



Evaluation of sexual behavior of stallion (Arabian versus Barb) during breeding season in Algeria

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ABSTRACT

This study was carried out at National Haras of Tiaret (west of Algeria) to understand and to compare the normal sexual behavior and libido of stallions (Arabian vs Barb) while mounting a mare in estrus. Eighty-four stallions were divided into two groups from 5 to 24 years of age (n=47 Arabian; n=37 Barb). Results revealed significant differences between Arabian and Barb stallion: in sniffing ($p<0.001$), libido score ($p<0.05$), flehmen response ($p<0.05$), time to first mount with erection ($p<0.05$), number of mounts to ejaculation ($p<0.05$) and mount time for ejaculatory ($p<0.01$). These stallions were exactly tested in the same place and conditions allowed us to discard any side effects due to animal management or any other confounding bias. Our study provided us the knowledge of sexual behavior under Algerian environmental conditions and the distinction between Arabian and Barb stallion in their sexual behavior expression.

Key words: Algeria, Race, Season, Sexual behavior, Stallion.

INTRODUCTION

The applied animal behavior science focus on the use of this knowledge in domestic animal management. Although extraordinarily relevant to breeding of domestic animals, basic or applied ethology and animal behavior science are rarely included in much practical detail in animal husbandry (McDonnell, 2016). Rua *et al.* (2015) reported that the assessment of stallion's sexual behavior is greatly important because it is connected to reproductive efficiency.

For maximum reproductive efficiency, stallions have to be managed to maintain normal sexual behavior and good libido (Pickett *et al.*, 1975). To maximize the reproduction efficiency of stallions, they should be handled frequently to maintain adequate sexual behavior and good libido. (Sieme *et al.*, 2004).

Hurtgen (2009) reported that many factors influence libido and mating ability in stallions. These factors may be hereditary, environmental condition, or learned patterns and are highly influenced by management of stallions.

The problems are most typically seen in young or in experienced stallions. Furthermore, a common cause for reduced or arrested libido in stallions is a mismanagement, especially overuse or repetitive abusive punishment for expression of sexual interest. (McDonnell 1992; Bugalia *et al.*, 2000; Blanchard *et al.*, 2011; Kumar *et al.*, 2011 and Houssou *et al.*, 2018).

Pycocock *et al.* (2006) concluded that the evaluation of the reproductive behavior is an integral part of examination for breeding potential or problems in the stallions. An understanding of the sequence of behaviors displayed by the stallion in preparation, during and after mating is important for the diagnosis of disorders such as poor libido, erection, or ejaculation failure. The age don't affect the sexual behavior (Flehmen, number of bites, kicks, sniffs, vocalizations reaction time, mount time and ejaculation time) or libido in stallions (Rua *et al.*, 2015).

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This study begins with the description of the sexual behavior in order to explain their stages, to illustrate their usefulness, and to compare between Arabian and Barb stallion in order to provide the difference between their expression of sexual behavior under Algerian conditions.

MATERIALS AND METHODS

Data location

The study was performed in the National Haras of Chaouchaoua Tiaret. This province is located in the west of Algeria (35°15'N of latitude and 1°26' E of longitude).

It is characterized by a continental climate with harsh winter and hot and dry summer, and the rainfall is 300-400 mm per year on average. The Haras, created in 1877, on a surface of 800 ha, with a total of 250 horses, compound of two main breeds (Arabian and Barb).

Study population

The study was conducted in March, April and May (2012-2015), for four consecutive breeding seasons. The number chosen based on the availability of breeding animals. Eighty-four stallions were used in the development of the sexual behavior parameters of Arabian (n= 47; age range: 05-24 years) and Barb (n= 37; age range: 05-24 years).

The body weight (BW): was done as per work on the Algerian horse population (Boukhaboul *et al.*, 2006; Rahal *et al.*, 2009 and Houssou *et al.*, 2012) and other works worldwide (Marcenac and Aublet, 1980; Martin-Rosset, 1990). The body condition score (BCS) was evaluated on a scale of 1 to 9. According Henneke *et al.* (1983).

Precopulatory latency

The stallion typically approaches a mare in a prancing gait with arched neck and raised tail. Reaction time was recorded beginning when the stallion entered the breeding facility and ending when the stallion mounted a mare in estrus. (McDonnell and Murray, 1995; McDonnell, 2000; Noue *et al.*, 2001; Tibary *et al.*, 2005; Cavinder *et al.*, 2010 and Najjar *et al.*, 2010).



