav.	Therophyte	**سجوه زيتية**
		138	*Solanum nigrum* L.	Hemicryptophyte	**عنب الديب**
		139	*Withania somifera*(L.)DunaL.	Chamaephyte	**سم الفار-سم الفراخ**
38	***Tamaricaceae***	***140***	*Tamarix jordanis* Boiss.	Tree	**أثل – طرفة**
39	***Urticaceae***	***141***	*Urtica dioica* L.	Therophyte	**قريص**
		142	*Urtica membranacea* poir	Therophyte	**قريص ممبرنياسى**
		143	*Urtica pilulifera* L.	Therophyte	**قريص نجاج**
		144	*Urtica urens* L.	Therophyte	**قريص عادى**
40	***Verbenaceae***	***145***	*Lantana cammara* L.	Phanerophyte shrub	**وردة الديب**

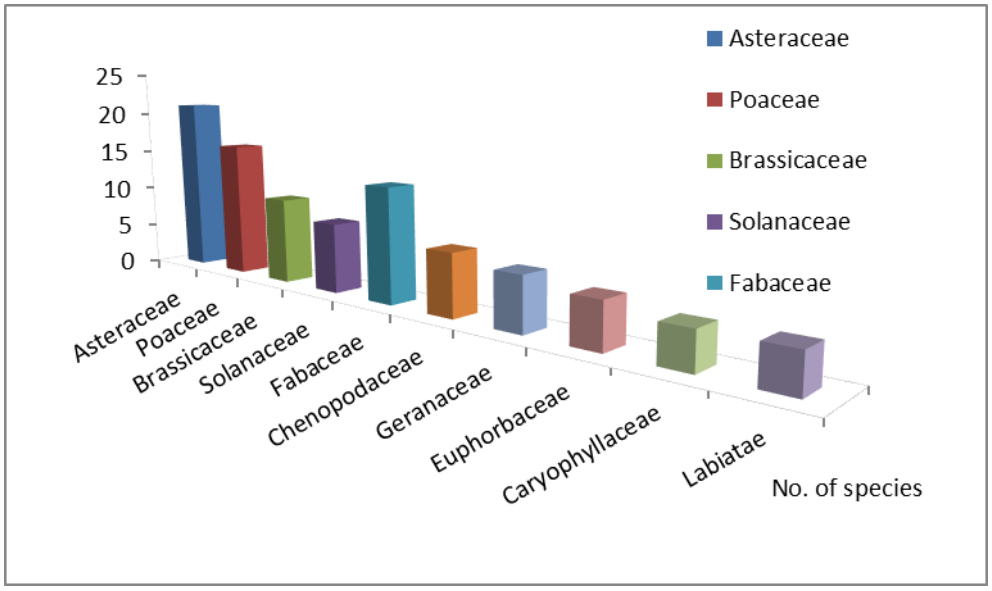

Figure 2: Frequency graph of plants families in Al-salqa Wadi

Biological spectrum

'life forms' defined by the way in which their meristems were located and protected. Table 3 shows the life forms for the species in Al-salqa Wadi.

Five life forms were recognized, of which Therophytes represented by 72.2% constitute the largest number of total species (104), Phanerophytes 12.5% (species18), Chamaephytes 6.25% (9 species), Hemicryptophytes 5.55% (8 species) and Cryptophytes 3.4% (5 species) recorded in Al-salqa Wadi, Parasites have one species, *Orobanche cernua*.

Table 3: Life form distribution of recorded species of Al-salqa Wadi area.

Life form	No. of species	Percentage %
Chamaephyte	9	6.20
Cryptophyte	5	3.4
Hemicryptophyte	8	5.51
phanaerophyte	19	13.1
Therophyte	104	71.7

The researchers in this study classified the life forms of the recorded plant species following the system proposed by Raunkiaer (1937). This comprehensive classification system categorizes the plants based on the location of their dormant vegetative buds and propagation strategies:

1. Chamaephytes: Perennial plants with their dormant vegetative buds situated just at or above the surface of the ground.
2. Cryptophytes: Perennial plants that propagate using underground structures such as bulbs, tubers, or corms.
3. Hemicryptophytes: Plants with their surviving buds or shoot apices located at the soil surface.
4. Phanerophytes: Plants with their surviving buds or shoot apices borne on shoots that project into the air.

5. Therophytes: Plants that complete their entire life cycle from seed to seed and then die.

The researchers have presented the distribution of these life forms in Figure3, which clearly illustrates the relative abundance of each category within the studied plant community.

This classification system, developed by Raunkiaer, emphasizes that the growth and development of higher plants are primarily dependent on the initiation and location of their meristematic tissues or apices. By categorizing the plants according to their 'life forms', the researchers can gain valuable insights into the adaptive strategies and ecological characteristics of the plant community in the study area.

The application of this life form classification, in conjunction with the other methodological approaches employed, provides a comprehensive understanding of the vegetation dynamics and the underlying environmentalfactors shaping the plant community in the region.

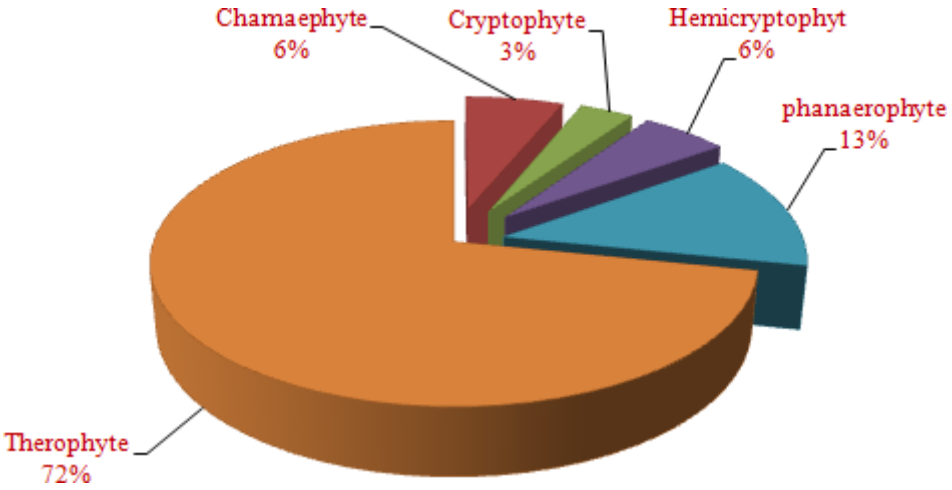

Figure 3: Life- form spectrum of in the recorded species in Al-salqa Wadi.

Species cover-abundance scale

The Al Berka Location

The Al Berka location is represnted by two quadrates as follows:

The Wadi open **field, quadrate (A_1)**

Table 4 represented the cover-abundance of the Wadi open field (A_1). Species cover-abundance was the best in Winter and Spring seasons, the most abundant species were *Atriplex semibaccata R. B. and Chenopodium murale,* while *Datura innoxia* Mill., *Amaranthus blitum* L., *Datura stramonium* L., *Cenchrus echinatus* L. and *Erigeron bonariensis* L. represented the best cover abundance in summer season with range 25%, 40%, 30%, 44% and 14% respectivily.

The least abundant plant species in the three seasons Winter, Spring and Summer are, *Artemisia monosperma* Delile *and Cichorium endivia* L. with an abundance value ranged from of three individual species to one individual per quadrate of the Wadi open field of Al Berka location. A total of 24 species belonging to 20 genera and 12 families in the A1 quadrate were occurred.The best represented families were the

Asteraceae (7 genera and 7 species), Followed by Chenopodaceae (3genera and 4 species),poaceae (2genera and 2 species) and Solanaceae, Amaranthaceae, Geraniaceae (1genera and 2 species) for every one . On the other hand there are other families were represented only by one species.

