ARTIFICIAL INSEMINATION IN GOATS

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ABSTRACT

Technical and economical evaluation of determined practices of reproduction and breeding, focused here on artificial insemination and the further measurement of matings, shows a high productive efficiency in the development of dairy goats.

Artificial insemination in Brazil, especially in the Northeast, spread in a rapid, massive and positive way to determine genetic characteristics for dairy production. This program through the utilization of tested bucks has contributed to the first offspring with significant increases in milk production.

The preservation of the best breeds through a germ plasm bank, using improvement technology of goat semen has made possible new technological alternatives for goat breeders in Brazil. This guarantees initially the continuity of the breeding program of dairy goats in the Northeast and for extension to other parts of Brazil.

INTRODUCTION

Brazil, as part of Latin America, is one of the countries with little goat milk production (FAO, 1976).

The world goat population is about 500 million head. Of this, 76% is located in the tropics (FAO, 1980).

Genetic improvement of goats in Brazil aims at better dairy goat productivity. Goats in developing countries are raised basically for the production of meat and skins. Dairy production of goats in the tropics is still very low, 30 kg per animal annually, which is just the essential amount required to feed the kid (Loysel, 1984).

In various countries of Latin and Central America, excellent results were obtained in breeding research to increase local dairy production utilizing indigenous bucks of the Saanen,

Alpine, Toggenburg and Anglo-Nubian breeds. This has been obtained primarily from first cross offspring. In Mexico, dairy production in local herds is about 560g per day as a result of this procedure (Carrera & Sevilla, 1971). The introduction of exotic breeds such as Saanen and Anglo-Nubian improved dairy production in F_1, approximately 48% and 29% for the two breeds respectively, in relation to the native breed (Montaldo et al, 1981).

In Venezuela, native dairy goat production is approximately 500g daily and crossing with exotic Alpine and Anglo-Nubian bucks improved dairy production of native herd around 15% in the F_1 animals (Gonzales, 1971).

In Brazil, the utilization of Saanen bucks crossed on native does of the Marota breed improved dairy production of the F_1 offspring from 500g to 2,600g daily (Cancio et al, 1985; Nunes et al, 1985).

The use of bucks of better genetic potential, through artificial insemination, disseminates in a rapid and economical way genetic characteristics for dairy production improvement (Corteel, 1981).

In the tropics, under semi-extensive management conditions, the continuing pasture production during the year is very difficult. The mating period is of fundamental importance, to allow for a time of favorable lactation, less stress for the animals, and so the females can express in a positive way their genetic potential. Control of the estrous cycle and the use of artificial insemination (programmed reproduction) in Venezuela and in Brazil have been shown to be an efficient technological instrument to improve dairy production (Gonzales, 1978 and Nunes, 1985).

The utilization of programmed reproduction requires knowledge of male and female physiological behavior in the ecological conditions where the program is developed. Knowledge of the physiological events, of the estrus and ovulation in the female and the quanti-qualitative production of the sperm in the male, integrates directly in the reproductive efficiency of the breeding stock (Nunes, 1983).

Different methods, means and drugs have been demonstrated and utilized by different authors in various countries for the synchronization of estrus in goats (Nunes & Silva, 1983; Corteel, 1975; and Gonzales, 1974).

With reference to goat semen technology, most difficulties have to do with freezing of the sperm, due to problems interrelated with seminal plasm and phospholipids present in dilutors, normally used in the freezing of semen (Nunes et al, 1982; Corteel, 1976).

Corteel (1974) has demonstrated that seminal plasm decreases viability of frozen spermatozoa. Washing significantly increased the percentage of motile sperm after freezing, thawing, and incubation at 37°C compared to non-washed sperm. The decrease in sperm motility during conservation at -196°C is important in the presence of seminal plasm, but practically zero in its absence. This decrease in the presence of seminal plasm is 16.6% up to three months after freezing and 22% from three to six months after freezing. In the absence of seminal plasm (washed sperm), loss of motility is only 1.3% between three and six months after freezing (Corteel, 1975).

The deleterious effect of seminal plasm comes from a phospholipase type enzyme secreted by the bulbourethral gland, which interacts with the phospholipid in the seminal plasm and in the dilutor, releasing lisolethicins and fatty acid that are toxic to the spermatozoa (Roy, 1957).

Nunes (1982) isolated the substance corresponding to a protein, from the bulbourethral glands, utilizing a sefadex G_{100} column. In the non-sexual state the bulbourethral glands hypertrophy and are quite rich in phospholipase, but in the sexual state the secretion diminishes significantly (Nunes, 1980).

The seminal vesicles contain a substance capable of blocking the negative effects originating in the bulbourethral secretions (Nunes, 1982).

In the sexual state, the blocking of the negative effect of the bulbourethral secretion is present in reasonable quantity in the seminal vesicle secretions (Nunes, 1980). It is pointed out that 10 mg of phospholipase provoked total death of spermatozoa diluted in milk. Dilutors that contain smaller quantities of phospholipid facilitate, in a significative way, the freezing of goat semen and artificial insemination, and contribute in this way to a greater use of the genetic potential of tested bucks and to the improvement of dairy production.

