Study on Sexual BehaviourParameters of Marwari Stallions during Breeding Season

ABSTRACT

The libido of stallions almost remains steady throughout the whole year. The ejaculation and mounting times of a stallion, as well as the amount of time it takes for the stallion to respond to an oestrus mare, are all elements that might affect the libido of the horse. In order to gain an understanding of how tropical horses adapt to potentially difficult climatic circumstances in terms of their sexual performance, it is necessary to study their reproductive behaviour. The present investigation was carried out on six healthy Marwari stallions (aged between 50 to 140 months) to evaluate and toanalyse their sexual behaviour during the breeding season in the arid region. The study was carried out for a period of three weeks ~~and sexual behaviour parameters were recorded at~~the time of semen collection. Parameters observed and analysed in the present study include erection time, reaction time, ejaculation time, number of mounts and number of thrusts. Erection time, reaction time and ejaculation time of stallions was 19.02±1.18 sec, 29.11±1.37 sec, 26.86±0.95 sec, respectively. The number of mounts and number of thrusts of stallions was 1.39±0.09 and 10.00±0.17 respectively.The above study describes the normal sexual behaviour parameters of Marwari stallions in the arid region and analysed that non-significant(P>0.05) difference exists among the horses for various sexual behaviour parameters.

Keywords:arid region, breeding season, libido, Marwari stallions, sexual behaviour parameters.

INTRODUCTION

In equines, major considerations for breeding programmes include a clinical assessment of genital organs and breeding behaviour as well as an examination of the semen quality of the male (Colenbrander*et al.*, 1992). Instead of the scarcity of information regarding the sexual behaviour of stallions and their ability to reproduce (Melo *et al*., 1998; Sereno, 2002), stallions engage in a variety of sexual behaviours, including exposing their penis, trying to mount, sniffing, biting, kicking, and even making noises (Henry *et al*., 2013). Just like other domestic males, stallions go through two distinct stages of mating behaviour; the first stage is libido, or sexual excitement. The second stage, copulation, starts with copulatory movements and concludes with ejaculation (Tischner *et al.*, 1974; Hart, 1989; Houpt, 2004). The arrival of a mare, regardless of whether she is in estrus or not, usually arouses the domestic stallion (McDonnell, 2009). The passionate stallion takes a keen interest in the mare right away (Brinsko *et al*., 2011). The horse's whinnying, bellowing, and distinctive nickering indicate his sexual excitement when it approaches the mare to smell its outside genitalia and groin (Tischner *et al.*, 1974; Houpt, 2004). In addition, the stallion will exhibit signs of impatience, pawing, and vocalisation before copulating with the mare. This includes sniffing, licking, and nibbling on the mare's croup, hind legs, and occasionally

Formatted: Numbering: Continuous

Comment [N1]: to remove, is not yet proven by your study

Formatted: Font color: Red

Formatted: Font color: Red

Comment [N2]: add

Formatted: Font: 12 pt, Font color: Red

Comment [N3]: mention the period

Comment [N4]: during

Formatted: Font: 12 pt, Font color: Red

Comment [N5]: In lines 201 and 202 you have mentioned that there were a notable difference (P<0.01) among stallions in terms of the number of mounts per ejaculate and their reaction time

forelegs. As the penis is completely erect, the stallion will also display the flehmen reaction (Tischner *et al*., 1974; Brinsko *et al*., 2011). Stallions' libido is constant year-round, with the sex desire being at its peak in the spring and gradually decreasing (but not entirely disappearing) in the fall and winter (Sharp, 1999).The ejaculation and mounting times of a stallion, as well as how long it takes the stallion to respond to an estrus mare, are all factors in influencing the libido of the horse. During the breeding season, you can use the resulting libido score to pick stallions based on their predicted reproductive effectiveness (McKinnon *et al*., 2011). Understanding how tropical horses adjust to potentially harsh climatic conditions in terms of their sexual performance requires research into their reproductive behaviour. To prevent lower breeding efficiency due to misuse of stallions or too frequent seminal collections, it is important to evaluate the breeding potential of stallions. Because (a) mares only breed in the spring and summer due to their seasonal polyestrus, and (b) estrus lasts for about seven days, requiring multiple matings to achieve maximum reproductive efficiency, the latter is particularly important in a natural service breeding programme (Pickett *et al*., 1975). Therefore, purpose of this investigation was to study the sexual or ~~reproductive~~behaviour of Marwari stallions in arid region during the breeding season, define the values of sexual behaviour parameters and to compare these parameters among the stallions using statistical methods.

