aJava

Asian Journal of Animal and Veterinary Advances

Academic
Journals Inc.

www.academicjournals.com

Asian Journal of Animal and Veterinary Advances 7 (2): 205-209, 2012
ISSN 1683-9919 / DOI: 10.3923/ajava.2012.205.209

Evaluation of Testicular Measurement and Sperm Production of Tunisian Arab Stallions using Ultrasonography

[1]A. Najjar, [2]B. Benaoun, [2]M. Ezzaouia and [1]M. Ben Mrad

[1]Institut National Agronomique de Tunisie, 43, Avenue Charles Nicolle, Cité Mahragène, 1082, Tunis, Tunisie

[2]Haras National de Sidi Thabet, Fondation Nationale de l'Amélioration de la Race Chevaline, Tunisie

Corresponding Author: A. Najjar, Institut National Agronomique de Tunisie, 43 Avenue Charles Nicolle, Cit Mahragène, 1082, Tunis, Tunisie

ABSTRACT

The aim of this study was to determine the testicular sperm production of Tunisian Arab stallions during (n = 8) and out (n = 3) the breeding season. Testicular width was measured monthly by ultrasonography. Moreover, testicular, albuginea and parenchyma weight were determined. Results showed that, testicular albuginea and parenchyma weights tended to increase during the breeding season having the highest values in June ($p<0.1$). Out of the breeding season, these parameters tended to increase in September and October ($p<0.1$). We found that testicular weight was positively correlated with the testicular width ($r = 0.82$). According to these results, we conclude that the increase of testicular sperm production out of the breeding season may be related to the change in the photoperiod length. Present result showed that all testicular parameters of sperm production, estimated by ultrasonography such as width measurements, varied in the same direction during and out the breeding season. Besides, testicular width can be measured quickly by ultrasonography and allows the assessment of testicular sperm production. We also concluded that semen stallions can be collected out of the period of the breeding season from September to October and used in an artificial insemination program.

Key words: Ultrasonography, testicular width, weight, albuginea, parenchyma

INTRODUCTION

Ultrasonographic examination of the testicles can easily be performed and can provide an accurate measure of testicle sperm production (Lopate *et al*., 2003). It can be affected by many sources of error (Chenier, 2009). *In vivo* Ultrasonography of testicles was used to determine the testicular sperm production in bull (Bailey *et al*., 1998), ram (Cartee *et al*., 1990), boar (Clark *et al*., 2003) and stallion (Love *et al*., 1991). For stallion, Testicular measurements by ultrasonography have been an important part of the physical examination of the breeding stallion. It can be useful for the assessment of the fertility and as a management tool of stallions (Chenier, 2009).

Individual testicular measurements correlate well with testicle sperm production. Infact, several studies on testicular measurements of the stallion showed that the width of each testicle is the most measure that correlates with testicle weight. Palmer *et al*. (1998) found that the testicular width is highly correlated with his weight ($r = 0.83$) than those brought by the length ($r = 0.80$), or by the height ($r = 0.78$).

In order to develop Artificial insemination in Tunisian Arab stallions that practiced only natural service during the breeding season, our study was conducted to assess testicular sperm production by ultrasonography during and out of the breeding season. This will allows us (1) to determine the monthly variation of the testicular sperm production and (2) to manage the use of these stallions in a program of an artificial insemination.

MATERIALS AND METHODS

General: The experiment took place in the stud farm of Sidi Thabet, situated in the north of Tunisia, from February 2007 to January 2008. Testicular measurements were determined monthly by ultrasonography from Tunisian Arab stallions aged between 7 to 22 years. Eight stallions were used during the breeding season and 3 stallions were used out of the breeding season. In Tunisia, the officially breeding season starts each year from the 15th February to 15th June.

Ultrasonography measurement of testicles and testicular sperm production parameters: The width of paired testicles were determined by ultrasonography (AGROSCAN AL) using a linear probe (5 MHz) as described by Love *et al.* (1991).

Testicular weights were determined using mathematical formula as described by Gebauer *et al.* (1974):

- Testicular weight (g) = 71 x testicular width (cm)-140
- Albuginea weight (g) = 0,145 x testicular weight+2, 52
- Parenchyma weight (g) = testicular weight-albuginea weight

Statistical analysis: Statistical analysis was carried out on data using a software SAS. Testicular weights were carried out to ANOVA using the procedure of the general linear model (GLM). The effects of months and stallions were considered. Correlation between and the width was calculated. The threshold of significance was $\alpha = 5\%$.

RESULTS

Results showed that mean width of the testicles varied from 37 to 48 and 49 mm, respectively in February, April and June during the breeding season. However, it varied from 36 to 51 and 44 mm, respectively in December, September and October out of the breeding season. Right testicular width varied from 50 mm in February to 58 mm in June and left testicular width varied from 40 mm in February to 58 mm in April, during the breeding season. Out of the breeding season, right testicular width varied from 44 in December to 58 mm in September and October, and left testicular width varied from 47 mm in September to 54 mm in October (Table 1). The testicular width is shown on the screen of the ultrasound (Fig. 1).

