Puberty of crossbred male goat kids

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Abstract: This study aimed to determine the characteristics of puberty of crossbred goat male kids (Nubian × Saanen). The following puberty characteristics: weaning weight, growth rate, age at complete separation of prepuce from the penis, scrotal circumference at puberty, weight and age at puberty, volume of the first ejaculate, individual and mass motility percent of semen, abnormal morphology spermatozoa and the concentration of spermatozoa, were evaluated. Furthermore, the correlation between body weight at birth and body weight at puberty, ejaculation volume and scrotal circumference and the age of puberty and scrotal circumference were also studied. Eight single born male kids (Saanen × Nubian) were used in this experiment. Their mean weight at birth was 3.80 ± 0.14 kg. The puberty characteristics were as follow: the average of weaning weight was 14.4 ± 0.73 kg, growth rate 82.9 ± 0.83 gm/day, age at complete separation of prepuce from the penis 16.3 ± 0.33 week, puberty age 30 ± 0.30 week with a mean body weight of 22.38 ± 0.94 kg and an average scrotal circumference of 23.4 ± 0.83 cm. The ejaculate volume, mass motility, individual motility percentage, the percent of live sperms, sperm cell concentration and the percentage of sperms with abnormal morphology were 0.68 ± 0.05 ml, 3.60, 76.30 ± 3.41%, 87.30 ± 1.63%, 2.8 × 10^9 and 5.7 ± 0.71%, respectively. The correlation between the weight at birth and the weight at puberty was weak (R=0.076) but the correlation between scrotal circumference and the ejaculate volume was significant (R=0.36). No correlation between the age at puberty and the scrotal circumference (R=0.009) was found. Considering all the reported results of pubertal characteristics of goat male kids, it is concluded that the crossbred goat male kids attain puberty earlier and their growth rate is higher. Furthermore, the volume of their first ejaculated semen is directly correlated to scrotal circumference.

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1. Introduction

The Nubian goat breed, which produces good milk (Hassan and Elderani, 1990), is considered one of the best dairy goats in Africa (Devendra and Macleroy, 1982). The Nubian goat's population in the Sudan is 2.5 million out of 40 million head of goats (MAR, 2002). Recently goat's breeders introduced Saanen bucks to improve the productivity of Nubian goat. One of the most important steps, to achieve this goal, is their reproductive potentials be known and exploited. The weaning weight, growth rate, age at complete separation of prepuce from the penis, scrotal circumference at puberty, weight and age at puberty, volume of ejaculate, and individual and mass motility percent of semen, abnormal morphology spermatozoa and the concentration of spermatozoa are important puberty indicators in goats (De La Vega et al., 2001; Bezerra et al., 2009). When a male start to display sexual behaviors, mate and ejaculate semen containing enough viable sperm to impregnate a female, it is said to be pubertal (Bezerra et al., 2009; Jimeno et al., 2001). To evaluate the reproductive efficiency of a male, it should be capable to express normal sexual behaviors that enable it to complete the mating successfully. Consequently semen can be collected from it and its reproductive capacity is evaluated and used for genetic improvement, if it comes from superior parents (Madani & Rahal, 1988; Bezerra, et al., 2009). The reproductive information of any animal breed is crucial to adopt any strategies for genetic upgrading of herds.

Thus, the objectives of the present study are to determine and record the following pubertal characteristics: weaning weight, growth rate, age at complete separation of prepuce from the penis, scrotal circumference at puberty, weight and age at puberty, volume of ejaculate, individual and mass motility percent of live semen, abnormal morphology

spermatozoa and the concentration of spermatozoa of crossbred buckling (Nubian × Saanen) in the Sudan.

2. Materials and methods

2.1. Study area and Animals

This study was carried out in a private goat farm in Shambat, Khartoum North, Sudan (Latitude 15° 36' N, Longitude 32° 32' E). A total of 8 newly born singletons crossbred male goats (Pure Nubian × Pure Saanen) were used in this study. Their mean body weight at birth was 3.80 ± 0.14 kg. They were born in January 2006.

