Journal of American Science

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# Reproductive Characters of two species *Acacia ehrenbergiana* and *Acacia raddiana*, Al-Jummum District, Western Area, K.S.A.

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**Abstract:** The present study has been carried out at Al-Jummum District, Western K.S.A., with aim of investigating some reproductive characters of *Acacia ehrenbergiana* and *Acacia tortilis subsp raddiana*. The specific goals are to investigate and measure the fruit and seed sizes and weights, and seed number per fruit. The findings of the research work show that the pod and seeds characteristics differed significantly among the two species under the study. The differences were in parameters measured, which included Pod length (PL cm), Pod width (PW cm), Seed number/pod (SNP-1), Seed length (SL mm), and Seed width (SW mm). However, the mean pod length of 6.4cm of *Acacia ehrenbergiana* was significantly higher than that of acacia *tortilis subsp.raddian* with 4.5cm. The *Acacia tortilis subsp raddiana* recoded the highest mean seed number/pod of 9.8 seed/pod against 5.3 seed number/pod of *Acacia ehrenbergiana* The mean pod width of 5mm of *Acacia tortilis subsp raddiana*, was higher than the 3,8mm of *Acacia ehernbergiana*. The study also revealed considerable variations in pods and seeds weights between two species under study. The weight of 100 pods of *Acacia raddian*a reported the highest weight of 240 gm, and 18 gm for *Acacia ehrenbergiana*. The weight of 31 gm of 30pods and 15gm of the seeds of 30 pods were obtained from *Acacia raddiana* against 3gm and 1gm for *Acacia erhrenbergian* respectively. The study found that *Acacia tortilis susp. raddiana* had the largest weights of empty pod 0.53gm, pod 1.03gm, seed/pod 0.5gm and 5gm of100seeds, while *Acacia ehrenbergiana* had the smallest weights of 0.03gm, o.1gm, 0.07gm and 1gm respectively. The variations of *Acacia tortilis susp. radiana* pods, this may be due to the ecological adaptability.
[K. Elsafori. **Reproductive Characters of two species *Acacia ehrenbergiana* and *Acacia raddiana*, Al-Jummum District, Western Area, K.S.A.** *J Am Sci* 2021;17(2):40-44]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 4. doi:10.7537/marsjas170221.04.

**Keywords:** Reproductive; Characters; species; *Acacia ehrenbergiana; Acacia raddiana;* Al-Jummum; Western Area

## Introduction:

Acacia, commonly known as the wattles or acacias, is a large genus of trees and shrubs in the subfamily Mimosoidae of pea family Fabaceae. Initially, it comprised a group of plant species native to Africa and Australia. The genus Acacia is the second largest in the family leguminosae, with about 1350 species. It is distributed throughout the tropical and warm temperate areas of the world, with the largest concentration of species in Australia (957 species) and also with high numbers in the Americas (185 species), Africa (144 species) and Asia (89 species), (Malsin et al, 2003). *Acacia tortilis subsp. raddiana* is a pioneer tree of dry areas and it is a drought –resistant species. The averages of the main descriptive morphological values o*f Acacia tortilis* trees are 3.25m of the height, 13.83cm of the diameter at the base, 7.47cm for the diameter at 1.3m, 4.46m for the diameter of crown north- south and 4.15m for diameter of crown east- west. The means of the main descriptive morphological values of pods are for the number of seeds before maturity 189.26, for number of seeds after maturity 50.625, for loss in pods 85,04%, for a total number of seeds 406.11 for a total weight of seeds 14.12g, and for the percentage of seeds infested 32.72%. Most of measured parameters showed significant differences that indicate a high genetic diversity (Jaouadi et al, 2013). Acacia species in Saudi Kingdom are threatened due to human and environmental pressure, narrow genetic diversity, small population size and low population density (Aref et al, 2003). *Acacia raddiana* shows remarkable climatic tolerance and ecological adaptability. It is characterized by large ecological plasticity colonizing regions receiving between 50-1000mm of annual precipitation (Quarda et al, 2009).

