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Effect of some hormones on reproductive performance and some serum biochemical changes in synchronized black goats

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Abstract

In randomized block design, 58 indigenous black mountain goats were examined for the effect of different hormonal treatments in inducing oestrus on selected biochemical characteristics of blood serum that were (aspartate transaminase, AST. Alanine transaminase ALT, Akaline phosphatase, ALP, total protein, albumin and total cholesterol). The animals were randomly assigned into four groups according to their treatment. The control group (C) consisted of 10 females whereas the rest of the groups, each consisted of 12 females. The treatments included a double $PGF_2\alpha$ (Dinoprost tromethamine) intramuscular injection (5 mg) at a time interval of 11 days plus an intramuscular injection of pregnant mare serum (PMSG) (400I. Uand 600I. U.) two days before second injection for (treatments, TI, T2) respectively. Treatment (T3) was as that of T1 except PMSG was not injected. T4 was treated as T3 plus an intramuscular injection of gonadotropin releasing hormone (GnRH) (12. 5µg) after 24 hours of second injection of $PGF_2\alpha$ was added. The results indicated that oestrus was higher ($P<0.05$) in all treatment groups (100%, 91%, 100%, 100%) respectively than that of control group (70%). There was a significant effect ($P<0.05$) of hormonal treatment on kidding rate in which the ratio were (116%, 115%, 75% and 83%) for treatment groups respectively in comparison with 70% for control group, also there was significant effect ($P<0.05$) of hormonal treatment on litter size in (T3). There were significant increases in activity of AST, ALT, during late pregnancy and the first week of parturition, whereas the activity of ALP enzyme was increased during early pregnancy. The concentration of total protein, total cholesterol and albumin were increased ($P<0.05$) during late stage of pregnancy and then decreased during the first week after parturition. It was concluded that administrating of $PGF_2\alpha$ to does on this synchronization regimen in the natural breeding season is desirable.

Keywords: Black goat, Prostaglandin, Estrus synchronization.
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تأثير بعض الهرمونات على الأداء التناسلي وبعض التغيرات الكيمياحياتية في مصل دم الماعز الأسود موحدة الشبق

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الخلاصة

تم توزيع ٥٨ رأس من الماعز الأسود الجبلي (الماعز الكوردي) بصورة عشوائية لغرض دراسة تأثير استخدام الهرمونات المختلفة في أحداث الشبق والتغيرات البايوكيميائية في مصل الدم (الأنزيمات الناقلة للامين، أنزيم الفوسفاتيز القاعدي، البروتين الكلي، الألبومين والكولسترول) قسمت حيوانات المعاملة عشوائيا إلى أربعة مجاميع (١٢ معزة لكل مجموعة) بالإضافة لمجموعة السيطرة (١٠ ماعز). حقنت مجاميع المعاملة بجرعتين $PGF_2\alpha$ (٥ ملغرام) وبفاصل ١١ يوم، و قبل الجرعة الثانية بيومين حقنت ٤٠٠ و ٦٠٠ وحدة دولية PMSG للمجموعة الأولى والثانية على التوالي. أما المجموعة الثالثة فقد عوملت بنفس معاملة المجموعة الأولى

باستثناء حقن هرمون PMSG، وتمت معاملة المجموعة الرابعة نفس معاملة المجموعة الثالثة بالإضافة حقنها بعد ٢٤ ساعة من الجرعة الثانية ($PGF_2\alpha$) هرمون GnRH (١٢. ٥ مايكرو غرام). أظهرت النتائج للمجاميع الأربعة زيادة معنوية ($P<0.05$) في ظهور الشبق والتي بلغت (١٠٠%، ٩١ %، ١٠٠ % و١٠٠ %) على التوالي مقارنة مع مجموعة السيطرة (٧٠ %). أما نسبة الولادات فكانت مرتفعة معنويا ($P<0.05$) في مجاميع المعاملة (١١٦%, ١١٥%، ٧٥% و٨٣%) على التوالي, أما مجموعة السيطرة فكانت (٧٠%) ، كما أظهرت المجموعة الثالثة ارتفاعا معنويا ($P<0.05$) في عدد المواليد من البطن الواحدة. ازدادت معنويا تركيز أنزيمات الناقلة للامين خلال المرحلة الأخيرة من الحمل والأسبوع الاول بعد الولادة, بينما ارتفع معنويا تركيز أنزيم الفوسفاتيز القاعدي في المرحلة الأولى من الحمل, كما ارتفعت معنويا تراكيز كل من البروتين الكلي، الألبومين و الكولسترول خلال المرحلة الأخيرة من الحمل وهبطت خلال فترة أسبوع بعد الولادة.

Introduction

Kurdistan native goats breeding are carried out extensively for meat and milk production. The boosting goats production are by using synchronization of estrus conjunction with either natural or artificial insemination.

Synchronization of estrus remains a tool with great potential in controlled breeding of sheep and goats has involved the artificial manipulation of ovaries varies in goat when estrus period are synchronized during breeding season (1).

The Prostaglandin ($PGF_2\alpha$) or their analogues are used to synchronize estrus in cattle (2), Sheep (3) and goats (4).

