



Biodiversity and Classification of Plant Communities of Sabaloka area-central Sudan

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Abstract

The study was carried out during the period 2016 – 2018, through several extensive and intensive field trips that covered deferent habitats (Wadis & River Nile banks) of Sabaloka area central Sudan. The study dealt with Analysis of plant communities which include species diversity and classification of plants communities by Cluster Analysis (CA).

The species diversity in Wadis for trees and shrubs was lower than the diversity of herbs , while it was higher in River Nile Banks for both trees and herbs.

The study shown that the study area was included seven plant communities located in two sites. Site 1 was represented by six Wadis which included six plant communities. Site 2 was represented by River Nile Banks which included one plant community (Community 7).

Introduction:

Sudan has a high diversity in vegetation zones as a result of variation in its climate, soil and topography. The study area is located in semi-desert, or semi-arid land which is characterized by a fragile ecosystem , so aridity and various practices such as farming on River Nile Banks and over-grazing by sheep have led to deterioration of soil and vegetation. The aim of the present study is to calculate plant diversity at Sabaloka area.

MATERIALS and METHODS:

Field work :

To investigate the plant communities in every studied site, 50 quadrates of

1m X 1m (1m sq) size were randomly laid to study herbs and 50 quadrates of 10mX 10m (100 sq m) size were randomly laid to study trees and shrubs, during the rainy seasons 2016-2017 in wadis, and during winter 2016 & summer 2017 on River Nile Banks.

Analysis of plant communities:

Species diversity analysis (D):

Biodiversity Calculator Technique which is available online; <https://www.aloung> . was used to obtain Simpson's Index of species diversity, Shannon Index of species diversity , Species richness , Dominance and Equitability (Evenness) of the plant communities .

Classification of Plant Communities:

The Cluster Analysis (CA) was used by Statistical Package For Social Sciences (SPSS version. 23) for clustering the plants communities in similar groups where species abundance was used as the main parameter.

RESULTS and DISCUSSION:

Generally the results show that the species diversity (Tables 1,2) in Wadis for trees and shrubs was lower than herbs .This may be due to location of study area in semi desert region where the herbs (mainly annuals species) are adapted to complete their lifecycle during rainy season . While on River Nile Banks the species diversity for both trees and annuals species was high . This indicates that plant community 7 (River Nile Banks) is ecologically stable . This may be due

to water abundance and soil fertility caused by sedimentation of clay and silt on the River Nile Banks.

The total abundance of trees and Shrubs in study area (Wadis & River Nile, table 3) classified through application of hierarchical cluster analysis that led to three clusters shown on dendrogram (Fig.1) . This indicate that there was dissimilarity between plant species in their abundance and was clear some plant species were endangered mainly result to deforestation for building ,fire wood and mechanical farming.

The total abundance of herbs in study area (Wadis & River Nile) is shown in table (4). It classified through application of hierarchical cluster analysis that led to three clusters shown in dendrogram (Fig.2) .It was clear that most herbs are characterized by low abundance . This may be due to human activities (farming and pastoralism).

Table (1): Diversity of trees and Shrubs in Sabaloka area-central Sudan

Plant communities	Total Number of species	Total Number of individuals	Simpson's Diversity Index	Shannon Index	Dominance Index	Equitability Index
Plant community 1	5	81	0.49	1.41	0.50	0.60
Plant community 2	2	46	0.95	0.15	0.04	0.15
Plant community 3	4	132	0.45	1.25	0.54	0.62
Plant community 4	4	432	0.87	0.42	0.12	0.21
Plant community 5	3	181	0.55	0.68	0.45	0.62
Plant community 6	4	176	0.41	1.39	0.58	0.69
Plant community 7	14	1417	0.25	2.61	0.74	0.70

Table (2) : Diversity of Herbs in Sabaloka area-central Sudan

Plant communities	Total Number of species	Total Number of individuals	Simpson's Diversity Index	Shannon Index	Dominance Index	Equitability Index
Plant community 1	13	424	0.31	1.98	0.68	0.50
Plant community 2	15	771	0.32	1.98	0.68	0.50
Plant community 3	14	1141	0.29	2.15	0.70	0.56
Plant community 4	11	2914	0.66	0.75	0.33	0.31
Plant community 5	11	2469	0.42	1.07	0.57	0.44
Plant community 6	17	968	0.34	2.13	0.65	0.52
Plant community 7	26	6422	0.19	3	0.80	0.64

Location of plant communities : **Plant community 1;** AlAbyad wadi , **Plant community 2;** Al Duhum wadi , **Plant community 3;** Al Shareif wadi , **Plant community 4 ;** Abu Gidad wadi , **Plant community 5 ;** Abu Gidum wadi , **Plant community 6;** Abu Telieh wadi , **Plant community 7;** River Nile Banks.

