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Tree Associations in Relation to Ecology in El Suki Area, Sennar State, Sudan

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Abstract

The first attempt to study the flora of the study area was in 1958, which included in the work of Harrison and Jackson about classification of the Sudan vegetation. The study area was very rich of plant diversity, especially trees, because of the high rainfall.This study is an attempt to investigate and update the associations between the treespecies to know their ecological positions among the vegetation cover.A field survey was conductedin the years 2011 to 2012 at the south-eastern part of Sinnar State for two seasons. Five major transects were taken, each of 3000m length, 10m width in a total area of 150.000m^2.Results showed that *Acacia seyali*s thedominant tree species throughout the study area, with *Acacia nilotica* and *Balanitesaegyptica* as ecological associates, because they were abundant, frequent and ofhighdensity, and less diversity in the area in the two seasons.

Key words: *Acaciaseyal, Acacia nilotica, Blanitesaegyptica,* ElSuki

Introduction

In community ecology and phytosociology an association is a type of ecological community with a predictable species composition; consistent physiognomy (structural appearance) which occurs in a particular habitat type (Barbour *et al*. 1999).The term was first coined by Alexander von Humboldtand formalized by the International Botanical Congress in 1910. (Barbour *et al*. 1999) (Willner, Wolfgang, 2006).

An association can be viewed as a real, integrated entity shaped either by species interactions or by similar habitat requirements or it can be viewed as merely a common point along a continuum. The former viewed was championed by American ecologist Frederic Clements, who viewed the association as a whole that was more than the sum of its parts, and by Josias Braun-Blanquet, a Swiss-born phytosociologist. On the other end of the argument was American ecologist Henry Gleason, proponent of the "individualistic concept" of plant associations (Barbour *et al*. 1999).

Not all of the Sudan has been covered by post studies. Smith (1948) related trees distribution in Northern Sudan to climatic and edaphic factors. An outstanding contribution is the well-documented

classification of the Sudan vegetation by Harrison and Jackson (1958), Ramsay (1958) studied central Darfur, Bruin and Massey (1929) stands as the best flora produced for the Sudan.

Recently, more comprehensive studies were undertaken. These include: Hassan (1974) who studied the flora of Erkouit, Wickens (1976) presented a detailed multi-disciplinary studies of JebalMarra. Gumma (1988) study was on Ingessana Hills, El Amin (1990) covered the woody species of the Sudan, El Awad (1995) presented an eco-taxonomical study of the Red Sea Hills, Mohammed (2001) studied the ecology of JebalAlFaw and surrounding area.This study is an attempt to fill the gap by addressing El Suki area regarding associations between trees to know their ecological positions among the vegetation cover.

Material and Methods

A field survey was conducted in the year 2011- 2012 in the south-eastern part of Sinnar State for two consecutive seasons to investigate the association between the treespecies to know their ecological position among the vegetation cover. The study area (fig.1) is located at latitude N: 12.80404 and longitude E: 34.26082in the central clay plains of the Sudan. It has a semi-arid tropical climate with high temperature during summer and relatively low temperature during winter. Relative humidity varies with maximum of 67% in winter, and minimum of 47% in summer. The soil was dark cracking with very high clay content, characterized by high swelling and shrinking characteristic (Abdelaziz, 2010).

