GROWTH AND PUBERTY TRAITS OF THAI NATIVE (TN) AND TN × ANGLO-NUBIAN DOES

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Summary

This paper presents results from a study of the age and weight at puberty of Thai does. A randomized block 3 × 3 factorial design was used. Factors were genotype (Thai Native; TN, 75% TN × 25% Anglo-Nubian; AN and 50% TN × 50% AN does), year of kidding (1989, 1990 and 1991) and birth type (single or twin) as a block. It was shown that there were no significant ($p > 0.05$) difference in age at puberty among genotypes (167.6 ± 6.0, 157.6 ± 7.0 and 160.0 ± 4.7 days for TN, 75% TN × 25% AN and 50% TN × 50% AN does, respectively) and between birth types. However, does kidded in 1991 had significantly ($p < 0.01$) longer age at puberty (194.0 ± 7.4 days) than did does kidded in 1989 (143.0 ± 4.5 days) or in 1990 (148.1 ± 5.7 days). There was an interaction effect between genotype and year. Fifty % TN × 50% AN does had significantly ($p < 0.05$) higher weights at pubery (17.2 ± 0.4 kg) than those of TN (14.3 ± 0.5 kg) and 75% TN × 25% AN (14.4 ± 0.6 kg) does. There was no significant difference in weights at puberty between TN and 75% TN × 25% AN does. There was no effect of birth type on weight at puberty. There was an interaction effect between genotype and year of kidding on age and weight at puberty and on growth rate from birth to weaning.

(**Key Words** : Growth, Puberty Traits, Thai Goats, Cross-breds)

Introduction

The productivity of all classes of domestic animals depends directly or indirectly on their reproductive performance. Reproductive performance is one of the major determinants of productivity of sheep and goats. Puberty may be defined as the age (or weight) at first oestrus (ovulation). First oestrus is usually preceded by one or more ovulation cycles unaccompanied by oestrus (Entwistle, 1978). Studies in many parts of the world suggest that there is wide variation in age at puberty in does, and age at puberty depends upon weight, which in true is associated with the availability of quantity and quality of feeds (Devendra and Burns, 1970; Shelton, 1978). Agrawal et al. (1992) reported that with good management and care of female kids, small and dwarf Indian breeds attain puberty as early as 150 days (range : 150-437 days), while medium and large breeds attain puberty at a very late age (range: 325-550 days). There is no information on age and weight at puberty of Thai does. Therefore, the present study was carried out to investigate age and weight at puberty along with the growth rate of different goat genotypes over 3 years of kidding. This information on the performance of goat genotypes will be applied both under improved management and village environments, especially in southern Thailand.

Materials and Methods

Location and climate

This study was conducted at the Small Ruminant Research and Development Centre, Faculty of Natural Resources, Prince of Songkla University, Hat Yai, Songkhla, Thailand. The region is situated at 7° N, 100° 30′ E, and has an annual rainfall of 1,120-2,800 mm with a dry period extending from mid January to March/April, with marked increases in rainfall in May/June and October /November. The area is 20 m above sea level with temperatures of 20-35℃, relative humidity of 63-88%, and

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a 50 minute difference in daylength between solstices (Milton et al., 1987).

Experimental design

A 3 × 3 factorial in randomized block design was used. The factors were genotype (TN, 75% TN × 25% AN and 50% TN × 50% AN), year of kidding (1989, 1990 and 1991) and birth type (single or twin) as a block.

Animals and their management

The annual mating commenced in October. One hundred and sixty-six (22, 15 and 28; 35, 14 and 13; 8, 4 and 27 for TN, 75% TN × 25% AN and 50% TN × 50% AN in 1989, 1990 and 1991, respectively) female kids were used. At weaning, they were drenched with levamisole and niclosamide and vaccinated against (i) caseous lymphadenitis (CLA), pulpy kidney disease, tetanus, black diseases, malignant oedema and black leg, using Glanvac-6 vaccine (Commonwealth Serum Laboratories, Victoria, Australia), (ii) foot and mouth disease (Type A, O and Asia 1) and (iii) haemorrhagic septicaemia (Pagchong, Thailand). The details of management of the animals were similar to those mentioned by Milton et al. (1991).

Diets and feeding methods

All does were grazed on grass/legume pastures. Pregnant and lactating does were also offered a concentrate diet (15.0% crude protein) similar to that mentioned in Milton et al. (1991). Female weaners were rotationally grazed and were offered concentrate at 1.75% of body weight up to about 8 months of age.

Measurements

Each year, the weaner kids were run with vasectomised males (1:40 does) fitted with a harness and coloured crayon ("Stafix", Stafix Ltd., New Zealand) to synchronise oestrus by "buck effect". Does were bought from the paddock at about 08:00 hr to record the position and intensity of marks (score 1-4) on the body. All marks on does were then washed off and the does returned to the paddock. Does with the first rump mark scored ≥ 2 were recorded as having reached puberty. The puberty weight of the doe was also recorded.