*Acacia ehrenbergiana* is a tall shrub or small tree, seldom exceeding 4m. in height. The compound leaves are small, with up to four pair's o pinnae, each with eight to twelve pairs of pinnules. The seedpods are flattened and curved with constrictions

between the seeds. It is native to the central and south Sahara and the northern part of the Sahel but is uncommon in the Western Sahara. It also occurs in East Africa and Arabia. It is a very drought –tolerant species and can survive in areas with rainfall range of between 50 and 400mm. Raddad (2007), noticed that in Sudan, clay plain provenances showed considerable variation in seed weight and seed number *of Acacia Senegal*. They had the smallest seed weight but the highest seed number; while the sand provenances had the largest seed weigh but the lowest seed number. The genus Acacia is currently drawing great interests due to their drought stress resistance abilities (Oba et al,2002) and Multi- purpose use-values such as fodder, sources of wood and non-wood products, provision of shade and live fencing and maintain soil fertility through nitrogen fixation (Belsky et al, 189). The morphological variation found in pods of *Acacia subsp. raddiana* (El- Ayadi et al, 2011). The Acacia population in Saudi Arabia is threatened due to their narrow genetic diversity and geographical range, small population size and low density, extreme environmental conditions, and indiscriminate cutting of trees, despite the fact that they have a high reproductive capacity (Hamad, 2012).

**Material s and Methods:**

The study was conducted at Al-jummum District ($21^0 48^/ 3^{//}$ N,$39^0 43^/ 25^{//}$E), Western Area, Saudi Arabia. The climate of the study area is characterized by high temperature in summer and warm in winter. The study area has an arid climate and rainfall apart from it is scantiness is irregular and variable.

The specimens of pods were collected randomly from the trees in the study area and randomly from the branches of the trees. The specimens were collected in paper bags,; finally, the specimens were labeled and deposited at the laboratory of Agricultural Research Station of King Abdul-Aziz University, Hada Al-Sham.

**Specimens Assessment:**

In the laboratory, further assessments were done, initially by examining the morphological characters of the specimens collected by using a hand lens. The sensitive balance was used for weighing collected specimens of pods and seeds and vernier caliper (digital) and threads were used for measuring pod length, pod width, seed length and seed width.

Quantitative assessment included: Pod length (PL cm), pod width (PW mm), seed number/pod ($SNP^{-1}$), seed length (SL mm), Seed width (SW mm). The weights in (gm) were assessed for 100 and 30 pods, seeds of 30 pods, an empty pod, and a pod with seeds, seed/pod and 100 seed. The 100 pods collected randomly/tree and 30 pods were selected randomly from the 100 pods for assessment.

**Results:**

The findings of the work show that the pod and seeds characteristics differed significantly among the two species under the study *(Acacia ehrenbergiana* and *Acacia raddiana*). They significantly differed for all the parameters measured which included: the weights of pods and seeds in gms. Weight of 100 pods, the weight of 30 pods, the weight of seeds of 30 pods, the weight of an empty pod, the weight of a pod, the weight of seed/pod and the weight of 100 seeds, are given in Table 4.

Morphological differences of pods and seeds of two species *Acacia ehrenbergiana* and *Acacia tortilis subsp raddian*a are given in Tables 1, 2 and 3, respectively.

**Table (1).** Seed characteristics of *Acacia ehrenbergiana* Pods**:**

| Pod No. | PL cm | PW mm | $SNP^{-1}$ | SL mm | SW mm |
|---|---|---|---|---|---|
| 1 | 7 | 4 | 1 | 4 | 2 |
| 2 | 7.2 | 3 | 4 | 4 | 2 |
| 3 | 7.5 | 4 | 6 | 4 | 2 |
| 4 | 6.5 | 5 | 4 | 4.5 | 2 |
| 5 | 4.5 | 4 | 2 | 4.5 | 3 |
| 6 | 7 | 4 | 6 | 4 | 2.8 |
| 7 | 5 | 3 | 6 | 4.6 | 2.5 |
| 8 | 7.3 | 4 | 7 | 4.1 | 2.5 |
| 9 | 7.2 | 4 | 5 | 5 | 3 |
| 10 | 8.8 | 3 | 6 | 5 | 3.1 |
| 11 | 7.2 | 4 | 2 | 4.5 | 2.4 |
| 12 | 5.5 | 3 | 9 | 4.9 | 2.2 |
| 13 | 7 | 4 | 5 | 4.9 | 2.5 |
| 14 | 5.5 | 3 | 6 | 5 | 3 |
| 15 | 7.5 | 4 | 7 | 4.5 | 2.5 |
| 16 | 7.6 | 4 | 4 | 5 | 2.5 |