Comment [N6]: programmer

MATERIALS AND METHODS

Animals

The study involved six healthy Marwari stallions housed at the Equine Production Campus, ICAR-National Research Centre on Equines, Bikaner, Rajasthan, India. Animals used in the study were aged between 50 and 140 months and reared under uniform conditions of feeding and management (Table 1). The study was carried out for a total of 3 weeks with a frequency of semen collection twice a week and sexual behaviour parameters for each Marwari stallion were recorded at the time of semen collection during breeding season with a mare in oestrus used as a dummy.

Table 1: Identification of horses with their age

S. No.	Marwari Stallion (identification)	Age (months)
1.	Mohit	140
2.	139	86
3.	Dogger	78
4.	167	52
5.	170	51
6.	175	50

Sexual Behaviour Parameters

Sexual behaviour parameters, including erection time, reaction time, ejaculation time, number of mounts and number of thrusts, were recorded for each Marwari horse (Figure 1). Ejaculation time was considered as the time between the penile intromission by the male and its first seminal emission. Erection time was considered as the time between the dummy female being seen by the male and the full erection of the male's penis achieved (Waheed *et al*., 2015). Reaction time was considered as the time between the entering of male inside the breeding area and its mounting on the dummy (Cavinder *et al*., 2010). The number of mounts performed by males on the dummy female was counted, as reported by McDonnell (1992). The number of thrusts performed by males for the ejaculation of semen was counted, as reported by McDonnell (1992).

Figure 1: Mounting behaviour of Marwari horse

Data Analysis

Data on sexual behaviour parameters of Marwari stallions were collected, organised, summarized and statistically evaluated for mean, standard error (SE), analysis of variance (ANOVA) and Duncan's new multiple range test (DNMRT) using IBM-SPSS Statistics Version 26.

RESULTS AND DISCUSSION

Thepresent study was designed to assess various attributes of the sexual behaviour of Marwari horses.

Comment [N7]: Preferably put a table or figure which makes it easier for the authors to read the results

Erection Time

The duration of erection time in Marwari stallions shown during the breeding season ranged from 13.47±1.06to 25.19±3.59 sec, with an average of 19.02±1.18 sec. Non-significant difference (P>0.05) was seen among Marwari horses for mean values of erection time in the present study. Mehra (2021) observed the range of 16.00±1.30 to 20.8±6.07 sec with an mean of 18.45±1.61 sec. Sultan (2021) observed the range of 14.00±3.78 to 19.40±1.96 sec

with an mean of 16.60±1.35 sec.Non-significant difference (P>0.05) among Marwari stallions for mean values was also seen by Mehra (2021) and Sultan (2021) which is similar to the present results.

Reaction Time

The duration of reaction time in Marwari stallions shown during the breeding season ranged from 23.44±1.41 to 35.59±4.76 sec, with an average of 29.11±1.37 sec.Non-significant difference (P>0.05) was seen among Marwari horses for mean values of reaction time in the present study.Mehra (2021) observed range of 16.40±2.52 to 60.00±11.94 sec with an mean of 34.65±4.65 sec. Sultan (2021) the range of 14.00±1.58 to 69.40±6.23 sec with an mean of 34.35±5.13 sec.Significant difference (P≤0.01) among Marwari stallions for mean values was seen by Kumar (2018), Mehra (2021) and Sultan (2021) in their studies, which is in contrast tothe performed study.

Ejaculation Time

The duration of ejaculation time in Marwari stallions shown during the breeding season ranged from 22.75±1.83 to 31.46±2.80 sec, with an average of 26.86±0.95 sec.Non-significant difference (P>0.05) was seen among Marwari horses for mean values of ejaculation time in the present study. Mehra (2021) observed the range of 30.00±2.85 to 40.8±6.62 sec. with an mean of 34.65±2.26 sec. Sultan (2021) observed the range of 22.80±2.51 to 38.00±4.85 sec with an mean of 31.25±2.33 sec. Mehra (2021) and Sultan (2021) also observed non-significant (P>0.05) difference among Marwari stallions for mean values, which is in conformity to the present results.