Statistical analysis

Data were analysed using the Statistical Analysis Systems Package (SAS, 1987). Comparisons of age and weight at puberty and growth rates of kids across genotypes, years of kidding and birth type were made by analysis of variance and the means separated using the least significant difference (Steel and Torrie, 1960).

Results and Discussion

Effect of genotype on age and weight at puberty and growth rate

Table 1 shows mean squares from analysis of variance for age and weight at puberty and growth rate of does. Least squars means (with standard error) of the main effects for genotype and year of kidding on age and weight at puberty of does are shown in table 2. There was no significant difference in age at puberty among genotypes (167.6 ± 5.59, 157.6 ± 7.03 and 160.0 ± 4.75 days for TN, 75% TN × 25% AN and 50% TN × 50% AN does, respectively). However, 50% TN × 50% AN does had significantly ($p < 0.05$) higher weights at puberty (17.2 ± 0.39 days) than those of TN (14.3 ± 0.49 days) and 75% TN × 25% AN (14.4 ± 0.58 days) does. There were no significant difference in weights at puberty between TN and 75% TN × 25% AN does. This finding is in agreement with that of Jalaluddin (1992), who found that age at puberty of Black Bengal goats in Bangladesh was 160.4 ± 23.3 days. However, in dry

TABLE 1. MEAN SQUARES FROM ANALYSIS OF VARIANCE FOR AGE AND WEIGHT AT PUBERTY OF DOES

Source	df	At puberty		Growth rate		
		Age	Weight	Birth to weaning	Weaning to puberty	Birth to puberty
Genotype (G)	2	1,020.73	129.39**	34.32**	14.65	12.26
Year (Y)	2	21,923.39**	49.48**	144.76**	19.23	194.42**
G × Y	4	3,317.06*	32.30**	15.35**	19.68	10.04
Birth type (block)	1	9.27	19.54	51.04**	82.33**	1.84
Error	156	1,040.81	6.98	4.17	14.18*	6.00

* ($p < 0.05$), ** ($p < 0.01$).

TABLE 2. LEAST-SQUARES MEANS WITH STANDARD ERROR (±) OF THE MAIN EFFECT FOR GENOTYPE, YEAR AND BIRTH TYPE OF KIDDING ON AGE AND WEIGHT AT PUBERTY OF DOES AND THEIR GROWTH RATE

	At puberty		Growth rate ($g/kg^{.75}/d$)		
	Age (days)	Weight (kg)	Birth to weaning	Weaning to puberty	Birth to puberty
Genotype					
Thai native (TN)	167.6 ± 5.59	14.3 ± 0.49[a]	25.0 ± 0.38[a]	8.7 ± 0.69	16.5 ± 0.45[a]
75% TN × 25% Anglo-Nubian (AN)	157.6 ± 7.03	14.4 ± 0.58[a]	25.2 ± 0.45[a]	9.5 ± 0.82	16.9 ± 0.53[a]
50% TN × 50% AN	160.0 ± 4.75	17.2 ± 0.39[b]	26.5 ± 0.30[b]	8.2 ± 0.55	17.5 ± 0.36[b]
Year of kidding					
1989	143.0 ± 4.50[a]	14.5 ± 0.45[a]	26.0 ± 0.28[a]	8.5 ± 0.52	18.3 ± 0.34[a]
1990	148.1 ± 5.71[a]	16.5 ± 0.46[b]	27.6 ± 0.36[b]	9.6 ± 0.67	18.7 ± 0.43[a]
1991	194.0 ± 7.41[b]	15.0 ± 0.60[ab]	23.2 ± 0.47[c]	8.3 ± 0.87	13.9 ± 0.56[b]
Birth type					
Single	162.1 ± 7.37	15.9 ± 0.60	26.5 ± 0.47[a]	7.7 ± 0.86[a]	17.1 ± 0.56
Twin	161.3 ± 3.38	14.8 ± 0.28	24.7 ± 0.21[b]	9.9 ± 0.39[b]	16.8 ± 0.26

[a,b] Means within the levels of main effects, within columns and with different superscripts differ significantly.

conditions (in Ta Takstan), age at puberty was 12.1 ± 0.5 months.

Fifty % TN × 50% AN kids had significantly ($p < 0.01$) higher growth rates ($g/kg^{.75}/d$) than those of TN and 75% TN × 25% AN kids, but there was no significant difference between TN and 75% TN × 25% AN kids from birth to weaning or to puberty. There was no effect of genotype on growth rate in the post-weaning period (weaning to puberty).