| | | | | | |
|---|---|---|---|---|---|
| 17 | 6.5 | 4 | 6 | 4.9 | 2.5 |
| 18 | 5 | 4 | 7 | 4.5 | 2.5 |
| 19 | 8.4 | 4 | 6 | 4.8 | 2.5 |
| 20 | 5 | 4 | 4 | 5 | 2.7 |
| 21 | 3.3 | 5 | 6 | 5 | 3 |
| 22 | 6.5 | 3 | 5 | 4.8 | 2.9 |
| 23 | 5.5 | 4 | 7 | 4.9 | 2.5 |
| 24 | 6 | 4 | 5 | 5 | 2.5 |
| 25 | 5.7 | 3 | 6 | 4 | 2.2 |
| 26 | 6.8 | 4 | 7 | 3.5 | 1.9 |
| 27 | 5 | 3 | 6 | 4.7 | 2.9 |
| 28 | 7.1 | 4 | 5 | 4.8 | 2.8 |
| 29 | 5.2 | 3 | 4 | 5.1 | 3 |
| 30 | 6.3 | 4 | 5 | 5 | 2.4 |
| Total | 190.6 | 113 | 159 | 138.5 | 76.3 |
| Mean | 6.4 | 3.8 | 5.3 | 4.6 | 2.5 |

**Table (2).** Seed characteristics of *Acacia tortilis subp. raddiana* Pods

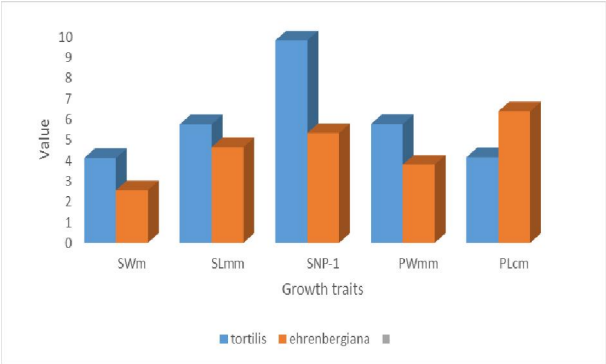
| Pod No. | PL cm | PW mm | SNP-1 | SL mm | SW mm |
|---|---|---|---|---|---|
| 1 | 5.58 | 6 | 10 | 5.2 | 3 |
| 2 | 6 | 5 | 11 | 6 | 4 |
| 3 | 4 | 4 | 10 | 3.5 | 4 |
| 4 | 4.5 | 5 | 10 | 6.1 | 5 |
| 5 | 3.5 | 4 | 13 | 6 | 4.1 |
| 6 | 4.5 | 5 | 11 | 6 | 4 |
| 7 | 5.4 | 6 | 10 | 6 | 4 |
| 8 | 4 | 5 | 12 | 6 | 4.2 |
| 9 | 4 | 6 | 9 | 5 | 4 |
| 10 | 3.5 | 4 | 7 | 4 | 3 |
| 11 | 4.8 | 6 | 11 | 6 | 4 |
| 12 | 3.5 | 7 | 10 | 6.1 | 4.2 |
| 13 | 6.5 | 5 | 9 | 6 | 4 |
| 14 | 3.5 | 6 | 7 | 5 | 4 |
| 15 | 6 | 5 | 11 | 6 | 5 |
| 16 | 3.6 | 4 | 10 | 7 | 5 |
| 17 | 4.2 | 4 | 11 | 6 | 4.1 |
| 18 | 3 | 5 | 10 | 5.4 | 4 |
| 19 | 2.5 | 5 | 10 | 6.2 | 4.9 |
| 20 | 4.9 | 5 | 11 | 6.1 | 5 |
| 21 | 3.5 | 4 | 9 | 5.1 | 3 |
| 22 | 4.9 | 4 | 6 | 6 | 4.2 |
| 23 | 4 | 5 | 7 | 6 | 4 |
| 24 | 4.8 | 5 | 10 | 5.1 | 4 |
| 25 | 3.5 | 4 | 10 | 6.1 | 4.2 |
| 26 | 5 | 5 | 11 | 6.1 | 4 |
| 27 | 6 | 5 | 10 | 6 | 4 |
| 28 | 5.5 | 5 | 7 | 5.5 | 4 |
| 29 | 4 | 6 | 9 | 6 | 4 |
| 30 | 3.5 | 6 | 11 | 6 | 4 |
| Total | 133.9 | 151 | 293 | 171.5 | 122.9 |
| Mean | 4.5 | 5 | 9.8 | 5.7 | 4.1 |

