

LEVEL OF TESTOSTERONE IN BLOOD PLASMA OF SELECTED RAMS

S. Abdul Wahid¹ and J. M. Yunus²

Animal Research Division, MARDI, Lot 411 Block 14, Jalan Santubong, 93055 Kuching, Malaysia

Summary

Following importation of temperate Australian breeds of sheep into Malaysia, it was demonstrated that there was variability in libido and semen productivity. Consequently, a study was conducted to determine the concentration of testosterone and relate it with libido and semen production. A total of 10 rams each of Dorset Horn, Cross of Merino with Border Leicester, Siamese Long Tail, Suffolk and local Malin were used to study the composition of testosterone in the blood plasma of these breeds. The study showed that there was significant difference between the testosterone level of different breeds in Spring and Summer but not in Autumn and Winter. The difference was pronounced in August and January. A significant difference ($p > 0.05$) was recorded in the testosterone levels of the different breeds during the day where Malin had better libido compared to the other breeds. There was no significant difference between the testosterone levels of the different breeds at night. The testosterone level of Suffolk, however, was elevated throughout the night (2.00 ng/ml and over) which resulted in better libido at night compared to the other breeds.

(Key Words : Testosterone, Blood plasma, Rams)

Introduction

The capability of the male to mount a female is depicted by the libido which in turn is influenced by the level of hormone called testosterone in the blood. Behavioural characteristics of sexual activity were often indicative when higher level of testosterone would produce a more aggressive animal which in turn would be able to serve a larger number of females. The rams which were imported from a temperate country were found to possess variable libido and poor semen quality (Abdul Wahid et al., 1992) resulting in reduced conception and lambing rates (Abdul Wahid and Rozimah, 1987). As testosterone level is related to semen quality it was the objective of this study to determine the testosterone profile of these rams so that it can be related with the libido and semen quantity and quality of the imported breeds.

Materials and Methods

Ten rams each of Dorset, Suffolk, Cross of Merino with Border Leicester, Siamese Long Tail and Malin were used for the study. The animals were housed in a wooden shed and the management procedures were as described by Abdul Wahid et al. (1991). Libido test was performed every two weeks for one year (July 1990 - June 1991) and semen was collected using an artificial vagina and evaluated as described by Abdul Wahid et al. (1992). Blood was taken fortnightly from the jugular vein on the same day for one year and the plasma subjected for testosterone assay using the standard radioimmunoassay (RIA) technique at MARDI. Blood was also collected every three hours for six months (July 1991 - Dec. 1991) and the testosterone level determined for diurnal variation. Statistical analysis was done using the summary methods of Luginbuhl et al. (1985).

Results and Discussion

The five breed groups had variable concentration of blood testosterone ranging from 0.90 ng/ml in Suffolk to 3.92 ng/ml in Malin breeds (table 1). It was observed that the lowest level of testosterone was at 09:00 hrs and then again at 18:00 hrs in all breeds except Siamese Long Tail. Between the tropical breeds, Siamese Long Tail showed a different pattern where the lowest level was at 12:00 hrs instead of at 09:00 hrs. This phenomenon is believed to

¹Address reprint requests to Dr. S. Abdul Wahid, Animal Research Division, MARDI, Lot 411 Block 14, Jalan Santubong, 93055 Kuching, Malaysia.

²Address reprint requests to Dr. J. M. Yunus, Technology and Social Studies Division, MARDI, G.P.O. Box 12301, 50774 Kuala Lumpur, Malaysia.