Five major transects were taken, each of 3000m length, 10m width within a total area of 150.000m^2 (Figure 1). Sampling precision was obtained by long narrow rectangles crossing contour lines, according to Barmann (1953). Four parameters were taken; density, abundance, frequency and diversity, to measure associations between treespecies. Analysis was done by using formulae of the above parameters.
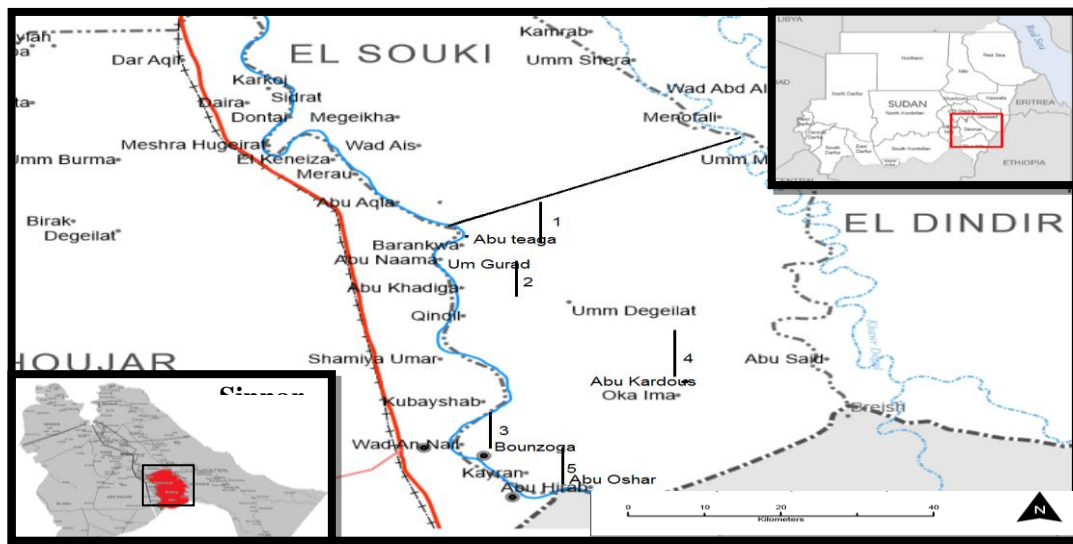

Figure 1: Study area

Source: OCHA (2012

Results and Discussion

Density: Results obtained in this study, as shown in Table (1) revealed that, *Acacia seyal* had a high density in transect 1 in the two seasons, while *Acacia nilotica* had a high density in transects 2 and 3 in season 2011 and in transects 2 in season 2012, while *Acacia Senegal* had a high density in Transect 4 in the two seasons. In transect 5 *Balanites aegyptica* had a high density in the two seasons. Results found in transect 4 agreed with Andrews (1948), who reported that rocky granting hills in Sudan such as Jebel Sagadi and Jebel Moya- west of Sinnar – are occupied by a selected number of trees such as *Angeissusleiocarpus*and *Dalbergiamelanoxylon*. *Balanites aegyptica* was dominant in transect 5 through the bank of the Khour north of Abu Oshar village. This result agreed with finding of Mohammed (2001) who reported that, foothills with 'mayaas' support dense woody cover varying from large, *Balanites aegyptica* to bushy *Acacia nubica*.

Table 1: Trees density in El Suki area the two seasons of 2011-2012

Species	Season 2011					Season 2012				
	TR 1	TR2	TR 3	TR 4	TR 5	TR 1	TR2	TR 3	TR 4	TR 5
Acacia seyal	**71.88**	10.19	8.72	11.95	6.16	**83.57**	5.06	2.33	17.64	0.00
Ziziphusspinachristi	20.54	14.81	2.56	5.98	0.00	6.43	5.06	0.00	1.70	0.76
Acacia Senegal	4.69	11.11	27.69	**61.75**	0.68	7.86	5.06	11.63	**67.91**	0.00
Dichrostachysglumerata	1.79	27.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Balanitesaegyptica	0.89	8.80	25.64	10.36	**89.04**	2.14	5.91	**75.58**	11.69	**93.18**
Acacia nilotica	0.22	**27.78**	**32.31**	0.00	0.00	0.00	**78.90**	5.81	0.00	0.00
Combretumglutinosum	0.00	0.00	2.56	0.40	0.68	0.00	0.00	2.33	0.11	0.00
Sterculiasetigera	0.00	0.00	0.51	0.00	0.00	0.00	0.00	1.16	0.00	0.00
Cephalucrotoncordofanus	0.00	0.00	0.00	8.57	0.00	0.00	0.00	0.00	0.00	0.00
Acacia polyacantha	0.00	0.00	0.00	0.60	3.42	0.00	0.00	0.00	0.21	3.03
Adansoniadigitata	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Anogeissusleiocarpus	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Hyphaenethebaica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16	0.00	0.00
Acacia fistula	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	3.03
Dalbergiamelanoxylon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00

TR = Transect

Trees abundance, frequency, diversity and density: Results as shown in Table (2) revealed that, *Acacia seyal*is common throughout the area with *Acacia nilotica* and *Balanites aegyptica* as ecological associates, because they showed high abundances, frequency and density in both two seasons. This result agreed with Mohammed (2001) who reported that, the Acacias can sometimes form a community rather than isolated stand.

