# ON THE CLASSIFICATION OF *ACACIA SENEGAL L.* WILLD

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**ABSTRACT:**

Being one of the most important trees in the world Acacia Senegal, the gum Arabic tree warrants intensive research. One, and basic research area is the taxonomy of the tree.

This is not only needed because it belongs to the large genus of Acacia, but also due to the fact that there is a lot of variation in the inter and intraspecific levels. The present study gives anote the present classification of the tree, and recommends more joint taxonomical research especially at especially at the varietal level.

**ملخص الدراسة**

شجرة الصمغ العربي كواحدة من أهم الأشجار عالمياً تتطلب بحوثاً مكثفة في مجالات عديدة أحد هذه المجالات الأساسية هو تصنيف الشجرة. لاترجع أهمية الدراسات التصنيفية لضخامة جنس الأكاسيا (*Acacia*) الذي تنتمي إليه الشجرة فحسب، بل أيضا للتباين الشديد فوق وتحت مستوى نوع الشجرة. تشير الدراسة الحالية إلى فوائد واستخدامات الشجرة ثم تعطى لمحة حول تصنيف الشجرة في الوقت الحاضر كما توصى بمزيد من البحوث التصنيفية المشتركة خاصة عند مستوى الأصناف.

## INTRODUCTION

*Acacia Senegal* (locally known as hashab)is multipurpose tree. It is the Gum Arabic tree. GumArabic has found amultitude of uses as emulsifier, stabilizer and thichening agents in foods, pharmaceutical applications cosmetics, insecticides,panits corrosion inhibitor of some metals including iron and medicine. As medicine, Gum Arabic stimulates intestinal epithelial cells turnove thus contributing to the maintenance of the muca wall. It also proved to reduce blood lipids,blood urea content and to depress activity of cholestrol levels (Osman,2000,Elhalifa,1999).Moreover bark and leaves are reported to have local medicinal uses(Alkhalifa, 1996).

Other uses of the tree include bulding purposes, fence posts, fuel wood, charocoal and fodder.The bark of surface roots is used for the strongest from of cordage, ropes and fishing nets(Sahni,1968).Enviromentally, the tree is of great value as its roots extend laterally for a very long distance thus result in soil fixation especially when it grows in its natural habitat on sands.Itals increases soil fertility, when coupled to its uses and values including gum arabic production, it becomes one of the most important trees in agroforestry projects(Elkhalifa, 1996).

The present study reports on the classification of Acacia Senegal showing both the inter and intra specific variation concerning this valuable tree.

## PRESENT CLASSIFICATION:

### A- Interspecific Variation:

The tree belongs to family *mimosoidae* amongst the *legumes* order. This family is characterized by the compound bipinnate leaves, mostly spiny tress and spicate infloresence, within *Mimosoidae* family, the Gum Arabic tree belongs to the genus Acacia which is readily distinguished by the presence of spines, minute leaflets, spines, free stamens and flat seeds(Elkhlifa, 1996).

*Acacia* is the largest genus in the *Mimosoidae* which comprises about 750 genera. Since 1875 Bentham classified the genus *Acacia* according to the habit, inflorescence and geographical distribution. He divided the gnus into six series and fifteen subseries.The series are: *Phyllodinae*, *pullchellae*, *Gummiferae*, *Vulgare* and *fillicinae*, *Botryocephalae*, *Pullchellae*, *Gummiferae*, *Vulgare* and *Fillicinae* (Osman, 2000).

The species from the series *phyllodinae* are native to Australlia, Hawaii and New Caledona. The species from series *Botrycephalae* and *pullchellae* are native to Australia. The species from series *Gummiferae* and *Vulgare* are found throughout tropical and subtropical parts of the world, while species from series fillicinae are native to south America. The last series(*vulgare*)is further divided into four sub series the most important of which is *Gerontogeae Spiciflorae* to which the gum Arabic tree belongs. The Gum Arabic tree (*Acacia Senegal*) is widely distributed in Asia. The

most important gum producing countries are Sudan, Nigeria and Chad.

Sudan produces about 85% of the world supply (Anderson, etal 1983). The gum Arabic tree is wide spread throughout the Sudan. It has two main areas of distribution, the first is on stabilized sand under rainfalls of 280 mm and above (up to 450 mm) and the second on dark cracking clays under rainfalls of 500 mm, these habitats exist in western eastern and central states of the Sudan(sahni, 1968).