Table 4: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa WadiOpen Field of El Berka location A1.

No.	list of Species	Cover-abundance scale		
		winter	spring	summer
1	*Amaranthus blitum* L.	1	3	3
2	*Amaranthus spinosus* L.	+	1	1
3	*Anagallis arvensis* L.	+	2	r
4	*Anchusa aegyptiaca(L.)*DC.	+	r	r
5	*Artemisia monosperma* Delile	r	+	+
6	*Atriplex semibaccata* R. Br.	2	4	r
7	*Calendula arvensis(vaill.)* L.	+	1	r
8	*Casuarina glauca sieber ex spreng.*	r	r	r
9	*Carpobrotus edulis (L.)*N.E.Br.	+	2	+
10	*Chenopodium chenopodioides* (L.)Aellen	+	1	+
11	*Chenopodium murale* L.	2	4	3
12	*Cenchrus echinatus* L.	2	3	3
13	*Carduus getulus* pomel	1	2	r
14	*Cichorium endivia* L.	r	+	r
15	*Crebis aspera* L.	1	2	r
16	*Datura innoxia* Miller	+	2	3

17	*Datura stramonium* L.	+	2	3
18	*Diplotaxis erucoides* (L.) DC.	2	2	r
19	*Emex spinosa* (L.) Campd.	1	2	r
20	*Erigeron bonariensis* L.	1	2	2
21	*Erodium moschatum* (L.)L' Her	1	1	r
22	*Erodium touchyanum* Delile	+	+	r
23	*Glebionis coronaria* (L.) Cass.ex Spach	+	1	r
24	*Lamium amplexicaule* L.	+	+	r

The Wadi Open Feild, quadrate (A_2)

Table 5 represented the cove-abundance scale in the Wadi open field (A_2).
Species cover abundance ranged from 1% in Spring and Winter for two species to 100% for another species, the most abundant, *Urtica pilulifera* L. followed by *Senecio glaucus L.* 75% in Winter to 96% in Spring and *Malva parviflora* L .60,73% in Winter and Spring respectively. The least abundant plant species is *Plantago coronopus* L. and *Vicia sativa* L. with an abundance value of one individual species per quadrate. A total of 21 species belonging to 17 genera and 12 families are recorded in the Wadi Open Field.
The best represented families were the Asteraceae (4 genera and 5 species), Fabaceae (4genera and 4 species), Urticaceae (1genera and 3species. On the other hand, there are other families were represented only by one species (Malvaceae, Labiate, Aizaceae, Solanaceae, Oxalidaceae, Plantagonaceae, poaceae, Polygonaceae and Brassicaceae.

Table 5: Cover-abundance (Braun-Blanquet) of the recorded species in Al-salqa WadiOpen Field of El Berka location A2.

NO.	list of Species	Cover-abundance scale		
		Winter	spring	Summer
1	*Malva parviflora* L.	4	4	r
2	*Marrbium vulgare* L.	+	2	r
3	*Medicago truncatula* Gaertn.	2	2	r
4	*Melilotus sulcatus* Desf.	1	4	r

5	*Mesembryanthemum crystallinum* L.	1	2	r
6	*Nicotiana glauca* Graham	1	1	1
7	*Oxalis pes-caprae* L.	+	+	+
8	*Plantago coronopus* L.	r	r	r
9	*Polypogon monspeliensis(L.)*Desf.	1	1	r
10	*Rumex pictus* forssk.	+	+	r
11	*Scolymus hispanicus* L.	+	+	r
12	*Senecio glaucus* L.	4	5	r
13	*Senecio vulgaris* L.	+	r	r
14	*Sinapis alba* L.	2	3	1
15	*Trifolium bullatum* Boiss.& Hausskn	+	+	r
16	*Urtica dioica* L.	3	4	r
17	*Urtica pilulifera* L.	5	5	1
18	*Urtica urens* L.	1	1	r
19	*Vicia sativa* L.	r	r	r
20	*Xanthium spinosum* L.	1	2	2
21	*Xanthium stramarium* L.	r	1	1

The Abou Fiaad location

The Abou Fiaad location is represented by one quadrate, the Wadi Buttom.

Table 6 represented cover-abundance scale in Wadi Buttom (B). Species cover-abandance ranged from 1% for two species to 100% for three species species in Winter and Spring seasons, the most abundant species were. *Arundo donax* L., *Cynodon dactylon* (L.) Pers and *Silybum marianum* (L.) Gaerth with an abundance percentage (100%).The least abundant plant species are *Matthiola arborescens* and *Opuntia stricta var.dillenii (*Ker-Gawl.) *L.* Benson with an abundace value of one individual species per quadrate of the Wadi Buttom of Abou Fiaad location. A total of 26 species belonging to 24 genera and 13families in the (B) quadrate were occurred

.The best represented families were the Fabaceae (5 genera and 5 species), Asteraceae (4genera and 4 species), Poaceae (4genera and 4 species), Polygonaceae (2genera and 2 species) and Urticaceae (1genera and 3 species). On the other hand, there are other families were represented only by one species (Chenopodiaceae, Brassicaceae, Cactaceae, Apiaceae, Araceae, Rosacea, Fumariaceae and Rhamnaceae).

Table 6: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa WadiAbou Fiaad location

	List Of Species	cover-abundance scale		
		Winter	Spring	Summer
1	*Acacia farnesiana* (L.) willd	+	+	+
2	*Alhagi graecorum* Boiss.	+	r	r
3	*Anethum graveolens* L.	+	+	r
4	*Arisarum vulgare* O .Targ-Tozz.	1	1	r
5	*Arundo donax* L.	5	5	5
6	*Avena wiestii* steud .	2	2	r
7	*Cetaurea hyalolepis* Boiss.	1	2	r
8	*Chenopodium murale* L.	2	3	r
9	*Cynodon dactylon* (L.)Pers	5	5	5
10	*Emex spinosa* (L.)Campd	2	2	r
11	*Fumaria capreolata* L.	+	+	r
12	*Hordeum glaucum* Steud .	3	3	r
13	*Matthiola arborescens*	r	r	r
14	*Matricaria recutita* L .	+	1	r
15	*Medicago littoralis* Loisel	+	2	r
16	*Melilotus sulcatus* Desf.	2	2	r
17	*Onobrychis crista-galli (*L.)lam	1	1	r
18	*Opuntia stricta var.dillenii (*Ker-Gawl.) L.Benson	r	r	r
19	*Polygonum equisetiforme* Sm.	+	+	+
20	*Rubus sanctus* Schreb.	+	+	+
21	*Silybum marianum* (L.)Gaerth	5	5	r
22	*Urtica membranacea* poir	3	3	r
23	*Urtica pilulifera* L.	3	4	r
24	*Urtica urens* L.	1	1	r
25	*Verbesina encelioides* (Cav.) Benth & Hook .f. ex Gray .	2	2	2
26	*Ziziphus spina-christi* (L.) Desf.	1	1	1

Al Mashaala location The Mashaala location is represented by the Wadi Bank quadrate.

The Wadi Bank, quadrate (C)

Table 7 represented cover-abundance in the Wadi Bank (C)**.**
Species cover-abundance ranged from 1% for two species to 60% for one species in Summer seasons. The most abundant plant species were *Urtica pilulifera* L. (60%), *Solanum elaegnifolium* Cav. (40%), also the Summer season is the best for *Solanum elaegnifolium* Cav. growth. The least abundant plant is *Crucianella latifolia* L. and *Plantago afra* L. with an abundance one individual species per quadrat of the Wadi Bank of Al Bahar location.
A total of 25 species belonging to 23 genera and 14 families in the (C) quadrate were occurred. The best represented families were the Solanaceae (5 genera and 6 species), Asteraceae (4genera and 4 species), Poaceae (2 genera and 2 species), Chenopodiaceae (1genera and 2 species) and Euphorbaceae (2 genera and 2 species).
On the other hand, there are other families were represented only by one species (Plantagonaceae, Cactaceae, Moraceae, Urticaceae, Boragenaceae, Aizoaceae Cupressaceae, Cyperaceae and Tamaricacea).