Sterculiasetigera and *Adansoniadigitata,* showed less abundances, frequency and density in the two seasons, because they are far beyond their natural belt, they were in fact very rare and localized trees. This result agreed with El Amin (1990).

Acacia seyal dominates the whole area- a small, slender tree, reaching 6-15m high with an estimated cover of 83 to 153 trees per feddan in the area. *Acacia seyal* associates with *Acacia nilotica,* tree 5-20 m high with a dense spheric crown.*Balanites aegyptica,* a second associate with *Acacia seyal,* occurs along banks of the larger khors.

Table 2: Trees abundance, frequency, diversity and density in the two seasons of 2011-2012 in El Suki area

Species	Season 2011				Season 2012			
	A	F%	SiD	Density%	A	F%	SiD	Density%
Acacia seyal	**86**	**100**	12.30	**28.53**	59.4	**100**	26.8	19.34
Ziziphusspinachristi	39.75	80	90.34	10.55	9.5	80	1676.9	2.47
Acacia Senegal	82	**100**	13.53	27.21	**168**	80	5.2	**43.75**
Dichrostachysglumerata	33.5	40	513.24	4.45	0	0	0	0.00
Balanitesaegyptica	51	**100**	35.04	16.92	63	**100**	23.8	20.51
Acacia nilotica	41.33	60	148.80	8.23	96	40	64.3	12.50
Combretumglutinosum	2	80	40527.54	0.53	1.5	40	392960	0.20
Sterculiasetigera	0.5	40	**0**	0.07	1	20	**0**	0.07
Cephalucrotoncordofanus	21.5	40	1256.67	2.85	0	0	0	0.00
Acacia polyacontha	2.67	60	40527.54	0.53	3	40	78592	0.39
Adansoniadigitata	0.5	40	**0**	0.07	0	0	0	0.00
Anogeissusleiocarpus	0.5	40	**0**	0.07	0	0	0	0.00
Hyphaenethebaica	0	0	0	0	1	20	**0**	0.07
Acacia fistula	0	0	0	0	4	40	42102.9	0.52
Dalbergiamelanoxylon	0	0	0	0	3	20	392960	0.20

A = Abudance, F = Frequency, SiD = Diversity

Conclusion

It is to be concluded that, *Acacia seyal* is common throughout the study area with *Acacia nilotica* and *Balanitesaegyptica* as ecological associates, because they showed high abundances, frequency and density in both seasons.

Recommendation

It is to be recommended that further researches are needed in the study area to know the ecological relations between trees species or trees and shrubs.

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ترافق الأنواع الشجرية وعلاقتها بالبيئة في منطقة السوكي، ولاية سنار، السودان

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المستخلص

كانت المحاولة الأولى لدراسة نباتات منطقة الدراسة في عام 1958، ضمن الدراسة التي أجراها هاريسون وجاكسون عن تصنيف الغطاء النباتي في السودان. و كانت منطقة الدراسة غنية جداً بالتنوع النباتي ، و بالأخص الأشجار نسبةً لمعدلات الأمطار العالية. هذه الدراسة محاولة للتحديث والتحقق من العلاقات بين الأشجار في منطقة الدراسة لمعرفة مواقعها البيئية ضمن الغطاء النباتي للمنطقة. تم إجراء مسح حقلي في العامين 2011– 2012 في الجزء الجنوبي الشرقي لولاية سنار. وتم اختيار خمسة أشرطة كبيرة بطول 3000 متر وعرض10 متر داخل مساحة كلية تبلغ 150.0000 م^2. أظهرت الدراسة أن الطلح *Acacia seyal* هو النوع السائد من الأشجار مع وجود السنط *Acacia nilotica* و الهجليج *Blaanites aegyptiaca*، الشريكان على البيئة نفسها لأنهما الأكثر وفرةً وتردداً وكثافةً و الأقل تنوعاً في منطقة الدراسة في الموسمين بالترتيب.