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Original article

PREGNANCY RATE IN DRY AND LACTATING GOATS AFTER ESTRUS SYNCHRONISATION WITH ARTIFICIAL INSEMINATION AND NATURAL BREEDING (A FIELD STUDY)

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Summary

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The objective of this study was to determine the pregnancy rate in dry and lactating goats after estrus synchronisation with artificial insemination and natural breeding of unconceived animals. The investigation was conducted with 75 dry (group I) and 32 lactating (group II) local goats in breeding season. All animals were submitted to estrus synchronisation by intravaginal sponges for 12 days, PMSG injection on day of sponge removal and two artificial inseminations (AI) with fresh semen – 48 and 56 hours after sponge withdrawal. Two weeks after the AI, daily test for goats which had not conceived after the AI was performed by teaser and the detected animals in estrus were naturally mated with a fertile buck. Ultrasonographic pregnancy examination was carried out at 20-day intervals until day 100 after the AI. The pregnancy rate in artificially inseminated and naturally bred animals and the interestrus intervals were calculated. The pregnancy rate between both synchronised groups differed significantly ($P<0.05$), while the values in the groups with natural breeding were comparable. Different pregnancy rates between artificially inseminated and naturally bred goats in group I (72% vs. 42.9%) and group II (19% vs. 73%) were registered ($P<0.05$). Additionally, considerable differences ($P<0.05$) between the values after first natural breeding (9.6% and 46.6%) were detected. The total pregnancy rate (84%) in dry goats was higher ($P<0.05$) than that (54%) in lactating animals. The interestrus intervals were similar ($P=0.2$). In conclusion, the current data could be used for optimisation of the pregnancy rate and the reproductive efficiency in local goat breeds.

Key words: estrus synchronisation, goats, pregnancy rate

INTRODUCTION

Accelerated introduction of new reproduction biotechnologies has been accepted as a prerequisite for high economical efficiency in intensive goat breeding (Leboeuf *et al*., 1998; Holtz, 2005; Mellado *et al*., 2006; Paramio & Izquierdo, 2014).

Estrus synchronisation (ES), artificial insemination (AI) and ultrasound check of reproductive system are important management tools that have been used to improve reproductive performance in goats (Riaz *et al*., 2012; Pietroski *et al*., 2013; Fasulkov, 2014; Arredondo *et al*., 2015). One of the most important indicators for success after introduction of the aforementioned biotechnological methods is the increase in pregnancy and kidding rates (Leboeuf *et al*., 2008; Arrebola *et al*., 2012; Uzabaci *et al*., 2014). Various factors affecting pregnancy have been reported but the genetic and environmental factors (animal breed, photoperiod, temperature, etc.) were shown to be of primary importance in most of the studies (Mellado *et al*., 2004, 2006; Salvador *et al*., 2005). Controversial pregnancy results (from 40 to 72.2%) have been determined in dairy goats with synchronised oestrus and artificial insemination by several authors (Dogan *et al*., 2005; Saribay *et al*., 2011, Tasdemir *et al*., 2011; Ciptadi *et al*., 2014). In most of the experiments different factors (season, breed, age and body condition score of the animals, estrus synchronisation protocol, time and number of AI and the breeding technology) have been shown as a cause for varying results (Dogan *et al*., 2005; Mellado *et al*., 2006; Martemucci & D'Alessandro, 2011; Nunes & Salgueiro, 2011; Ciptadi *et al*., 2014).

The information about pregnancy rates in dry and lactating goats from local breeds is insufficient. The objective of this study was therefore to determine the pregnancy rate in dry and lactating goats after estrus synchronisation with artificial insemination and natural breeding of unconceived animals.

MATERIALS AND METHODS

The study was conducted with 107 clinically healthy Bulgarian White dairy goats and local crosses, aged 2–4 years, weighing 45–50 kg and housed in the same place (closed barn, separated in sections with access to farmyard for walk). The dry (group I; n=75) and lactating (group II; n=32) goats received a ration for dry and lactating goats, respectively, and water *ad libitum*. The milking process was done twice – morning and evening in a milking parlour. The farm was located at a latitude N 42° 25' and a longitude E 25° 37'. The experiment was done during the breeding season (September-December).

All animals were submitted to estrus synchronisation by intravaginal sponges, containing 30 mg fluorogestone acetate (Syncro-part, Ceva Animal Health, France) for 12 days and injection of 500 IU (Syncro-part PMSG, Ceva Animal Health, France) on day of sponge removal. Semen was collected using an artificial vagina immediately before insemination from two bucks proved to be fertile. Fresh semen with no deviations in macroscopic parameters was used: $>1.6\times10^9$ spermatozoa/mL, >80% motile spermatozoa, <20% abnormal spermatozoa in the ejaculate and no agglutination. Fresh semen was diluted with TFC-based extender with soybean lecithin (Yotov, 2015), and after the final dilution, a single AI dose of 0.4 mL contained 160×10^6 motile spermatozoa. During AI, semen was stored at a water bath at 37 ^{o}C. Artificial insemination was made twice, 48 and 56 h after sponge withdrawal. Two weeks after the AI, goats that have not conceived were submitted to a daily test by a teaser and the detected animals in estrus were naturally mated by fertile bucks.

