



PLANT BIODIVERSITY AND VEGETATION ANALYSIS OF CHILAT, NORTH TIB, AMARA PERSIAN FOOTHILLS DISTRICT IRAQ

Abdulrida A.AL-Mayah , Suhad A.Taha & Eman M. Abdulzahra

Department of Ecology, College of Science, University of Basra

*Department of Biology, College of Science, University of Basra

Abstract

A total of 127 species belong to 101 genera and 37 families of vascular plants were recognized . Fabaceae (19 spp), Astraceae (18 spp), Poaceae (18 spp), Chenopodaceae (8 spp) and Brassicaceae (7 spp) were the largest families. The annuals (therophytes) and the perennial herbs were the most frequent indicating the spring characteristic physiognomy of the studied area. The plant biodiversity of Chilat in spring based on Shannon Weiner index was 2.07 and Simpson index was 0.194 , but the highest species richness value based on the same indices respectively were 2.15 and 0.16 in station 1. In spring the annual *Plantago boisseri* has the highest frequency with a relative abundance 20% and IVI 80.31, while the most dominant perennial species were *Pennisetum divisum* , *Hamada salicornica* , *Cornulaca monantha* and *Artemisia herba-alba* . Based on Sorenson's Coefficient , the similarity between the two stations studied was 0.604 and the Jaccard Coefficient was 0.433. *Ziziphus nummularia* is very common Big shrub species forming a characteristic community recognized here for the first time.

Keywords : Biodiversity , Vegetation , Chilat , Tib , Amara , Iraq .

Introduction

Upper plains and Foothills Region is one of the most important and diverse physiographic region of Iraq . According to Guest (1966) , this region is divided into five districts of that the eastern district which runs along the Persian border southwardly to Tib in Amara province is the Persian Foothills District (FPF) . The southern part of this district which lies between 32° 25' N and 47° 25' E about 60 Km N-N.N.E Amara and runs in S.E. direction to Tib is called Jabal Hamrin (Red mountain) . The FPF, including Jabal Hamrin , is a very rich district in plant and animal diversity , in some places deers can be seen grazing on the top of Jabal Hamrin . Guest (1966) (Flora of Iraq V.1) provided an introduction to the flora of Iraq with an account of the Topography , geology , soil , climate and ecology of Iraq . He described the vegetation and phytogeographic subdivision of Iraq , mentioning 25 Associations in the Iraqi desert. Thalen (1979) (Translated in Arabic by Unis, M. and Alani H. 2012) is the most important ecological work on the desert of Iraq, he gave details about the utilization of desert shrub rangelands in Iraq and the vegetation types and dominant communities.

The plant species , growth , life and communities of the FPF are similar to that in the desert region of Iraq . Malih (2015) in his Ph.D.thesis on the vegetation and biodiversity of the southern desert SDS of Iraq mentioned 180 species and 15 obvious plant communities in the desert of Basrah province .

Al-mayah *et al.* (2016) in the Ecology and Flora of Basrah presented 20 plant associations with 6 halophytic communities in Basrah and adjacent area, Also they gave a floristic account for the species and their distribution in Basrah , Amara and Thi Qar .

Several local plant ecological studies have been published on small scales in different places of Iraq e.g. Weiner & Al-Hilli (1975) studied the vegetation of Jabal Sanam in SDS S.S.W. of Basrah . Chaudri *et al.* (1971) determined the plant indicators of alluvial soils of central Iraq . Batanouny & Hilli (1973) provided a phytosociological study of the Gauraf Adhaim Desert (DGA) .Al-Ani and Hdad (1973) studied the seasonal changes in the plant behavior of Falluja and Skanderiya gypsum desert flora but no studies have been published on the FPF district particularly Chilat and wadi Tib .

Study Area

Chilat (Chlat) lies in Persian Foothills District (FPF) between Tib and Badra at alt. 150 m. about 25 Km N.E. of Ali Al-Gharbi some 85 Km N. Amara on down slope of southern Hamrin foothills near to the Iranian border were the Hamrin small foothill running along the Persian frontier in S.E. direction to Tib post . The study area is bounded by Badra to the North , Tib to the South , Iran to the East and Eastern Alluvial plain District (LEA) to the West . Its total surface area is about 125 square Km. with length from North to South about 30 Km. Topographically it ranges from (West to East) flat to wavy to hillsides with some depression with very shallow water . The soils vary from loose sands to gravel sands to compact gravel sands or sometimes clayey . The vegetation cover is very seasonally depending on soil moisture which depends on the time , amount and season of rain . The physiognomy of

the area is characteristic and interesting in spring and dominated by many annual and perennial herbs , while in Summer and Autumn nearly all the annuals die . In general the area in Autumn is dominated by shrubs or bushes rarely trees of closed communities sometimes of halophytes . There are any scientific research available on this area . Guest (1966) in his gazettes of place names in Iraq only referred to the name of this area as Chilat or Chlat but he mistakenly mentioned that it lies between Mandli and Badra. *Ziziphus nummularia* , *Ephedra foliata* , *Periploca aphylla* , and *Hamada salicornica* are the most common species . The climate is a long hot summer and a short variable winter.