2.2. Husbandry and management

The kids were kept with their dams to feed on milk till they age of 6 weeks. They were then given a concentrate made at the farm at a rate of 200 gm per day. This ration is formulated of 19 % groundnut cakes, 45% sorghum (Sorghum vulgare, vr. Fetarita), 31% molasses, 3% mineral mixture and 2% sodium chloride. They were offered water and Alfa alfa ad libitum. The kids were weaned at the age of 12 weeks. They were injected against encto- and endoparasites with 1ml/50 kg ivermectin (Ivomec, Merial Company, France).

2.3. Measuring puberty characteristics

The kids were weighted immediately after birth and their body weight was recorded weekly until they reached puberty. After weaning they were examined for preputial separation (Hovel, 1976; Bezerra et al., 2009). The scrotal circumference was measured weekly (Boundy, 1992). Trials of semen collection started immediately after preputial separation using artificial vagina (Evans and Maxwell, 1987). The semen volume was recorded and the semen was kept in a water bath at 37° C. The mass motility and the forward motilities were recorded (Evans and Maxwell, 1987). The percent of live, dead and abnormal sperms were determined after staining with eosin and negrosin stains (Blom, 1950). The sperm cell concentration was determined by counting sperms with a hemocytometer (Evans and Maxwell, 1987; Leboeuf et al., 2000). Onset of puberty was defined as the age at which an ejaculate containing motile spermatozoa was first collected from the kids.

2.4. Statistical analysis

Data are presented as means ± standard error of the mean (SE). The correlation between body weight at birth and body weight at puberty, ejaculation volume and scrotal circumference and the age of puberty and scrotal circumference were determined by the Pearson partial correlation analysis.

3. Results

As shown in figure (1) the buckling body weight increased gradually in a sigmoid pattern until it reached the peak at puberty. The mean daily body gain was 82.9 ± 0.83 gm per day. The best growth rate was achieved during the 1st 16 weeks. At puberty slight decrease in body weight was observed. The body weight at puberty was 19.20 to 26.60 kg with a mean of 22.40 ± 0.9 kg. The puberty age was 29 to 31 week with an average of 30.00 ±0.30 week. The mean age for preputial separation was 16.5 ± 0.33 week. The lowest age was 16 weeks and the highest was 18 weeks. The mean scrotal circumference was 23.40 ±0.83 cm (range of 20 to 25.5 cm). The mass motility of the semen ranged from 3 to 4 (mean = 3.6). The individual motility range was 65% to 85% with a mean of 76.25 ± 3.41% and the percentage of sperms with abnormal morphology was 5.7 ± 0.71%. A significant relation (R = 0.36) was observed between the scrotal circumference and the first ejaculate volume (Fig.2), while a weak relation (R = 0.076) was found between the birth body weight and the puberty weight (Fig.3). No relation was found (R = 0.009) between the age at puberty and testicular size (Fig.4).

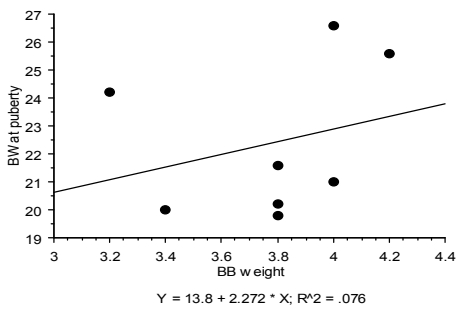

Fig. (1). The growth curve of cross bred male goat kids.

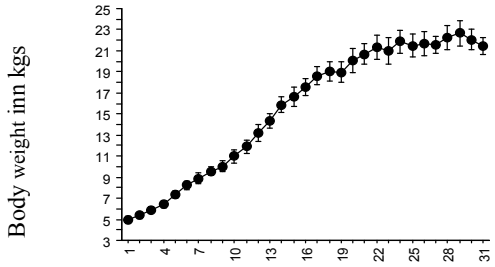

Fig. (2). The correlation of the first ejaculate volume with scrotal circumference. (Y=-1.17 + 0.07 * ×; R ^ 2=0.36)S

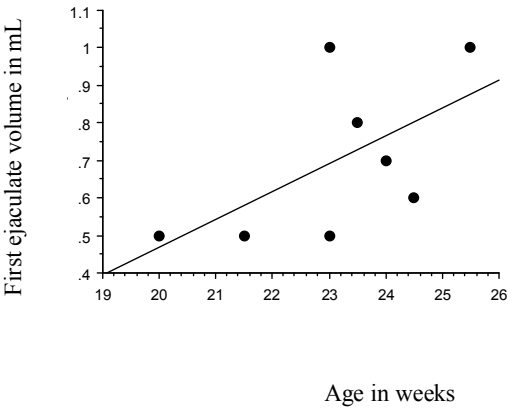

Fig. (3). The relation between birth body (BB) weight and body Weight (BW) at puberty.