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TABLE 1. DIURNAL FLUCTUATION OF TESTOSTERONE IN BLOOD PLASMA OF IMPORTED TEMPERATE RAMS

	Time (hr)	Breed					Mean
		Dorset Horn	Merino × Border Leicester	Siamese Long Tail	Suffolk	Malin	
Day	06:00	1.31 ^{aA} ± 0.24	1.67 ^{aB} ± 0.37	1.82 ^{aA} ± 0.70	1.89 ^{aAB} ± 0.37	1.38 ^{aB} ± 0.42	1.62 ^B ± 0.20
	09:00	1.01 ^{aA} ± 0.45	1.23 ^{aB} ± 0.43	2.13 ^{aA} ± 0.65	0.90 ^{aB} ± 0.10	1.09 ^{aC} ± 0.15	1.28 ^B ± 0.19
	12:00	1.81 ^{abA} ± 0.61	1.85 ^{abAB} ± 0.66	1.59 ^{abA} ± 0.49	1.21 ^{abAB} ± 0.38	3.92 ^{aC} ± 1.51	2.00 ^{AB} ± 0.35
	15:00	1.70 ^{aA} ± 0.49	2.73 ^{aA} ± 0.47	2.68 ^{aA} ± 1.05	2.59 ^{aA} ± 0.49	3.05 ^{aA} ± 0.57	2.55 ^A ± 0.29
	Mean	1.46 ^{aA} ± 0.23	1.87 ^{aA} ± 0.26	2.04 ^{aA} ± 0.36	1.65 ^{aA} ± 0.20	2.31 ^{aA} ± 0.42	
Night	18:00	1.13 ^{aA} ± 0.25	1.25 ^{aB} ± 0.32	1.39 ^{aA} ± 0.25	2.16 ^{aAB} ± 0.50	1.32 ^{aAB} ± 0.33	1.44 ^B ± 0.15
	21:00	2.09 ^{aA} ± 0.57	1.39 ^{aB} ± 0.26	1.79 ^{aA} ± 0.27	2.39 ^{aAB} ± 0.97	1.57 ^{aBC} ± 0.34	1.86 ^B ± 0.25
	24:00	1.96 ^{aA} ± 0.68	1.39 ^{aB} ± 0.38	1.12 ^{aA} ± 0.30	2.12 ^{aAB} ± 0.41	1.38 ^{aBC} ± 0.20	1.58 ^B ± 0.18
	03:00	1.39 ^{aA} ± 0.41	1.20 ^{aB} ± 0.21	1.71 ^{aA} ± 0.41	2.00 ^{aAB} ± 0.43	1.78 ^{aBC} ± 0.30	1.62 ^B ± 0.16
	Mean	1.61 ^{abA} ± 0.23	1.30 ^{abB} ± 0.14	1.50 ^{ba} ± 0.16	2.17 ^{aA} ± 0.30	1.51 ^{ba} ± 0.15	

Means ± S.E. (Row-wise amongst breeds) with the same small letter are not significantly different ($p < 0.05$).

Means ± S.E. (Column-wise) with the same capital letter are not significantly different ($p < 0.05$).

follow the normal practice of the farmers who let out the sheep for grazing at about 09:00 until 16:00 hrs. The hungry animals so engrossed with feeding had no desire to mount and the secretion of testosterone was at its minimum.

In Malin, Suffolk, Cross of Merino with Border Leicester and Dorset Horn, the testosterone level increased from 09:00 to 12:00 hrs which suggests that there might be a relationship between the environmental temperature and the testosterone secretion. As a result, with the rise in daily temperature secretion of testosterone is initiated and the concentration in the blood is highest at about 12:00 to 15:00 hrs. In Malaysia, between 12:00 and 15:00 hrs is the hottest part of the day. Animals with higher testosterone levels tend to copulate more often than with low testosterone levels. The desire to mount, therefore, is greater in the afternoon when the animals have returned from grazing with the belly full. Thus, the best time to mate these breeds would be in the afternoon.

The variation in Malin as compared to the other breeds is attributed to the fact that this breed had been adapted to the Malaysian climatic and managerial impositions and as such depicted the expected pattern of testosterone, whereas Dorset Horn, Cross of Merino with Border Leicester, and Suffolk had been imported from the southern hemisphere. The level of testosterone in Suffolk was maintained above 2.00 ng/ml throughout the night which resulted in the animals demonstrating desire to mount at night instead of the day. However, statistically, there was no significant difference ($p < 0.05$) between the

mean testosterone concentration of day and night. Significant difference was only recorded in Cross of Merino with Border Leicester. The diurnal variation was thus influenced by breed. It was observed that those breeds that possessed more than 1.0 ng/ml testosterone in their blood plasma showed better libido and more aggressive behaviour.