Materials and Methods

Two stations were selected for biodiversity analysis in Chilat, station 1 to the North and station 2 to the South. Transect and quadrat methods were used for vegetation analysis. Three line transects (50 m) were taken in each direction to record the species present and their cover percent . Five (1 m) quadrats were taken in each area to determine frequency, abundance, density, cover and biodiversity. Samples were taken monthly, species were photographed, collected , mounted and deposited in Basrah university Herbarium (BSRA) . Reching (1964), Townsed & Guest (1966-1985) , Davis 1982 , Ghazanfer and Edmenson(2013-2016) and Al-mayah *et al.* (2016) were followed for species identification . Environmental factors such as air and soil temperature , soil moisture , PH , soil texture and salinity were measured using multipurpose apparatus. Altitude was determined by the Global positioning system (GPS) .

Table 1 : Species present during the spring 2016 in Chilat

| Family | Species | Months 2016 | | | | Duration | Life form |
|--|---|-------------|-----|----|-----------|-----------|----------------|
| | | Ja | Fe. | Ma | Ap | | |
| Ephedraceae | <i>Ephedra foliata</i> Boiss. ex C.A.Mey. | + | + | + | + | Perennial | Shrub (switch) |
| Apiaceae | <i>Anisosciadium lanatum</i> Boiss. | | | + | | Annual | Herb |
| | <i>Oliveria decumbens</i> Vent. | | | | + | Annual | Herb |
| Asclepidaceae | <i>Periploca aphylla</i> Decne. | + | + | + | + | Perennial | Shrub (Switch) |
| Asteraceae | <i>Anthemis deserti</i> Boiss. | | + | + | | Annual | Herb |
| | <i>Artemisia herba-alba</i> Asoo. | + | + | + | + | Perennial | Shrublet |
| | <i>Asteriscus pygmaeus</i> (DC.) Coss. et Dur. | | + | + | | Annual | Stemless herb |
| | <i>Atractylis cancellata</i> L. | | | + | + | Annual | Herb |
| | <i>Calendula arvensis</i> L. | + | + | + | + | Annual | Herb |
| | <i>Carduus pycnocephalus</i> L. | | | + | | Annual | Herb |
| | <i>Carthamus oxycantha</i> M. Bieb. | | | | + | Annual | Herb |
| | <i>Centaurea bruguierana</i> (DC.) Hand. Mazz | | | + | + | Annual | Herb |
| | <i>Centaurea</i> sp. | | | | + | Annual | Herb |
| | <i>Echinops sphaerocephalus</i> L. | + | + | + | + | Annual | Herb |
| | <i>Filago pyramidata</i> L. | + | + | + | | Annual | Herb |
| | <i>Gymnarrhena micracantha</i> Desf. | | | + | | Annual | Stemless herb |
| | <i>Ifloga spicata</i> (Forssk.) Sch.- Bip. | | + | + | + | Annual | Herb |
| | <i>Launaea mucronata</i> (Forssk.) Musch. | + | + | + | + | Perennial | Herb |
| | <i>Picris desertorum</i> Nab. | + | | + | | Annual | Herb |
| | <i>Reichardia tingitana</i> (L.) Roth. | + | + | | | Annual | Herb |
| | <i>Senecio glaucus</i> L. | + | + | + | | Annual | Herb |
| <i>Xanthium strumarium</i> L. | + | + | + | + | Annual | Herb | |
| Boraginaceae | <i>Arnebia decumbens</i> (Vent.) Coss. et Kral. | | | | + | Annual | Herb |
| | <i>Arnebia tinctoria</i> Forssk. | | | + | | Annual | Herb |
| | <i>Anchusa strigosa</i> Banks & Sol. | + | + | + | + | Perennial | Herb |
| | <i>Heliotropium bacciferum</i> Forssk. | + | + | + | + | Perennial | Shrublet |
| | <i>Heliotropium europaeum</i> L. | | | + | + | Perennial | Herb |
| <i>Moltkiopsis ciliata</i> (Forssk.) Johnst. | + | + | + | + | Perennial | Herb | |
| Brassicaceae | <i>Brassica tournefortii</i> Gouan. | + | | + | | Annual | Herb |
| | <i>Cakile arabica</i> Vel. & Bornm. | + | + | + | + | Annual | Herb |
| | <i>Diplotaxis acris</i> (Forssk.) Boiss | | | + | | Annual | Herb |
| | <i>Diplotaxis harra</i> (Forssk.) Boiss. | | + | + | + | Annual | Herb |
| | <i>Matthiola longipetala</i> (Vent.) DC. | + | + | + | | Annual | Herb |
| | <i>Savignya parviflora</i> (Del.) Webb. | | + | + | | Annual | Herb |
| | <i>Strigosella grandiflora</i> (Bunge) Boch. | | | + | | Annual | Herb |
| Capparidaceae | <i>Capparis spinosa</i> L. | + | + | + | + | Perennial | Shrublet |
| Caryophyllaceae | <i>Gypsophila capillaris</i> Forssk. | | | | + | Annual | Herb |
| | <i>Paronychia arabica</i> (L.) Del. | + | + | + | + | Annual | Herb |
| | <i>Pteranthus dichotomous</i> Forssk. | | | | + | Annual | Herb |
| | <i>Silene villosa</i> Forssk. | | + | + | + | Annual | Herb |
| | <i>Spergella fallax</i> (Lowe.) Kra. In Sturm | | | | + | Annual | Herb |
| Chenopodiaceae | <i>Bassia eriophora</i> (Schrud.) Aschers | + | | + | | Annual | Herb |
| | <i>Caroxylon imbricatum</i> (Forssk.) Maq. | + | + | + | + | Perennial | Shrub |
| | <i>Chenopodium murale</i> (L.) Fuentes | | | + | | Annual | Herb |
| | <i>Cornulaca aucheri</i> Moq. | | + | | + | Annual | Herb |

