

PUBERTY IN FOUR GENOTYPES OF FEMALE GOATS IN NORTHEAST BRAZIL¹

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ABSTRACT - This experiment was carried out with 99 female kids from four native breeds (Canindé, Marota, Moxotó, and Repartida, raised on native pasture at the Brazilian National Goat Research Center, Ceará State, Northeast Brazil. Body weight of the animals were taken at birth, and at four-week intervals until each female kid showed the first puberal estrus. Between 40-60 hours after puberal estrus was detected using teaser bucks, the ovaries of each female kid were observed by laparotomy to determine the number of corpora albicantia and/or corpora hemorrhagica, as an estimate of the occurrence and rate of prepuberal and puberal ovulation, respectively. The overall mean age and live body weight at puberty was 363.6 ± 6.9 days and 12.6 ± 0.2 kg, respectively. Breed or type of birth did not affect significantly ($P > 0.05$) the age and weight at puberty. The ovulation rate at prepuberal period and at puberal estrus was 1.00 and 1.04, respectively ($P > 0.05$). Forty percent of the female kids ovulated prior to puberal estrus and 100% ovulated at puberal estrus. Ovulation occurred more frequently in the right than in the left ovary at prepuberal ($P < 0.01$) and puberal ($P < 0.05$) respectively.

Index terms: reproduction, ovulation, Canindé; Marota; Moxotó; Repartida; native pasture.

PUBERDADE EM FÊMEAS CAPRINAS DE QUATRO RAÇAS NO NORDESTE DO BRASIL

RESUMO - Este trabalho foi conduzido com 99 cabritas; 11 da raça Canindé, 13 Marota, 64 Moxotó e 11 Repartida, mantidas em pastagem nativa, no Centro Nacional de Pesquisa de Caprinos, em Sobral, estado do Ceará, Nordeste do Brasil. As cabritas foram pesadas ao nascer e, a cada quatro semanas até o primeiro estro clínico (puberdade). Entre 40-60 horas após o início do estro a cabrita foi submetida à laparotomia com o objetivo de se avaliar a função ovariana, quantificando-se a ocorrência e a taxa de ovulação nos períodos pré-puberal e puberal. A idade e o peso corporal à puberdade foram $363,6 \pm 6,9$ dias e $12,6 \pm 0,2$ kg, respectivamente. A raça e o tipo de parto não afetaram significativamente ($P > 0,05$) a idade e o peso à puberdade. As taxas médias de ovulação, no período pré-puberal e à puberdade, foram 1,00 e 1,04, respectivamente ($P > 0,05$). Aproximadamente 40,0% das cabritas tinham ovulado antes de apresentarem o primeiro estro clínico, enquanto 100,0% delas ovularam à puberdade. A ovulação ocorreu com maior frequência no ovário direito do que no esquerdo, no período pré-puberal ($P < 0,01$) e à puberdade ($P < 0,05$).

Termos para indexação: reprodução; ovulação; Canindé; Marota; Moxotó; Repartida; pastagem nativa.

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INTRODUCTION

The age at puberty is highly variable among female kids. That variation may range from 119 days of age in the Savana Brown breed of Nigeria (Molokwu & Igono 1982) to 776 days in the Jamnapari breed of India (Khan et al. 1981). Factors such as nutrition and climate,

in addition to genetics, are important in determining the age and body weight at which female kids become puberal and consequently the age at first parturition. Information on the onset of puberty in goats deals primarily with body weight and age, or with the age at first kidding. Information associated with ovarian activity at puberty is not well documented.

An attempt has been made in this study to relate the age and live body weight with ovarian activity at the onset of puberty (first behavioral estrus) of native female kids in Northeast Brazil.

MATERIAL AND METHODS

This experiment was carried out at the Brazilian National Goat Research Center in Sobral, Ceará State, Northeast Brazil, with 99 female kids of the Canindé, Marota, Moxotó and Repartida native breed types (11, 13, 64 and 11 animals, respectively). The Research Center is located in the southern hemisphere at 3°42' south latitude and 40°21' west longitude characterized by hot weather (22-36°C) throughout the year, with the rainy season usually from January to May (300-900 mm).

The animals were born in February and March of 1980 and 1981 and were exposed continuously to teaser bucks from birth to the end of the experiment. The animal's body weight was taken at birth and at four week intervals, until each female kid showed its first puberal estrus. The animals grazed on native pasture (caatinga) for approximately nine hours/day. During the remainder of the time they were kept in open corrals and received a mixture of equal parts of bone meal and sodium chloride, ad libitum, and had free access to water. Weaning occurred at 112 days of age. Deworming and vaccination against foot-and-mouth disease were carried out as recommended by Sistema de Produção (1982), and following the protocol of Agricultural Ministry, respectively. Between 40-60 hours after puberal estrus was detected, using teaser bucks, the ovaries of each female kid were observed by laparotomy to determine the number of corpora albicantia (CA), as an estimate of the occurrence and rate of ovulation prior to the time of first puberal estrus. This provides a minimum estimate of prepuberal ovulation; however, because all CA were likely not visible at the time, laparotomies were performed.

Corpora hemorrhagica (young corpora lutea - CL), were also observed as an estimate of the occurrence and rate of ovulation at the time of puberal estrus.

The General Linear Models procedure (Barr et al. 1976) for data on age and weight at puberty, chi-square analysis for occurrence of ovulations, and simple correlations between age and body weight at were applied.

RESULTS

Genotype and type of birth did not significantly affect ($P > 0.05$) the age or weight at puberty. The overall mean age at puberty was 363.6 ± 6.9 days (range 105-474 days) and 12.6 ± 0.2 kg of live body weight (range 7.7 to 22.7 kg) (Table 1).