MATERIAL AND METHODS

Animals

One hundred and eighty females of the exotic Saanen breed, 200 females of the exotic breed and native goats of Moxoto, Marota and SRD (Non-defined breed) were utilized. Of the total, 180 females belonged to experimental stations and 200 females belonged to private producers.

Treatment For Synchronization of Estrus

Vaginal sponges impregnated with 50 mg Medroxy-Progesterone Acetate (MAP) were used for the synchronization of estrus and remained for ten days in the cranial portion of the vagina. On

the eighth day 200 I.U. of Pregnant Mare Serum Gonadotrophin (PMSG) and 100 mg prostaglandin were administered intramuscularly. Thirty-eight hours after the removal of the sponge, the does were artificially inseminated using semen diluted with coconut water or milk.

Handling of Semen

Estrogenized females were utilized for semen collection from six bucks. At the moment of mounting by the buck, the semen is ejaculated into the artificial vagina thus allowing deposition of sperm into the collection tube.

After collection, the concentration of the spermatozoa was determined using 0.01 ml of semen diluted in 10 ml of physiological saline solution containing 0.1% formalin and read in the Spectrophotometer. After evaluation of the number of spermatozoa in the ejaculate, the first dilution in coconut water or milk was made, at the ambient temperature, to obtain 800 X SPZ/ml. The second dilution was done at $4^{o}C$ where the number of spermatozoa was reduced to 400 X 10^{6} SPZ/ml. Each frozen pellet has a volume of 0.05 ml, therefore, each dose contained 200 X 10^{6} SPZ. Cooling and freezing methods followed the technique described by Nunes (1985).

For comparison of the dilutors, an evaluation test "in vitro" at $37^{o}C$ of individual progressive motility and percentage of motile spermatozoa from 5 to 120 minutes of incubation was adopted.

RESULTS AND DISCUSSION

Eighty goats were inseminated with semen diluted with skimmed milk plus glucose and 100 goats were inseminated with semen diluted in coconut water at the experimental stations. Eighty does were inseminated with semen diluted in milk and 120 with semen diluted in coconut water on the private farms.

Fertility was based on non-return to estrus to sixty days. Of the total animals, 85% and 88% of the goats were pregnant that were inseminated with semen diluted in milk and coconut water, respectively. Parturition rate was 60 and 68%, and prolificacy was 110 and 180% for milk and coconut water, respectively (Table 1).

Out of 375 kids born, 270 were born from insemination with semen diluted in coconut water, while 105 were born from semen diluted in milk. It is also pointed out that the percentage of female offspring was significantly greater ($P < 0.05$) with semen diluted in coconut water, 72% against 43% of semen diluted in milk. The effect of location (experiment station or producer farm) was not significant ($P > 0.05$) on the goat reproductive performance.

The thermal resistance test at 37°C measured by the motile spermatozoa and by motility, was far superior for this latter parameter, when the semen was diluted in coconut water in comparison to milk (Table 2).

The maintenance of a higher motility of sperm diluted in coconut water compared to milk, was statistically superior ($P < 0.05$) when incubated to 120 minutes (Figure 1).

At incubation for five minutes, the percentage of alive spermatozoa was superior in milk, 75%; in coconut water this rate was 50%. At three minutes incubation, the percentage of spermatozoa in milk was lowered to 50% while coconut water maintained the initial rate of 50%.

This initial loss of 25% sperm cells in coconut water in relation to milk seems to provide evidence for the pre-selection of spermatozoa that are more fragile to the shock of osmotic pressure and pH, that is less ideal in coconut water. Perhaps this favors a higher survival of spermatozoa, producing female offspring. (X vs Y bearing chromosomes). This hypothesis needs to be tested.

CONCLUSION

The acceptable fertility rate as well as the feasibility of improved technology of semen, evaluated "in vitro" and "in vivo", suggests the utilization of semen diluted in coconut water, thus opening up broad perspectives for the use of artificial insemination in introducing exotic dairy breeds by crossing in goats in Brazil.

It can also be pointed out that genetic quality of the offspring, from native goats, is superior, as expected, to that of their mothers.

The utilization of artificial insemination in native goats will probably increase milk production in the first generation.

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TABLE 1

Reproductive efficiency of goats inseminated with semen diluted in coconut water or milk

PARAMETER	COCONUT WATER	MILK
Fertility (%) up to 60 days	88 (220)	85 (160)
Birth Rate (%)	68 [a]	60 [b]
Prolificacy (%)	180 [c]	110 [d]
Sexual proportion:		
% Females	72 (194)	43 (45)
% Males	28 (72)	57 (60)

The parameters with different superscript letters show significant difference at the ($P < 0.05$) level.

( ): number of observations for each parameter.

TABLE 2

Percentage of movable spermatozoas and individual motility of semen diluted in coconut water and milk during 180 minutes of incubation at 37°C.