| Family | Species | Months 2016 | | | | Duration | Life form |
|------------------------------------|---|-------------|-----|----|--------|-----------|----------------|
| | | Ja | Fe. | Ma | Ap | | |
| | <i>Cornulaca monochantha</i> Del. | + | + | + | + | Perennial | Shrublet |
| | <i>Halothamnus iragensis</i> Botsch. | + | + | + | + | Perennial | Shrublet |
| | <i>Hamada salicornica</i> (Moq.) Iljin. | + | + | + | + | Perennial | Shrub(Switch) |
| | <i>Suaeda vermiculata</i> Forssk. | + | + | + | + | Perennial | Shrub |
| Cistaceae | <i>Helianthemum lipii</i> (L.) Dum. Cours. | + | + | + | + | Perennial | Subshrub |
| Cleomaceae | <i>Cleome glaucescens</i> DC. | + | + | + | + | Perennial | Woody herb |
| | <i>Cleome noeana</i> Boiss. | + | + | + | + | Annual | Herb |
| Convolvulaceae | <i>Convolvulus oxyphyllus</i> Boiss. | + | + | + | + | Perennial | Shrublet |
| Cucurbitaceae | <i>Citrullus colocynthis</i> (L.) Schrad. | + | + | + | + | Perennial | Prostrate herb |
| Cuscutaceae | <i>Cuscuta planiflora</i> Ten. | + | + | + | + | Annual | Parasite |
| Dipsacaceae | <i>Scabiosa olivieri</i> Coult. | | | + | | Annual | Herb |
| | <i>Scabiosa palaestina</i> L. | | | + | + | Annual | Herb |
| Euphorbiaceae | <i>Chrozophora tinctoria</i> (L.) Raf. | | | + | + | Annual | Herb |
| Fabaceae | <i>Alhagi graecorum</i> Boiss. | + | + | + | + | Perennial | Shrublet |
| | <i>Astragalus annularis</i> Forssk. | | + | + | | Annual | Herb |
| | <i>Astragalus dactylocarpus</i> Boiss. | + | + | + | + | Perennial | Subshrub |
| | <i>Astragalus fasciculifolius</i> Boiss. | + | + | + | + | Perennial | Subshrub |
| | <i>Astragalus hamosus</i> L. | | + | | | Annual | Herb |
| | <i>Astragalus schimperi</i> Boiss. | | + | + | | Annual | Herb |
| | <i>Astragalus spinosus</i> (Forssk.) Muschl. | + | + | + | + | Perennial | Subshrub |
| | <i>Astragalus tribuloides</i> Del. | + | + | | | Annual | Herb |
| | <i>Hippocrepis bicontorta</i> Lois. | | | + | | Annual | Herb |
| | <i>Hippocrepis unisiliquosa</i> L. | | + | + | | Annual | Herb |
| | <i>Lotus halophilus</i> Boiss. & Sprun. | + | + | + | | Annual | Herb |
| | <i>Medicago laciniata</i> (L.) Mill. | | | + | | Annual | Herb |
| | <i>Medicago polymorpha</i> var. <i>vulgaris</i> | + | | + | | Annual | Herb |
| | <i>Onobrychis crista-galli</i> (L.) Lam. | | | + | | Annual | Herb |
| | <i>Trifolium tomentosum</i> L. | | + | | | Annual | Herb |
| | <i>Trigonella hamosa</i> L. | | | | + | Annual | Herb |
| <i>Trigonella stellata</i> Forssk. | | + | + | | Annual | Herb | |
| <i>Vicia monantha</i> Retz. | | | | + | Annual | Herb | |
| <i>Vicia sativa</i> L. | | | + | | Annual | Herb | |
| Geraniaceae | <i>Erodium pulverulentum</i> (Cav.) Willd. | + | | + | | Annual | Herb |
| Lamiaceae | <i>Salvia comperssa</i> Vent. | + | + | + | + | Perennial | Shrublet |
| | <i>Teucrium polium</i> L. | + | + | + | + | Perennial | Shrublet |
| Malvaceae | <i>Malva parviflora</i> L. | + | + | + | + | Annual | Herb |
| | <i>Malva aegyptia</i> L. | | | | + | Annual | Herb |
| Orobanchaceae | <i>Cistanche tubulosa</i> (Schenk.) Wight. | | + | + | + | Annual | Parasite |
| | <i>Orobanche cernua</i> L. | | | + | + | Annual | Parasite |
| Papaveraceae | <i>Phelipanche aegyptiaca</i> (Pers.) Pomel. | + | + | + | + | Annual | Parasite |
| Papaveraceae | <i>Papaver dubium</i> L. | + | + | | | Annual | Herb |
| | <i>Plantago afra</i> L. | + | + | | | Annual | Stemless herb |
| | <i>Plantago boisseri</i> L. | + | + | + | + | Annual | Stemless herb |
| | <i>Plantago lagopus</i> L. | | + | + | + | Annual | Stemless herb |
| | <i>Plantago ovata</i> Forssk. | | | + | | Annual | Stemless herb |
| Polygonaceae | <i>Plantago psamophylla</i> Agn. et Ka' bi | | | | + | Annual | Stemless herb |
| | <i>Emex spinosus</i> (L.) Campd. | + | | + | + | Annual | Herb |
| | <i>Polygonum aviculare</i> L. | | | | + | Annual | Herb |
| Primulaceae | <i>Rumex vesicarius</i> L. | | + | | | Annual | Herb |
| Primulaceae | <i>Anagalis arvensis</i> L. | + | + | + | | Annual | Herb |
| | <i>Reseda arabica</i> Boiss. | | + | + | + | Annual | Herb |
| | <i>Reseda aucheri</i> Boiss. | + | + | + | + | Perennial | Herb |
| Resedaceae | <i>Reseda decursiva</i> Forssk. | | + | + | | Annual | Herb |
| Rhamanaceae | <i>Ziziphus nummularia</i> (Burm.f.) Wight et Arn | + | + | + | + | Perennial | Big shrub |
| Rosaceae | <i>Neurada procumbens</i> L. | | + | + | + | Annual | Prostrate herb |
| Rubiaceae | <i>Galium tricornutum</i> Dandy. | | | + | + | Annual | Herb |
| Rutaceae | <i>Haplophyllum tuberculatum</i> (Forssk) AdrJuss | + | + | + | + | Perennial | Woody herb |
| Salixaceae | <i>Populus euphratica</i> Oliv. | + | + | + | + | Perennial | Tree |
| Tamaricaceae | <i>Tamarix aucheriana</i> (Decne. ex Walp.) Baum. | + | + | + | + | Perennial | Big shrub |
| Zygophyllaceae | <i>Fagonia bruguieri</i> DC. | + | + | + | + | Perennial | Subshrub |
| | <i>Fagonia glutinosa</i> Del. | + | + | + | + | Perennial | Prostrate herb |
| Alliaceae | <i>Allium macrochaetum</i> Boiss & Haussk. | | | + | + | Perennial | Bulbs |
| Asphodelaceae | <i>Asphodelus tenuifolius</i> Cav. | + | + | + | | Annual | Herb |
| Cyperaceae | <i>Cyperus aucheri</i> Jaub et. Sp. | + | + | + | + | Perennial | Sedge |
| Poaceae | <i>Aegilops crassa</i> Boiss. | | | + | | Annual | Grass |
| | <i>Aegilops kotschy</i> Boiss. | | | | + | Annual | Grass |
| | <i>Avena barbata</i> Pott ex Link | | | + | | Annual | Grass |
| | <i>Bromus lanceolatus</i> Roth. var. <i>lanceolatus</i> | | | + | | Annual | Grass |

