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FERTILITY AND KIDDING RATE IN THAI NATIVE GOATS INSEMINATED WITH FROZEN SEMEN

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SUMMARY

Thai native goats were inseminated with fresh native breed semen (cervical insemination) or frozen Anglo-Nubian semen (intra-uterine insemination) at natural oestrus during a 25 day period, with or without a prior 21 day contact with bucks. With fresh native breed semen, fertility (82.1%) and kidding percentage (132%) to a single insemination were high, but were much reduced for frozen Anglo-Nubian semen (43.2% and 64%). Indirect estimation procedures indicated that fertilisation failure (27.6%) and embryo loss (41.3%) were major components of wastage with the frozen semen. However, with fresh semen fertilisation failure (3.7%) and embryo mortality (11.6%) were low. Contact with bucks for 3 weeks prior to insemination appeared to reduce fertilisation failure and embryo mortality, although differences were not statistically significant.

Keywords: Thai native goats, fertility, frozen semen, reproductive wastage.

INTRODUCTION

Techniques for dilution and frozen storage of goat semen are well advanced but the subsequent fertility can be unpredictable (Corteel 1977; Ritar 1984). Intra-uterine insemination improves fertility (Ritar and Salamon 1983), but the components of reproductive wastage following the use of frozen semen have not been reported in detail.

This paper reports the use of frozen semen to introduce the Anglo-Nubian breed into the Thai native goat population and describes an indirect method for the estimation of the components of reproductive wastage.

MATERIALS AND METHODS

Experimental animals

The trial was carried out at the goat research facility of the Faculty of Natural Resources, Prince of Songkla University, Hatyai, Thailand situated 7°N, 100°30'E, with an annual rainfall of 1120-2800 mm having a dry period commencing in mid January and marked increases in rain in April and October.

A breeding herd of 116 mixed age, native does grazed improved pastures consisting mainly of Brachiaria spp with Centrosema pubescens and Stylosanthes hamata cv verano, and were supplemented with a mixture of corn grain and agricultural byproducts (150 g crude protein, 11 MJ DE/kg DM). The herd was mated in October 1986 by artificial insemination (AI) and the kidding in March 1987 was closely supervised to identify mother and offspring.

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Semen preparation

Semen was collected by artificial vagina from Anglo-Nubian bucks in Brisbane, Australia, deep frozen by the pellet method of Salamon and Ritar (1982) and air-freighted to Thailand in liquid nitrogen. Pellets were thawed at 37°C and held at 30°C before insemination. At least 30 x 10^6 motile cells (0.1 ml volume) were placed in each uterine horn by the technique of Killeen and Caffery (1982).

Semen from native Thai bucks was collected by electro-ejaculation after tranquilising with Rompun. Doses of 0.2 ml containing at least 100 million motile cells were placed in the cervix of the does.

Mating organisation

The native does were randomised into two groups:

Group 1. Vasectomised bucks harnessed with raddle blocks were placed with does 21 days before the commencement of the AI; raddle marks on mated does were scored for intensity and spread and recorded daily (n = 70).

Group 2. Does separated from males until the commencement of AI. (n = 46).

At the commencement of AI, the two groups were combined and run with vasectomised males fitted with raddle harnesses. Does with heavy raddle marks on the rump were separated from the mob each morning and inseminated within two hours with either fresh native buck semen or frozen Anglo-Nubian semen. This program was concluded after 25 days.

Determination of reproductive wastage

Blood samples were obtained by venipuncture from each doe 20 days after insemination, the sera stored at -10°C and subsequently assayed for progesterone. On the basis of other studies with this herd (Restall and Milton unpublished), does with values above 2 ng/ml were considered pregnant. The proportion of pregnant does was used as an estimate of fertilisation rate.

The ovulation rate was estimated from the kidding rate for does inseminated with fresh native semen, and was assumed to be the same in does inseminated with frozen semen. This under-estimates the true ovulation rate as it cannot account for partial failures in multiple pregnancies.

Kidding was closely supervised and the number of kids born to each doe was accurately recorded.

The estimates of ovulation and fertilisation rate were used to calculate the total kids conceived in each group, and the embryonic losses were determined by difference from the actual number born. Only first inseminations have been considered in the analyses.