INCUBATION PERIOD (minute)	COCONUT WATER		MILK	
	MOTILE SPERM (%)	MOTILITY SCORE	MOTILE SPERM (%)	MOTILITY SCORE
5'	50	3,5	75	3,5
30'	50	3,5	60	3,0
60'	50	3,5	50	3,0
90'	50	3,0	45	2,5
120'	45	3,0	35	2,5
150'	45	3,0	30	2,0
180'	45	3,0	30	1,5

FIGURE 1

Motility of goat spermatozoas, diluted in coconut water or milk incubated at 37°C during 180 minutes

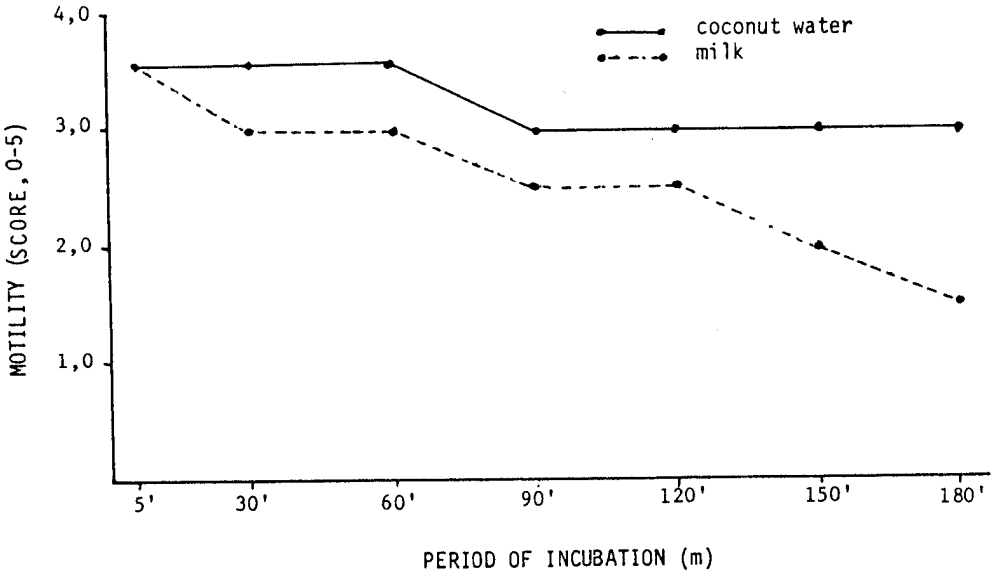
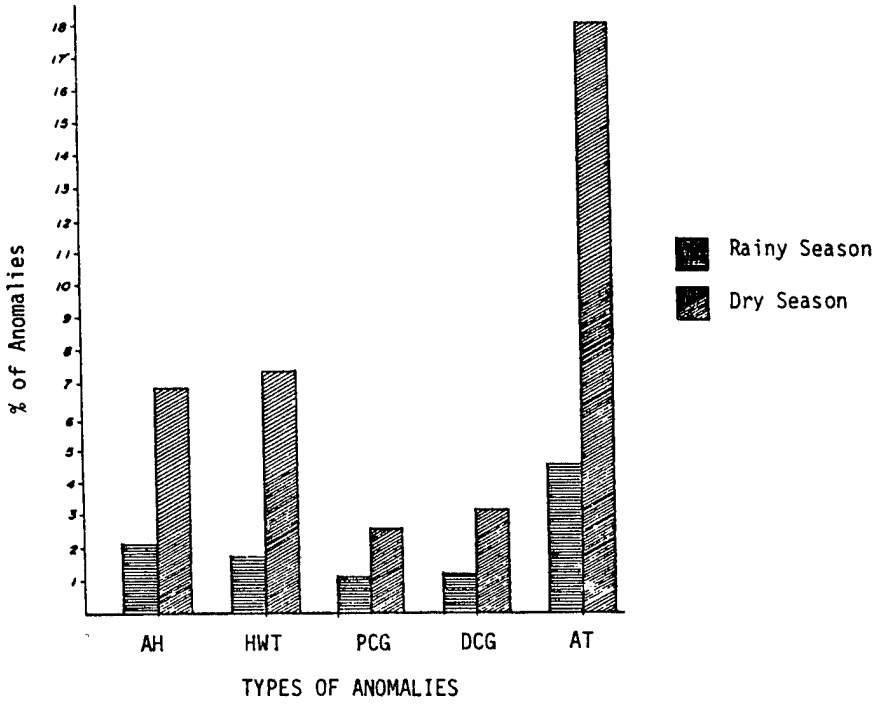


FIGURE 2

Morphological alterations of anglo-nubian goat breed semen during the rainly and dry seasons



A.H. Abnormal Head
H.W.T. Head Without Tail
P.C.G. Proximal Cytoplasmic Gota
D.C.G. Distal Cytoplasmic Gota
A.T. Anomaly of Tail