

TAXONOMIC CHARACTERS OF SOME SUDANESE ACACIA TAXA BASED ON SEED MORPHOLOGY

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ABSTRACT

The study of seed surfaces revealed a number of important micro / macro morphological characters which exhibited interesting intra specific variation that was of significance for identification. In the present research work both light microscopic and scanning electron microscopic studies were used which complemented each other in obtaining a perfect differentiation between species. Numerical taxonomy uses a large number of characters and gives equal weight to all of the characters used to construct a classification. Thus, the classification obtained by numerical taxonomy gave more information than did conventional methods on the relationship between the *Acacia* taxa used in the present study. Although this study added new findings to the literature, it is somewhat limited to few *Acacia* spp. distributed in Sudan. All *Acacia* species seems to be necessary to construct a more satisfactory classification and also it would be much better of further studies use molecular data other than the ones (macro/microscopical and ecological characters) used in this study.

Keywords: Plant taxonomy, *Acacia* taxa, seed morphology, Sudan.

INTRODUCTION

Seed feature is one of the important characters used in the plant taxonomy. It has been known that the seed shape and the size are key to species. Also, the surface shapes of the seeds, sometimes have been used to distinguish varieties from each other (Cutter, 1971). Seed coated hard are not only more resistant to environmental factors, but also they preserve their shape a long time. Generally, most of the leguminosae members possess hard seed coat and contain less moisture.

Several authors have studied the taxonomy of *Acacia* using morphological characters (Bentham, 1842 and 1875; Vassal, 1972; Guinet and Vassal, 1978; Cialdella, 1984; Pedley, 1986). In Sudan *Acacia* represented by 34 species (AL-Amin, 1990). A numerical taxonomy review on morphology of northern Sudanese *Acacia* species has been carried out by Kordofani and Ingrouille (1991). Several studies emphasize seed morphology as an important tool for the taxonomic work. In spite of the importance and stability of seed characters in systematic, very little work seems to have been done on seed morphology of *Acacia*, especially no studies have been conducted so far regarding the seeds of *Acacia mellifera*, *A. nilotica* ssp. *adansonia*, *A. nilotica* ssp. *nilotica*, *A. orefolia*, *A. polyacantha* ssp. *cambylacantha*, *A. senegal* var. *senegal* *A. seyal* var. *seyal*, and *A. sieberiana* var. *sieberiana*. (AL-Gohary and Mohamed, 2007).

MATERIALS AND METHODS

Plant Material:

Acacia seeds (8 taxa) : *Acacia mellifera*, *A. nilotica* ssp, *adansonia*, *A. nilotica* ssp. *nilotica*, *A. oerfota*, *A. polycantha* ssp. *campylacantha*, *A. senegal* var. *senegal*, *A. seyal* var. *seyal* and *A. sieberiana* var. *sieberiana*.

The voucher specimens are kept at Herbarium of Botany Department, Faculty of Science and Technology, Omdurman Islamic University. The identification of the studied taxa was done according to AL-Amin, 1990. The taxa under investigation were brought from Soba Research Centre, Khartoum.

Seeds of the selected eight *Acacia* taxa were collected from various areas of West Sudan. These seeds were identified by plant taxonomist of Soba Research Forests, Ministry of Science and Technology, Khartoum. (Ustaz Hassan AL-Bager). The identification of studied taxa was also done according to AL-Amin, 1990. The voucher specimens are kept at Herbarium of Botany Department, Faculty of Science and Technology Omdurman Islamic University.

The macro – and micromorphological characters of the candidate *Acacia* taxa seeds used in numerical taxonomy analysis are:

Seed surface: large, medium, small. Seed colour: smooth, smooth-shing, pitted, rough. Seed shape: oblong-ovate, ovate, ovate-globose, globose.