| Family | Species | Months 2016 | | | | Duration | Life form |
|----------|---|-------------|-----|-----|----|-----------|-----------|
| | | Ja | Fe. | Ma | Ap | | |
| | <i>Bromus tomentellus</i> Boiss. | | | + | | Annual | Grass |
| | <i>Cutandia dichotoma</i> (Forssk.) Trab. | | | + | | Annual | Grass |
| | <i>Cutandia memphitica</i> (Spereng.) Benth. | | + | + | | Annual | Grass |
| | <i>Cynodon dactylon</i> (L.) Pers. | + | + | + | + | Perennial | Grass |
| | <i>Hordeum glaucum</i> Stoud. | | | + | | Annual | Grass |
| | <i>Lolium rigidum</i> Gaud. | | + | | | Annual | Grass |
| | <i>Panicum turgidm</i> Forssk. | + | + | + | + | Perennial | Grass |
| | <i>Pennisetum divisum</i> (Gmel.) Henr. | + | + | + | + | Perennial | Grass |
| | <i>Phalaris minor</i> Retz. | | | + | + | Annual | Grass |
| | <i>Phragmites australis</i> (Cav.)Trin.ex Staud. | + | + | + | + | Perennial | Grass |
| | <i>Polypogon monspeliensis</i> (L.) Desf. | | | + | | Annual | Grass |
| | <i>Schismus barbatus</i> (L.) Thell. | + | + | + | | Annual | Grass |
| | <i>Stipa capensis</i> Thunb. | | + | + | | Annual | Grass |
| | <i>Stipagrostis plumosa</i> (L.) Munroex T.anders | + | + | + | + | Perennial | Grass |
| Total 37 | 127 | 63 | 79 | 105 | 76 | | |

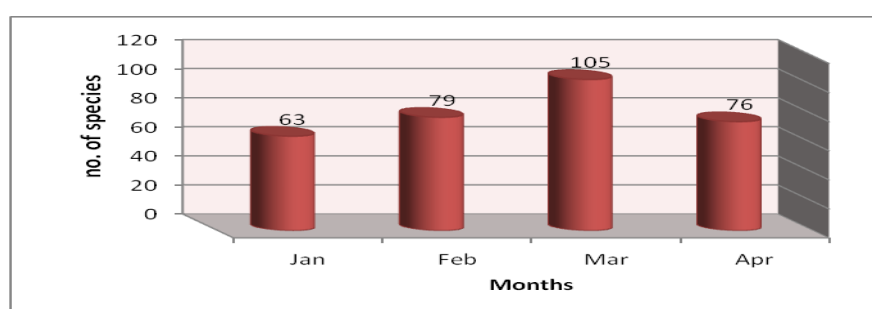
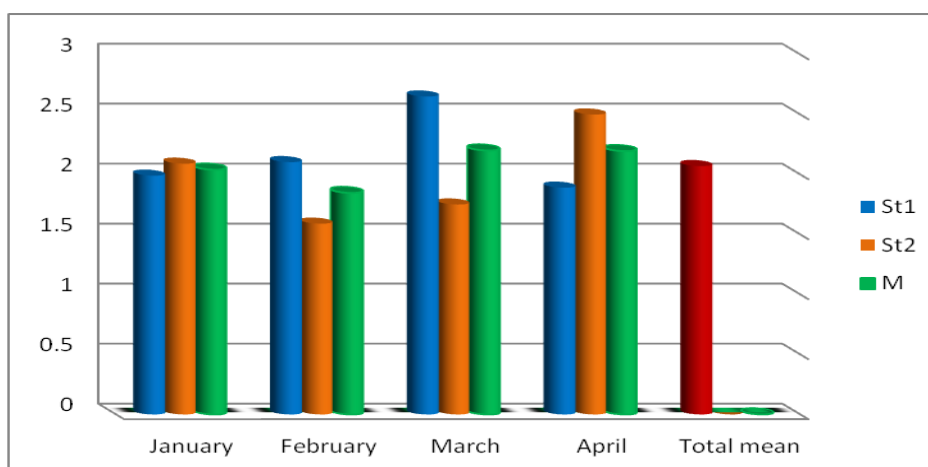