Table 7: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa WadiAl-mashaala location (C).

	list of Species	Cover-abundance scale		
		Winter	spring	Summer
1	*Arundo donax* L.	*2*	2	2
2	*Cetaurea hyalolepis* Boiss	*1*	2	r
3	*Chenopodium murale* L.	*2*	3	3
4	*Chenopodium vulvaria* L.	+	1	1
5	*Crucianella latifolia* L.	*r*	r	r
6	*Cupressus sempervirens* L.	+	+	+
7	*Cutandia dichotoma* (Forssk.) Trab.	*1*	2	r
8	*Cypreus laevigatus* L.	+	3	3
9	*Euphorbia peplus* L.	*1*	2	2
10	*Ficus Sycomorus* L.	+	+	+
11	*Hormuzakia aggregate(*Lehm.)Gusuleac	+	1	r
12	*Lycium schweinfurthii* Dammer	*1*	1	1
13	*Matricaria recutita* L.	*1*	1	r
14	*Mesembryanthemum crystallinum* L.	*2*	2	r
15	*Nicotiana glauca* Graham	*1*	2	2
16	*Opuntia ficus indice(*L.)P.Mill	*2*	2	2
17	*Plantago afra* L.	*r*	r	r
18	*Ricinus communis* L.	*1*	1	1

19	*Silybum marianum* (L.) Gaerth	*2*	3	r
20	*Solanum elaegnifolium* Cav.	*3*	4	5
21	*Solanum nigrum* L.	+	+	r
22	*Tamarix jordanis*	*1*	1	1
23	*Urtica pilulifera* L.	*4*	5	r
24	*Withania somifera*(L.)DunaL.	*1*	2	2
25	*Xanthium spinosum* l..	*2*	2	2

Am AL-osban location

Am AL-osban location is represented by the Wadi Bank quadrate.

The Wadi Bank**, quadrate (D):**

Table 8 represented cover-abundance in the Wadi Bank (C)**.**

Species cover-abundance ranged from 4% for two species to 50% for one species in Winter and Spring seasons. The most abundant plant species were *Urtica pilulifera* L. (50%), *Cynodon dactylon* (L.) Pers (45%). The least abundant plant is *Silene Colorata* Poir**.** and *Mercurialis annua* L. with an abundance 4 individual species per quadrate of the Wadi Bank. A total of 20 species belonging to 20 genera and 12 families in the (D) quadrate were occurred. The best represented families were the Asteraceae (4genera and 4 species), Caryophallaceae (3 genera and 3 species), Poaceae (2genera and 2 species), and Euphorbaceae (2 genera and 2 species). On the other hand, there are other families were represented only by one species (Fabaceae, Solanaceae, Malvaceae, Urticaceae, Boragenaceae, polygonaceae, Fumariaceae and Asparagaceae).

Table 8: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa WadiAm al-ozban location(D).

	list of Species	over-abundance scale		
		Winter	spring	Summer
1	*Arundo donax* L.	2	2	2
2	*Asparagus horridus* L.	+	+	r
3	*Calendula arvensis*(vaill.)L.	1	1	r
4	*Carduus getulus* pomel	1	2	r
5	*Cynodon dactylon*(L.)Pers	3	5	5
6	*Emex spinosa* (L.)Campd	2	2	r
7	*Fumaria parviflora* lam .	1	1	r
8	*Hormuzakia aggregate* (Lehm.)Gusuleac	1	1	r

9	*Lotus glaber* Mill.	1	1	r
10	*Malva parviflora* L.	1	2	r
11	*Matricaria aurea* (loefl.)Sch.Bip	+	+	r
12	*Mercurialis annua* L.	+	+	r
13	*Paronychia argenta* Lam.	+	+	r
14	*Polycarbon succulentum* (Delile) j.Gay	1	2	r
15	*Ricinus communis* L.	1	1	1
16	*Silene Colorata* Poir.	+	1	r
17	*Solanum elaegnifolium* Cav.	2	4	5
18	*Sonchus oleraceus* L.	1	2	2
19	*Urtica dioica* L.	2	3	2
20	*Urtica pilulifera* L.	3	4	r

Bobaa location

Bobaa location is represented by the Wadi Bottom quadrate.

The Wadi Bottom**, quadrate (E)**

Table 9 represented cover-abundance in the Wadi Bottom(E).
Species cover-abundance ranged from 2% for three species to 80% for one species in Winter and Spring seasons. The most abundant plant species were *Cynodon dactylon(*L.)Pers (80%), *Atriplex halimus* L. (30%). The least abundant plant is *Chenopodium polyspermum* L., *Portulaca oleracea* L. and *Euphorbia terracina* L. with an abundance two individual species per quadrat of the Wadi Bottom of Bobaa location. A total of 28 species belonging to 27 genera and 14 families in the (E) quadrate were occurred. The best represented families were the Asteraceae (5genera and 5 species), Poaceae (5genera and 5 species), Solanaceae (4genera and 4 species), Chenopodiaceae (3genera and 4 species) and (2genera and 2 species). On the other hand, there are other families were represented only by one species (Fumariaceae, Euphorbaceae, Moraceae, Labiate, Portulaceae, Cyperaceae, Scrophulariaceae, Rhamnaceae and Tamaricacea).

Table 9: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa WadiBobaa location

list of Species		Cover-abundance scale		
		Winter	Spring	Summer
1	*Alhagi graecorum* Boiss.	+	1	1
2	*Arundo donax* L.	2	2	2

3	*Atriplex halimus* L.	3	3	3
4	*Chenopodium vulvaria* L.	1	1	1
5	*Chenopodium polyspermum* L.	+	+	r
6	*Cynodon dactylon*(L.)Pers	5	5	5
7	*Cypreus rotundus* L.	+	1	r
8	*Euphorbia terracina* L.	+	+	+
9	*Datura innoxia* Miller	1	1	1
10	*Erigeron bonariensis* L.	1	2	2
11	*Ficus Sycomorus* L.	1	1	1
12	*Fumaria parviflora* lam .	1	2	r
13	*Hordeum glaucum* Steud .	2	3	r
14	*Lolium rigidum* Gaudin	3	3	r
15	*Marrbium vulgare* L.	2	2	r
16	*Matricaria recutita* L.	1	1	r
17	*Nicotiana glauca* Graham	1	1	1
18	*Poa annua* L.	1	1	r
19	*Portulaca oleracea* L.	+	+	+
20	*Salsola kali* L.	2	2	2
21	*Solanum elaegnifolium* Cav.	2	4	5
22	*Silybum marianum* (L.) Gaertn	2	2	r
23	*Tamarix jordanis* Boiss.	1	1	1
24	*Verbascum sinuatum* L.	+	+	+
25	*Verbesina encelioides (*Cav.)Benth & Hook .f. ex Gray.	1	2	2
26	*Withania somifera* (L.)DunaL.	+	1	1
27	*Xanthium stramarium* L.	1	1	1
28	*Ziziphus spina-christi* (l..) Desf	1	1	1

Salah Aldeen location

Salah Aldeen location is represented by the Wadi Bank quadrate.