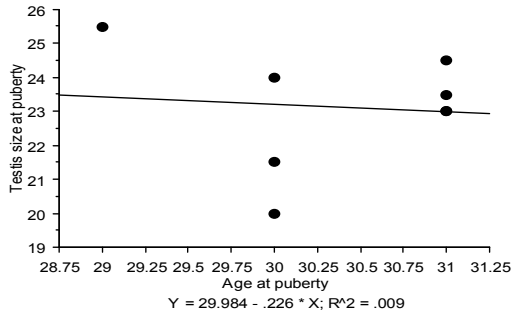

Fig. (4). The relation between puberty age and testicular size.

4. Discussion

This study revealed that the pubertal characteristics of crossbred Nubian bucklings agree to some extent with that of other breeds with slight discrepancies. The average weight at weaning found in this study is slightly higher than that reported in desert goats native to Kordofan in west Sudan (Alamin, 2003). The weaning weight reported here is much higher than that reported in the Damascus goats (Karagiannidis et al., 2000). This is probably due to the different management, breed and the environment. The average age of full detachment of the prepuce is less than that of all the previous studies except the results of Bezerra et al., (2009). Most of the previous studies considered the age of preputial detachment as the age of puberty, while in this study full detachment and exit of penis does not mean age of puberty. Preputial detachment means a period when only penis separation, erection and mounting take place without ejaculation.

In this study, the average age and weight of crossbred goat bucklings at puberty (Saanen × Nubian) is identical with that of Sinaloa goat bucklings (Comloav, et al., 1992), the Anglo Nubian bucklings (Chakraborty, et al., 1999), the Marwari bucklings (Mehta et al. 1992) and almost equal with that of Botswanai bucklings ((Aganga, 2005). Contrary, the results are higher than that of Syrian monutain goat's bucklings (Habib, 2001) and the Peral Cashmere bucklings (Wolde, et al., 1989). The results of this study are much less than that of Kutchi goats (Mittal, 1991).

The average daily growth of crossbred male goats (Saanen × Nubian) is comparable to that report elsewhere (Elabid, 1996; Wilson, 1976; Khalaffalla and Elshafie, 1988). Contrary, the average daily growth is greater than what mentioned by Alsayed, (2001) and Aganga, (2005). The scrotal circumference which is an indicative for testicular size was almost equal to that reported in Toggenburg, Alpine and Saanen buckling (Ahmed and Noakes 1992) and greater than that of Marwari and Surti (Mehta, et al., 1992).

The semen volume reported here is similar to what was reported in Saanen bucklings in India ((Shamsuddin, et al., 2000), in Sudan (Adam, 1996; Ahmed et al., 1997), less than that reported in Alpine and Saanen (Karatza, et. al., (1997) and Boer goats (Tuli et al., 1991). These differences with previous studies in semen volume are due to the differences of estimating age of puberty, collection methods, as well as breeds.

Individual motility reported in this study is identical with what was found in Nubian bucks in the United States and in Alpine and Saanen (Karatza et al., 1997. The semen volume in this study is less than that reported in Nubian bucks in Sudan (Gubartallah et al., 2004). This difference is perhaps due to the combined effects of age, breed and management. The mass motility recorded in this study was almost identical to what is recorded in most previous studies (Gubartallah 1998, Gubartallah et al., 2004). The percent of live sperms is similar to that of all the previous studies.

The average concentration of sperm in this study is in agreement with that of Alpine male goats in France (Delgadillo et al., 1991) and that of Angora bucklings (Montaldo et al. 1981). The sperm concentration in this study is less than that of Boer buckling (Tuli et al., 1991) and higher than that of Nubian buckling reared in the United States (Skal et al., 1988).