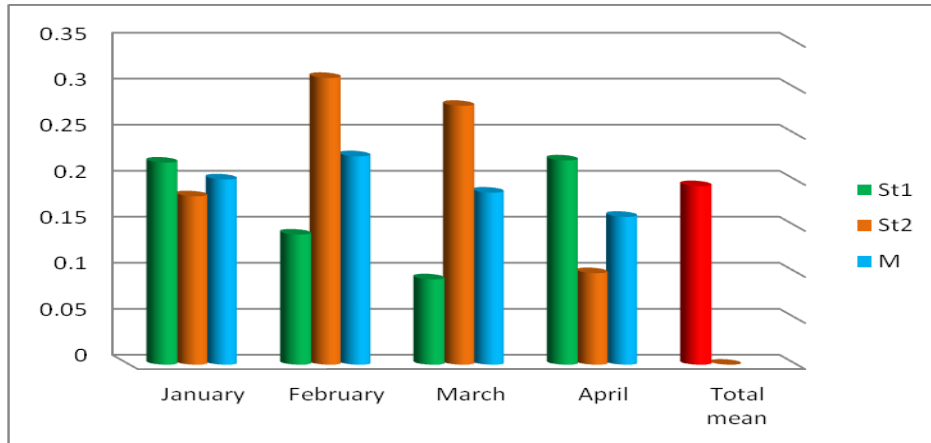
Fig 1 : number of species in months .

Table 2 : Biodiversity indices in station 1 & station 2.

| Months | Shannon – Weiner index | | | Sampson index | | |
|------------|------------------------|--------|-------|---------------|-------|-------|
| | St1 | St2 | Mean | St1 | St2 | Mean |
| January | 1.99 | 2.09 | 2.04 | 0.2196 | 0.183 | 0.201 |
| February | 2.103 | 1.59 | 1.84 | 0.1414 | 0.312 | 0.227 |
| March | 2.65 | 1.75 | 2.2 | 0.0928 | 0.281 | 0.187 |
| April | 1.89 | 2.5 | 2.195 | 0.222 | 0.099 | 0.161 |
| Total mean | 2.15825 | 1.9825 | 2.07 | 0.169 | 0.219 | 0.194 |



A



B
 Fig 2 : Plant biodiversity indices. A : Shannon-Weiner index , B : Simpson index

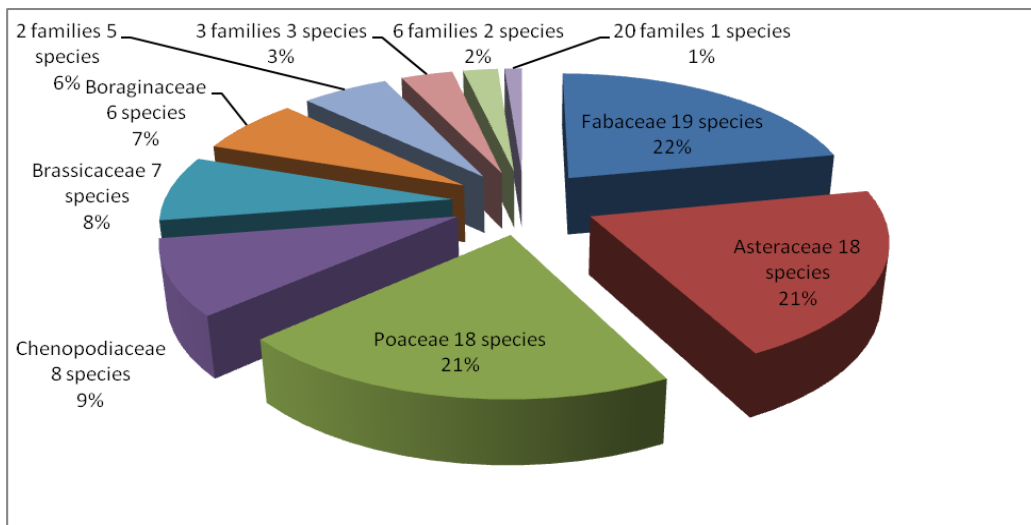


Fig.3 : Percentage and number of species in each family .

