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Research Article

Influence of Buck Effect and Exogenous Hormone Treatments on Oestrus Synchronisation and Litter Size in Shami (Damascus) Goats

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Abstract: This study was carried out to investigate the influence of buck effect and exogenous hormone treatments on oestrus synchronisation and the litter size of Shami (Damascus) goats. Goats were divided into four treatment groups, a buck effect group (group A), a buck effect + one dose of prostaglandinF2α ($PGF_{2\alpha}$) group (group B), a buck effect + two doses of $PGF_{2\alpha}$, 11 days apart group (group C), and a abuck effect + two doses of $PGF_{2\alpha}$, 11 days apart + pregnant mare serum gonadotropin (PMSG) group (group D). The time interval (mean ± s.e.) for each group between the cessation of treatment and onset of oestrus was 52.4 ± 4.69 h, 50.1 ± 4.10 h, 24.5 ± 0.66 h and 30.0 ± 1.43 h, respectively ($p < 0.01$). It was also found that PMSG treatment has a statistically significant effect on litter size ($p < 0.01$). Litter sizes of the groups were 1.46, 1.59, 1.54 and 1.96 in the order A to D.

Key Word: Shami goat, oestrus synchronisation, litter size

Şam Keçilerinde Teke Etkisi ve Eksojen Hormon Uygulamalarının Kızgınlık Toplulaştırma ve Döl Verimi Üzerine Etkileri

Özet: Bu çalışma, teke etkisi ve eksojen hormon uygulamalarının Şam (Damaskus) keçilerinde kızgınlık toplulaştırması ve döl verimi üzerine etkilerini incelemek amacı ile yapılmıştır. Çalışmada yeralan keçiler, teke etkisi grubu (A grubu), teke etkisi + 1 doz prostaglandinF2α ($PGF_{2\alpha}$) uygulama grubu (B grubu), teke etkisi + 11 gün ara ile 2 doz $PGF_{2\alpha}$ uygulama grubu (C grubu), teke etkisi + 11 gün ara ile 2 doz $PGF_{2\alpha}$ + gebe kısrak hormonu (PMSG) uygulama grubu (D grubu) olmak üzere 4 gruba ayrılmıştır. Uygulama ile kızgınlık başlangıcı arasında geçen süre (ortalama ± standart hata) her grup için sırası ile, 52.4 ± 4.69 saat, 50.1 ± 4.10 saat, 24.5 ± 0.66 saat ve 30.0 ± 1.43 saat olarak saptanmıştır ($p < 0.01$). Çalışmada ayrıca, PMSG uygulamasının döl verimi üzerine istatistiksel olarak önemli etkisi tespit edilmiştir ($p < 0.01$). Grupların döl verimleri aynı grup sırası ile 1.46, 1.59, 1.54 ve 1.96 olarak hesaplanmıştır.

Anahtar Sözcükler: Şam keçisi, kızgınlık toplulaştırması, döl verimi

Introduction

The effect of hormone treatment on the manipulation of reproduction in livestock depends on animal species. Reproduction and its relationship to environmental conditions, including changes in climate, are well known. Goats are polyoestric animals with a 20-21 day oestrus interval during the breeding season that is dependent on photoperiod. The oestrus cycle of goats contains two different phases, the follicular (2-4 days) and luteal phases (16-17 days). Mating occurs only if the animal is in oestrus (1).

Artificial control of reproduction provides some advantages for goatkeepers. Control of reproduction is necessary both to eliminate undesirable consequences of haphazard reproduction (inbreeding, kidding at long duration, etc.) and to contribute to the making of more productive genotypes in better environmental conditions (2).

Using buck (male) effect for oestrus synchronisation is more economical than exogenous hormone administration and is recommended in extensive production, when animals are in oestrus cycle. However, prostaglandins can provide more efficient oestrus synchronisation and ovulation in cyclic does. It has been demonstrated that the impact of prostaglandins on oestrus synchronisation is dependent upon the presence of a functional corpus luteum (2,3).

Prostaglandin administration techniques involve applying this luteolytic hormone or its analogue and the subsequent maintenance of acceptable post-treatment

fertility. Pregnancy rates in goats following double prostaglandin applications after the first service were reported as 70.6% (4). This was achieved by two injections of $PGF_{2\alpha}$, between 5 and 16 days of the oestrus cycle (5). According to these researchers, the time interval between the prostaglandin administration and incidence of oestrus was shorter following double injections of prostaglandin than that of a single injection of prostaglandin (55.3 and 62.4 h, respectively).