Table (3): Total abundance of trees and shrubs in Sabaloka area-central Sudan

Species	Abundance
1. <i>Acacia ehrenbergiana</i> Hayne.	8
2. <i>Acacia tortilis</i> Subsp. <i>spirocarpa</i>	3
3. <i>Balanites aegyptica</i> (Linn.)Del	1
4. <i>Ziziphus spina-christi</i> (L.)Desf	5
5. <i>Acacia nilotica</i> Subsp. <i>nilotica</i> L.	3
6. <i>Ricinus communis</i> L.	8
7. <i>Leptadinia heterophyllae</i>	2
8. <i>Calotropis procera</i> Ait-f	3
9. <i>Parkinsonia aculeate</i> L.	3
10. <i>Capparis deciduas</i> (Forsk.).	4
11. <i>Capparis oblongifolia</i> Forssk	3
12. <i>Acacia seyal</i>	3
13. <i>Tamarix nilotica</i> (Ehrenb.).	10
14. <i>Mimosa pigra</i> L.	2
15. <i>Sesbania sesban</i> (L.) Merrill	6
16. <i>Salix mucronata</i> Thunb.	2
17. <i>Faidherbia albida</i> (Delile) A..	5

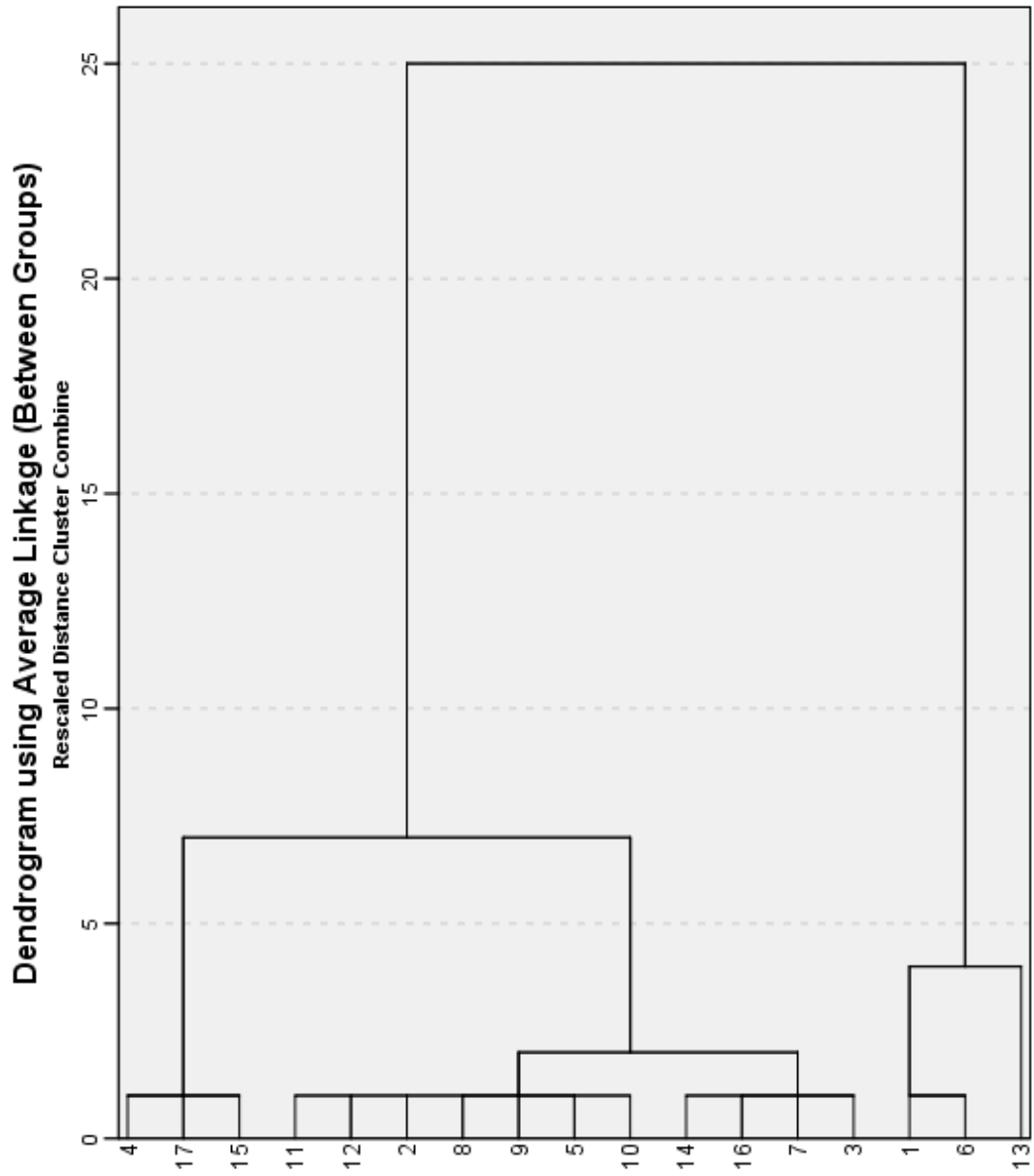


Fig.(1): Similarity between trees and shrubs in their abundance

Table (4): Total abundance of herbs in Sabaloka area-central Sudan

Species	Abundance
1. <i>Aristida adscensionis</i>	59
2. <i>Boerhaavia repens</i> L.	37
3. <i>Tribulus terrestris</i> L.	5
4. <i>Euphorbia forskalii</i> J.Gay.	8
5. <i>Tragus berteronianus</i> Schult.	11
6. <i>Indigofera hochstetteri</i> Bak.	4
7. <i>Corchorus tridens</i> L.	1
8. <i>Corchorus depressus</i> L.	5
9. <i>Citrullus colocynthis</i> L.	1