Number of Mounts

The number of mounts taken by Marwari stallions during breeding season ranged from 1.17±0.17 to 1.83±0.17, with an average of 1.39±0.09.Non-significant difference (P>0.05) was seen among Marwari horses for mean values of number of mounts in the present study. No traceable literature available for number of mounts on Marwari stallions.

Number of Thrusts

The number of thrusts taken by Marwari stallions during breeding season ranged from 9.33±0.42 to 10.83±0.40, with an average of 10.00±0.17.Non-significant difference (P>0.05) was seen among Marwari horses for mean values of number of thrusts in the present study. Mehra (2021) observed the range of 7.00±0.32 to 7.2±0.37 with ~~an~~amean of 7.05±0.19. Sultan (2021) observed the range of 6.60±0.51 to 7.60±0.24 with ~~an~~ amean of 7.05±0.21.Mehra (2021) and Sultan (2021) also noted non-significant (P>0.05) difference among Marwari stallions for mean valuesfavouring theobtained results.

Little traceable literature is available regarding the sexual behaviour parameters of Marwari stallions.However, study was carried out on few different breeds of horses.

Houssou *et al*. (2020) documented the libido scores of Arabian and Barb stallions, which had mean values of 3.07±0.66 and 3.67±0.76, respectively. The study found a significant difference between the two groups (P<0.05). The study found that there was no significant difference between Arabian and Barb stallions in terms of the time it took for them to achieve an erection (48.70±56.20 sec vs. 50.38±20.15 sec). However, there was a significant difference in the time it took for them to mount with an erection (112±58.90 sec vs. 90.54±33.17 sec), with the Arabian stallions taking longer. There was also a significant difference in the number of mounts required for ejaculation (2.00±1.00 vs.1.46±0.51), with

Formatted: Font: 12 pt, Font color: Red

Formatted: Font: 12 pt, Font color: Red

the Arabian stallions requiring more mounts. Additionally, there was a significant difference in the time it took for ejaculatory mount (19.15±10.76 sec vs. 12.23±2.68 sec), with the Arabian stallions taking longer. However, there was no significant difference in the total time spent in the breeding area (218±18.24 sec vs. 169±55.80 sec) between the two groups.Rua *et al*. (2016) examined how the month of assessment and age category influenced the breeding behaviour of nine Brazilian pony stallions during both the breeding and non-breeding seasons. The stallions were divided into two age categories: 5–8 years and 9–13 years. The researchers measured the average reaction time of stallions in the 5-8 year age group to be 16.3±19.7 seconds, whereas stallions in the 9-13 year age group had an average reaction time of 93.2±116.5 seconds. In addition, they noted that the month of assessment also has an impact on some breeding behaviour characteristics. Furthermore, they found no significant association between the age of stallions and their response time, erection time, and ejaculation time.Waheed *et al*. (2015) conducted a study on 16 healthy Arabian stallions and found that the season had a significant impact ($P<0.05$) on all sexual behaviour indicators, except for the time it took for ejaculation to occur. They observed that the lowest latency to ejaculation was observed during the spring in the normal breeders. The researchers also noted that slow breeder stallions had significantly longer latency to ejaculation (erection time), time to first mount (reaction time), number of mounts per ejaculate, and latency to mount compared to normal breeder stallions. The differences were statistically significant ($P<0.001$). The specific values for slow breeder stallions were 228.26±50.48 sec, 259.82±42.66 sec, 2.63±0.35, and 371.95±36.27 sec, respectively (n=4). In contrast, normal breeder stallions had values of 49.45±3.78 sec, 61.12±5.18 sec, 1.32±0.04, and 82.54±6.39 sec, respectively (n=12).Rua *et al*. (2015) conducted a study on the sexual behaviour of male horses throughout both the non-breeding and breeding seasons. They examined indicators of sexual desire, such as the duration of mounting, the time taken to react, and the time taken for mounting and ejaculation. The researchers measured the average time it took for mounting as 32.4±8.2 sec and 34.7±4.5 sec, the average reaction time as 15.0±6.1 sec and 13.9±3.4 sec, and the average time for mounting and ejaculation as 23.9±2.1 sec and 24.5±1.1 sec during the non-breeding and breeding seasons, respectively.Cavinder *et al*. (2010) measured the response time and frequency of mounts in seven stallions. The average response time was found to be 4.67±2.6 minutes, while the average number of mounts was 1.47±0.563. A statistically significant difference ($P<0.05$) was found among stallions in terms of the average reaction time. No statistically significant difference was found among stallions in terms of the average number of rides.Noue*et al*. (2001) examined the sexual conduct of 42 stallions during in-hand natural service and semen collection. The stallions belonged to various breeds, including French Saddlebred (n=8), Standardbred (n=19), Thoroughbred (n=5), Anglo-Arab (n=2), draft horses (n=7), and one pony. The age range of the stallions was between 6 and 19 years. We noticed a lack of substantial association between the age of stallions and both erection time and the number of mounts.McDonnell (1992) conducted a study on the sexual behaviour of horses, specifically focusing on various parameters. These parameters included the duration from mounting to penetration (ranging from 1 to 5 seconds), the number of mounts (ranging from 1 to 3), the total duration of mounting (ranging from 15 to 45 seconds), the time taken for insertion before ejaculation (ranging from 8 to 20 seconds), the overall time spent in the breeding area (ranging from 0.5 to 10 minutes), and the number of thrusts (ranging from 2 to 12).Tischner *et al*. (1974) conducted an analysis of the ejaculation pattern of four stallions. The number of observations for each stallion was 8, 8, 8, and 9, respectively. The researchers found that the total time of copulation for the four stallions had mean values of 8.92 seconds, 10.25 seconds, 10.50 seconds, and 12.18 seconds. The mean number of thrusts for the four stallions was 5.9, 7.3, 7.1, and 8.2. The time of semen emission had mean values of 6.07, 8.09, 8.10, and 8.16 for the four stallions. The mean number of thrusts during