The Wadi **bank, quadrate (F)**

Table 10 represented cover-abundance in the Wadi bank (F). Species cover- abundance ranged from 2% for four species to 30% for two species in Winter and Spring seasons, the most abundant plant species were *Verbascum sinuatum* L. and *Urtica pilulifera* L. (30%), *Atriplex* semibaccata R. Br. (20%) and Datura innoxia miller (15%). The Summer season is the best for *Verbascum sinuatum* L. growth. The

least abundant plant is *Anchusa aegyptiaca* (L.) DC., *Galium aparine* L., *Aegilops bicornis* (Forssk.) Jaub.& spach. and. *Scolymus moculatus* L. with an abundance two individual species per quadrat of the Wadi bank of Salah Aldeen location.
A total of 27 species belonging to 27 genera and 16 families in the (F) quadrate were occurred. The best represented families were the Brassicaceae (5genera and 5 species) Asteraceae (3 genera and 3 species), Poaceae (3 genera and 3 species), Boraginaceae(2 genera and 2 species), Scrophulariaceae (2 genera and 2 species) and Solanacea (2 genera and 2 species). On the other hand, there are other families were represented only by one species (Plantagonaceae, Euphorbaceae, Papaveraceae, Fabaceae, Rubiaceae, Cacctaceae, Aizoaceae, Urticaceae, Cyperaceae, and Chenopodiaceae).

Table 10: Cover-abundance (Braun-Blanquet) of the collected species in Al-salqa Wadi Salah Aldeen location.

	Species	Cover-abundance scale		
		Winter	Spring	Summer
1	*Aegilops bicornis* (Forssk.) Jaub.& spach.	+	+	r
2	*Anchusa aegyptiaca* (L.) DC.	+	1	*r*
3	*Artemisia monosperma* Delile	+	1	r
4	*Arundo donax* L.	2	2	2
5	*Atriplex semibaccata* R. Br.	2	2	r
6	*Brassica tournefortii* Gouan	1	2	r
7	*Cakile maritime* Scop.	1	1	1
8	*Carthamus tenuis* (Boiss.& Blenche)Bornm	+	1	1
9	*Cypreus alternifolius* L.	+	1	1
10	*Datura innoxia* miller	2	2	2
11	*Echium angustifolium* Mill.	1	2	2
12	*Erucaria rostrata* (Boiss.) A.w. Hill	1	2	r
13	*Galium aparine* L	+	+	r
14	*Hordeum glaucum* Steud .	1	2	r
15	*Medicago polymorpha* L	1	2	r
16	*Mercurialis annua* L.	1	1	r
17	*Mesembryanthemum crystallinum* L.	1	2	r
18	*Nicotiana glauca* Graham	1	1	1
19	*Opuntia ficus indice*(L.)P.Mill	1	1	1
20	*Papaver umbonatum* Boiss.	+	1	r
21	*Plantago lagopus* L.	+	1	r

22	*Scolymus moculatus* L.	+	+	r
23	*Sinapis alba* L.	+	1	r
24	*Sisymbrium orientale* L.	1	1	r
25	*Verbascum sinuatum* L.	1	3	3
26	*Veronica persica* Poir .	1	2	r
27	*Urtica pilulifera* L.	2	3	r

Species Frequency Percent:

Frequency percentage and cover-abundance of each species were calculated in the seven quadrates (Table 11). The analysis of species abundance indicated that *Urtica pilulifera* L. and *Arundo donax* L. expressed the highest species frequency (71.42%), followed by two species *Matricaria recutita* L., *Nicotiana glauca* Graham (frequency 57.14%), and six species, *Hordeum glaucum* Steud., *Chenopodium murale* L., *Cynodon dactylon*(L.)Pers , *Datura innoxia* miller, *Silybum marianum (L.) Gaerth*, *Emex spinosa* (L.) Campd (frequency 42.85%), 72 species (frequency 14.28%), 27 species(frequency 28.75 %) .

Chorological affinities

Results of the total chorological analysis of the surveyed flora, presented in Figure 4 revealed that 70 species (50% of the total flora) are monoregional, of which 15 species (57.14%) are native to the Mediterranean region, Saharo-Arabian chorotype ranked second with 18.6%. About 28.6% of the recorded species are biregional and 21.4% pluriregional. Mediterranean, Irano-Turanian and Saharo-Arabian extending their distribution all over the regions. Thus, it forms the major component of the floristic composition of this study (Table 12).

Table 11: List of family, species, chorotypes and frequency of Al-salqa Wadi area.

NO.	Species	Chorotype	Freq.
1	Aizoaceae		
	Carpobrotus edulis (L.)N.E.Br.	South Africa	14.28
	Mesembryanthemum crystallinum L.	ME-ES	28.75
2	Amaranthaceae		
	Amaranthus blitum L.	T	14.28
	Amaranthus spinosus L.	A	14.28
3	Apiaceae		
	Anethum graveolens L.	ME	14.28
4	Araceae		
	Arisarum vulgare O .Targ-Tozz.	ME	14.28
5	Asparagaceae		
	Asparagus horridus L.	ME-SA	14.28
6	Asteraceae		
	Artemisia monosperma Delile	SA	28.75
	Cetaurea hyalolepis Boiss.	ME-IT	28.75
	Carduus getulus pommel	SA	28.75
	Calendula arvensis (vaill.)L.	ME-IT	28.75

	Cichorium endivia L.	ME-IT	14.28
	Carthamus tenuis (Boiss.& Blenche)Bornm.	ME	14.28
	Crepis aspera L.	ME	14.28
	Erigeron bonariensis L.	A	28.75
	Echinops philistaeus Feinbrun & zohary.	ME	14.28
	Glebionis coronaria	ME	
	Matricaria aurea (loefl.)Sch.Bip.	ME-IT	14.28
	Matricaria recutita L .	ES-ME-IT	57.14
	Silybum marianum (L.)Gaerth.	ME-IT	42.85
	Sonchus oleraceus L.	ES-ME-IT	14.28
	Senecio glaucus L.	ME-IT	28.75
	Scolymus hispanicus L.	ME	14.28
	Scolymus moculatus L.	ME	14.28
	Senecio vulgaris L.	ES-ME-IT	14.28
	Verbesina encelioides (Cav.)Benth & Hook .f. ex Gray .	A	28.75
	Xanthium spinosum L.	PL-T	28.75
	Xanthium stramarium L.	PL-T	28.75
7	Borginaceae		
	Echium angustifolium Mill.	ME	14.28
	Hormuzakia aggregate	ME	28.75
	Anchusa aegyptiaca(L.)DC.	SA	14.28
8	Brassicaceae		
	Brassica tournefortii Gouan	ME-SA	14.28
	Cakile maritime Scop.	ME-ES	14.28
	Diplotaxis erucoides (L.)DC.	ME	
	Eruca vesicaria subsp .sativa(Mill)	ME-IT	
	Erucaria rostrata (Boiss.) A.w. Hill	SA	14.28
	Lobularia arabica (Boiss.) Muschl.	SA	
	Matthiola arborescens	ME	14.28
	Matthiola livida (Delile.)DC.	SA	
	Sinapis alba L.	ES-ME-IT	28.75
	Sisymbrium orientale L.	ME-IT	14.28
9	Cactaceae		
	Opuntia ficus-indice (L.)P.Mill.	Indianan	28.75
	Opuntia stricta var.dillenii (Ker-Gawl.) L.Benson.	A	14.28
10	Caryophyllaceae		
	Paronychia argentea Lam.	ME	14.28
	Polycarbon succulentum (Delile) J.Gay	ME	14.28
	Silene Colorata Poir.	ME	14.28
	Spergularia bocconei (scheele)Graebn.	ME-ES	
11	Casuarinaceae		
	Casuaina glauca sieber ex spreng.	AU	14.28
12	Chenopodiaceae		
	Atriplex halimus L.	ME-SA	14.28
	Atriplex semibaccata R. Br.	AU	28.75
	Chenopodium chenopodioides (L.)Aellen	PL-T	14.28
	Chenopodium murale L.	PL-T	42.85
	Chenopodium polyspermum L.	ES-ME-IT	14.28
	Chenopodium vulvaria L.	ES-ME-IT	28.75
	Salsola kali L.	ME	14.28