Prostaglandin has been shown to induce luteolysis in the cycling doe during the breeding season. The effectiveness of double injection regime of $PGF_2\alpha$ for synchronization of estrus by natural mating in goats was reported (5) although conception rate was high with no adverse effective fertility (6).

This study was initiated to compare the effectiveness of synchronized technique in the normal breeding season does treatment with $PGF_2\alpha$ alone or combined with pregnant mare's serum gonadotropin (PMSG) or with gonadotrophin releasing hormone (GnRH) to examine the estrus appearance and to parameters determine fertility and conception rate. In addition the alteration in biochemical of blood serum during estrus cycle, pregnancy and at parturition were examined.

Materials and Methods

The experiment was conducted during breeding season (September 2001 to April 2002) at north part of Iraq. Fifty eight breeding cyclic does of local non-descript breed, average weight 34±0.3 kg and aged 1.5-2 years. The animals were divided randomly into four treatment groups including 12 does for treating except control group which estimated of 10 does.

The animals in four treatment groups were treated as follows:

1-First group (T1) was treated by double intramuscular injection of prostaglandin ($PGF_2\alpha$) (5mg/dose Dinoprost thromethamine, Lutalyse, Upjohn) at a time interval of 11 days but 48 hours before the second injection of $PGF_2\alpha$, the animals were injected with 400 I. U. PMSG. (Folligon; Intervert Holland).

2-Second group (T2) was treated as in group T1 but the dose of PMSG was 600 I.U.

3-Third group (T3) was treated by double intramuscular injections of prostaglandin (5 mg/dose Dinoprost thromethamine, Lutalysae) 11 days apart.

4-Fourth group (T4) was treated as group T3 but after 24 hours of the second injection of $PGF_2\alpha$ animals were with injected with 12.5 µg GnRH. (Lecirelin acetate, Fatro, S. P. A. Bolgona Italy)

The control group was bred at time naturally occurring estrus.

Three Black bucks (local–breed) 3-4 years old were used to service all does by handing-mating twice daily during standing estrus in each group. The bucks were evaluated before experiment by a breeding soundness examination.

For biochemical analysis of serum, a blood sample was collected by jugular vein-puncture using non- heparinzed vacutainer tubes. Serum was harvested and stored at freezing (-20C) for later assays.

1−Enzymes determination: The blood serum was determined for activities of Aspartate transaminase (AST) (Glutamic Oxaloacetate transaminase, GOT) enzyme according to (7) method and Alanine transaminase (ALT) (Glumate Pyruvate transaminase, GPT) enzyme according to (8) method, whereas activity of Alkaline Phosphates enzyme was determined by using (9) method.

2−Non enzymes, determination of serum Total protein by using Biuret method (10), while the concentration of albumin was determined according to (11) method. Total cholesterol concentration was analyzed used by (12) method.

Statistical analysis: The results were analyzed statistically using SAS (13) assuring the following model:

$Y_{ij} = u + T_i + e_{ij}$

Where:
Y_{ij}: The value of j observation having ith treated
U : overall mean.
T_i : Effect of ith treated (i=control, 1, 2, 3 & 4)
e_{ij}: Experimental error assuming to be NID with (o, I σ^2e).

The model which used to analyze the results of Biochemical traits include the effect of period (Pj) beside the above effects:
$Y_{ij} = u + T_i + P_i + e_{ij}$

Comparison between means of each factors were tested by Duncan Multiple Range test.

Results

Estrus response of does following double $PGF_2\alpha$ injection alone or with PMSG and GnRH was higher (P<0.05) in four treatment groups (100%, 100%, 91%, 100%) respectively than control group 70% (Table 1). There were no significant effects of hormones used in this study on fertilization and fertility, but there was existence of significant effect (P<0.05) of hormonal treatment on kidding rate in which the ratios in four treated groups, were higher than the control value (Table 1). The hormonal treatment a significantly (P<0.05) increased litter size ratio in four treatment groups (Table 1).

There was significantly increases (P<0.05) in activity of AST in the blood serum during estrus phase in comparison with luteal phase whereas there were no significant differences in the activities of (ALP) and (ALT) during estrus and luteal phases. There was no significant effect of hormonal treatment on the activity of blood enzymes (AST, ALT, ALP) (Table 2) and concentration of total protein, albumin and total cholesterol in treated groups (Table 3).

Table 1: Treatment effects on Fertilization, Fertility, Kidding-rate, Estrus and Litter size in goats.

Effecting factors/ Groups	Fertilization %	Fertility %	Kidding – rates%	Estrus %	Litter size
Control (C)	0.70±0.15 a	0.60±0.16 a	0.70±0.21 a	0.70±0.15a	1. 16±0.16 a
Treatment1 (T1)	100±0.00 a	0.92±0.04 a	1. 16±0.16ab	1. 00±0.00b	1. 27±0.14 ab
Treatment2 (T2)	0.92±0.08 a	0.92±0.08 a	1. 50±0.23 b	0.92±0.00b	1. 63±0.2 b
Treatment3 (T3)	0.83±0.11 a	0.67±0.14 a	0.75±0.75 a	1. 00±0.00b	1. 12±0.12 a
Treatment 4 (T4)	0.92±0.08 a	0.83±0.11 a	0.83±0.11 a	1. 00±0.00b	1. 00±0.0 a

Values are Mean ± (S. E.)
Values with different superscripts in the same column are different (P<0.05)

Table 2: The effect of treatment on serum enzymes activities in goats.