Formatted: Font: 12 pt, Font color: Red

Formatted: Font: 12 pt, Font color: Red

emission was nil, 0.6, 1.7, and 5.2, respectively.Pickett *et al*., (1975) examined the reproductive physiology of stallions who ejaculated at different frequencies (1, 3 and 6 times per week) and found that there was no significant difference in the number of mounts per ejaculate, with mean values of 1.2, 1.4, and 1.4 for the frequencies of 1, 3, and 6 times per week, respectively. Reaction time was varied depending on the frequency of ejaculation, with mean values of 1.75, 1.93, and 2.10 for the frequencies of 1, 3, and 6 times per week, respectively. As the frequency of ejaculation rose, the reaction time also tended to rise. However, there ~~was~~were a notable difference (P<0.01) among stallions in terms of the number of mounts per ejaculate and their reaction time.

Comment [N8]: remove

Formatted: Font: 12 pt, Font color: Red, Strikethrough

Comment [N9]:

Formatted: Font: 12 pt, Font color: Red, Strikethrough

Formatted: Font: 12 pt, Font color: Red

Comment [N10]: add

Formatted: Font: 12 pt, Font color: Red

Comment [N11]: Except the number of mounts per ejaculate and their reaction time (P<0.01)

CONCLUSION

Performed experiment defines the normal value of sexual behaviour parameters of Marwari stallions in arid region during breeding season. It may be concluded thatno significant difference exists among the stallions for different sexual behaviour expressions during breeding season. It seems that the sexual behaviour expression of Marwari horses may correlate with other individual parameters. The effect of age and body weight on sexual behaviour expression should be studied to know the individual horse pattern.

