

MORPHOLOGICAL STUDY AT THE INTRA-VARIETAL LEVEL OF ACACIA SEYAL VAR. SEYAL

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The present study has been devoted to the morphological variations within *Acacia seyal* var. *seyal*, one of the multipurpose wide-spread leguminous trees in Africa and Asia. Three categories within this variety, differentiated by bark color, have been studied at mature and seedling's stages. The study has entailed quantitative measurements that analysed statistically where significant differences were detected among the measurable data. Consequently, three different forms, following the bark color have been suggested.

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Key words. Acacia seyal var. *seyal*, Intravarietal morphology.

بررسی ریخت‌شناسی در سطح واریته گونه *Acacia seyal* var. *seyal* کمال فضل السید الخلیفه

گونه *Acacia seyal* var. *seyal* از گیاهان چند منظوره در آفریقا و آسیا است. در این مطالعه ریختار گیاه مورد بررسی قرار گرفته است. این گونه بر اساس رنگ پوست در مراحل بلوغ و نونهال به ۳ گروه قابل تفکیک است. نتایج حاصل از اندازه گیری‌های کمی مورد تجزیه و تحلیل آماری قرار گرفت و در بین گروه‌های مختلف اختلاف معنی‌دار وجود دارد. در نتیجه ۳ شکل بر اساس رنگ پوست پیشنهاد می‌گردد.

Introduction

Acacia seyal (Talh in Arabic) is one of the leguminous trees wide-spread in Africa and some Arabic countries. The tree belongs to *Mimosoideae* within *Leguminosae*. Talh is readily distinguished by the long white paired spines and the bright yellow head inflorescence. The tree is of multiple uses and values in different countries. Common uses and values of the tree include medicinal (where bark and gum have an astringent property and timber used as perfume and anti-rheumatism), fuel, fodder, decoration, soil fertility and soil fixation (Sahni, 1968, Thirakul (1984) and Elkhalifa (1996). The gum excreted from the tree constitutes about 10% of the famous Gum Arabic that enters in many industries.

Acacia seyal has two distinctive varieties, namely *seyal* that characterized by the reddish bark, and *fistula* that characterized by the whitish powdery bark and the white galls at the spinal nodes (Sahni, 1968). However, Hall et. al (1993) mentioned a third variety (*multijuga*). The two varieties are wide-spread in Africa. However, the author has noted that there are some morphological variations among *Acacia seyal* var. *seyal* (as no galls are noticed) trees pertaining to the bark's color. Such variations were noted in Rawashda forest of eastern Sudan, Shambat area northern Khartoum, and Deirab farm southern Riyadh, Saudi Arabia. Some authors e.g. N.A.S. (1980 a), Chaudhary (1983), Duke (1983 a), Collenette (1986), Booth and Wickens (1988) and El-Amin (1990) had either described *Acacia seyal* only or pointed generally to some variations within the species. However, Three main bark's colors could be distinguished: red, yellow and green. They also grow naturally on the same sites so they can not be considered as different ecotypes of the variety *seyal*.

The present study aims to check the morphological differences among the three

color categories of *Acacia seyal* var. *seyal*. The specific objectives set are to study the variations in the vegetative characteristics (mainly spines, leaves, leaflets and pinnae) at both mature and seedling' stages, and reproductive characteristics at the mature stage.

Materials and Methods

Random samples of growing trees from each color group were taken for experimentation. Morphological characters of spines, leaves, pinnae, leaflets, inflorescence, pods and seeds were studied (Table 1) .The study entails quantitative measurements (pod length, inflorescence diameter(as it is spherical), and spine, leaf and pinnae lengths, and number of pinnae and leaflets) besides the qualitative characters of color, shape etc. This study utilizes the procedures adopted by Aref et. al (2002) and Elkhalifa and Aref (2004) for differentiation among mature Acacias, and among seedlings, respectively.

In order to study the seedlings' variations, ripen pods were collected from each color group separately and seeds were extracted manually. Samples of one hundred seeds were taken from each group, treated with boiling water for three minutes, and sown in a randomized layout of five replicates in a traditional nursery in Deirab farm fifty kilometers south Riyadh, Saudi Arabia. The nursery soil (mixture of sand and clay 1:1) was used.

At the age of three months, random samples of five seedlings were taken from each group where seedling's height (cm), leaf length (cm), pinna's length (cm) and spine length (mm) were measured, and number of pinnae and leaflets (in pairs) were counted (Table 1).

Measurable data of both adult trees and seedlings were subjected to statistical analysis, and means were separated using L.SD.

Table 1. Morphological characters measured for comparison among categories within *Acacia seyal* var. *seyal*.

Morphological organ	detailed morphological measurements
A/ Mature trees	
Spines	Length (cm)
Pinnae and leaflets	Number (in pairs) and leaf
Leaves	Length (cm)
Pinnae	Length (cm)
Seeds	No./ kg., length (mm) and diameter (mm)
Inflorescence	Diameter((cm) and stalk (cm)
Pod (crescent shpae)	Length (cm)
B/ Seedlings	
Spines	Length (mm)
Pinnae and leaflets	Number (in pairs) and leaf
Leaves	Length (cm)
Seedling's height	Shoot height (cm)
Pinnae	Length (cm)

Results and Discussion

The present study fulfilled its primary aim as significant differences are detected among the parameters measured for adult trees and seedlings of the different categories of *Acacia seyal* var. *seyal*. As some more detailed characteristics are needed for distinction at the intra-varietal level, the present study utilizes more measurable morphological characters than those adopted by Aref (2000), Aref et. al (2003) and Elkhalfifa and Aref (2004).

