

# Phenotypic characteristics and sexual behavior of *Sennar Jacks (Equus asinus)*

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## Abstract

This study was carried out with an objective of evaluating the breeding soundness and sexual behavior of *Sennar* jackasses. The physical characteristics such as the body weight, height at wither, body condition, and age of the jacks was measured and recorded. The characteristics of sexual behavior as determined by score of the sex derive, and the time taken for erection, first mount and intromission were assessed in the presence of estrous Jennies and recorded before semen collection. The body weight of the jacks range between 119 and 380 kg, with mean body condition score of 7 for the breeding and 4.8 for the working jacks. The mean ( $\pm$ SE) of height at wither, the chest girth and the head-tail length were 118 $\pm$ 5.54 cm, 124.4 $\pm$ 2.2 cm, 150.3 $\pm$ 1.0 cm, respectively. The frequency of mounting without erection and with erection, time to full erection, time to ejaculation and number of ejaculatory thrust were in the order of 4.62 $\pm$ 1.93 and 1.9 $\pm$ 0.88, 13.45 $\pm$ 7.02 minutes, 23.03 $\pm$ 7.78 minutes, 4.21 $\pm$ 0.61, respectively. Libido score was mostly (89.5%) strong during the 160 collections. The longest time to ejaculation was 58 minutes. The most frequent sexual behavior was sniffing of the vulva, flehmen, and mounting with or without erection. Flehmen responses and mounts without erection greatly varied among the jacks. The most notable difference from Abyssinian donkeys was the libido, which was relatively stronger in *Sennar* donkeys. However, they usually took longer time for ejaculation, which is also a common behavior among donkeys as compared to stallions. This study confirms that body characteristics of *Sennar* donkeys with respect to size are better than other donkey types, and semen collection and AI are feasible procedures for breed improvement in *Sennar* donkeys.

**Keywords:** *Sennar* donkeys, Body morphometry, Sexual behavior, Jacks, Gondar

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## Introduction

Ethiopia has the second largest donkey population in the world with estimated 5.2 million heads (CSA, 2011). Donkeys are known to play a significant role in the livelihood of the resource poor farmers. While they represent an indispensable transport system in areas whose landscape comprise rough terrain to accommodate motorized vehicles, efforts made to improve donkey's performance or even understand their biology is largely ignored (Alemu G/wold *et al.*, 1997; Fielding and Krause, 1998). Various attempts have been made to classify African donkeys into breeds. In fact, many authors confirm that there are little recognized differentiations among the donkeys of Africadue to a lack of breed characterization studies (Payne and Wilson, 1999). In addition there is huge information gap on the reproductive characteristics of donkeys hence they are frequently assumed to be physiologically similar to horses contrary to the available scientific facts (Melaku Tefera, 2002). The *Sennar* donkey, one of the donkey types found in the Northwestern and central part of Ethiopia, is by far the largest and the only one reputed for producing good mules. According to Fesseha Gebreab, *et al.*, (1997), *Sennar* donkeys have better body conformation than other donkey types currently present in Ethiopia. Mules produced from *Sennar* donkeys are reputed for their fitness and survival in harsh environmental conditions than their parents (MelakuTefera, 2002). Unpublished information (personal communication) suggests *Sennar*jacks are expensive partly due to their unique phenotypic features, and are not easily accessible in all areas of the country. Moreover, the work performance of *Sennar* donkeys is believed to be nearly twice that of the Abyssinian types. Although breeding ages were reported to be between 4-5 years for others (FessehaGebreabet *al.*, 2003; AlemayehuLemma *et al.*, 2006), information is scarce for *Sennar* donkeys. The choice of adequate parameters for evaluation of the reproductive soundness and work performance are very important (Gadeaet *al.* 2004). This study was conducted with the objective of generating basic morphometric data and parameters for breeding soundness evaluation *Sennar*jacks through sexual behavioral assessment.