Fig 1: Posture of mare in estrus.



Fig 2: Stallion-typical approach posture and gait.



Fig 3: Stallion detect the receptivity of mare.

Photographs of sexual behavior have been taken as part during precopulatory sequences and were presented in Fig 1 to 4. Time to erection, time to first mount with erection and number of mounts to ejaculation were recorded.

To quantify the intensity of sexual arousal, 2 individual appraisers assigned libido scores (Table 1) to each stallion when presented with an estrous mare (Cavinder *et al.*, 2010).

Copulatory phase

The copulatory event begins with a quiet approach of the pair includes mounting, insertion, thrusting, ejaculation, and dismount (Fig 5). The number of mounts required before ejaculation and the reaction time for each stallion were recorded. The sexual behavior sequences have been described in detail in Mandal *et al.* (2004), McDonnell (2016) and Zeidan *et al.* (2017).

Data analysis

Data were analyzed using SPSS 20 and expressed as the mean \pm standard error of mean (SD) min and max. Data collected were subjected to various statistical tools in a one-way analysis of variance followed by the Student Newman-Keuls multiple comparison test, in order to study the effect of breed on sexual behavior and libido score. Differences with values of ($p < 0.05$, $p < 0.01$ and $p < 0.001$) were considered to be statistically significant.

Table 1: Libido score description (Cavinder and *et al.*, 2010).

Score	Description
0	No interest in an estrous mare
1	Slight vocalization and interest initially, but quickly fades
2	Moderate vocalization and interest in mare, but interest dissipates
3	Moderately interested and consistent contact with mare
4	Highly interested, with vocalization and squealing; or attempt to mount



Fig 4: The flehmen.



Fig 5: Mounting position and copulation.

RESULTS AND DISCUSSION

Table 2 showed the results of the mean age of stallion (15.55 ± 4.62 vs 15.08 ± 4.85) respectively for Arabian and Barb stallion ($p > 0.05$).

The body condition score system (BCS) developed for broodmares can be used to evaluate the condition of stallions (Henneke *et al.*, 1983). Routine evaluation of stallion's body condition can be an effective tool for determining if we have underfeeding or overfeeding of stallion. The mean of BCS respectively for Arabian and Barb stallions (5.02 ± 0.21 vs 5.30 ± 0.24) and the weight (367 ± 30.38 vs 374 ± 33.59) are not significant ($p > 0.05$) during experience and under the same feeding programs (Table 2).

Research revealed that nutrition plays an important role in the reproductive performance of various species. According to Laura *et al.* (2004), Mantovani and Bailoni (2011), a minimum level of body condition is needed to ensure adequate reproductive activity in stallions. Perkins *et al.* (1985) and Burkholder (2000) reported that the body condition could also have an influence on the animal's productivity and health as well as reproduction.

Behavioral analysis

The ability of a stallion to copulate normally should be assessed before the stallion is considered to be a satisfactory prospect for breeding. (Blanchard *et al.*, 2011). Key elements of stallion behavior (Arabian and Barb) are listed in Table 3.

The cyclic behavioral patterns observed in the stallions in this study were similar to those described by other authors (McDonnell, 1986; Cavinder *et al.*, 2010; Guillaume *et al.*, 2018).

Libido score

Libido assessment traits were quantified for stallions with a mare estrous on scale of 0 to 4 the one described by Cavinder *et al.* (2010).

The mean value of libido score (3.07 ± 0.66 vs 3.67 ± 0.76) respectively for Arabian and Barb stallions present a significant difference ($p < 0.05$). The mean libido score for Arabian stallions similar to (3.15 ± 0.87) reported by Cavinder *et al.* (2010) in contrast, the Barb stallion present a higher libido score, consequently the highly interested to the mare.

Table 2: Descriptive statistics of the age, weight and BCS of stallions.

Variable	Race	N	Mean	SD	Min	Max	P value
Age	1	47	15,55	4,62	5,00	24,00	0,537
	2	37	15,08	4,85	5,00	24,00	
BCS	1	47	5,02	0,21	4,00	6,00	0,650
	2	37	5,30	0,24	4,00	6,00	
Weight (kg)	1	47	367	30,38	314	412	0,174
	2	37	374	33,59	376	426	

Table 3: Descriptive statistics of the quantitative sexual behavior of Stallions (Arabian & Barb).