Ultrasonographic pregnancy examinations were carried out at a 20-day interval until day 100 after the AI by scanner A5 Vet SonoScape (SonoScape, Co. LTD, Shenzhen, China) with a linear probe 5-12 MHz frequency. The positive pregnancy diagnosis was based on visualisation of embryo/foetus and placentomas in the fluid-filled uterine lumen. The pregnancy rate in artificially inseminated and naturally bred animals and interestrus intervals were calculated.

Statistical processing was performed by means of non-parametric analysis for comparison of two means and proportions, using Student's *t*-criterion (Stat-Soft 1984-2000 Inc. statistical software). Differences were considered significant when P values were < 0.05.

RESULTS

The pregnancy rate between both synchronised groups (72% vs. 19%) differed significantly (P<0.05), while the values in the naturally bred groups (42.9% and 73.3%) did not (P=0.08) (Table 1). Significant differences (P<0.05) in the pregnancy rates between artificially inseminated and naturally bred goats within each of the groups were also registered. The pregnancy results after the first and the second natural breeding in dry goats (9.6% and 33.3%) and in lactating animals (46.6% and 26.7%) did not differ considerably (P=0.1; P=0.2). However, the values after the first natural breeding differed significantly between the dry and lactating groups (P<0.05). The total pregnancy rate (84%) in dry goats was higher (P<0.05) than that (53%) in lactating animals. Until day 100 after artificial insemination, 16% and 47% of the animals from the first and second group, respectively, were recorded as non-pregnant. The average interestrus intervals in the dry group (18.9±1.4 days) tended to be shorter, compared to that (20.7±2.5 days) in the lactating group, but a statistically significant difference was not determined (P=0.2).

DISCUSSION

The current study was designed to determine the pregnancy rate in dry and lactating goats after estrus synchronisation with artificial insemination and after natural breeding of the unconceived animals. The

Table 1. Pregnancy rate, non-pregnant animals and interestrus interval in dry and lactating goats

Reproductive parameters	Group I (dry goats)	Group II (lactating goats)
Pregnancy rate after estrus synchronisation and artificial insemination, % (n)	72 (54/75)^{1A}	19 (6/32)^{2A}
Pregnancy rate after natural breeding - % (n)	42.9 (9/21)^{1B}	73.3 (11/15)^{1B}
First natural breeding	9.6 (2/21)^{1A}	46.6 (7/15)^{2A}
Second natural breeding	33.3 (7/21)^{1A}	26.7 (4/15)^{1A}
Total pregnancy rate, % (n)	84 (63/75)^{1}	53 (17/32)^{2}
Non-pregnant goats, % (n)	16 (12/75)^{1}	47 (15/32)^{2}
Interestrus interval (mean±SD), days	18.9±1.4^{1}	20.7±2.5^{1}

Different numbers within the same row and different letters within the same column indicate significant differences (P<0.05).

significantly higher pregnancy rate in group I than in group II indicated better response of the dry goats after the applied synchronisation treatment. Probably, the lactation was a main factor for unsatisfactory pregnancy rate in lactating goats.

Increased milk yield could be a reason for accelerated metabolism of progesterone resulting in failed ovulation or early embryo loss. The lactation influences the fertility through functional pathways related to energy intake or linkage of genes and may conduct to different hormonal and metabolic changes (Veerkamp *et al.*, 2003; Serin *et al.*, 2010). Mellado *et al.* (2005) reported that the prolonged milk synthesis during the dry season caused a significant reduction in pregnancy rate in lactating does with high prenatal wastage and lower foetal survival.

The greater pregnancy rate in the lactating group after natural estrus and breeding, compared to that obtained after estrus synchronisation and the insignificant difference in pregnancy rates between the groups supported the aforementioned hypothesis. It could be explained with higher percentage of successful ovulations in natural estrus, better synchronisation between time of ovulation and semen application or higher number of fertile spermatozoa per insemination. Advantage of natural breeding in comparison with AI in lactating goats has also been shown by Uzabaci *et al.* (2014). Significantly higher pregnancy rate (46.6%) in group II after the first natural breeding, compared to the value (9.6%) in group I could be attributed to increased pregnancy failure in group I. Chao *et al.* (2008) determined a high incidence of short luteal lifespan of the first estrous cycle after estrus synchronisation in goats and explained embryonic loss with the instability of the luteal lifespan. This could be an explanation for the unsatisfactory number of pregnant goats after mating in group I. The present findings did not determine significant difference between the interestrus intervals (18.9±1.4 and 20.7±2.5 days) in unconceived goats, but there was a tendency towards shorter first estrous cycle after estrus synchronisation in dry goats. The similar pregnancy results after the second natural breeding could be accepted as indicator for normal duration of the second estrous cycle with adequate ovulation and corpus luteum lifespan. The considerably higher total pregnancy rate (84%) in group I was in agreement with another study reporting better pregnancy rate in dry than in lactating goats (Mellado *et al*., 2005). The analysis shows that the achievement of good reproductive efficiency requires a different approach in the insemination schedule of dry and lactating goats under field conditions.

In conclusion, the current data could be used for optimisation of the pregnancy rate and the reproductive efficiency in local goat breeds.

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