## Materials and Methods

### Study area

The study was conducted in Gondar, Northwestern part of Ethiopia. The altitude ranges from 4620 meters in the Semein Mountain in the North to 550 meters in the west. The rainfall varies from 880 mm to 1772 mm with a bimodal

distribution(wet season from June to September, and the dry season from October to May), while the minimum and maximum temperatures are in the order of  $-10^{\circ}\text{C}$  in the highland and  $34.5^{\circ}\text{C}$  in the North West. The natural habitat of the *Sennar* donkeys is the Northwestern lowland around Metema. According to the 2009 report of the regional agricultural department, there are 0.5 million equines, and 2.9 million human population. In the Northwestern lowland, donkey crossing with selected descendents of the Kessella Nubian asses is a very common practice, while mule production from Sudan *Sennar* donkeys and local horses is practiced in the highlands. Mating, in almost all cases, except for the crossing, is uncontrolled and hence usually associated with year-round foaling. In rare cases deliberate breeding(when farmers are interested to get larger sized donkeys by crossing with wild asses around North Western Ethio-Sudan border) is also undertaken. The livestock feed is predominantly derived from the rain fed unimproved pasture and fallow land grazing, hay, and crop residues. The extent of relative use of these feed resources depends on proximity to town however; the lowlanders give grain feeds for their donkeys while the highlanders do this for their riding horses throughout the year.

## Study animals

A total of 45 *Sennar* jacks aged between 6 and 8 years of which 5 were previously selected for cross breeding at Wekin *Sennar* Donkey multiplication center. Except those from the breeding center that are used to produce donkey crosses and mules, the jacks were mainly used for transport of goods and agricultural products. The jacks were freely provided with ample amount of hay and were also allowed to graze in the field. The breeding jacks were additionally supplemented with 5kg concentrate feed (combination of bean barn 50%, whole maize 10%, lentil bran 20%, salt 1%, and oat 18%) while water was provided *ad libitum*.

## Body morphometry

Body measurements were performed on live animals using an ordinary flexible tape. Height at the wither, chest girth, head-tail length (from the highest point between the ears to the base of the tail, tail length (from the base to the tip on the tail), ear length, neck length and height of the foreleg. Body weight was estimated from Nomogram while body condition was determined on a 1-9 scale according to the method described in Pearson and Quasat (2000). Scrotal circumference, testicular width and length were also measured using a flexible tape and Vernier caliper as described in Davis-Morel (2008).

## Evaluation of the sexual behavior

The breeding jacks (n=5) were isolated and presented with a jenny well into estrous for teasing and evaluation of sexual behavior as described in Prudy, (2005). Jennies (n=5) were induced into estrus using 1ml intramuscular injection of Lutalyse (Dinoprost tromethamine, Lutalyse®, USA) to assist teasing. The teasing was conducted twice a week during morning hours (9:00 – 11:00 am) with an interval of 48hrs between collections (a total of 160 semen collections). Evaluation of the sexual behavior was carried out using score of the sex drive on 1-4 scale (1 showing very strong to 4 showing poor sexual drive). Time to erection [minutes], and length to semen collection [minute], the number of mount (with or without erection), and number of thrust, and the interejaculatory interval [minute] were recorded (Alemayehu Lemma and Benti Derresa, 2009).

## Result

Summary of the phenotypic characteristics the *Sennar* jackasses is presented in Table 1. Mean BCS was 7 for breeding jacks and 4.8 for working *Sennar* jacks. The most common colour of *Sennar* donkeys is white with relatively short hair, but black to dark gray or whites with gray tint (Figure 2B) colours are not uncommon. Crosses with Abyssinian donkeys often result in more hairy, longer, saggy and dark coloured hybrids (Figure 1 and Figure 2A).

**Table 1: Summary of phenotypic measurements (Mean±SE) of *Sennar* jacks.**

Body parameters	Breeding <i>Sennar</i> jacks (n=5)	Range	Working <i>Sennar</i> jacks (n=40)	Range
Height at wither [cm]	114.9±1.4	110 – 140	118±5.54	102-140
Chest Girth [cm]	131±12.35	110-158	124.4±2.2	103-158
Ear Length [cm]	28.9± .51	27-30	29.3±0.2	26-32
Head-Tail Length [cm]	149.2± 3.48	141-158	150.3±1.0	135-158
Neck Length [cm]	62.2± .200	62-63	62.3±0.6	48-67
Tail Length [cm]	63.8± 2.75	56-73	65.9±0.9	56-80
Foreleg Height [cm]	83.8± 1.11	82-88	84.3±0.4	79-93