Table 3. Pod and seed characteristics of two species (*Acacia raddiana and A. ehrenbergiana*):

| Characteristics | Acacia tortilis subp. raddiana | Acacia ehrenbergiana |
|---|---|---|
| weight of 100 pod gm | 240 | 18 |
| Weight of 30 pods gm | 31 | 3 |
| Wt. of seed of 30 pods gm | 15 | 1 |
| Wt. of empty pod gm | 0.53 | 0.03 |
| Wt. of pod gm | 1.03 | 0.1 |
| Wt. of seed / pod gm | 0.5 | 0.07 |
| Wt. of 100 seed gm | 5 | 1 |

Table (4): Group Statistics:

| Var. | Species | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| SW (mm) | *1- Acacia raddiana* | 30<br>30 | 4.097<br>2.543 | 0.5156<br>0.3549 | 0.0941<br>0.0648 |
| SL (mm) | *2 – Acacia ehrenbergiana* | 30<br>30 | 5.717<br>4.617 | 0.6899<br>0.4284 | .1260<br>0.0782 |
| SNP-1 | *1-Acacia raddiana* | 30<br>30 | 9.77<br>5.30 | 1.612<br>1.685 | 0.294<br>0.308 |
| PW (mm) | *2-Acacia ehrenbergiana* | 30<br>30 | 5.73<br>3.77 | 3.723<br>0.568 | 0.680<br>0.104 |
| P (cm) | *1-Acacia raddiana* | 30<br>30 | 4.4060<br>6.3533 | 1.01049<br>1.22664 | .18449<br>0.22395 |




The results revealed significant differences between the two species *Acacia tortilis subsp raddiana and Acacia ehrenbergiana* regarding reproductive characters studied. The differences were in parameters measured, which included: Pod length (PL cm), Pod width (PW cm), Seed number/pod (SNP$^{-1}$), Seed length (SL mm) and Seed width (SW mm).

Fig. (1): Histogram showing the mean differences in the parameters measured of *(Acacia ehrenbergiana and Acacia raddiana).*

However, the mean pod length of 6.4cm of *Acacia ehrenbergiana* was significantly higher than that of A*cacia tortilis subsp. raddian* with 4.5cm. The *Acacia tortilis subsp raddiana* recoded the highest mean seed number/pod of 9.8 seed/pod, against 5.3 seed number/pod of *Acacia ehrenbergiana*. The mean pod width of mm of *Acacia tortilis subsp raddiana*, was higher than the 3,8mm of *Acacia ehernbergiana.*

The mean of seed width of *Acacia tortilis subsp. raddiana* recorded the highest' mean of 4.1mm, while the mean of *Acacia ehrenbergian* was 2.5mm. Fig (1).

The weight of 100 pods of *Acacia raddiana* reported the highest weight of 240 gm, and 18 gm for *Acacia ehrenbergiana.* The weight of 31 gm of 30pods and 15gm of the seeds of 30 pods were obtained from *Acacia raddiana* against 3gm and 1gm for Acacia *erhrenbergiana* respectively. The study found that *Acacia raddiana* had the largest weights of an empty pod 0.53gm, the weight of a pod 1.03gm, the weight of seed/pod 0.5gm and 5gm of100seeds, while *Acacia ehrenbergiana* had the smallest weights of 0.03gm, o.1gm, 0.07gm and 1gm respectively.

The obtained findings show a wide difference between the two species in pods and seeds characters. The *Acacia tortilis subsp raddiana* has shown significant differences in pods and seeds characters, as against *Acacia ehrenbergiana.*

**Discussion:**

The variations observed and measured may be due to the genetic composition of the two species, with each having distinct morphological features. These results could be used to direct for further research towards improvement of promising acacia species in the leguminous family. These variations obtained are important for conservation and further improvement

programs of genus acacia of the leguminous family. The differences investigated of two species were in line with (Raddad,2007). The *Acacia tortilis susp. raddiana* has shown significant variations in pods and seeds, which agrees (Al-Ayadi et al,2011).

From the field observations the two species well established, this may be due to tolerance to salinity, high temperatures and low rainfall rates. The species under study are very important in the study area for browsing, fodder and reclamation of degraded lands, and the present study hoped to facilitate their regeneration by seeds.

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2/25/2021