Ross, (1975) described the *Acacia Senegal* complex from botanical stand point. He described 14 species in addition to *Acacia Senegal*. The complex mentioned was meant to include all *Acacia* with spicate inflorescence. Apart from *Acacia Senegal* which is widely spread throughout Africa and extend to Arabia, and Aduageoni which is confined to tropical West Africa, the remaining species in the complex are concentrated in northeast tropical Africa and Arabia. He based his classification on vegetative characters. He such as *pinnae Paris*, petiole, leaflet size and number of leaflet. He arranged *Acacia Senegal* under the group of 3-16 *pinnae pairs* with 5-25 pairs of leaflets of 0.5-1.75 mm wide.

*Acacia Senegal*, however, is the most widely spread and unquestionably the most variable and taxonomically difficult species within the entire complex mentioned above. Its natural habitat extends in tropical Africa from Senegal in the west to Ethiopia and Somalia in the northeast, southwards to the Transvaal, Swaziland and natal, and extends to India. Consequently there is much variation in parts of the species range, and more information and research are needed concerning Intraspecific taxa within *Acacia Senegal*.

**B- Intraspecific Variation:**

Ross (1975) recognized four varieties Senegal. These are *leiorhachis*, *Senegal*, *rostrata* and *kerensis*. The first variety is characterized by yellow, papery and peeling barks and the usual glabrous inflorescence axis. The second variety is of peeling but not papery bark and olive-green inflorescence axis, and the apex of the pod usually rounded to acute, seldom acuminate. The third variety is characterized by the pubescent inflorescence axis, and the strongly

acuminate or rostrate apex of pod. The forth variety, is of pubescent inflorescence axis but the apex of the pod is rounded to acute, and the leaves with up to four pinnae pairs.

However, the distinction is not always ready between these varieties due to the fact that some of them exhibit different growth forms in different ranges. Hence, more data is required concerning the exact nature of the morphological variation from different parts of the species wide range so as to refer to the intraspecific taxa more specifically.

## CONCLUSIONS AND RECOMMENDATIONS:

It is above that valuable taxonomic works have been carried concerninig *Acacia Senegal*, the Gum Arabic tree. These works were devoted to inter or intraspecific variation. As there is no much confusion above the specific level, the future research should elaborate on intraspecific variation. Ateam of botanists in the habitats of tree, worldwide, may work together for a reliable globally adopted classification at these levels.

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# NORMAL HAEMATOLOGICAL AND SEROCHEMICAL VALUES FOR MALE AND FEMALE BALADI RABBITS IN SUDAN

By

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**Abstract:**

Normal values of some blood constituents of Sudanese baladi rabbits were determined. The mean values for WBC, Neutrophils, Eosinophils, Basophils, Lymphocytes and Monocytes were 4.85 x $10^9$/L, 33.85%, 0.0%, 0.0%, 61.6%, 4.49% respectively. RBC, Hb, PCV, ESR, Platelets, MCV, MCH and MCHC were 5.9 x $10^{12}$/L, 13.95 gm/dl, 40.45%, 1.07/h, 219.5 x $10^3$/$mm^3$, 68.6fl, 23.64pg and 6.0gm/dl respectively.

The mean serum concentration of Na, K, Ca, Mg, Fe, Cu, Mn and Zn were 195.0 mEq/L, 4.78 mEq/L, 10.42 mg/100ml, 1.00 mg/100ml, 177.11 µg/100 ml, 14.4 µg/100ml, 20.61 µg/100ml and 101.5 µg/100ml, respectively.

الملخص

تم في هذه الدراسة قياس القيم الطبيعية لبعض مكونات دم ذكور وإناث الأرانب البلدية السودانية وكانت النتائج كالآتي:

- عدد كريات الدم البيضاء 4.85 × $10^9$/L ونسبة الخلايا المتعادلة 33.85%، الخلايا الحمضية 0.0%، الخلايا القاعدية 0.0% والخلايا الليمفاوية 61.6% والخلايا وحيدة النواة 4.49%.

عدد كريات الدم الحمراء 5.9 × $10^{12}$/L، تركيز خضاب الدم 13.95g/dL، حجم الخلايا المرصوصة 40.45%، الصفائح الدموية 219.5 × $10^3$/mm، معدل ترسيب الكريات الحمراء 1.07/hr، حجم الكريه المتوسط 68.6fl، متوسط خضاب الدم 23.64 Pg ومتوسط تركيز خضاب الخلية 6.0 g/dl.

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بينما تركيز الصوديوم 195mEq/L، البوتاسيوم 4.78 mEq/L، الكالسيوم 10.42 mg/100ml، الماغنسيوم 1 mg/100 ml، الحديد 177mg/ 100ml، النحاس 114.4mg/100ml، الزنك 101.5 mg/100ml والمانجنيز 20.6/mg 100 ml.