13	Cupressaceae		
	Cupressus sempervirens L.	ME	14.28
14	Cyperaceae		
	Cyperus alternifolius L.	Cool tropical	14.28
	Cyperus rotundus L.	Subtropical/Tropical	14.28
	Cyperus laevigatus L.	ME-IT-SA	14.28
15	Euphorbiaceae		
	Chrozophora tinctorria (L.)A.Juss.	ME-IT	
	Euphorbia peplus L.	ES-ME-IT	14.28
	Euphorbia terracina L.	ME	14.28
	Mercurialis annua L.	ME-IS	14.28
	Ricinus communis L.	Subtropical/Tropical	28.75
16	Fabaceae		
	Acacia farnesiana (L.) willd	A	14.28
	Acacia saligna (Labill.)Wendl.f.	AU	
	Alhagi graecorum Boiss.	ME-IT	28.75
	Lotus glaber Mill.	ME-ES	14.28
	Lotus cytisoides L.	ME	
	Medicago littoralis	ME	14.28
	Medicago polymorpha L	ES-ME-IT	14.28
	Medicago truncatula	ME	
	Melilotus sulcatus Desf.	ME	28.75
	Onobrychis crista-galli(L.) lam.	SA	14.28
	Trifolium bullatum Boiss.& Hausskn.	ME	14.28
	Trigonells arabica Delile.	SA	
	Vicia sativa L.	ME	14.28
17	Fumariaceae		
	Fumaria capreolata L.	ME-ES	14.28
	Fumaria parviflora lam .	ES-ME-IT	28.75
18	Geraniaceae		
	Erodium touchyanum Delile ex Godr.	SA	14.28
	Erodium laciniatum (Cav.)willd.	ME	
	Erodium malacoides (L.)L'Her.ex Ait.	ME-IT	
	Erodium ciconium(L.)L'Her.ex Ait.	ME-IT	
	Erodium moschatum(L.)L'Her.ex Ait.	ME-IT	14.28
	Geranium rotundifolium L.	ES-ME-IT	
19	Labiate		
	Lamium amplexicaule L.	ES-ME-IT	14.28
	Marrbium vulgare L.	ME-IT	28.75
20	Lythraceae		
	Punica granatum L.	Exotic	
21	Malvaceae		
	Malva parviflora L.	ME-IT	28.75
	Abelmoschus esculentus (L.) Moench	Exotic	
22	Moraceae		
	Ficus carica L.	ME-IT	
	Ficus Sycomorus L.	Tropical	28.75
23	Oleaceae		
	Olea europaea L.	ME	
24	Orobanchaceae		

	Orobanche cernua Loefl .	ME-IT-SA	
25	Oxalidaceae		
	Oxalis pes-caprae L.	PLT	14.28
	Oxalis corniculata L.	PLT	
26	Papaveraceae		
	Papaver humile Fedde	SA	
	Papaver umbonatum Boiss.	ME	14.28
27	Plantaginaceae		
	Plantago coronopus L.	IT-SA	14.28
	Plantago afra L.	ME-IT	14.28
	Plantago lagopus L.	ME	14.28
28	Palmae		
	Phoenix dactylifera L.	SA	
29	Poaceae(Graminae)		
	Aegilops bicornis (Forssk.)Jaub.& spach.	SA	14.28
	Arundo donax L.	ME-IT	71.42
	Avena wiestii steud .	IT-SA	14.28
	Bromus rigidus Roth.	ME	
	Cenchrus echinatus L.	A	14.28
	Crypsis schoenoides (L.) lam.	ES-ME-IT	
	Cutandia dichotoma (Forssk.) Trab.	IT-SA	14.28
	Cynodon dactylon (L.)Pers.	PL-T	42.85
	Elytrigia juncea(L.)Nevs K.	ME	
	Hordeum glaucum Steud .	ME-IT	42.85
	Lolium rigidum Gaudin	ME-IT	14.28
	Phalaris paradoxa L.	ME-IT	
	Poa annua L.	ES-ME-IT	14.28
	Polypogon monspeliensis (L.)Desf.	ME-IT-SA	14.28
	Triticum aestivum L.	Exotic,planted, Escaped from caltivation	
	Rostraria pumila (Desf.)Tzvelev	IT-SA	
30	Polygonaceae		
	Emex spinosa (L.)Campd.	ME	42.85
	Polygonum equisetiforme Sm.	ME-IT	14.28
	Rumex pictus forssk.	ME	14.28
31	Portulaceae		
	Portulaca oleracea L.	PL-T	14.28
32	Primulaceae		
	Anagallis arvensis L.	ES-ME-IT	14.28
	Anagallis Feomina Mill	ME-ES	
33	Rhamnaceae		
	Ziziphus spina-christi (l.) Desf.	Sudanian	14.28
34	Rosaceae		
	Rubus sanctus Kuntze	ME	14.28
	Prunus amygdalus Stokes	ME	
35	Rubiaceae		
	Crucianella latifolia L.	ME	14.28
	Galium aparine L.	ES-ME-IT	14.28
36	Scrophulariaceae		
	Verbascum sinuatum L.	ME-IT	28.75

	Veronica persica Poir .	IT	14.28
37	Solanaceae		
	Datura innoxia Miller	PL-T	42.85
	Datura stramonium L.	PL-T	14.28
	Lycium schweinfurthii Dammer	ME	14.28
	Lycopersicon esculentum	Exotic	
	Nicotiana glauca Graham	PL-T	57.14
	Solanum elaegnifolium Cav.	A	24.85
	Solanum nigrum L.	ES-ME-IT	14.28
	Withania somifera(L.)Dunal.	ME-IT	28.75
38	Tamaricaceae		
	Tamarix jordanis	ME	28.75
39	Urticaceae		
	Urtica dioica L.	ME	28.75
	Urtica membranacea poir	ME	14.28
	Urtica pilulifera L.	ES-ME-IT	71.42
	Urtica urens L.	ME-ES	28.75
40	. Verbenaceae		
	Lantana camara L..	Exotic,planted,Escaped from caltivation	

ME: Mediterranean,ES: Euro-Siberian, IT: Irano-Turanian,SA: Saharo-Arabian, Au:Asturalian, A:American, IS: Irano-Siberian, PL-T:plurireginalbor-tropical.

Table 12: List of Chorotype, species No. and percentage of Al-salqa Wadi area.