For the data analysis, the data obtained from total number of the recorded characters in each taxon were subjected to the numerical analysis. The presence or absence of each of each of all characters was treated as a binary character in a data matrix. For computation to the SPSS, version 10 was used. SPSS (Statistical Package for the Social Science), version 10 is a data management and analysis product. It can perform a variety of data analysis and presentation functions, including statistical analysis and graphical presentation of data. The OUT s (Operational Taxonomic Units), produced from the analysis of present characters of the taxa under investigation and resulted in a dendrogram that was compared with the current taxonomic treatments of *Acacia*. Similarity coefficient were calculated and phenograms were constructed using the Unweighted Pair-Group method with the Arithmetic Mean (UPGMA) Method (Rollf, 1993).

The recorded data on macro – and micro-morphological characters were used to construct the Key for help the confirmation of their identification of candidate *Acacia* taxa from seeds.

RESULTS AND DISCUSSION

Table 1 shows seed macromorphology of the candidate *Acacia* taxa. Table 2 shows macro and micromorphology criteria of the studied taxa of *Acacia*. Figure 1 shows UPGMA dendrograms of the relationships within the studied taxa.

The recorded data on macro/ micromorphology characters (Tables 1 & 2 ; Plates 1-16 and Figure 1) were used to construct the following indented Key to the eight *Acacia* taxa respectively, so that it might help the confirmation of their identification:

1. Seed surface sculpture is reticulate, with wingless seed, seed brownish-black, areole shape obovate, hilum position subterminal hilum shape slit-like, seed texture rough,.....

A. nilotica ssp. adansonia

A. nilotica ssp. nilotica

1a. Seed surface is medium, Seed shape oblong – ovate

A. nilotica ssp., adansonia

1b. Seed surface is relatively large, Seed shape ovate

A. nilotica ssp. nilotica

2. Seed surface with mottled wax; seed shape ovate; winged seeds; hilum position terminal; seed texture smooth-shiny; Hilum shape slit-like; seed texture smooth-shiny; seed surface is relatively large seed surface is medium

A. mellifera

3. Seed surface sculpture is reticulate; Seed shape oblong – ovate reticulate with wingless seeds; hilum position lateral; hilum shape round; seed texture pitted; Hilum shape slit-like; seed texture smooth-shiny; seed surface is relatively large seed surface is medium

A. seberiana var. seberiana

4. Seed surface is medium; Seed surface sculpture is reticulate; winged seeds; hilum position terminal; shape round,.....

A. orefota

A. polycantha ssp. camplyacantha

4a. Seed shape ovate; seed colour grey-olivegrey; areole shape obovate, ...

A. orefota

4b. Seed surface with mottled wax; seed shape ovate-globose; seed colour brown; areole shape horseshoe

A. polycantha ssp. camplyacantha

5. Seed surface with spotted wax; winged seeds; areole shape horseshoe; hilum position terminal;.....

A. Senegal var. senegal

A. seyal var. seyal

5a. Seed surface is small; hilum shape round; seed texture smooth.....

A. seyal var. seyal

5b. seed shape globose;... ..