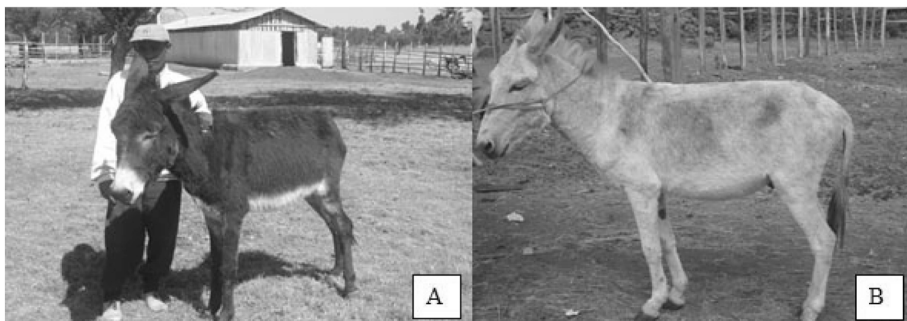
The body weight of the jacks range between 119 and 380 kg. The mean (±SE) scrotal circumference, testicular length and testicular width were 25.08±1.43



cm (Range=23-27 cm),  $16.8 \pm 1.07$  (Range=14-20 cm) and  $9.28 \pm 2.53$  cm (Range=8.5-10.8 cm), respectively.



**Figure 1. Group of Sennar donkeys at Wekin Sennar donkey multiplication center, Gondar**



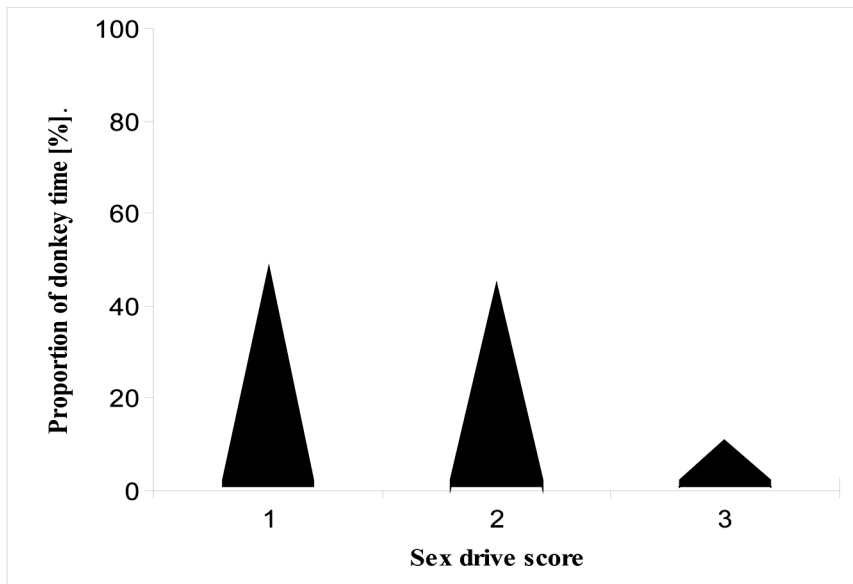
**Figure 2: A Sennar x Abyssinian donkey cross jack (A) and a pure Sennar jack (B)**

The sexual behavior of breeding jacks is summarized in Table 2. The most prominent pre-coital sexual displays observed during teasing included nibbling and/or sniffing of the vulva, head, neck, back of the knee, flank, perineum and tail, olfactory investigation of voided urine, flehmen reaction, mounting with and without erection, and naso-nasal contact.