During the breeding season, testicular weight varied from 179 g in February to 256 g in June. Out of the breeding season, this later varied from 188 g in December to 296 and 256 g in

Table 1: Monthly testicular width of the Arab stallions

	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Width (mm) right testicle	50±2	53±3	51±2	54±2	58±2	57±2	49±3	58±5	58±9	52±3	44±2	51±2.5
Width (mm) left testicle	40±4	51±2	58±3	50±1	54±1	48±2	52±3	47±1	54±3	50±2	49±2	50±4
Width mean testicle (mm)	37±2^{a}	47±2^{b}	49±2^{b}	46±2^{b}	48±1^{b}	40±1^{b}	39±2^{a}	51±1^{b}	44±1^{b}	41±3^{a}	36±3^{a}	39±1^{a}

Data is as Mean±SEM. Values with different latter are different at $p<0.1$

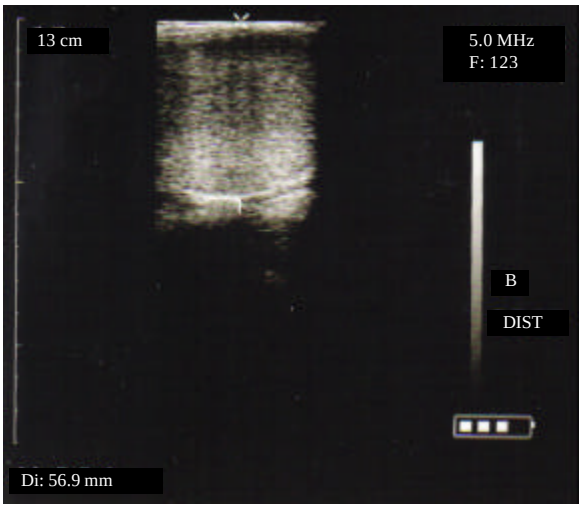

Fig. 1: Testicular width measured by ultrasonography

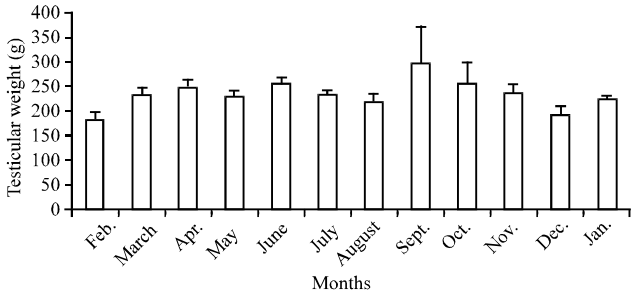

Fig. 2: Testicular weight variation in and out of the breeding season (Means±SEM)

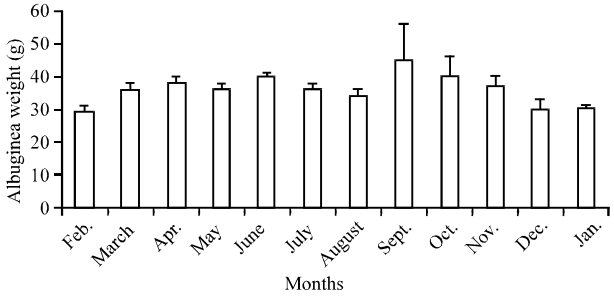

Fig. 3: Testicular albuginea weight variation in and out the breeding season (Means±SEM)

September and October, respectively (Fig. 2). Statistical analysis showed that testicular weight tended toward increasing for the months of June, September and October ($p<0.1$). Moreover, a significant correlation found between testicular weight and width ($r = 0.82$; $p<0.05$).

Testicular albuginea weight varied during the breeding season from 29 g in February to 40 g in June. Out of the breeding season, this later varied from 30 g in December and January to 45 and 40 g, respectively in September and October (Fig. 3). We noticed that there is a tendency for increasing the testicular albuginea weight in June which coincides with the end of the breeding season and in September and October out of the breeding season ($p<0.1$).

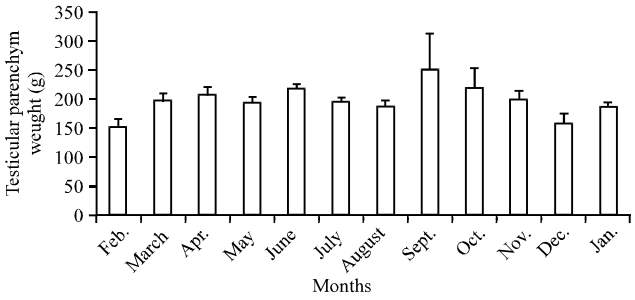

Fig. 4: Testicular parenchyma weight variation in and out the breeding season (Means±SEM)

Weight of testicular parenchyma increased during the breeding season. It varied from 151 g in February to 217 g in June ($p<0.1$) (Fig. 4). Out of the breeding season, testicular parenchyma weight reached the highest weight in September and October respectively 250 and 217 g ($p<0.1$). We found that testicular parenchyma weight varied in the same direction of the testicular weight.