It would seem that there was no significant difference in growth rates, weights at puberty and consequently ages at puberty between TN and 75% TN × 25% AN does. However, 50% TN × 50% AN does had higher growth rates, and so weight at puberty than did the other two genotypes. This would suggest that both age and weight at puberty should be considered for each genotype. However, El Hag et al. (1995) has suggested that body weight, rather than age is the most important factor determining puberty of Damascus (Shami) goats. The growth and development of reproductive systems happen gradually. In general, does are not allowed to mate immediately on reaching puberty. However, small farmers allow males and females to graze together after weaning and the does may be mated at any time. Further research should be conducted on the reproductive performances of each genotype of does breeding at various ages after puberty. However, Peters et al. (1979) has suggested that does should be mated at approximately 70% of their mature body weight. El Hag et al. (1995) has reported that age at mating (10 or 12 months of age) does not exert any effects on productive or reproductive performance. However, Saithanoo et al. (1993a) has studied with Thai native and Anglo-Nubian cross-bred does indicating that on the average litter size and multiple birth rate increase with age or parity. Live weight at mating appears to be the most important factor affecting the reproductive performance. In practice, reproduction rate of the flock could be improved by selecting does of heavier live weigth (within genotype and age) for mating.

Saithanoo (1990) reported that most of the goats in the survey areas were raised in association with agricultural systems such as fishing, rice-growing and rubber, oil palm and fruit tree plantations. More than 65% of owners employed a tethering system. A cut-and-carry system was practised only in the wet season and at low level. Few treatments for health problems were used. It is suggested that goat production in the village could improve in terms of management, feeds and feeding, parasite controls etc.

Effect of year of kiddings on age and weight at puberty and growth rate

Year of kidding affected growth rate from birth to weaning, from birth to puberty, and age and weight at puberty. Does kidded in 1991 had significantly ($p < 0.05$) lower growth rates than those kidded in 1989 or 1990. This result may be due to a higher average relative humidity in 1991 (83%) than that of 1990 (74.6%) and 1989 (77%). Although the average temperatures in 3 years

was similar (23.7-32.0, 23.9-32.4 and 23.7-32.2℃, for 1989, 1990 and 1991, respectively). It is possible that the low feed intakes, and therefore poor weight gains may have been related to high environmental temperatures and humidity. Does in 1991 may have low feed intake and consequently, they have low milk production. The kids may also have low feed intake. Consequently, they had reached puberty after does kidded in 1989 or 1990. In fact, there was no effect of year of kidding on post-weaning period, but from birth to weaning kids born in 1991 had significantly ($p < 0.01$) lower growth rates than those born in 1989 or 1990. This result suggests that pre-weaning growth affects age at puberty.

Effect of birth type on age and weight at puberty and growth rate

In this study, twin kids had significantly ($p < 0.01$) lower pre-weaning growth rates (24.7 g/kg$^{.75}$/d) than did single (26.5 g/kg$^{.75}$/d) kids. This finding is in agreement with those of Pym et al. (1982), Beischer (1986), Pralomkarn (1990) and Saithanoo et al. (1993b). However, they had higher post-weaning growth rates (9.9 g/kg$^{.75}$/d) than single (7.7 g/kg$^{.75}$/d) kids. This result may be due to a function of metabolic body weight to enable meaningful comparisons. It would seem that single kids can compensate in later growth period for the poor growth experienced in the 12 weeks of life. Therefore, there was no significant difference between birth types for growth rate from birth to puberty. It is suggested that birth type should be considered for post-weaning study. There was no effect of birth type on age and weight at puberty.

Interaction effect

It is well known that crossbreeding indigenous or native goats with European breeds markedly increases growth rate of kids. The improved growth of cross-breds may arise initially from heterosis, and in the longer term, from an increased feed intake and feed conversion efficiency. In this study, there was an interaction effect between genotype and year of kidding on age ($p < 0.05$) and weight ($p < 0.01$) at puberty and on growth rate from birth to weaning ($p < 0.01$). There was no effect in age and weight at puberty on year of kidding for 75% TN × 25% AN does, but in 1991 TN and 50% TN × 50% AN does had significantly higher ages at puberty than those of 1989 and 1990. There was no significant difference in weight at puberty between years of kidding for 50% TN × 50% AN does. However, does kidded in 1990 had significantly higher weights at puberty than those of 1989 and 1991. Moreover, Pralomkarn et al. (1995) found that although cross-bred goats under village environments in southern Thailand were drenched, during the first four months (no supplementation) all animals lost weight. The second period (supplementation) all groups, especially for drenched animals markedly gain weight throughout the experiment. This result suggests that nutritional conditions, which may be associated with season or year should be considered to improve the goat production. In terms of reproductive performances, Kochapakdee et al. (1994) found that there was no interaction between genotype and feeding on conception rate, % kidding opportunity, % multiple birth rate or post-partum oestrous of does. This indicates that under improved pasture, cross-bred does could have similar reproductive performances and concentrate supplementation did not improve these performances.

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