Prostaglandins can be administered singly or with PMSG, eCG or FSH-P (6,7). These treatments with gonadotrophins have to be administered in the follicular phase of the oestrus cycle in cyclic goats, or after a period of progesterone priming outside the breeding season to increase the number of growing follicles and consequently the litter size (8,9). After withdrawal of flurogestone acetate (FGA), the injection of PMSG in different doses resulted in more efficient oestrus synchronisation, pregnancy rate, kidding rate and kid yield (10).

The objective of the present study was to determine the influence of buck effect, single or double doses of $PGF_{2\alpha}$ and PMSG administrations on the oestrus synchronisation and litter size of Shami goats.

Materials and Methods

This study was carried out with Shami (Damascus) goats kept at the Research and Training Farm of the Agriculture Faculty of Mustafa Kemal University, which is located in the Antakya province of Turkey. Antakya is located between 36° north latitude and 36° east longitude on the Syrian border in the eastern Mediterranean region where climatic conditions are hot and dry in summer, and warm and rainy in winter.

Experimental goats were fed with roughage and concentrate (16% crude protein and 2500 kcal ME/kg) in addition to pasture. Does and bucks were daily fed with 1 kg and 2 kg of concentrate, respectively for 60 days and the following joining period. Both sex groups also consumed 600 g/day concentrate outside this period.

The design of the experiment was based on ANOVA classification in factorial experimental arrangement and conducted in the 2000 breeding and kidding season. The goats were assigned to four groups, the buck effect group (group A), the buck effect + one dose of $PGF_{2\alpha}$ group (group B), the buck effect + two doses of $PGF_{2\alpha}$, 11 days apart group (group C), and the buck effect + two doses of $PGF_{2\alpha}$, 11 days apart + PMSG group (group D). At the beginning of the experiment, goats were ranked according to their age and weight, and each treatment group contained animals of similar weight and age. Bucks were isolated from does two months prior to the introduction of the bucks. Does in group A were only treated with male effect; 1.25 cc/head $PGF_{2\alpha}$ was injected into group B on the 30th of August in 2000, right before the teaser buck joined on the same day. The same dose of $PGF_{2\alpha}$ was injected into the does of group C on the 19th and 30th of August. PMSG, 500 iu per goat, was injected into the does of group D on the 30th of August right after the injection of a $PGF_{2\alpha}$ dose as in group C. A teaser buck was introduced to all groups to detect animals in heat on the 30th of August, 2000. Goats were checked for oestrus at least three times a day, and were considered to be in heat when they stood for mounting by a buck. Oestrus date and time were recorded for each doe in all groups and one buck was allowed to mate with a maximum of 5 does during joining. The litter size of each group was calculated by dividing the numbers of kids born by the numbers of goats joined.

The effects of treatments on the onset of oestrus and litter size were analysed by using ANOVA in SPSS. The Duncan multiple range test was used to identify the differences in goat groups (11).

Results

The effects of treatments on the time interval between the cessation of each treatment and the onset of oestrus were shown as hours in Table 1 and the figure 1. The table shows that there was a significant difference ($p<0.01$) between the groups; however, this difference was not significant within the pairs of groups A-B and C-D.

The results showed that time intervals (mean ± s.e.) between the introduction of bucks and the onset of oestrus were 52.4 ± 4.69 h and 50.1 ± 4.10 h for groups A and B. The interval between cessation of treatment and onset of oestrus was shorter in groups C and D than in groups A and B ($p<0.01$). After the introduction of the teaser, the first incidence of oestrus was observed at the 20th h in groups C and D, and the last at the 192nd h in Group A.

Item	Group A	Group B	Group C	Group D
Number of does	55	56	37	28
Minimum time (h)	22	22	20	20
Maximum time (h)	192	164	35	44
Interval to oestrus[1] (h)	52.4 ± 4.69[b]	50.1 ± 4,10[b]	24.5 ± 0.66[a]	30.0 ± 1.43[a]

Table 1. Effect of synchronisation techniques on time interval between cessation of each treatment and onset of oestrus.