A. senegal







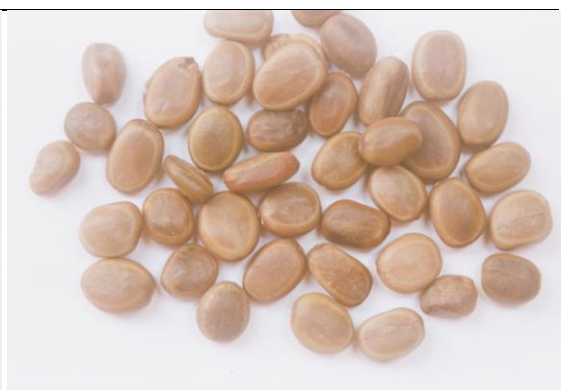
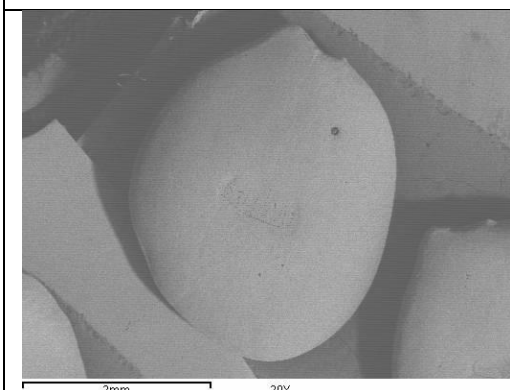
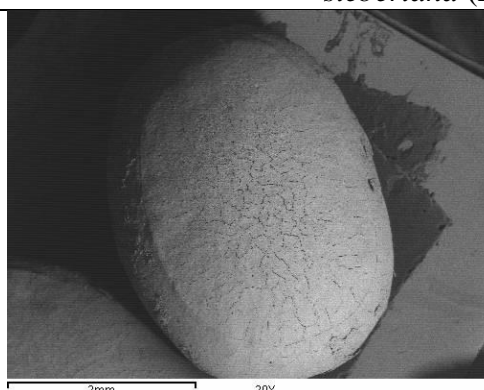
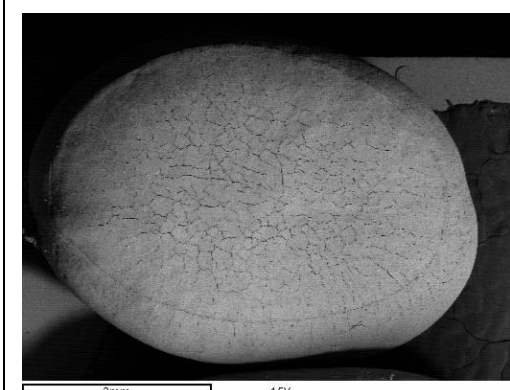
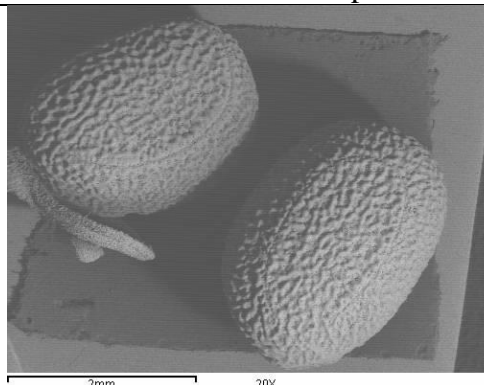
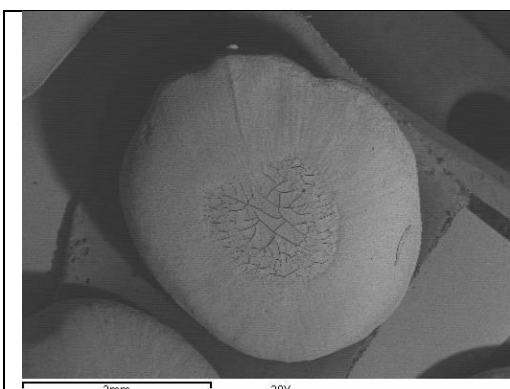
	
Plate (1) : <i>Acacia mellifera</i> (X20)	Plate (2) : <i>Acacia nilotica</i> ssp. <i>adansonia</i> (X20)
	
Plate (3) : <i>Acacia nilotica</i> ssp. <i>nilotica</i> (X20)	Plate (4): <i>Acacia oerfota</i> (X20)
	
Plate (5): <i>Acacia polyacantha</i> ssp. <i>campylacantha</i> (X20)	Plate (6) : <i>Acacia senegal</i> var <i>senegal</i> (X20)

Plate (7) : *Acacia seyal* var. *seyal*(X20)Plate (8): *Acacia sieberiana* var. *sieberiana* (X20)Plate 9. *Acacia mellifera* seed surfacePlate 10. *Acacia nilotica* ssp. *Adansonia*Plate 11. *Acacia nilotica* ssp. *Nilotica*Plate 12. *Acacia oerfota*Plate 13. *Acacia polyacantha* ssp. *Campylacantha*Plate 14. *Acacia Senegal* var *Senegal*