10. <i>Aristida mutabilis</i> Trin.& Rupr	75
11. <i>Dactyloctenium aegypticum</i> (L.	1
12. <i>Portulaca oleracea</i> L.	7
13. <i>Amaranthus graecizans</i>	26
14. <i>Senna alexandrina</i> Mill.	1
15. <i>Senna italica</i> Mill.	1
16. <i>Panicum turgidum</i> Forssk	2
17. <i>Fagonia cretica</i>	1
18. <i>Cynodon dactylon</i> L.	39
19. <i>Cyperus rotundus</i> L.	55
20. <i>Lasiurus hirsutus</i> Boiss .	1
21. <i>Eragrostis megastachya</i>	4
22. <i>Aristida hordacea</i> Kunth	7
23. <i>Mollugo cerviana</i> (L.)Ser.	10
24. <i>Zaleya pentandra</i> (L.) Jeffr .	4
25. <i>Limeum viscosum</i> (J.Gay) Fenzl	1
26. <i>Polygala erioptera</i> DC.	1
27. <i>Echinochloa colona</i> (L.)	11
28. <i>Amaranthus viridis</i> L.	16
29. <i>Pulicaria crispa</i> Sch.Bip.	8
30. <i>Glinus lotoides</i> L.	24
31. <i>Euphorbia hirta</i> L.	12
32. <i>Solanum americanum</i> Mill.	6
33. <i>Dactyloctenium aegypticum</i>	4
34. <i>Eclipta prostrata</i> (L.) L.	5
35. <i>Cardiospermum halicacabum</i>	2
36. <i>Chrozophora plicata</i> (Vahl.)	2
37. <i>Morettia philaeana</i> (Del) D	2
38. <i>Desmostachya bipinnata</i> L.	22
39. <i>Datura stramonium</i> L.	2
40. <i>Kyllinga alba</i> Nees	16
41. <i>Bergia suffruticosa</i> (Del.) F	2
42. <i>Hilotropium sudanicum</i>	1
43. <i>Ambrosia maritime</i> L .	2
44. <i>Argemone mexicana</i> L.	5
45. <i>Amaranthus spinosus</i> L.	39