The percentage of sperms with abnormal morphology agrees with that of Nubian buckling in Sudan (Gubartallah, 1998) and that reported in Damascus bucklings in Greece (Karagiannids et al., 2000). The abnormalities reported here are less than that reported in Sokoto bucks (Daudu 1984) and

Nubian bucklings in the United States (Skal et al., 1988).

The differences in the puberty characteristics of this study and the previous studies are attributed to the differences among breeds, climate, nutrition, management and also the methods of estimating the age of puberty and semen collection method employed.

Considering all the reported results of pubertal characteristics of goat male kids, we concluded that the crossbred male goats attain puberty earlier and their growth rate is higher. Furthermore, the volume of their first ejaculated semen is directly correlated to scrotal circumference.

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References

1. Hassan, N. I. and Elderani, O. H.. Goat resources in the Arab World 2. Republic of Sudan, ACSAD, 1990.
2. Devendra, C. and Mcleroy, G.B. Goats and sheep production in the tropics. Longman Singapore Publishers London, U.K, 1982; pp.26, 37-45.
3. M.A.R. Ministry of Animal Resources and Fisheries department of Statistics, 2002; 28: 15-23.
4. De La Vega, A., Ruiz, R. & Wilde, O. Relación de la circunferencia escrotal con algunos parámetros de calidad seminal en caprinos Criollos de Tucumán (Argentina). Zootecnia Trop., 2001; 19:455- 463. (In Spanish).
5. Bezerra, F.Q.G., Aguiar Filho, C.R., Freitas Neto, L.M., Santos Junior, E.R., Chaves, R.M., Azevedo, E.M.P., Santos, M.H.B., Lima, P.F. and Oliveira, M.A.L. (2009). Body weight, scrotal circumference and testosterone concentration in young Boer goat males born during the dry or rainy seasons. South African Journal of Animal Science, 2009; 39 (4):301-306.
6. Jimeno, V., Castro, T. & Rebollar, P.G. Interacción-Reproducción en ovinos de leche. XVII Curso de Especialización FEDNA, 2001; pp131-160. (In Portuguese).
7. Madani, M.O.K. & Rahal, M.S. Puberty in Libyan male goats. Anim. Reprod. Sci., 1988; 17: 207-216.
8. Hovell, G. J. R. Ram fertility. Edt. ADAS. Ministry of Agriculture, Fisheries and food. Un. of Sudan Science and technology, 1976. .
9. Boundy, J. Routine Ram and examination of rams. Uvce. the Reyal Veterinary collage, Vet. UI, 1992.
10. Evans, G. and Maxwall, W.M.C. Salmon's Artificial Insemination of Sheep and Goats. 1st ed Butterworths, London, 1987.
11. Blom, E. Interpretation of spermatic cytology in bulls. Fert. Steril., 1950; 1: 223-238.
12. Leboeuf, B.; Restall, B. and Salamons. Production and storage of goat semen for artificial insemination. Animal Reprod. Sci., 2000; 26:113-141.
13. Alamin, Y. A. Some production and reproduction traits of south Darfur indigenous goats. M. Sc. Thesis, Faculty of Animal production U of K Sudan, 2003.
14. Karagiannidis, A.; Varsakeli, S. and Karatzas, G. Characteristics and seasonal variation in the semen of Alpine, Saanen and Damascus goat bucks born and raised in Greece. Theriogenology, 2000; 53: 1285-1293.
15. Comloav, J.; Portillo, J.; Vadez, L. M.; Estrada B. E.; and Borquez G. J. Goat breeding in Sinaloa. Anim. Breed, Abst., 1992; 60 (12).
16. Chakraborty, P. K.; Stuart, L. D. and Brown, J. L. Puberty in the male Nubian goats: Serum concentration of LH, FSH and testosterone from birth through puberty and semen characteristics at sexual maturity. J. Animal. Reprod., Sci., 1999; 20: (2), 91-101.
17. Mehta, V.M., Patel, A.V., DeshPande, S.B. Pal , J. and Tiwari, S.R. Growth and biometry of testis and scortum in Surti and Marwari kids from birth to sexual maturity. International Conference on Goat. 2-8 March, New Delhi Nutan printers, 1982; pp 111-1116.
18. Aganga, A. A., Omphile, U. J., Chabo, B.G., Kgosimore, M. and Mochankana, M. Goat production under traditional management in Gaborone Agricultural Region in Botswana. J. Anim. Vet. Advances, 2005; 4(5): 515-519.
19. Habib, F. A study on the growth rate and increment of live body weight in Syrian mountain goats. Tashrin Journal for Scientific Research, 2001; 11 (23): 219-209. (in Arabic).
20. Wolde Michael, T; Miller, H. M.; Holmes, H. G., McGeryor, B. A. and Galloway Y. D. B. Effect of supplementary feeding and zeranol on puberty in Peral Cashmere goat, Aust.Vet. J., 1989; 66 (4):124-126 Abstract 122-126.
21. Mittal, J.P. Performance of Kutchi goat in arid western Rajasthan. Indian Journal of Animal Sciences, 1991; 61 (8): 904-905.
22. Elabid, K. E. Studies on some productive and reproductive traits of Sudan Nubian goats under