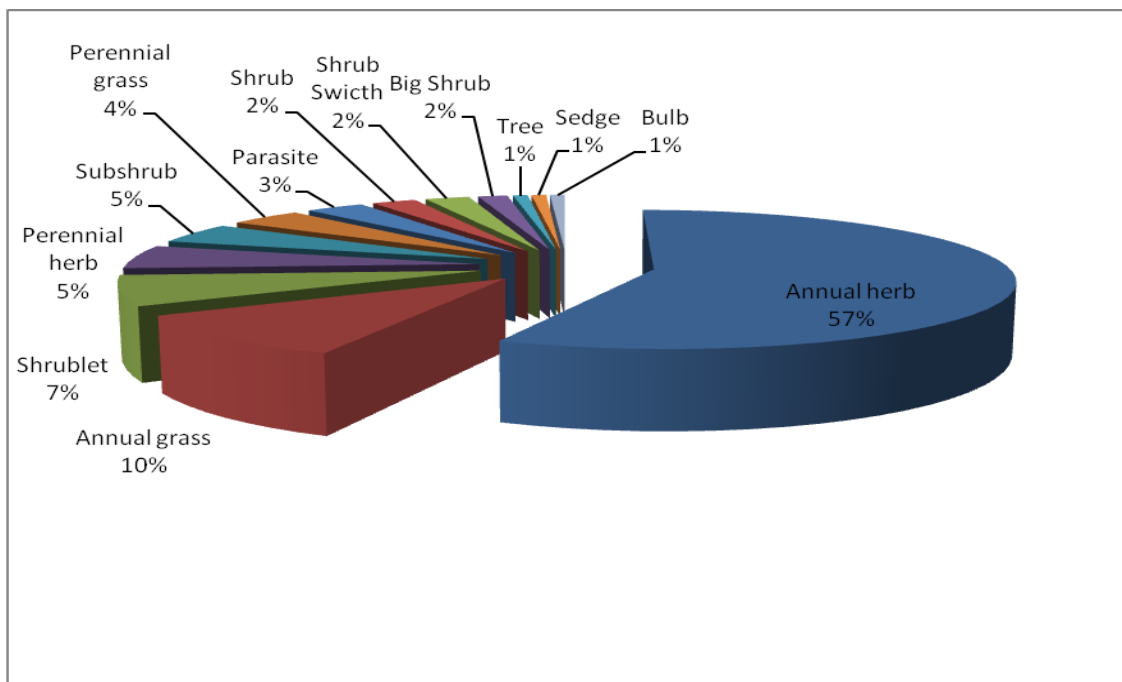


Fig.4 : Percentage of life forms of species in Chilat .

Table 3 : Relative frequency RF , Relative density RD , Relative cover RC and important value index IVI for species in station 1 and station 2 .

| Station | Species | RF | RD | RC | IVI |
|----------------------------|---------------------------------|----------|----------|----------|----------|
| Station 1 | <i>Anagalis arvensis</i> | 3.030303 | 0.518135 | 0.538793 | 4.087231 |
| | <i>Asphodelous tounifolius</i> | 3.030303 | 1.554404 | 2.155172 | 6.73988 |
| | <i>Atractylis cancellata</i> | 3.030303 | 0.518135 | 1.077586 | 4.626024 |
| | <i>Avena barbata</i> | 3.030303 | 10.36269 | 13.46983 | 26.86282 |
| | <i>Bassia euphorbia</i> | 3.030303 | 3.108808 | 5.387931 | 11.52704 |
| | <i>Calandula arvensis</i> | 6.060606 | 2.072539 | 1.885776 | 10.01892 |
| | <i>Carduus pycnocephalus</i> | 3.030303 | 0.518135 | 0.538793 | 4.087231 |
| | <i>Centaurea bruguierana</i> | 3.030303 | 1.554404 | 2.693966 | 7.278673 |
| | <i>Chrozophora tinctoria</i> | 6.060606 | 2.072539 | 1.346983 | 9.480128 |
| | <i>Erodium laciniatum</i> | 3.030303 | 1.036269 | 1.077586 | 5.144159 |
| | <i>Filago pyramidata</i> | 3.030303 | 2.590674 | 4.310345 | 9.931321 |
| | <i>Heliotropium europium</i> | 3.030303 | 1.554404 | 8.081897 | 12.6666 |
| | <i>Hippocrepis unisiliquosa</i> | 3.030303 | 5.181347 | 8.081897 | 16.29355 |
| | <i>Hordium glaucum</i> | 9.090909 | 8.290155 | 3.93319 | 21.31425 |
| | <i>Lotus halophilus</i> | 6.060606 | 3.626943 | 2.693966 | 12.38151 |
| | <i>Medicago laciniata</i> | 3.030303 | 2.072539 | 4.310345 | 9.413187 |
| | <i>Onobrychis grista-galli</i> | 3.030303 | 0.518135 | 1.077586 | 4.626024 |
| | <i>Orbanche cernua</i> | 3.030303 | 2.072539 | 5.387931 | 10.49077 |
| | <i>Plantagp boisseri</i> | 9.090909 | 17.09845 | 7.165948 | 33.3553 |
| | <i>Schismus barbatus</i> | 6.060606 | 12.95337 | 7.273707 | 26.28768 |
| <i>Senecio desfontanii</i> | 3.030303 | 0.518135 | 1.077586 | 4.626024 | |
| <i>Stipa capensis</i> | 6.060606 | 3.626943 | 1.885776 | 11.57332 | |
| <i>Trigonella stelata</i> | 3.030303 | 1.036269 | 1.077586 | 5.144159 | |
| <i>Vicia monantha</i> | 3.030303 | 15.54404 | 13.46983 | 32.04417 | |
| Station 2 | <i>Asphodelous tounifolius</i> | 15.38462 | 8.290155 | 4.17204 | 27.84681 |
| | <i>Astragalus annularis</i> | 3.846154 | 1.036269 | 3.792763 | 8.675187 |
| | <i>Cakile Arabica</i> | 3.846154 | 1.036269 | 6.068421 | 10.95084 |
| | <i>Cutandia memphitica</i> | 3.846154 | 5.181347 | 5.309869 | 14.33737 |
| | <i>Fagonia bruguieri</i> | 3.846154 | 1.036269 | 3.034211 | 7.916634 |
| | <i>Hamada salicornica</i> | 3.846154 | 1.554404 | 22.75658 | 28.15714 |
| | <i>Lotus haplophilus</i> | 11.53846 | 19.68912 | 10.11151 | 41.33909 |
| | <i>Malcolmia grandiflora</i> | 3.846154 | 3.626943 | 7.585527 | 15.05862 |
| | <i>Malva parviflora</i> | 3.846154 | 1.554404 | 3.792763 | 9.193321 |
| | <i>Matthiola longipetala</i> | 3.846154 | 2.590674 | 7.585527 | 14.02235 |
| | <i>Neurada procumbens</i> | 3.846154 | 1.036269 | 7.585527 | 12.46795 |
| | <i>Pennisetum divisum</i> | 3.846154 | 1.554404 | 2.275658 | 7.676216 |
| | <i>Plantagp boisseri</i> | 19.23077 | 48.18653 | 12.8954 | 80.31269 |
| <i>Reseda Arabica</i> | 15.38462 | 3.626943 | 3.034211 | 22.04577 | |