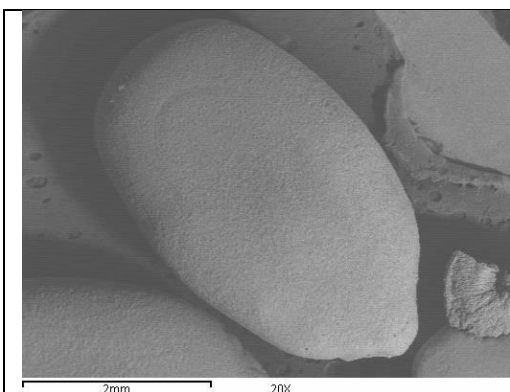


Plate 15. *Acacia seyal* var. *seyal*

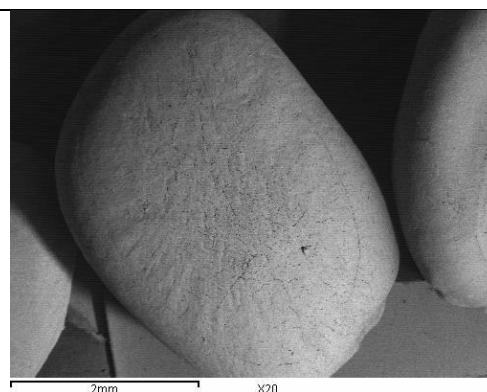


Plate 16. *Acacia sieberiana* var *sieberiana*

Table 1. Seed macromorphology of the candidate *Acacia* taxa

taxa\chracters	Mean Length (mm)	Mean Width (mm)	Thickness (mm)	Length/ Thickness Ratio	Width / Thickness Ratio	Shape	Texture	Areole shape	Hilum position	Hilum shape
<i>A.mellifera</i>	5.60	4.00	1.68	3.33	2.38	O	S-SH	H	T	SK
<i>A. nilotica</i> ssp. <i>Adansonia</i>	7.00	3.30	3.23	2.17	1.02	O-R	R	O	ST	SL
<i>A. nilotica</i> ssp. <i>Nilotic</i>	8.00	4.00	3.20	2.50	1.25	O-R	R	O	STT	SL
<i>Acacia oerfota</i>	4.60	4.00	5.20	1.13	0.77	OB	U	O	T	RO
<i>Acacia polyacantha</i> ssp. <i>campylacantha</i>	6.40	4.00	2.03	3.15	1.97	R-O	S	H	T	RO
<i>Acacia senegal</i> var. <i>senegal</i>	6.60	5.60	1.67	3.95	3.35	R-O	S-H	H	T	SL
<i>Acacia seyal</i> var. <i>seyal</i>	4.30	2.10	1.84	2.34	1.14	O	S	H	T	RO
<i>Acacia sieberiana</i> var. <i>sieberiana</i>	6.30	3.30	4.88	1.29	0.68	O-R	P	O	L	RO

Shape: O=obovate; OB=oblong; O-R= oblong-rectangular. Texture: SH=shiny; S=smooth; P=pitted; U=undulate.

Areole shape: H=Horseshoe; O=obovate. Hilum position: T=terminal; ST=subterminal; L=lateral.

Hilum shape: SK=sunken; RO=round; SL=slit-like

Table 2. Macro and micromorphological criteria of the studied taxa of *Acacia*

Macro- and micro-morphological criteria	<i>A.mellifera</i>	<i>A.nilotic</i> <i>a</i> ssp. <i>adansoni</i> <i>a</i>	<i>A.nilotica</i> ssp. <i>nilotica</i>	<i>A. oerfota</i>	<i>A.</i> <i>polyacantha</i>	<i>A.senegal</i>	<i>A.seyal</i>	<i>. siebriana</i>
Seed surface large	0	0	1	0	0	1	0	0
Seed surface small	0	0	0	0	0	0	1	0
Seed surface medium	1	1	0	1	1	0	0	1
Seed brownish black	0	1	1	0	0	0	0	0
Seed grey-olive to grey	0	0	0	1	0	0	0	0
Seed brown	0	0	0	0	1	0	0	0
Seed texture smooth	0	0	0	0	0	0	1	0
Seed texture smooth-shiny	1	0	0	0	0	1	0	0
Seed texture pitted	0	0	0	0	0	0	0	1
Seed texture rough	0	1	1	0	0	0	0	0
Seed shape oblong-ovate	0	1	0	0	0	0	0	1
Seed shape ovate	1	0	1	1	0	0	0	0
Seed shape ovate-globose	0	0	0	0	1	0	0	0
Seed shape globose	0	0	0	0	0	1	0	0