1) values are mean ± s.e.; a,b with the same superscript indicate no significant difference in the same row

Item	Group A	Group B	Group C	Group D
Number of does	55	56	37	28
Minimum	1	1	1	1
Maximum	2	2	2	3
Litter size1	1.46 ± 0.067[a]	1.59 ± 0.066[a]	1.54 ± 0.083[a]	1.96 ± 0.131[b]

Table 2. Effect of different exogenous hormones on litter size of Shami goats.

1) values are mean ± s.e.; a,b with the same superscript indicate no significant difference in the same row

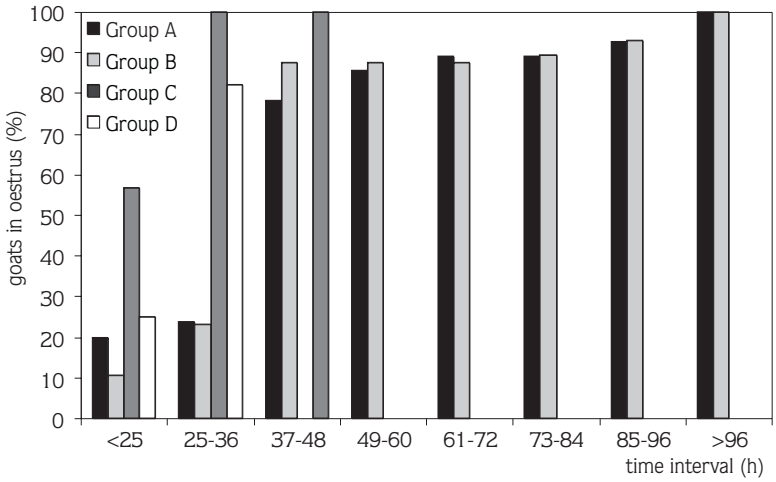

Figure. Changes in the number of goats in oestrus after the cessation of treatments.

The effects of these treatments on fertility are given in Table 2. The litter size of group D was 1.96, which is significantly ($p<0.01$) higher than groups A, B and C, which were 1.46, 1.59 and 1.54, respectively. The differences among these three groups were not significant ($p>0.05$).

Discussion

In the present study, a double injection of $PGF_{2\alpha}$ with or without PMSG caused more effective oestrus synchronisation than a single injection of $PGF_{2\alpha}$ in cyclic Shami goats. This can be explained by the fact that some goats could have been in the metoestrus phase of the oestrus cycle in group B. As was explained by Çoyan, (12) the corpus luteum cannot be destroyed by $PGF_{2\alpha}$ if animals are in this phase. In the study, some goats from group B may have been in this phase during the observation period. However, all does in groups C and D were out of the metoestrus phase by the second injection of $PGF_{2\alpha}$ after an 11 day interval. Thus, they showed oestrus in a shorter period. Greyling and Van Niekerk

(13) stated that oestrus synchronisation would be achieved in a shorter time with double doses of $PGF_{2\alpha}$ than with a single dose. Similar results were reported for goats kept under Mediterranean climatic conditions (14).

PMSG injection is required to stimulate follicular development and the ovulation rate in females during the non-breeding season. Its administration shortened the time interval between the end of prostagen and onset of oestrus as reported by Greyling and Van Niekerk (5).

Although the longest duration between the introduction of bucks and the onset of oestrus was observed in the buck effect group (52.4 ± 4.69 h), this treatment also provides oestrus synchronisation. All senses, especially olfactory stimulus, play a role in the response of intact does in male effect (15). Keeping does with males in the same pen stimulates LH concentration in the blood, begins ovulation (8).

Shami goats have which 167-176% of litter size in natural conditions (16-18). It has been reported that PMSG administration could be recommended to goatkeepers in order to increase the number of kids in the kidding season (19).

The litter size of group D was larger than those of groups A, B and C, which were all statistically similar. This may be a result of PMSG administration, which stimulates the number of graaf follicles, and ova as indicated by Greyling and Van Niekerk (5). Our results agree with El-Amrawi et al. (10) for $PGF_{2\alpha}$ and PMSG administrations.

In conclusion, more effective synchronisation was obtained with the injection of two doses of $PGF_{2\alpha}$, alone or with PMSG, in the present study. This synchronisation with PMSG also increased litter size. For this reason, the last synchronisation technique is recommended to Shami goatkeepers in the region.