Over the year, in relation to the breeding seasons of the northern and southern hemisphere it was observed that there were two depressions, one in August and again in January/February (figure 1). Dorset Horn had peaks in December (2.75 ng/ml) and in March (2.45 ng/ml). Cross of Merino with Border Leicester had good volume in May and June which coincided with the breeding season of the northern hemisphere. However, it recorded the lowest level of testosterone in August (0.51 ng/ml). Suffolk had testosterone level of 1.0 ng/ml and over throughout the year. The peak was in March (2.09 ng/ml). The lowest levels were in November and December (1.07 and 1.06 ng/ml respectively). It appeared that Suffolk did not follow the normal pattern of the other breeds. Although it had high levels of testosterone in March, April and May, it did not show any desire to mate and libido was poor. Such seasonal variation was also observed by Lincoln and Short (1980) in Finnish Landrace and Suffolk rams. They found the testosterone level in Suffolk to be as high as 5.5 ng/ml. In this study at no time the testosterone level was that high which suggests that animals in the temperate countries produce greater volume of testosterone compared to rams in the tropical countries. Testosterone

concentration also reflects the development of the testes as illustrated by the size of the testicles (Abdul Wahid et al., 1993).

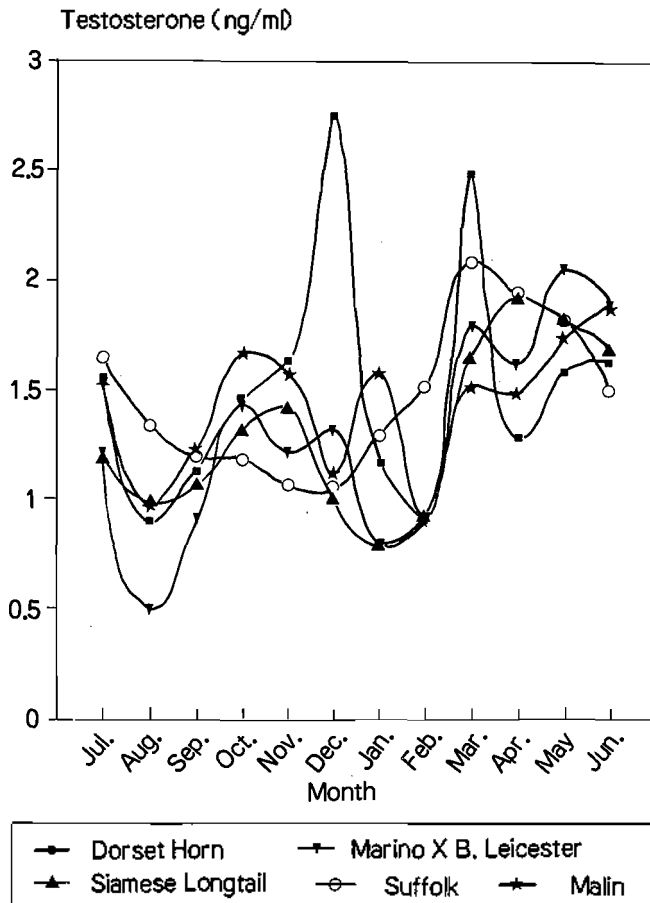


Figure 1. Testosterone level in selected rams.

This study showed that the lowest level of testosterone in most of the breeds was at 09:00 hrs which increased at 12:00 to 15:00 hrs possibly related to increase in

environmental temperature. There was also a seasonal pattern with greater production in March to May and lower production in June and August which coincided with the breeding pattern of the northern hemisphere. Suffolk compared to the other breeds demonstrated improved libido at night and preferred to mount at night instead of during the day.

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