Chorotype	Species NO.	Percent %
ME	40	28.6
SA	13	9.3
ME-SA	3	2.1
ME-IT	24	17.1
A	7	5
ES-ME-IT	17	12.1
PL-T	11	7.9
AU	3	2.1
ME-ES	6	4.3
Subtropical-tropical	2	1.4
Tropical	3	2.1
IT-SA	4	2.9
S	1	0.7
South African	1	0.7
IT	1	0.7
ME-IT-SA	2	1.4

Indianan	1	0.7
ME-IS	1	0.7

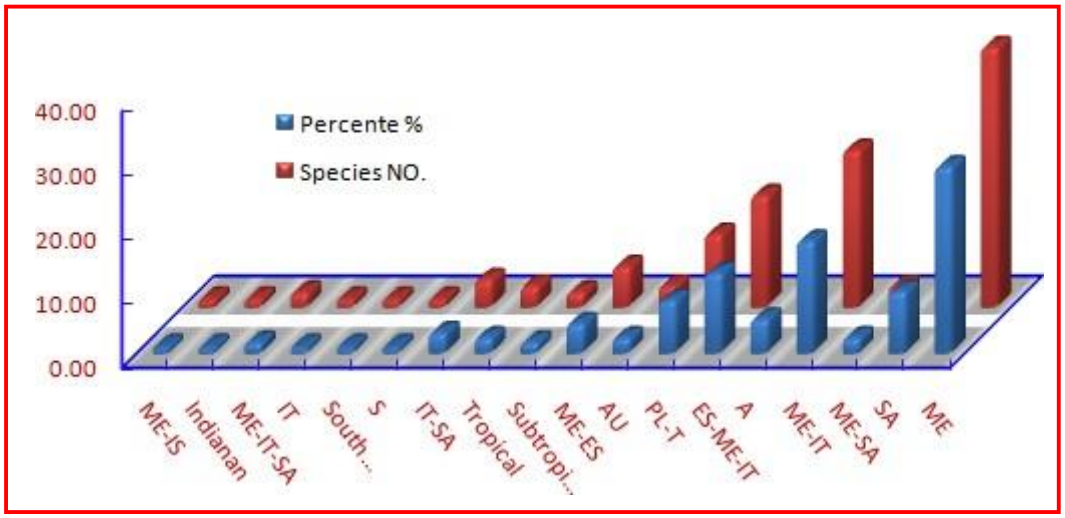

Figure 4: Chorological types affinities of flora in Al-salqa Wadi area.

Discussion

Floristic analysis

The flora of Palestine is remarkably diverse, encompassing a wealth of economically important plants, including vegetables, cereals, and fruit trees, which are essential components of the local agricultural system. Estimates suggest that the Palestinian flora comprises more than 2,750 species belonging to 138 families.

However, many of these plant species are facing threats of endangerment in their natural habitats due to various human activities, such as over-harvesting of wild species, expansion of buildings, and detrimental climatic and environmental changes (ARIJ, 2007). Over the past three decades, more than 600 species have been reported to suffer from population declines, with 90 species considered to be very rare, which poses a significant threat to their continued existence in the West Bank and Gaza (ARIJ, 2007).

Biodiversity has several key components, including the number of species and functional groups (species richness and functional group richness), the identity and composition of species, and the relative abundance of species and functional groups (Alhamad, 2006). In the case of historical Palestine, located in the heart of the Levant region, the combined influence of the moderating Mediterranean climate and the drying desert factor contribute to the remarkable floral diversity of the country (Budovsky and Fraifeld, 2012).

The current study, conducted in the Al-salqa Wadi area, recorded a total of 145 plant species belonging to 112 genera and 40 families. The most dominantfamilies were Asteraceae (21 species, 14.5%), Poaceae (16 species, 11%), Fabaceae (13 species, 6.9%), Solanaceae (8 species, 5.5%), and Chenopodiaceae (7 species, 4.8%). Other notable families represented in the study area include Geraniaceae, Euphorbaceae, Caryophyllaceae, Urticaceae, Polygonaceae, Plantaginaceae, Cyperaceae, Boraginaceae, Amaranthaceae, Primulaceae, Rubiaceae, Papaveraceae, Lamiaceae, Aizoaceae, Scrophulariaceae, Cactaceae, Fumariaceae, Rosaceae, Apiaceae, Araceae, Asparagaceae, Cupressaceae, Lythraceae, Oleaceae, Orobanchaceae, Rhamnaceae, Tamaricaceae, Casuarinaceae, Palmae, Verbenaceae, and Portulaceae.

This comprehensive analysis of the plant diversity in the Al-salqa Wadi area highlights the richness and significance of the Palestinian flora, while also underscoring the pressing need for conservation efforts to safeguard these valuable plant resources from the threats of human-induced disturbances and environmental changes.Boulos (1959) in his study on the flora of Gaza Strip, listed 251 species belonging to 46 families, the most represented families were Leguminosae (41 species 16.3%), Compositae (35 species 13.9%), Gramineae (32 species 12.7%) and Caryophyllaceae (13 species 5.2%), also Boulos findings are in agreement with similar findings on our study of the best occurrence of Compositae and Gramineae families. It is observed that 36 of the recorded species in our study similar to Boulos study, while we have recorded 109 species not included in the list species of Boulos (1959). Madi et al., (2002**)** in his study on flora of the costal sand dunes of Gaza Strip extends for about 45 kilometers from Rafah in the south to Gaza city in the north, listed 120 species belonging to 109 genera and 39 families, the most represented families were compositae (23 species 19.2 %), Leguminosae (9 species 7.5 %),
gramineae (9 species 7.58 5) and Solanceae (7 species 5.8 %). The most important comparative observation with our study included 89 species, more than Madi's listed species, belonging to the families Asteraceae, Poaceae and Fabaceae (Table 2, 13).

Abu Auda et al., 2009a in their study on flora of wadi Gaza extends for about nine kilometers from east to west, listed 219 plant species, belonging to 167 genera and 55 families. The most abundant Families were compositae, comprised 34 plant species (15.5%), Graminae 30 plant species (13.7 %) cruciferae (11 species 5%) and papilionaceae, 26 plant species (11.9 %). Abou Auda et al. 2009a findings are in agreement with similar findings on our study of the best occurrence of compositae, Graminae and cruciferae families. It is observed that 102 of the recorded species in our study similar to Abu Auda et al., 2009b study, while we have recorded 43 species not included in the list species of Abou Auda et al., 2009a. It is clear that our study area found among cities (Figure 1) and perhaps this is the reason of remarkably rich inplant species. This is in agreement with similar findings on urban floras which can be attributed to the fact that cities are remarkably rich in species because of a high habitat diversity (Gilbert, 1989), and enrichment by alien species (Kherissat, 2019). Plant species richness in cities is usually greater than in surrounding areas **(**Kuhn et al., 2004), and cities may harbor biodiversity hot spots and natural areas of a high wildlife value. The high diversity of urban landscapes, resulting from variable land use, create a great variety of ecological conditions for plants (Gilbert, 1989).

Table 13. Comparison between present study and relevant literature study in Gaza strip.

Previous Studies	Total of recorded species	Species included in the present study	New species included in the present study
Boulos (1959) - Gaza Strip	251	36	109
Madi *et al*., (2002) – Coastal sand dunes ofGaza Strip	120	31	89
Abou Auda et al., (2009a)	219	102	43

This indicates that the natural status of the area of Al-salqa Wadi is highly altered and suffers from the increasing rate of human population. A major problem associated with Wadis in Gaza Strip included, urbanization with increased building near those natural areas, discharge of untreated sewage and disposal of solid waste in the wadis coarse and loss of flow (e.g. Gaza Wadi) due to Israel interception (Khalafet al., 2006).

The introduction and invasion of alien species can have profound negative impacts on local biodiversity. This phenomenon, often referred to as "bio-pollution," has escalated in recent years due to the increased globalization and rapid movement of goods, fostering the spread of organisms through various means like ship ballast water, containers, and even traded commodities. Introduced species are a leading cause of recorded species extinctions, second only to habitat loss on a global scale (Simberloff, 1995).

Within the study area of the Al-salqa Wadi, five alien species were recorded: *Solanum elaegnifolium*, *Oxalis pes-caprae*, *Datura innoxia*, *Xanthium stramarium*, and *Emex spinosa* (L.) Campd. Among these, *Solanum elaegnifolium* stands out as a particularly concerning invasive species, with a high distribution across all locations in the study area.