RESULTS

The two groups of does showed similar mating patterns and 95% of does were inseminated. The inter-oestrus interval for does from Group 1 was 19.7 days (S.D. 4.36). The results of the inseminations and derived reproductive wastage estimates are given in Table 1.

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Table 1. Reproductive performance in Thai native goats inseminated with fresh native semen or frozen Anglo-Nubian semen. Group 1 does were teased for 21 days prior to the artificial insemination program, Group 2 does were not.

Type of semen	Native fresh			Anglo Nubian frozen		
Group	1	2	Total	1	2	Total
No. insem.	16	13	28	50	31	81
No. does kidded	15	8	23	24	11	35
Fertility	100.0	61.5	82.1	48.0	35.4	43.2
No. kids born	23	14	37	37	15	52
Kidding rate (per doe kidded)	1.53	1.75	1.61	1.54	1.36	1.49
Kidding %	153.3	107.7	132.1	74.0	48.4	64.2
Est. fert. rate	100.0	91.7	96.3	78.7	62.1	72.4
Est. ovulation rate	1.53	1.75	1.61	1.53	1.75	1.61
Theoretical no. of embryos	23	19.3	41.9	57	31.5	88.6
Est. embryo loss	0	5.3	4.9	20	16.5	36.6
% embryo loss	0	17.5	11.6	34.6	52.4	41.3

Fertility was higher (82.1%) for does inseminated with fresh semen than for those receiving frozen semen (43.2%, $P < 0.01$). The number of kids born per doe kidding was also lower for the does receiving frozen semen (1.61 vs 1.49 ns). Teasing does for 21 days prior to insemination resulted in better fertility irrespective of the type of inseminate,but the differences were not statistically significant.

The estimated fertilisation rate was high (96.3%) for does inseminated with fresh semen, but lower for those receiving frozen semen (72.4%). Embryo loss was considerably greater in does inseminated with frozen semen (fresh native 11.6% vs frozen Anglo-Nubian 41.3%, $P < 0.01$). The teasing treatment (Group 1) appeared to result in higher fertilisation and lower embryo loss rates.

DISCUSSION

The overall result from the use of the frozen Anglo-Nubian semen is within the range of reported values (Ritar 1987), but fertility and kidding percentage was much less than obtained from inseminations with fresh native breed semen. The precise nature of the reduction in fecundity is unknown as the primary aim of the exercise, to obtain crossbred kids, precluded measurements necessary for the rigorous calculation of the components of reproductive loss. Practical considerations prevented surgical intervention to determine ovulation and fertilisation rate directly, or to determine pregnancy status at various times. Nevertheless, cautious inferences about the components of reproductive wastage may be drawn from the indirect estimation procedures described.

These indirect procedures have inherent errors. The ferilisation rate estimate based on pregnancy at 20 days will include very early embryo losses occurring before the pregnancy could extend the normal cycle. The ovulation rate based on kidding data under-estimates the true rate as it does not account for the partial failure in multiple pregnancies; when both estimates are used to derive a loss rate for embryos, the net effect of the errors is an under-estimation of true embryo mortality.

Given the above qualifications, the data in Table 1 indicate that the low kidding percentage from the use of frozen semen was due to a greater fertilisation failure (3.7% fresh semen vs 27.6% frozen semen) and embryo loss (11.6% fresh semen vs 41.3% frozen semen). The reasons for the large difference in reproductive failure are not apparent but may include damage to spermatozoa during freezing, leading to impaired fertilising capacity and/or embryonic development. Uterine injury during insemination may interfere with embryo development and incompatability between the doe and the crossbred embryo must be considered.

The magnitude of the differences observed suggest that the inference of greater fertilisation failure and embryo loss with frozen semen is a reasonable one. The differences between the estimates for the Group 1 and 2 does, while not statistically significant, indicate that pretreating may improve the performance of does receiving fresh or frozen semen. The introduction of males to these goats induces reproductive activity (Restall and Milton unpublished) and does from the teased group would have had a longer progestational period prior to insemination than the Group 2 does. In view of the possible benefits this aspect warrants further work.

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