Results and Discussion

A total of 127 species belong to 101 genera and 37 families of vascular plants were recorded from various places of Chilat in spring 2016. *Ephedra foliata* was the only Gymnospermae species found in our area. It is a climbing switch plant always associated with *Ziziphus nummularia*. The largest family in number of species was Fabaceae with 19 species , Asteraceae with 18 species and poaceae with 18 species , while the most diverse family in number of genera was the Asteraceae with 17 genera. The number of species in the two stations studied was nearly unequal with 97 species in station 1 and 85 in station 2 and they are differ in their biodiversity. Fifty five species were shared between the two stations resulting in 40-60 percent similarity on sorenson's and Jaccard's indices respectively .

Species Richness

Species richness in both stations varies monthly and seasonally depending on the temperature suitability and the rainfall amount, the number of species recorded in January (winter) was 63 species rising gradually to become

79 species in February reaching its highest level 105 species in March then declined with the rising of temperature to 76 in April and then to nearly all annuals disappear in the summer season .

Life Forms

Life form of all species recorded in Chilat are shown in Fig.4 . The annuals or therophytes constituted 85 species of herbs and grasses .The annual herbs represented 57% while annual grasses represented 10% , followed by shrublets constitute 9 species about 7% of the total species recorded in the area .Other life forms record were perennial herbs 5% also subshrubs 5% , perennial grasses 4%, parasite 3% ,each of shrubs, shrubs(switch) and big shrubs were about 2% , and also each of tree, bulb and sedge were about 1% .

Plant Biodiversity

According to Shannon-Weiner index as shown in table 2 and Fig.2 , the highest value of biodiversity was in station 1 in March and the lowest value was in station 2 in February but the mean value of the biodiversity in spring in Chilat was 2.07, but according to Simpson index the highest value of biodiversity was in March and April in station 1 and 2 respectively and the lowest value was in February in station 2 , but the mean value of biodiversity for Chilat in spring was 0.194 ,that means the plant biodiversity in whole Chilat for 2016 was rich.

The Dominant Species

Table 3 shows the important value index based on relative frequency , relative density , and relative cover for some common species during spring 2016 in Chilat . It is clear that *Plantago boisseri* has IVI 80.31 in station 2 and 33.36 in station 1 followed by *Lotus halophilus* 41 IVI in station 2 , followed by *Vicia monantha* 32 IVI in station 1.The big shrub *Ziziphus nummularia* forms the most dominant and important community in the whole area . *Ephedra foliata* , *Periploca aphylla* , *Capparis spinosa* , *Malva parviflora* , *Cynodon dactylon* and *Phalaris minor* are the most common associated species to *Ziziphus nummularia* . Other dominant perennial species forming obvious characteristic physiognomic feature were *Hamada salicornica* in both stations , and *Artemisia herba-alba* , *Pennisetum divisum* and *Cornulaca monocantha* in station 2.

Our results as shown in table 1 revealed that the vascular flora of Chilat consists of 127 species, 101 genera and 37 families. About more than fifty percent of the species belong to only six rich families , these families were Fabaceae(Leguminosae)with 19 sp., Asteraceae(Compositae) with 18 sp., Poaceae (Graminae) with 18 sp., Chenopodiaceae with 8 sp., Brassicaceae(Cruciferae) with 7 sp., and Boraginaceae with 6 sp. These families represent the biggest and most common families in Iraq as well as in the south west Asia fig. 3 . On the other hand, Asteraceae, Poaceae, Fabaceae and Brassicaceae constitute the main alien Plant species in our Area, the same has been found in Egypt as mentioned Abd El-Ghani and Abdel Khalik(2006). Asteraceae which is considered the largest family in term of genera (with 17 genera in our area) is considered also the largest family in the world with 25000 sp., 1600 genera (Heywood *et al.* 2007) . The wide spread of this family may be due to their high seed dispersal capability and wide range of ecological tolerance. According to Guest(1966) the area under study lies in the middle Saharo Arabian sub-region and the climate in this sub-region characterized by mild winter and a very hot and dry summer with a low mean average annual rainfall often about 150-200 mm.The higher cover percent of species were the therophytes (annuals) 70% followed by the chamaephytes (perennial shrubs), 18% . The variation in frequency, abundance and density between species may be due to habitat differences and regeneration conditions. As (Ashraf *et al.* 2009) believe.