village and small holder system Ph. D. thesis U. of K. Sudan, 2002.
23. Wilson, R.T. Studies on the Livestock of southern Darfur, Sudan: IV. Production Traits in Goats. Tropical Animal Health and production, 1976; 8(4): 221-232.
24. Khalaffalla, A.M. and Elshafie, S. A. A note on the growth performance of exotic pure and cross-bred kids. Sudan J. Anim. Prod., 1988; 1: 45-49.
25. Alsayed, A. A. Seasonal influence on reproductive traits and artificial insemination results of Sudan desert rams. Ph. D. Thesis. Faculty of Veterinary Medicine, University of Khartoum, Sudan, 2001.
26. Ahmed, N. and Noakes, D.E. Seasonal variation in the semen quality of young British goats. British Vet. J., 1996; 152: 225-236.
27. Shamsuddin, M., Amiri, Y. and Bhuiyan, M. Characteristics of buck semen with regard to ejaculate numbers. Collection intervals diluents and preservation periods Reprod. Anim., 2000; 35: 53-57.
28. Adam, A. A. Reproductive performance of Saanen bucks under the tropical climate of the Sudan. M. Sc. Thesis. Faculty of Animal Production. University of Khartoum, Sudan, 1996.
29. Ahmed, M.M.M., Makawi, S.E. and Gadir, A.A. Reproductive performance of Saanen bucks under tropical climate. Small Rum. Res., 1997; 26: 151-155.
30. Karatza, G., Karagiannidis, A. Varsakeliand and S. Brikas, P. Fertility of fresh and frozen- thawed goat semen during the non breeding season. Theriogenology, 1997; 48 (6): 1049-1059.
31. Tuli, R.K. and Holtz, W. Effect of season on the freezability of Boer goats semen in the northern temperate zone. Theriogenology, 1995; 43: 1359-1363.
32. Gubartallah, K.A. Abdallah, M.A. Amel, O. Bakhiet and El Khider, O.A. (2004). Some observations on the reproductive performance of Sudanese Nubian bucks. Sud. J. Vet. Sci. Anim. Husb., 2004; 43: (1&2).
33. Gubartallah, K.A. Effect of energy and protein sources on some productive and reproductive potentials of Sudanese Nubian goats. Ph.D. thesis, University of Khartoum Sudan, 1998.
34. Delgadillo, J. A, Leboeuf, B. and Chemineau, P. (1991). Decrease in the seasonality of sexual behavior and sperm production in bucks by exposure to short photoperiodic cycles in goat bucks small Rum. Res., 1991; 9: 59-97.
35. Montaldo, H; Tapia, G. and Juarez A. Some genetic and environmental factors affecting milk yield and kidding interval in goats. Tecnia Pecuaria en Mexico, 1981; No. 41, 32 44 A. B.A. 55 (12):76-99.
36. Skal, L.H.; Rodrigues, H.D.; Goyal, H.O.; Maloney, M.A.; Vig, M.M. and Noble, R.C. (1988). Effect of age and season on the type and occurrence of sperm abnormalities in Nubian bucks. American L. Vet. Res. 8: 1284-1289.
37. Daudu, C.S. Spermatozoa output, testicular sperm reserve, and epididymal storage capacity of the Red Sokoto goats indigenous to northern Nigeria. Theriogenology, 1984; 21: 317-324.

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