Solanum elaegnifolium is known as a problematic colonizing invader from various parts of the world. Madi et al. (2002) have observed that it spreads rapidly, both sexually and vegetatively, along roadsides, creating dense populations that can now be found in gardens, fields, and orchards. Due to the species' rapid spread and regeneration, it poses significant threats to agricultural fields, necessitating further investigation and targeted management strategies.

Another notable alien species is *Emex spinosa* (L.) Campd, an annual plant from the Polygonaceae family that is native to the Mediterranean region. This monoecious species produces both aerial and subterranean propagules. The subterranean propagules are large, heavy, and spiny, positioned at the base of the plant near the root neck. These propagules do not disperse readily and typically germinate within the dead mother plant. In contrast, the aerial propagules are smaller, spiny, and develop at the nodes of the aboveground stem, allowing for easier dispersal(Shaltout et al., 2009).

The presence of these invasive alien species within the Al-salqa Wadi highlights the urgent need for proactive measures to address the threat they pose to thelocal biodiversity. Comprehensive monitoring, risk assessment, and targeted control strategies are essential to mitigate the negative impacts of bio-pollution and safeguard the ecological integrity of this valuable natural area.

Addressing the challenge of invasive species is a critical component of effective conservation and management efforts in the Al-salqa Wadi and beyond. By understanding the characteristics and impacts of these introduced species, appropriate management actions can be developed and implemented to protect the native flora and maintain the region's rich biodiversity.

Biological Spectrum and Chrological affinities

The phytogeographical analysis of the plant communities in the study area has revealed a high level of functional group diversity, encompassing trees, shrubs, grasses, and geophytes. This diverse composition is characteristic of arid and semi- arid regions, where the flora is often dominated by annual plants that are able to complete their life cycle within the relatively short favorable growth period.

The life form spectrum of the surveyed plants reflects this adaptation, with annuals comprising the majority at 72.2% of the recorded species. In contrast, the proportions of other life forms, such as phanerophytes (12.5%), chamaephytes (6.2%), hemicryptophytes (5.51%), and cryptophytes (3.4%), are relatively lower. This dominant presence of annuals in the plant community is a testament to their ability to thrive in the prevailing Mediterranean arid climate.

Furthermore, the Mediterranean arid climate has exerted a significant evolutionary force, shaping the resistance of plant species to grazing impact and their adaptations to different life-forms. Generally, plants with buds higher off the ground, such as phanerophytes and chamaephytes, are more sensitive to trampling than those with buds at or in the ground, like hemicryptophytes and geophytes (Liddle, 1975).

In contrast, the life form spectrum in the Eastern desert of Egypt, a region characterized by an arid desert climate, is dominated by chamaephytes (31% of the recorded species) and therophytes (28%), followed by hemicryptophytes and phanerophytes (19% each) (Salama et al., 2013).

The flora of the Al-salqa Wadi can be categorized into four phytogeographical groups: (1) Mediterranean species, distributed around the Mediterranean Sea; (2)Irano-Turanian species; (3) Saharo-Arabian species, also found in the Sahara, Sinai, and the Arabian deserts; and (4) Euro-Siberian species. Additionally, several bi-regional, tri-regional, and multi-regional species are present, growing in more than one of the aforementioned regions.

The phytogeographical analysis of the study area revealed that 93 species (66.4% of the total recorded species) are Mediterranean, 48 are Irano-Turanian (34.2%), 22 are Saharo-Arabian (15.7%), and 23 are Euro-Siberian (16.4%). The Mediterranean taxa represent the highest proportion among the mono-regional chorotypes, accounting for 57.1% of the recorded species.

This comprehensive phytogeographical assessment underscores the unique blend of plant communities in the Al-salqa Wadi, which has been shaped by the interplay of the Mediterranean and arid climatic influences, resulting in a diverse and adaptable flora.

Species cover–abundance scale

At the study area (Al-salqa Wadi), we collected the specimens from three separated locations on Wadi area Buttom, Bank and Open Field alongside the Wadi. The collection starts from Salah al-deen location characterized by high Banks, then the Al Berka location characterized by low and water rafting, that mean there were a different moisture at the soil of the wadi, soil characteristic and weather condition effective to the vegetation composition. The unique vegetation diversity in our study area may be resulting from the effect of various factors such as sewage water and solid waste which create a great variety of ecological condition for plants.

At Al Berka location, two quadrates were chosen, the first quadrate on Wadi Open Field (A1). In this quadrate the high value cover abundance scale was (4) for *Atriplex semibaccata* R.B. and *Chenopodium murale* in Spring season only (Table 4), compared with the second quadrate on Wadi Open Field (A2), the high value of cover abundance scale was (5) for *Urtica pilulifera* L. in Spring and Winter seasons, while *Senecio glaucu*s L. and *Malva parviflora* L. have the high value (4) in Winter season (Table 5).

In general, the period from May to June (i.e. Spring season) was characterized by the highest number of flowering species, while that January and February was the reverse. Phenological events in desert plants are triggered mainly by rainfall and suitable temperature, although the photo period is probably important for some species. The desert plants are capable of rapid growth where conditions are favorable, and they become stay dormant or inactive, or may have a delayed start of growth where soil moisture is low or temperatures are extreme (Ackerman et al., 1980).

In our study, the highest humidity period of the year extends from November to March which is associated with relatively low temperature leading to a much favorable soil moisture, during this period the recorded plants of present study, start their growth activity reaching to the flowering and fruiting stages in April and May (show the Tables 4-10). Arid and semi-arid regions often showcase a rich diversity of annual plants that have adapted to complete their entire life cycle within a brief periodof favorable growth conditions. These environments are marked by prolonged periodsof drought and high temperatures, which severely limit plant growth from late spring through early autumn. Such harsh climatic conditions typically favor short-lived life forms, especially annuals. These annual plants have evolved to take advantage of the limited window of optimal growing conditions, rapidly germinating, flowering, and setting seed before the onset of extreme weather conditions. This adaptation strategy allows them to survive and reproduce in environments where perennial plants might struggle. According to Zohary (1972), these regions see a proliferation of these resilient annual species, which play a crucial role in the local ecosystem by stabilizingsoil, providing food for herbivores, and contributing to the overall biodiversity.

In our study the summer season was characterized by less abundant flora, compared with other seasons (winter and spring). *Cynodon dactylon* (L.) Pers., *Arundo donax* L. and *Solanum elaegnifolium* Cav., were the most abundance species with value (5), followed by *Chenopodium murale* L., Datura sp., *Xanthium stramarium* L. and *Verbesina encelioides* (Cav.) Benth & Hook .f. ex Gray.

Al Berka quadrate (present near cultivated fields) was the high biodiversity plant species richness (62 taxa) while Salaheldeen quadrate was the lowest. These variations of the plant species richness might be caused by, various slope degree among the quadrates alongside the Wadi may be influence moisture availability.Furthermore, the increasing number of the weeds of urban habitats in a certain area reflects the degree of human impact, the so-called, degree of artificilization. Table 14 shows the comparison between the cover and abundance measures of species indifferent locations in Wadi Al-Salqa.