The results of vegetation patterns and species richness show that there is a considerable differences between the species composition in the two stations studied . Station 1 charactrized by the presence of a tree *Populus euphratica* (a riverine plant) and the annual herb *Chrozophora tinctoria* in a wet places in depressions and station 2 by the occurrence of the perennial grass *Pennisetum divisum* and the perennial shrublet *Artemisia herba-alba*. The number of species recorded in each station is nearly unequal 97 in station 1 and 85 in station 2 and the similarity between the two stations according to Sorenson's index was 40% this may be due to the differences in the availability of the amount of soil moisture and the edaphic characteristics of both stations, where the soil is sandy-clay in station 1 and sandy or sandy –gravely in station 2 same case has been found by (Malih, 2016) and (Al-Mayah *et al.* 2016).

The low value of plant biodiversity according to Simpson index 0.194 (table 2, Fig.2B) indicates that the vegetation in Chilat in spring 2016 is in a healthy condition with a high species diversity and abundance in comparision with other adjacent places with different adaphic conditions such as Eastern alluvial district which has a saline clay soil . *Plantago boisseri* which has the highest important value index (IVI) 80.31 forms the commonest and more abundance annual grazing species . *Ziziphus nummularia* which forms a leading and dominant tree like species in an obvious, widespread and characteristic community for the study area may indicate that this area including Wadi Tib may be the center of distribution of this species , and expunded westwardly to the southern desert of Iraq and also it may be the origin of the common *Z. spina-christi* in Iraq .

The various plant life forms recorded in Chilat (table 1) such as annual e.g. *Plantago* spp., *Anisosciadium lanatum* and *Medicago* spp. which have a short existence in spring and then survive the season of drought as seeds may be may be because of a mechanism of adaptation to face the dry and hot desert conditions such cases

emphasized by many authors Guest (1966), Thalin (2012), Malih(2016), while the persistent perennials such as *Artemisia herba-alba* , *Pennisetum divisum* and *Hamada salicornica* may need to have a different edaphic and environmental conditions .

The only endemic species recorded in this area , *Eremurus rechingeri* Wend., was mentioned by Rechinger (1964), Townsend & Guest(1985), Nature Iraq(s 2017). However the species was collected only once some 60 years ago and it was not confirmed in this study.

References

- Abd El-Ghani M.M.& Abdel-Khalik, K.N.(2006). Floristic diversity and phytogeography of Gebal Elba National Park, South-East Egypt. Turk. J.Bot. 30 121:136 .
- Al-Mayah, A.A., Al-Edani, T.Y., & Al-Asadi, W.M.(2016). Ecology and Flora of Basrah. 686 pp.
- Al-Rawi, A. (1964). Wild plant of Iraq with their distribution. Tech. Bull. No.14. Dir. Gen. of Agric. Government Press.
- Ashraf M.Y.,Al-Fredan ,M.A., Fathi, A.A. (2009). Floristic Composition of Lake Al-Asfar , Alahsa , Saudi Arabia .International Journal of Botany 5(2): 116-125 .
- Batanouny, K.H. (1973). Soil properties as affected by topography in desert wadis . Acta. Bot. Acad.Sc. Hung. 19 : 13 – 21 .
- Chaudri, I.I., H.A. Kareem, A. AL-Zubaidi & A.Y. Hanna (1971). Plant indicators of alluvial soils of central Iraq . Vegetation 23 : 315 – 322 .
- Davis,P.H., Edmondson, J.R., and Mill, R.R., (1982), Flora of Turkey .The university Press. Edinburgh. Vol.7 .
- Guest, E.R. (ed.) (1966). Flora of Iraq vol. 1. Introduction to the Flora , an account of the geology , soils , climate , and ecology of Iraq with gazetteer , glossary and bibliography . Min Agric., Iraq , 313 pp.
- Hewood,V.H., Brummitt, R.K.,Culham, A. & Seberg, O.(2007), Flowering plant families of the world 2122 pp. Firefly Books : Ontario Canada .
- Malih,H.R.(2015). Vegetation and Plant Biodiversity in the Southern Desert in Basra Governorate, Southern Iraq .Ph.D.Thesis. College of Science. University of Basra . 218 pp.
- Nature Iraq 2017 . Key Biodiversity Areas of Iraq . 297 pp. Sulaimaniyah Iraq .
- Rechinger, K.H. (1964). Flora of Lowland Iraq . Cramer Verlag, Weinheim, 746 pp.
- Ghazanver,S.A. & Edmonson,J.R. (2013). Flora of Iraq Vol. 5 part 2 .Lytharaceae ti Campanulaceae.Min. Agric. Iraq . 349 pp.
- Thalen, D.C.P.(1979) , Ecology and Utilization of Desert Shrub Rangelands in Iraq. Junk B. V. Publishers translated by Al-Yonus, M.A. (2012). Ministry of Agriculture. Baghdad, 626 pp.(In Arabic).
- Townsend, C.C. and Guest, E. (1966). Flora of Iraq . Vol.2 Ministry of Agriculture Baghdad . 184 pp.
- Townsend, C.C. and Guest, E. (1966). Flora of Iraq . Vol.8 Ministry of Agriculture Baghdad .440 pp.
- Weinert, E. & Al-Hilli,M.R. (1975). The vegetation of Jabal Sanam , South Iraq . Bull. Coll. Sci. Baghdad 16 : 3-27.