**Introduction**

In Sudan, Baladi rabbits are bred mainly for meat production and used as experimental animals. They are multicoloured, black, white, brown and grey with adult live weight range,1-1.5 kg.

Hematological studies have been carried out in different breeds of rabbits by Mitruka and Rawnsley (1), Jain (2), Kabata et al (3), and Lepitzki and Woolf (4). It has been found that the blood cellular elements of rabbits are affected by nutritional status, age, sex, breed and other factors (5).

The concentrations of a number of serum constituents have been investigated in several European or American breeds of rabbits by Bortolitti et al (6) and Lepitzki and Woolf (4).

In view of the paucity of information on blood and serum constituents for normal local rabbits in Sudan the present study was conducted to determine hematological and serochemical values of normal male and female Baladi rabbits.

**Materials and Methods:**

**Animals and blood samples:**

The animals investigated were fifty adult male and fifty adult female baladi (local) rabbits. Animals were purchased from a local market, kept within the premises of the College of Veterinary Medicine and Animal Production, Sudan University of Science and Technology, and fed ***ad libitum*** on fresh berseem ***(Medicago sativa)*** supplemented by layers ration containing Durra ***(Sorghum vulgare)*** 57.5%, groundnut cake 20%, wheat bran 12%, concentrate 5% and NaCl 0.5% and had free access to water.

Animals were clinically healthy and had body weight range 0.83 – 1.43 kg.

Blood samples were collected from the peripheral ear vein with and without anticoagulant, EDTA for haematological examination and serum analysis. Blood samples were examined for haemoglobin (Hb), packed cell volume (PCV), red blood cell (RBC),

white blood cell (WBC) and platelet count, red cell indices and differential WBC counts according to the methods described by Dacie and Lewis (7).

Serum sodium (Na) and potassium (K) were determined by flame photometry as described by Varley (1986), and Calcium (Ca), Magnesium (Mg), Iron (Fe), Copper (Cu), Manganese (Mn) and Zinc (Zn) concentrations were determined by atomic absorption spectrophotometry (Perkin Elmer, A.A.S. model 3110, Brighnweller, Germany).

**Statistical analysis:**

Data were analyzed as mean and standard deviation using Statistical Package for Social Sciences (SPSS) program.

**Results and Discussion:**

Although Baladi rabbits are mainly bred for meat production in Sudan, no information on normal hematological and serochemical values is available. The results of the present investigation showed that the mean values for RBC (5.8 ± 7), Hb (13.0 ± 0.7), PCV (42.3 ± 2.3), ESR (1.1 ± 0.8), platelets (222 ± 2.9), MCV (67 ± 5.1), MCH ( 22.4 ± 1.2) and MCHC (6 ± 1.6) in males were comparable to corresponding values. (6 ± 0.4), (13.2 ± 1.0), (38.6 ± 3.5) , (1 ± 0.7), (217 ± 2.3), (66 ± 6.3), (22 ± 2.1) and (6.2 ± 0.9) in females, respectively (Table 1).

Our findings as well as those of Mitruka and Rawnsley (1), Jain (2) and Kathy etal (10) indicated that sex had no appreciable effect on these blood parameters. However, male rabbits showed higher values of neutrophils (40.9 ± 4.2) than values (26.8 ± 3.8) in female rabbits but values of lymphocytes (54.8 ± 3.5) and monocytes (3.6 ± 0.4) in males were lower than corresponding values (68.4 ± 4.2) and (4.6 ± 0.4) in females, respectively.

Normal serum values for male and female rabbits are presented in Table 2. In male, the concentration of serum Fe (204.21±56.49), Mn (20.3 ± 7.2), Mg (1.02 ± 0.42) and Zn (108.57 ± 23.7) were higher than corresponding values (150.00 ± 24.9), (185 ± 22.8) and (94.4 ± 19.7) in females, respectively. However, mean values for Ca (6.6 ± 2.1) and Cu (84.5±16.8), in males were lower than corresponding values (14.28 ± 3.7) and (114.4 ± 17.9) in females, respectively. These differences between males and females

might be due to physiological function (10, 11). No significant difference was observed in the serum K (4.7± 1.13), Mg (1.02 ± 0.4), Mn (20.3 ± 7.2) of males respectively compared with that in K (4.8±0.9), Mg (0.97 ± 0.33) and Mn (20.93 ± 9.3) for females respectively. This finding was compatible with that described by Lepitzki and Woolf (4) and Bortolotti et al (6).

As this study established the normal blood and serum values for male and female local rabbits, an investigation of changes in both blood and serum parameters would be especially valuable for the assessment of safety of feed additives and other factors.