Variable	Race	N	Mean	SD	Min	Max	P value
Precopulatory latency							
Libido score	1	47	3,07	0,66	1,00	4,00	0,045*
	2	37	3,67	0,76	2,00	4,00	
Sniffing	1	47	6,54	3,78	2,00	15,00	<0,001***
	2	37	16,85	7,47	6,00	30,00	
Flehmen response	1	47	1,61	1,38	0,00	4,00	0,033*
	2	37	2,48	1,57	0,00	7,00	
Biting	1	47	1,33	1,27	0,00	5,00	0,057
	2	37	0,84	0,98	0,00	2,00	
Time to erection (sec)	1	47	48,70	56,20	8,0	245	0,940
	2	37	50,38	20,15	17,00	80,00	
Time to first mount with erection (sec)	1	47	112	58,90	29,0	365	0,020*
	2	37	90,54	33,17	47,00	180	
Copulatory latency							
Number of mounts to ejaculation	1	47	2,00	1,00	1,00	5,00	0,029*
	2	37	1,46	0,51	1,00	2,00	
Mount time for ejaculatory mount (sec)	1	47	19,15	10,76	8,00	65,00	0,005**
	2	37	12,23	2,68	9,00	17,00	
Total time in breeding area (sec)	1	47	218	18,24	75	710	0,373
	2	37	169	55,80	69	247	

1: Arabian stallion, 2: Barb stallion.

In breeding season, horses use various sensory cues to assess the reproductive status of their sexual partner such as auditory, visual, or olfactory cues (Stahlbaum *et al.*, 1989; Crowell-Davis, 2007).

Sniffing and flehmen frequency

The total frequency of sniffing and flehmen behaviors as well as the number of flehmen responses were shown in Table 3. These results were in agreement with those reported McDonnell (1986), McDonnell (1992) and Guillaume *et al.* (2018) for "normal" stallions.

There are significant difference ($p < 0.001$) presented in (Table 3) between the sniffing score of Arabian and Barb stallion. There is significant difference ($P < 0.05$) between Arabian and Barb stallion in flehmen frequency. So, they are highly interested to the mare. Jezierski *et al.* (2017) reported that the stallion with the highest libido sniffed significantly longer.

According to Lindsay *et al.* (1983) and Guillaume *et al.* (2018), all stallions were immediately interested in the olfactory stimulus and expressed sniffing behavior. Once stimulated with urinary odors, sniffing was immediately followed by the expression of flehmen. It is of interest that during the expression of flehmen, stallions produce a few milliliters of nasal secretion,

To our knowledge, no study has correlated scent marking by stallions through defecation and urination with olfactory information obtained by those stallions from faecal odour concerning the sex and reproductive status of faecal sample donors (Jezierski *et al.*, 2017). Studies on equine olfaction have concentrated primarily on the role of pheromones in mating behaviour (Saslow, 2002).

Precopulatory and copulatory latency

Most of these stallions exhibited some precopulatory interaction, achieved a full erection within 1 minute, and mounted within 1 or 2 minutes after erection similar findings also reported by many authors McDonnell (1986); McDonnell (1992); Tibary *et al.* (2005) and Guillaume *et al.* (2018).

All stallions were similar in number of Biting; however, some variation in reaction time was found in time to first mount with erection ($p < 0.05$), number of mounts to ejaculation ($p < 0.05$) and mount time for ejaculatory ($p < 0.01$) between the Arabian and Barb stallion.

A copulatory interaction, from approach to ejaculation, often occurs in a period of less than one minute is similar to the values reported by McDonnell (1986); mount time for ejaculatory (19.15 ± 10.76 ; 12.23 ± 2.68) respectively for Arabian and Barb stallion present a significant difference ($p < 0.01$).

CONCLUSION

In conclusion, from the present results sexual behavior of the Barb stallion was the best compared to the Arabian stallions during breeding season and under Algerian environmental conditions. The hope for the future studies in the following:

1. Knowledge of sexual function and dysfunction disorders with during the breeding season.
2. Greater use of routine sexual behavior assessment of stallions in an effort to establish characteristic patterns for each stallion while he is fertile.

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