**Table 2: Sexual behavior and copulatory displays in Sennar jacks (n=5, evaluated by 160 collections).**

Parameters	Mean( $\pm$ SD)	Range
Frequency of mount without erection	4.62 $\pm$ 1.93	1-10
Frequency of mount with erection	1.9 $\pm$ 0.88	1-10
Time to first erection [minutes]	12.11 $\pm$ 7.15	2-40
Time to full erection [minutes]	13.45 $\pm$ 7.02	3-41
Time to ejaculation [minutes]	23.03 $\pm$ 7.78	6-58
Number of thrust	4.21 $\pm$ 0.61	2-5

Flehmen responses and mounts without erection greatly varied among the study jacks. Vocalization was occasionally exhibited after the first visual contact with the estrous female and was more intense in the presence of a competing jack in the vicinity of a female in heat. Periodic vocalization appeared to attract the females and at the same time threatened other competing males. The most frequent sexual behavior was sniffing of the vulva, flehmen, and mounting with or without erection. Once a jack gets erection, then it took on average of less than two minutes to reach full erection that eventually lead to mating. Mostly (89.5%) the jacks exhibited a strong sexual drive (Figure 3). Participation of the females during sexual interaction was substantial and seems to be important for sexual stimulation of the jacks.



**Figure 3: Proportion of sex drive among the study jacks during semen collection (n=160)**

## Discussion

Few studies confirm *Sennar* donkeys to be one of the breeds found in Ethiopia that are classified based on average size and coat colour (Dreyfus, 1976). However, more recent nationwide studies carried out at molecular level identified six distinct donkey breeds with Afar, Hararghe, and Omo donkeys being the new inclusions while Jimma donkey was rejected as it failed to meet standard breed identification criteria (Kefena, *et al.* 2011). *Sennar* donkeys are known to be widespread in the warmest areas of the North West region of Ethiopia. Unlike previously reported for *Sennar* donkeys of the central Ethiopia (Fesseha Gebreabet *al.*, 1997; Melaku Tefara, 2002; Getachew Tadesse and Melaku Tefera, 2013), *Sennars* in this study area were not exclusively kept for breeding. Phenotypically, *Sennar* donkeys are elegant with long and slender legs but strong body build with most results of the morphometry generally higher than other donkey types found in Ethiopia. Gubitset *al.* (2000) suggested differences in morphological characters such as color patterns, and body dimensions reflect

ecological selection regimes, history or both. The average height at the wither ( $118 \pm 5.54$  cm) is larger than the previous reports ranging from 95 to 114 cm for all breeds of donkeys found in Ethiopia (FessehaGebreab, 1991; Alemu G/Wold *et al.* 1997). The coat color of *Sennar* donkeys is also very distinct from other donkey breeds of Ethiopia.

The results of evaluation of sexual behavior and copulatory sequences, although with some variations, generally agree with previous findings for donkeys elsewhere (Gastalet *al.* 1996; Henry *et al.* 1998; AlemayehuLemma and BentiDeressa, 2009; GetachewTadesse and MelakuTefera, 2013). Although *Sennar* donkeys had a strong sexual drive, time to erection, mounting and ejaculation were relatively longer compared to other tropical breeds (Gastalet *al.*, 1996). Time to first erection, time to full erection, frequency of mounting with erection, and time to ejaculation closely agrees with previous reports for different donkeys (Henry *et al.*, 1987; Pugh, 2002; Purdy, 2005). *Sennar* donkeys mounted with erection at a relatively higher frequency ( $1.9 \pm 0.88$ ) before ejaculation compared to the  $0.3 \pm 0.1$  of Nordestina breeds (Gastalet *al.*, 1996) but at a lower frequency than Pêga donkeys ( $2.1 \pm 1.4$ ) (Canissoet *al.*, 2010). Other pre-copulatory displays were found to be closely similar to Abyssinian donkeys (AlemayehuLemma and BentiDeressa, 2009). The time to ejaculation is in agreement with other findings too (Tibaryet *al.*, 2006).

## Conclusion

*Sennar* jacks are large donkeys compared to other donkey types found in Ethiopia. The most common coat color was white, but white with shades of gray or black colors are not uncommon. Relatively larger body size and strong sexual drive is perhaps one of the the main reasons for traditional preference of *Sennar* donkeys for mule production. Generally, the body morphometric values could be useful information for future selection either for breeding or specific draft work. The precopulatory sexual displays are also in close agreement with findings in other donkey types in both Ethiopia and elsewhere. The most notable difference is in their libido which is relatively stronger for instance than Abyssinian donkeys. *Sennar* jacks usually took relatively longer time before ejaculation, which is also a common behavior among donkeys as compared to stallions. This study further confirms semen collection using Equine AV and AI are feasible procedures from breed improvement in *Sennar* donkeys.

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