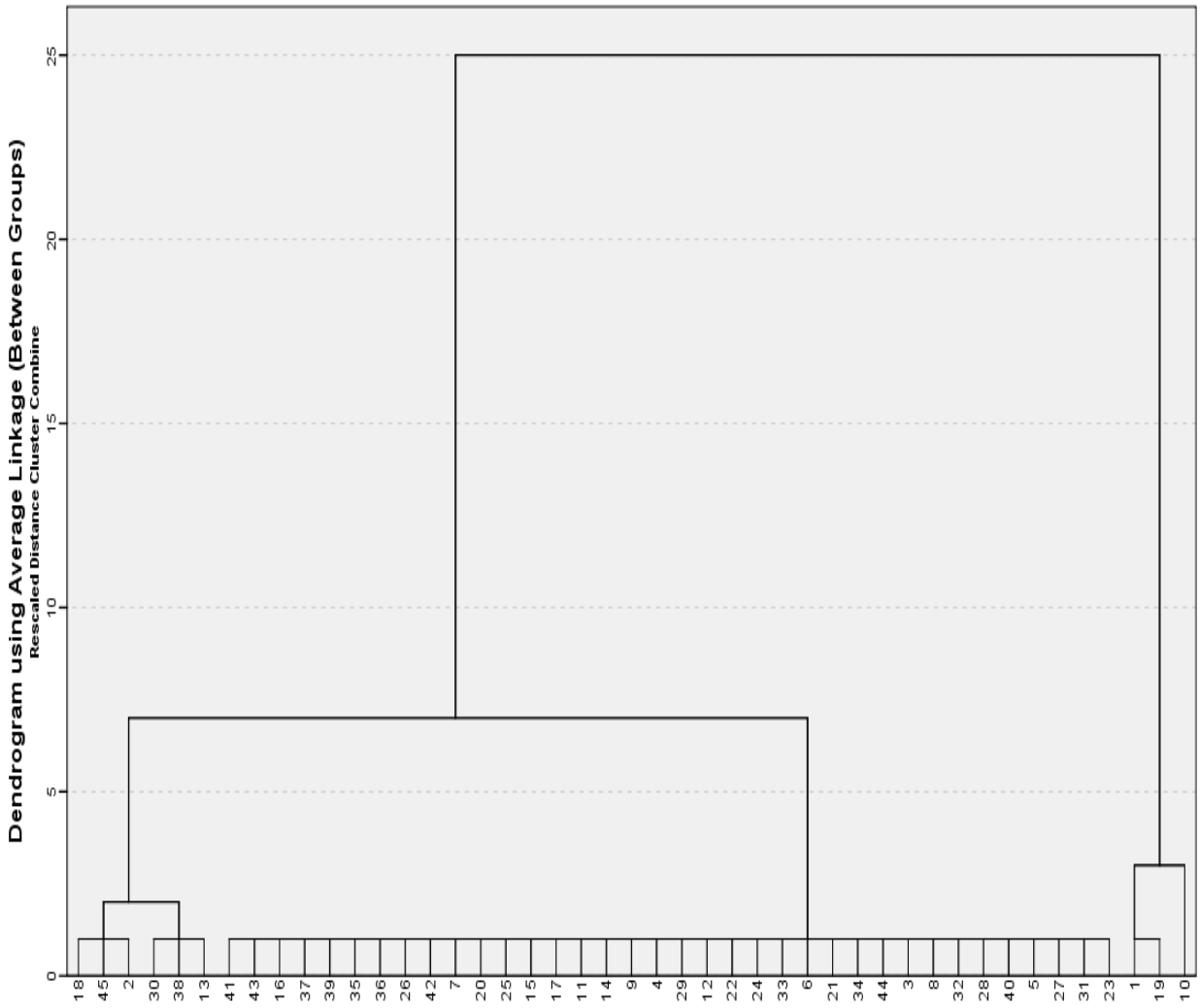


Fig.(2): Similarity between herbs in their abundance

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