References

1. Riera, G.S.: Reproductive Efficiency and Management in Goats. Proceeding of the 3rd International Conference on Goat Production and Disease. 1982; Tucson, Arizona.
2. Corteel, J.M., Gonzales, C., Nunes, J.F.: Research and Development in the Control of Reproduction. Proceeding of the 3rd International Conference on Goat Production and Disease. 1982; Tucson, Arizona.
3. Bosu, W.T.K., Serna, J., Barker, C.A.V.: Peripheral Plasma Levels of Progesterone in Goats Treated with Fluorogestone Acetate and Prostaglandin $F_{2\alpha}$ during the Oestrus Cycle. Theriogenology. 1978; 9: 371-390.
4. Ott, R.S., Nelson, D.R., Hixon, J.E.: Fertility of Goats Following Synchronisation of Oestrus with Prostaglandin $F_{2\alpha}$. Theriogenology. 1980; 13: 341-345.
5. Greyling, J.P.C., Van Niekerk, C.H.: Different Synchronisation Techniques in Boer Goat Does Outside the Normal Breeding Season. Small Rumin. Res. 1991; 5: 233-243.
6. Pandey, A., Sinha, S.K., Mishra, O.P., Pandey, J.N.: Synchronisation of Oestrus of Black Bengal Goats Following Administration of PG F_2 alpha and Gonadotrophins. J. Res., Birsa Agric. Univ. 1991; 3: 109-110.
7. Ishwar, A.K., Pandey, J.N.: Oestrus Synchronisation and Fertility in Black Bengal Goats Following Administration of Progesterone /Prostaglandin and Gonadotropins. Res. Vet. Sci. 1992; 52: 141-146.
8. Nelis, P.C.: Caprine Production. Compendium of Animal Reproduction, Intervet International B. V. 2e Druk. 1995; 115-127.
9. Alacam, E.: Control of Oestrus. In Alacam, E. (Ed.), Reproduction, Artificial Insemination, Birth and Infertility in Livestock. 1994; 81-88, Konya, Turkey.
10. El-Amrawi, G.A., Hussein, F.M., El-Bawab, I.E.: Oestrus Synchronisation and Kidding Rate in Does Treated with a Vaginal Sponge. Assiut Vet. Med. J. 1993; 29: 249-259.
11. Kinneer, P.R., Gray, C.D.: SPSS for Windows. Department of Psychology, University of Aberdeen. 1994; UK.
12. Çoyan, K.: Oestrus Cycles in Livestock. In Alacam, E. (Ed.), Reproduction, Artificial Insemination, Birth and Infertility in Livestock. 1994; 25-36, Konya, Turkey.
13. Greyling, J.P.C., Van Niekerk, C.H.: Synchronisation of Oestrus in the Boer Goat Doe: Dose Effect of Prostaglandin in the Double Injection. S. Afr. J. Anim. Sci. 1986; 16: 146-150.
14. Zhang, Y., Yuan, X.: A Study of Inducing Oestrus in Virgin Dairy Goats During Anoestrus Season. 11th International Congress on Animal Reproduction and Artificial Insemination, University College Dublin, Ireland, June 26-30 1988. Brief Communications. 1988; 464-467.
15. Chimineau, P.: Possibilities for Using Bucks to Stimulate Ovarian and Oestrus Cycles in Anovulatory Goats – A Review. Livestock Prod. Sci. 1987; 17: 135-147.
16. Morphakis, C., Hadjipanayiotou, M.: Productivity Data of Ewes and Goats under Farmer Conditions in Cyprus. Agriculture Programme de Recherche Agrimed. L'evaluation des Ovins et des Caprins Méditerranéens. Recueil des Communications Symp. "Philostios" Portugal, 23-25 Sept. 1987. EUR-Publication, 1989; No: 11893, 508-511.

17. Peters, K.J., Laes-Feetback, C.: A Comparative Study of Performance of Egyptian Goat Breeds. 1. Reproductive and Dairy Performance. Archiv-fur-Tierzucht. 1995; 38: 93-102.

18. Keskin, M.: Determination of Some Morphological Characteristics and Performance of Shami (Damascus) Goats under Intensive Breeding Condition in Hatay Region. Mustafa Kemal University, Institute of Natural and Applied Science, Dept. of Animal Science, Ph.D. thesis, 2000: Hatay, Turkey (Unpublished).

19. Antiningish, N.M., Purvantara, B., Achjadi, R.K., Sutama, I.K.: Effect of Pregnant Mare Serum Gonadotropin Injection on Litter Size in Young Etwah-Cross Goat Does. J. Ilmu Ternak dan Vet. 1996; 2: 11-16.