(1) = Present, (0) = Absent

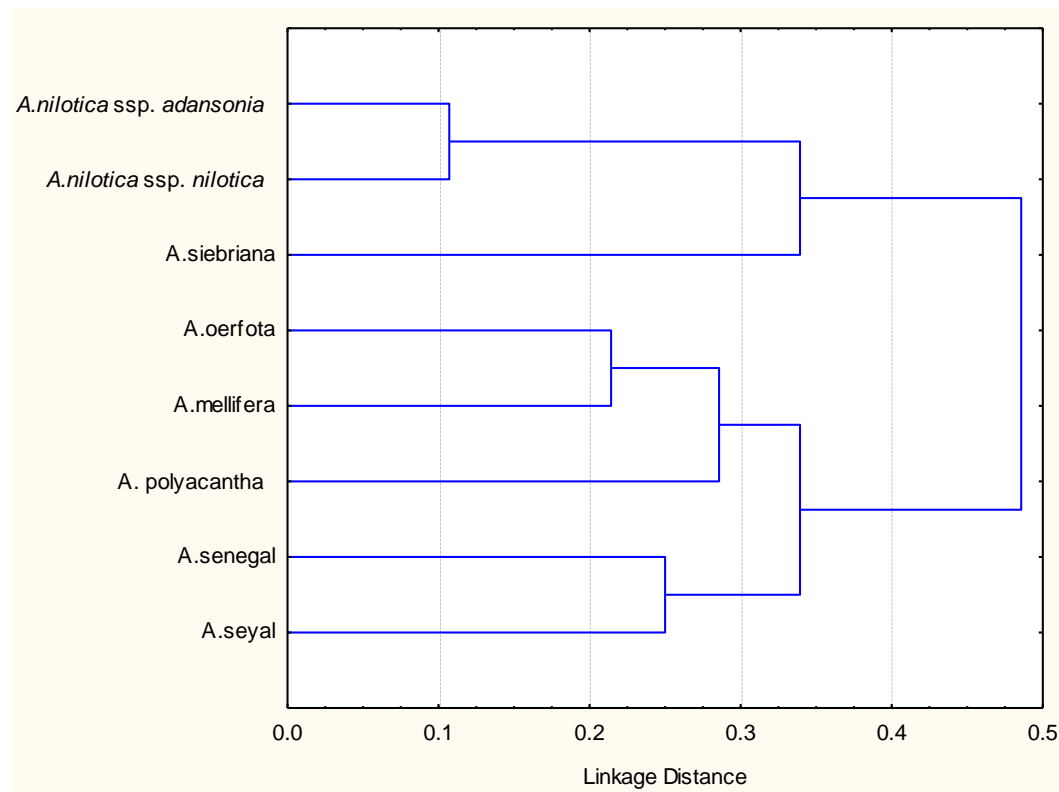


Figure (1) UPGMA dendograms of the relationships within the studied *Acacia* taxa .

CONCLUSION

On the basis of macro/micromorphological characters, the species of this genus present in three clusters. The first group indicates *A.nilotica ssp.adansonia* and *A. nilotica ssp. nilotica*, which are similar and subgroup include *A. sieberiana var. sieberiana*. The second group includes *A. oerfota* and *A. mellifera*, which are similar and subgroup include *A. polyacantha ssp. campylacantha* whereas third group includes *A. Senegal var. Senegal* and *A. seyal var. seyal* only.

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