TABLE 1. Least square means (\pm SEM) of live body weight (kg) and age (days) of female kids at puberty by breed and type of birth.

Variables	n	Weight	Age
General mean	99	12.6 ± 0.2	363.6 ± 6.9
Breed			
Canindé	11	12.5 ± 0.7 a	329.9 ± 23.7 a
Marota	13	13.3 ± 0.7 a	365.9 ± 22.8 a
Moxotó	64	12.6 ± 0.3 a	368.5 ± 8.7 a
Repartida	11	11.8 ± 0.7 a	371.3 ± 21.8 a
Type of Parturition			
Single	48	13.1 ± 0.6 a	380.1 ± 17.6 a
Multiple	51	12.0 ± 0.4 a	337.6 ± 13.4 a

$P > 0.05$ for means with different superscript letters by columns within main effects.

The mean ovulation rate prepuberally and at puberty, were 1.00 and 1.04, respectively, for female kids ovulating, and no statistically significant differences ($P > 0.05$) were found among breeds. From all female kids observed, 40.4 percent had ovulated prepuberally (prior to puberal estrus); this proportion did not differ significantly among breeds ($P > 0.05$), while 100.0 percent of female kids had ovulated at puberty (Table 2). Ovulation

TABLE 2. Incidence of animal ovulating, ovulation rate and ovarian activity at puberty in native Brazilian female kids.

Parameters	Breed type				Total
	Canindé	Marota	Moxotó	Repartida	
Incidence (%)					
Prepuberal	45.45(5/11) a	46.15(6/13) a	37.50(24/64) a	45.45(5/11) a	40.40(40/99)
Puberal	100.00(11/11)	100.00(13/13)	100.00(64/64)	100.00(11/11)	100.00(99/99)
Ovulation rate¹					
At prepuberal ovulation (CA)	1.00(5/5) ²	1.00(6/6)	1.00(24/24)	1.00(5/5)	1.00(40/40)
At puberal ovulation (CL)	1.00(11/11)	1.00(13/13)	1.03(66/64)	1.09(12/11)	1.04(103/99)
Ovarian activity at prepuberal ovulation					
Left ovary	80.00(4/5)	0.00(0/4)	41.94(13/31)	40.00(2/5)	42.22(19/45)
Right ovary	20.00(1/5)	100.00(4/4)	58.06(18/31)	60.00(3/5)	57.78(26/45)
Ovarian activity at puberal ovulation					
Left ovary	27.27(3/11)	30.77(4/13)	46.90(30/64)	45.45(5/11)	42.42(42/99)
Right ovary	72.73(8/11)	69.23(9/13)	53.13(34/64)	54.55(6/11)	57.58(57/99)

¹ Prepuberal ovulation was identified by the presence of CA at the time of laparotomy (40-60 hrs after beginning of estrus); puberal ovulation refers to the ovulation associated with first estrus and was identified as CL at laparotomy.

² Within parentheses are numbers of occurrences and observations, respectively.
P>0.05 for means with same superscripted letters among rows.

occurred more frequently from the right than the left ovary at prepuberal ($P < 0.01$) and puberal ($P < 0.05$) ovulation periods, respectively, and when data from both ovulation periods were combined P was smaller than 0.025 (Table 3).

Simple correlation coefficients shown in Table 4 indicate a positive, statistically significant ($P < 0.01$) association between weight and age at puberty. The weight at weaning and age at puberty were negatively correlated ($P < 0.01$). No correlation was found between birth weight and age at puberty.

TABLE 3. Differential ovarian activity prepuberal and at puberty in native Brazilia female kids (%).

Side	Prepuberal n = 45	Puberal n = 99	Overall n = 144
Right	57.8**	57.6*	57.6***
Left	42.2	42.4	42.4

* $P < 0.05$;
** $P < 0.01$;
*** $P < 0.025$ by columns.

TABLE 4. Simple correlations among weight and age variables in native Brazilian female kids (n = 99).

Variables	Weight (kg)		Age (days) at puberal estrus
	Weaning ¹	Puberal estrus	
Weight (kg)			
Birth	0.31**	0.37**	0.08 NS
Weaning	-	0.35**	-0.51**
Puberal estrus	-	-	0.31**

¹ 112 days

** P<0.01.

DISCUSSION AND CONCLUSIONS

In this study, under the same management conditions, no differences ($P > 0.05$) were found for weight and age at puberty among breeds or among type of birth of kids.

The average age of female kids at puberty found in this experiment, with native Brazilian breeds, are similar to those reported for the Black Bengal and Pashmina breeds in India (Rahman et al. 1977, Mazumder & Mazumder 1983) and in Northeast Brazil for Anglo-nubian and genetically non-descript (SRD) goats. German Brown dairy breed however was more precocious (Rodrigues et al. 1982). Also, Arriola (1936) and Khan et al. (1981) reported similar ages at puberty in graded Anglo-nubian and Jamnapari breeds in Philippine and India, respectively.

Single born kids, as a rule, have heavier weights and faster growth rates (Wijeratne 1968), and experienced their puberal estrus earlier than twin born kids (Ali et al. 1973). In this study, type of birth did not affect age or weight at puberty, which agrees with Singh & Singh (1974), but this may have resulted from the relatively older age at puberty, or the small size of the sample.

The ovulation rate in goats varied between

and within breeds (Amble et al. 1964). There was no significant ($P > 0.05$) variation in incidence or rate of ovulation among breeds, for either prepuberal or puberal ovulation. The statistically ($P < 0.025$) higher incidence of ovulation from the right ovary supports the findings of Rosales et al. (1984).

The occurrence of estrus without ovulation or ovulation without estrus in tropical goats is not well documented. The results of this study indicate that at least 40,4% of the female kids ovulate prior to the puberal estrus and that ovulation accompanies puberal estrus in all female kids.

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