DISCUSSION

Present results showed that testicular sperm production parameters varied according months of the years. They reached their highest value in June end of the breeding season, and reached the highest values in September and October out of the breeding season ($p<0.1$). Berndtson *et al.* (1983) showed that testicular sperm production increased during the breed season. Besides, Jones and Berndtson (1986) and Palmer *et al.* (1998) reported that testicular weight of the stallion increased during the periods coinciding with the photoperiod variations. They also found that testicular measurements were the same in the spring and autumn seasons.

The significant correlation between testicular weight and width measurement was in agreement with the studies performed on testicles bull and ram provided by Coulter and Keller (1982), Foster *et al.* (1989) and Palasz *et al.* (1994). They reported that testicular weight was positively correlated with its volume. This later was also positively correlated with daily sperm production and the percentage of normal spermatozoa. For stallions, Love *et al.* (1991) reported that testicular weight was positively correlated with daily sperm production ($r = 0.91$). Kavak *et al.* (2003) asserted that for stalhons obvious correlations were between testicular width, parenchyma weight and daily sperm production. We concluded that ultrasound of testicular width can be used to estimate sperm production.

CONCLUSION

Testicle ultrasound is an easy method to determine testicular sperm production using testicular width. This provided us determination of the monthly variation of the mass testis during the year. Moreover, we showed that not only testicular sperm production parameters increased in the end of the breeding season, but out of the breeding season in September and October, when stallions are at rest. So, for this reason, we recommend semen collection for conservation and use in a program of artificial insemination.

ACKNOWLEDGMENTS

We thank the personnel of the stud farm of Sidi Thabet for their help during this study.

REFERENCES

Bailey, T.L., R.S. Hudson, T.A. Powe, M.G. Riddell, D.F. Wolfe and R.L. Carson, 1998. Caliper and ultrasonographic measurements of bovine testicles and a mathematical formula for determining testicular volume and weight *in vivo*. Theriogenology, 49: 581-594.

Berndtson, W.E., E.L. Squires and D.L. Thompson Jr., 1983. Spermatogenesis, testicular composition and the concentration of testosterone in the equine testis as influenced by season. Theriogenology, 20: 449-457.

Cartee, R.E., P.F. Rumph, S. Abuzaid and R. Carson, 1990. Ultrasonographic examination and measurement of ram testicles. Theriogenology, 33: 867-875.

Chenier, T.S., 2009. Anatomy and Physical Examination of the Stallion. In: Equine Breeding Management and Artificial Insemination, Samper, J.C. (Ed.). Saunders Elsevier , USA., pp: 1-16.

Clark, S.G., D.J. Schaeffer and G.C. Althouse, 2003. B-mode ultrasonographic evaluation of paired testicular diameter of mature boars in relation to average total sperm numbers. Theriogenology, 60: 1011-1023.

Coulter, G.H. and D.G. Keller, 1982. Scrotal circumference of young beef bulls: relationship to paired testes weight, effect of breed and predictability. Can. J. Anim. Sci., 62: 133-140.

Foster, R.A., P.W. Ladds, D. Hoffman and G.D. Briggs, 1989. The relationship of scrotal circumference to testicular weight in rams. Aust. Vet. J., 66: 20-22.

Gebauer, M.R., B.W. Pickett and E.E. Swiestra, 1974. Reproductive physiology of the stallion. II. Daily production and output of sperm. J. Anim. Sci., 39: 732-736.

Jones, L.S. and W.E. Berndtson, 1986. A quantitative study of sertoli cell and germ cell populations as related to sexual development and aging in the stallion. Biol. Reprod., 35: 138-148.

Kavak, A., N. Lundeheim, M. Aidnik and S. Einarsson, 2003. Testicular measurements and daily sperm output of Tori and Estonian breed stallions. Reprod. Domestic Anim., 38: 167-169.

Lopate, C., M. Le Blanc and D.C. Knottenbelt, 2003. The Stallion. In: Equine Stud Farm Medicine and Surgery, Knottenbelt, D.C., M. Le Blanc, C. Lopate, R.R. Pascoe (Eds.). Saunders Elsevier, USA., pp: 43-112.

Love, C.C., M.C. Garcia, F.R. Riera and R.M. Kenney, 1991. Evaluation of measures taken by ultrasonography and calliper to estimate testicular volume and predict daily sperm output in the stallion. J. Reprod. Fert., Suppl., 44: 99-105.

Palasz, A.T., W.F. Cates, A.D. Barth and R.J. Mapletoft, 1994. The relationship between scrotal circumference and quantitative testiculaire traits in yearling beef bulls. Theriogenology, 42: 715-726.

Palmer, E., F. Clement, G. Plongere and M. Magistrini, 1998. Assessment of the sexual function in the stallion. Point Veterinaire, 29: 61-66.