**Table 1. Normal haematological values (range and mean ± SD) for male and female baladi rabbits:**

| Parameters | Male | Female | Range (M ± SD) |
|---|---|---|---|
| WBC (x $10^9$/L) | 4.0 – 8.8 (5.20 ± 1.31) | 3.2 – 7.4 (4.5 ± 1.13) | 3.2 – 8.8 (4.85 ± 1.22) |
| Neutrophils (%) | 21 – 58 (40.9 ± 4.2) | 13 – 14 (26.8 ± 3.8) | 13 – 58 (33.85 ± 3.9) |
| Eosinophils (%) | 0 | 0 | 0 |
| Basophils (%) | 0 | 0 | 0 |
| Lymphocytes (%) | 38 – 75 (54.8 ± 3.5) | 56 – 81 (68.4 ± 4.2) | 38 – 81 (61.6 ± 4.1) |
| Monocytes (%) | 2 – 6 (3.57 ± 0.4) | 2 – 11 (4.57 ± 0.39) | 2 – 11 (4.49 ± 0.4) |
| RBC (x $10^{12}$/L) | 4.59 – 7.24 (5.8 ± 0.67) | 5.55 – 6.76 (6 ± 0.39) | 4.59 – 7.24 (5.9 ± 0.53) |
| Hb (g/dl) | 11.9 – 13.9 (13.01 ± 0.69) | 11.7 – 14.3 (13.18 ± 0.97) | 11.7 – 14.3 (13.95 ± 0.49) |
| PCV(%) | 38 – 46 (42.3 ± 2.3) | 33 – 45 (38.6 ± 3.5) | 33 – 46 (40.45 ± 2.9) |
| ESR/hr | 0 – 3 (1.14 ± 0.77) | 0 – 2 (1 ± 0.68) | 0 – 3 (1.07 ± 0.73) |
| Platelets (x $10^3$ mm) | 180 – 265 (222 ± 2.83) | 180 – 256 (217 ± 2.31) | 180 – 265 (219.5 ± 2.57) |
| MCV (fl) | 58.73 – 75.78 (67 ± 5.1) | 54.37 – 77.59 (66 ± 6.3) | 54.37 – 77.59 (68.6 ± 5.9) |
| MCH (pg) | 22.6 – 23.6 (22.43 ± 1.2) | 20.8 – 24.07 (22 ± 2.1) | 20.8 – 24.07 (23.64 ± 1.7) |
| MCHC (g/dl) | 4.8 – 7.19 (6.0 ± 1.6) | 5.85 – 6.5 (6.2 ± 0.9) | 4.8 – 7.19 (6.0 ± 1.2) |

n = 14 replicate/sex, M = mean, SD = standard deviation

**Table 2. Serochemical constituents (range and mean ± S.D) of healthy male and female baladi rabbits**

| Parameters | Male | Female | Range and (mean ± SD) |
|---|---|---|---|
| Na (mEq/L) | 132.13 – 230.44 (205 ± 58.3) | 145.65 – 224.78 (185 ± 22.78) | 132.13- 230.44 (195 ± 30.54) |
| K (mEq/L) | 2.8 – 6.3 (4.7 ± 1.13) | 2.8 – 6.3 (4.84 ± 0.86) | 2.8 – 6.3 (4.78 ± 0.99) |
| Ca (mg/dl) | 4.11 – 9.8 (6.55 ± 2.07) | 10.92 – 21.68) (14.28 ± 3.7) | 4.11 – 21.68 (10.42 ± 2.88) |
| Mg (mg /dl) | 0.64 – 1.66 (1.02 ± 0.42) | 0.16 – 1.94 (0.97 ± 0.33) | 0.16 – 1.94 (1.00 ± 0.37) |
| Fe (µ g/ 100ml) | 137 – 267 (204.21 ± 56.49) | 124 – 208 (150.00 ± 24.94) | 124 – 267 (177.11 ± 50.95) |
| Cu (µ g/ 100ml) | 42 – 114.8 (84.54 ± 16.75) | 105 – 198 (144.42 ± 17.94) | 42 – 198 (114.4 ± 17.3) |
| Mn (µ g/ 100ml) | 12 – 32 (20.26 ± 7.19) | 8 – 32 (20.93 ± 9.31) | 8 – 32 (20.61 ± 8.25) |
| Zn (µ g/ 100ml) | 20.4 – 174.8 (108.57 ± 23.69) | 34.4 – 147.2 (94.43 ± 19.71) | 20.4 – 174.8 (101.5 ± 21.7) |

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