REFERENCES

1. Brinsko, S. P., Blanchard, T. L., Varner, D. D., Schumacher, J., Love, C. C. and Hinrichs, K. (2011). Manual of Equine Reproduction, 3rd ed. China, St Louis Mosby, pp. 176-206.
2. Cavinder, C. A., Zoller, J. L., Briers, G. and Sigler, D. H. (2010). Sexual behaviour and blood hormone profiles around the time of ejaculation and subsequent sperm characteristics in stallion. The Professional Animal Scientist, 26(5):540-546.
3. Colenbrander, B., Puyk, H., Zandee, A. R. and Parlevliet, J. (1992). Evaluation of the stallion for breeding. Acta Veterinaria Scandinavica. Supplementum, 88:29-37.
4. Hart, B. L. (1989). In: The behavior of domestic animals. New York, WH Freeman and Company, pp. 83-95.
5. Henry, M., Neves, J. P. and Jobim, M. I. M. (2013). Manual para exameandrológico e avaliação de sêmen animal, 3rd ed. ColégioBrasileiro de Reprodução Animal, Belo Horizonte.
6. Houpt, K. A. (2004). Domestic animal behavior for veterinarians and animal scientists, 5th ed. New Delhi, John Wiley & Sons, Inc., pp. 37-43.
7. Houssou, H., Bouzebda-Afri, F., Bouzebda, Z. and Benidir, M. (2020). Evaluation of sexual behavior of stallion (Arabian versus Barb) during breeding season in Algeria. Indian Journal of Animal Research, 54(9):1078-1082.
8. Kumar, A. (2018). Evaluation of various parameters affecting semen quality in Marwari stallion. PhD Thesis, College of Veterinary and Animal Science, Bikaner, Rajasthan.
9. McDonnell, S. M. (2009). In: Stallion sexual behavior. Equine Breeding Management and Artificial Insemination. Missouri, Saunders, Elsevier Inc., pp. 41-46.
10. McDonnell, S. M. (1992). Stallion sexual behavior. Veterinary Clinics of North American Equine Practice, 8(1):71-89.

11. McKinnon, A. O., Squires, E. L., Vaala, W. E. and Varner, D. D. (2011). Equine Reproduction, 2nd ed. Wiley-Blackwell Publishing.
12. Mehra, R. (2021). Effect of addition of lyophilized heterologous seminal plasma and colostrum to semen extender on cooled and post thaw stallion semen quality. MVSc Thesis, College of Veterinary and Animal Science, Bikaner, Rajasthan.
13. Melo, M. I. V., Sereno, J. R. B., Henry, M. and Cassali, G. D. (1998). Peripuberal sexual development of Pantaneiro stallions. Theriogenology, 50:727-737.
14. Noue, P., Bernabe, J., Rampin, O., Vidament, M., Dumas, T., Palmer, E. and Magistrini, M. (2001). Sexual behavior of stallions during in-hand natural service and semen collection: an observation in French studs. Animal Reproduction Science, 68(3-4):161-169.
15. Pickett, B. W., Sullivan, J. J. and Seidel, G. E. (1975). Reproductive physiology of the stallion: effect of frequency of ejaculation on seminal characteristics and spermatozoal output. Journal of Animal Science, 40(5):917-923.
16. Rua, M. A. S., Quirino C. R., Junior, A. B., Santoro, P. N., Bastos, R., Ribeiro, M. D. S., Matos, L. F. and Vega, W. H. O. (2016). Evaluation of the breeding behavior of Brazilian Pony stallions. Animal Reproduction Science, 172:137-142.
17. Rua, M. A. S., Quirino, C. R., Bastos, R., Junior, A. B., Santoro, P. N, Ribeiro, M. D. S., Matos, L. F. and Barreto, M. A. P. (2015). Evaluation of sexual behavior and testosterone concentration of MangalaMarchadaor stallions. Applied Animal Behaviour Science, 171:101-107.
18. Sereno, J. R. (2002). Status-quo de la conservación genética de los caballos y bovinos Pantaneiros en Brasil. Archivos de Zootecnia, 51:65-82.
19. Sharp, D. C. (1999). In: Horses. Encyclopedia of Reproduction, vol. 2. California, California Academic press.
20. Sultan, T. (2021). Effect of zinc and gold nanoparticles on cooled and post thaw quality of stallion semen. MVSc Thesis, College of Veterinary and Animal Science, Bikaner, Rajasthan.
21. Tischner, M., Kosiniak, K. and Bielanski, W. (1974). Analysis of the pattern of ejaculation in stallions. Journal of Reproduction and Fertility, 41:329-335.
22. Waheed, M. M., Ghoneim, I. M. and Abdou, M. S. (2015). Sexual behaviour and hormonal profiles in Arab stallions. Journal of Equine Veterinary Science; 35(6):499-504.

Formatted: Font: 12 pt, French (France)