As far as mature trees are concerned, green bark trees have shown significantly longer spines and larger number of seeds per kilogram than either of the other two categories. However, yellow bark trees have shown significantly longer leaves, and share the green category the large number of pinnae (Table 2).

Concerning the seedlings growth of the different bark categories of *Acacia seyal* var. *seyal*, the trees of yellow bark have given taller seedlings at three months old, and longer

spines than either of the other two categories (Table 3). Accordingly, the present work gives more details to the work of Elkhalfifa and Aref (2004) on morphology of some *Acacia* seedlings.

The present study reveals that the three bark categories have distinguished morphological characters at mature stage, where the yellow bark trees have superior growth at seedling's stage and longer leaves at the adult stage, while green bark trees have longer spines at the adult stage and of lighter seeds. The red bark trees are of inferior vegetative growth throughout course of the experiment, and of smaller number of pinnae at maturity.

The findings of this research may suggest that these bark categories form different genetic lines or forms within *Acacia seyal* var. *seyal*. It might be followed by some alteration in the taxonomy of *Acacia seyal* at the intraspecific level, a matter that warrant further studies, especially on the chromosomal field.

Table 2. Comparison among mean morphological characters of mature trees of three categories within *Acacia seyal* var. *seyal*. (Means with the same small letter at the same row are not significantly different ($p=0.05$)).

Tree category Character	Green bark	Red bark	Yellow bark
Spine length-cm	4.0a	2.8b	2.3b
Leaf length-cm	4.0b	3.0ab	5.5a
Pinna length-cm	1.6a	1.3a	1.5a
No. of pinnae	5.0a	3.0b	5.0a
No. of leaflets	11.0a	11.0a	10.0a
Inflorescence stalk (cm)	1.2a	1.5a	1.3a
Inflorescence in diameter-cm	1.2a	1.1a	1.5a
Pod length (cm)	6.4a	5.0a	4.5a
No. of seeds/kg	38709a	28787b	29900b
Seed length-mm	5.6a	5.2a	6.2a
Seed diameter-mm	3.0a	2.7a	3.2a

Table 3. Average seedlings' growth of three categories within *Acacia seyal* var. *seyal* (3 months old). (Means with the same small letter at the same row are not significantly different ($p=0.05$)).

Trees Character	Green	Red	Yellow
Seedling length (cm)	23.5 b	23.0 b	26.0 a
Leaf length (cm)	3.0 a	2.5 a	2.4 a
Pinna length (cm)	1.3 a	1.5 a	0.9 a
Spine length (mm)	4.0 b	2.0 b	16.0 a
No. of pinnae (in pairs)	4.0 a	3.0 a	3.5 a
No. of leaflets (in pairs)	11.6 a	11.2 a	10.2 a

References

- Aref, I. M. 2000: Morphological characteristics of seeds and seedling growth of some native acacia trees in Saudi Arabia. *Journal of King Saud University, Agricultural Sciences* 12 (2), 31-95.
- Aref, I. M. Elkhalifa, K. F., Al-Juhany, L. I. A 2003: Dendrological Key for Identification of Acacias Growing in Saudi Arabia and Northern Sudan. *Journal of King Abdulaziz University, Meteorology, Environment and Arid Land, Agriculture Sciences*, vol. 14, 87-94.
- Booth, F. E. M. and Wickens, G. E. 1988: Non-timber Uses of Selected Some Trees and Shrubs in Africa. F.A.O. Conservation Guide, 19: 8-12.
- Chaudhary, S. A. 1983: Acacia and other Genera of Mimosoideae in Saudi Arabia. Ministry of Agriculture and Water, Saudi Arabia.
- Collenette, S. 1985: An Illustrated Guide to the Flowers of Saudi Arabia. Scorpion publishing LTD., London. Pp. 286-291.
- Duke, J. A. 1983 a: Medicinal Plants of the Bible. Trado-Medic Books, Owerri, NY.

- El-Amin, H. M. 1990: Trees and Shrubs of the Sudan. Ithaca Press. 484 p.
- Elkhalifa, K. F. 1996: Forest Botany. Khartoum University Press. Pp. 79-94.
- Elkhalifa, K. F., Ibrahim, M. A. and ElGhazali G. 2003: Contribution to the Flora of the Gash River Delta, Eastern Sudan. Bulletin Research No. Agriculture Research Center, King Saud University.
- Elkhalifa, K. F., Aref, I. M. 2004: Morphological Studies on Fourteen Acacia Seedlings. Bulletin Research No. Agriculture Research Center, King Saud University.
- Hall, J. B. and Mc Allan, A. 1993: *Acacia seyal*: A Monograph. School of Agricultural and Forest Sciences, University of Wales, Bangor.
- N.A.S. (1980a) Firewood Crops. Shrub and Tree species for Energy Production. National Academy of Sciences, Washington, DC.
- Sahni, M. 1968: Important Trees of the Northern Sudan. Khartoum university Press. Pp. 40-63.
- Thirakul, S. 1984: Manual of Dendrology. Quebec, Canada.