Table 14: Comparison of Species Cover-Abundance Scale in Different Locations of Al-salqa Wadi

Location	Quadrate	Season	Species	Cover-Abundance Scale
Al Berka	A1	Spring	*Atriplex semibaccata* R.B.	4
		Spring	*Chenopodium murale*	4
Al Berka	A2	Spring/Winter	*Urtica pilulifera* L.	5
		Winter	*Senecio glaucus* L.	4
		Winter	*Malva parviflora* L.	4
General (Summer)	-	Summer	*Cynodon dactylon* (L.) Pers.	5
		Summer	*Arundo donax* L.	5
		Summer	*Solanum elaegnifolium* Cav.	5
		Summer	*Chenopodium murale* L.	4
		Summer	*Datura* sp.	4
		Summer	*Xanthium stramarium* L.	4
		Summer	*Verbesina encelioides*	4

Species frequency percent

The vegetation survey of the Al-salqa Wadi area reveals intriguing patterns of plant species distribution and adaptability. The high frequency of occurrence recorded for *Urtica pilulifera* L. and *Arundo donax* L. (71.42%, Table 11) indicates their remarkable ability to thrive in the face of livestock grazing and the spatially heterogeneous environment within the reserve.

In contrast, the low frequency (14.28%, Table 11) observed for 72 species suggests a more variable distribution along the Al-salqa Wadi, likely influenced by the presence of distinct physical microenvironments. This observation aligns with the findings of Alhamad (2006), who attributed the positive interactions between individual plants to either direct facilitative relationships or the influence of physical environmental heterogeneity, such as variations in topography (Couteron and Kokou, 1997).

Plant communities are characterized by complex interactions involving both competition and facilitation (Callaway, 1995). Interestingly, the positive associations in the study area were predominantly found among individuals of the therophyte life form (annual plants). However, a biennial herb, *Centaurea hyalolepis* Boiss. (a species with a Mediterranean and Irano-Turanian distribution), exhibited an important association with *Poa annua* L., *Erodium ciconium*, and *Silene colorata*.

The environmental conditions in the Al-salqa Wadi area pose additional challenges for plant establishment and regeneration. High soil salinity and unsuitable soil structure are significant factors that limit the growth of many plant species. Only highly salt-tolerant plants, such as *Cakile maritima, Mesembryanthemumcrystallinum, Salsola kali, Paronychia argenta, Spergularia bocconei, Acacia saligna,*and *Artemisia monosperma*, are able to thrive in the saline conditions prevalent in the study area.

The observed differences in plant biomass production between the wadi sites and the hilltop sites are noteworthy. The wadi sites exhibited high plant biomass, reaching a sub-humid primary productivity level, whereas the hilltop sites displayed lower productivity. This variability in biomass production reflects the small-scale spatial heterogeneity that characterizes the arid and semi-arid Mediterraneanrangeland ecosystems (Osem et al., 2002, 2004). However, the overall energy flow through these ecosystems is largely constrained by the availability of soil moisture (Snyman, 1999).

Table 15 provides a valuable comparative analysis of the frequency of plant species and their adaptability, further illuminating the intricate interplay between environmental factors and species-specific characteristics in shaping the plant community dynamics within the Al-salqa Wadi area.

This comprehensive understanding of the vegetation patterns and adaptations offers insights that can inform future conservation, management, and restorationefforts in this ecologically significant region.

Table 15: Comparison of Plant Species Frequency and Adaptability in the Study Area

Species Name	Frequency (%)	Adaptability/Notes
Urtica pilulifera L.	71.42%	High adaptation to livestock grazing and environmental heterogeneity
Arundo donax L.	71.42%	High adaptation to livestock grazing and environmental heterogeneity
72 other species	14.28%	Variability in distribution due to specific microenvironments
Centaurea hyalolepis Boiss.	-	Important associations with Poa annua L., Erodium ciconium, and Silene colorata
Cakile maritima	-	Adaptability to saline soils
Mesembryanthemum crystallium	-	Adaptability to saline soils
Salsola kali	-	Adaptability to saline soils
Paronychia argenta	-	Adaptability to saline soils
Spergularia bocconei	-	Adaptability to saline soils
Acacia saligna	-	Adaptability to saline soils
Artemisia monosperma	-	Adaptability to saline soils

Conclusions

The flora of Al-salqa Wadi area, Gaza Strip, Palestine, is one of the richest biodiversity areas in the Mediterranean region and comprises very important genetic resources of crops and medicinal plants. In addition to its large number of plant families, the components of the flora are the admixture of the elements of Asia, Africa and Mediterranean region. A detailed botanical survey for Al-salqa Wadi was done and showed that 145 flowering plant species belonging to 112 genera and 40 families were growing in the study area. The best respresented families were the Asteraceae (17 genera and 21 species), Poaceae (16 genera and 16 species), Fabaceae (9 genera and13 species), Brassicaceae (9 genera and 10 species), Solanaceae (6 genera and 8 species).

Based on results of our studies, related to vegetation analysis, species cover-abundance scale, species frequency and life forms, we found unique vegetation diversity in our study area may be resulting from the effect of various factors such as sewage water, soil moisture, soil salinity, soil texture, urban effects, bordering agricultural fields and solid waste which create a great variety of ecological condition for plants. Therefore, it could be establishing a baseline from which environmental impact can be assessed.

Furthermore, our study area is characterized by an abundant flora of annual plants that complete their life cycle within a relatively short favorable growth period, the findings emphasized the relatively strong correspondence between vegetation parameters such as life forms and environmental factors such as rainfall average at various locations. Among the changes in the vegetation induced by human disturbances which lead to the retrogressive changes in the study area the following can be mentioned: continued destruction of grass-cover due to uncontrolled grazing increases, water relations, construction activities, especially digging and widening the roads, result in the removal of vegetation, sever cutting of trees and shrubs for fuel, this may cause these plants on the long-run to be endangered. The modification of species composition of the natural vegetation in the study area by continued human interference is inevitable and affects its diversity and potentiality.

Wild plants have always been important in the folk traditions of the Mediterranean region. However, food and medicinal uses of these plants have been two of the most relevant and consistent reasons for popular plant management, evenin cultures that are increasingly losing their close relationship with nature.

It is essential to make the complete inventory of the medicinal component of the flora of Palestine for conservation and sustainable use. The conservation of the threatened and endangered medicinal species in Al-salqa Wadi area is indispensable.

Recommendations

The conservation and management of the plant diversity in the Al-salqa Wadi area requires a multifaceted approach. Key recommendations include:

1. Reservation and clinical investigation of endangered medicinal plant species: Urgent action is needed to identify and protect the endangered medicinal plant species found in the region, as well as to conduct clinical research on their potential therapeutic properties.

2. Prioritizing threatened medicinal plants and their habitats: The management and conservation plan for the Gaza Strip, and the Al-salqa Wadi in particular, should prioritize the protection of threatened medicinal plants and their natural habitats.

3. Promoting public and private involvement in sustainable management and utilization: Engaging both public and private stakeholders in the sustainable management and utilization of medicinal plants is essential to combat the human-induced pressures on these valuable natural resources.

4. Adopting comprehensive approaches for genetic conservation: Integrated methods that combine ecology, physiology, molecular biology, and evolutionary biology should be employed to conserve the biological diversity at all levels.

5. Developing and optimizing protocols for in vitro propagation: In the absence of a national program to conserve the Palestinian plantdiversity, protocols for enhancing callus culturing, organogenesis, and micropropagation of the threatened wild plants should be developed and optimized.

6. Cultivating water-consuming trees and shrubs: To minimize and avoid further salinization of the Al-salqa Wadi area, the cultivation of water-consuming tree and shrub species, such as Tamarix, Acacia, and Casuarina, should be encouraged.

7. Promoting biodiversity in urban areas: In urban settings, it is recommended to preserve existing areas of indigenous vegetation, reduce management intensity, and create small-scale green areas using seed material or plant species native to the region, in order to enhance overall biodiversity.

By implementing these multifaceted strategies, the conservation and sustainable management of the plant diversity in the Al-salqa Wadi and the broader Gaza Strip can be significantly improved, ensuring the protection of these valuable natural resources for the benefit of present and future generations.

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