Affecting factors	AST U/L	ALT U/L	ALP U/L
Hormonal treatment			
Control-group (C)	64. 65±1. 17a	25. 80±0.63a	92. 52±1. 42a
Treatment/group1 (T1)	65. 129±0.91a	26. 67±0.76a	93. 48±1. 41a
Treatment/group2 (T2)	66. 70±0.86a	27. 23±0.65a	95. 31±1. 65a
Treatment/group3 (T3)	67. 18±0.99a	27. 16±0.66a	93. 00±1. 38a
Treatment/group4 (4)	66. 23±1. 03a	27. 09±0.70a	94. 65±1. 57a
Estrus phases			
Luteal phase	59. 05±1. 15a	22. 22±0.52a	86. 15±1. 80a
Estrus phase	62. 22±0.99bc	23. 84±0.43ab	89. 09±1. 82ab
Pregnancy months			
First month	62. 66±1. 11c	24. 31±0.54b	95. 62±1. 83de
Second month	64. 93±0.89cd	25. 50±0.69bc	100.80±1. 85e
Third month	66. 46±0.83d	26. 76±0.43c	99. 19±1. 82de
Forth month	69. 24±0.86e	28. 57±0.69d	95. 32±1/51cd
Fifth month	69. 33±0.73e	30.36±0.53e	90.22±1. 22ab
First week after parturition	73. 95±0.58f	32. 75±0.57f	93. 94±1. 80bcd

Values are Mean ± (S.E.)
Values with different superscripts in the same column are different (P<0.05).

The activity of AST was increased significantly (P<0.05) during second semester of gestation (Table 2), and it's highest activity during first week after parturition in comparison with the last month of pregnancy. ALT activity increased significantly (P<0.05) during five months of gestation and also at first week of parturition (Table 2). The activity of ALP was increased significantly (P<0.05) during early pregnancy and it reached it's highest activity in the second month of pregnancy and decreased gradually during last three months of pregnancy (Table 2).

The concentration of total protein increased significantly at the late pregnancy and decreased during the first week after parturition, total cholesterol at the late pregnancy and declined during first week of parturition, albumin was decreased significantly (P<0.05) during the first week of parturition in comparison with late pregnancy (Table 3).

Table 3: The effect of treatment on the serum total protein, albumin, cholesterol activities in goats.

Affecting factors	Total Protein g/dl	Albumin g/dl	Cholesterol mg/dl
Hormonal treatment			
Control group (C)	7. 23±0.06a	3. 04±0.01a	87. 43±2. 29a
Treatment group (T1)	7. 37±0.07a	3. 01±0.01a	85. 47±1. 78a
Treatment group (T2)	7. 40±0.07a	3. 05±0.01a	87. 48±1. 78a
Treatment group (T3)	7. 26±0.06a	3. 05±0.01a	85. 40±2. 15a
Treatment group (T4)	7. 33±0.06a	3. 06±0.01a	86. 10±1. 52a
Estrus phases			
Luteal phase	7. 08±0.07a	3. 02±0.01a	77. 27±1. 89a
Estrus phase	7. 13±0.04a	3. 00±0.01a	76. 35±1. 98a
Pregnancy months			
First month	7. 21±0.08ab	3. 00±0.01a	80.50±1. 87ab
Second month	7. 26±0.08ab	3. 04±0.02ab	85. 44±2. 21abc
Third month	7. 39±0.08bc	3. 08±0.02b	90.66±2. 49cd
Forth month	7. 48±0.07c	3. 08±0.01b	93. 13±1. 99d
Fifth month	7. 59±0.07c	3. 10±0.01b	94. 61±1. 88d
First week after parturition	7. 41±0.07c	3. 02±0.02a	92. 33±1. 33d

Values are Mean ± (S. E.)
Values with different superscripts in the same column are different (P<0.05).

Discussion

The results have shown that $PGF_2\alpha$ given 11 days apart was effective for synchronization of estrus in cycling does. The 10 mg. was sufficient to produce lutolysis in does. The ratio of estrus in females that were treated with $PGF_2\alpha$ alone or combine with PMSG or GnRH have highly significant difference from control group. These observations are similar to those reported by (14,15). The results showed increased level of fertilization and fertility in treated groups mainly with it $PGF_2\alpha$ alone or combine PMSG or GnRH (1), while was differed from those obtained by (16) who observed that lack effect of $PGF_2\alpha$ in fertilization and fertility. Kidding rate was highly significantly in treated groups than control group. The combination of $PGF_2\ \alpha$ with 600 IU/PMSG had more kidding rate, this more likely due to PMSG treatment, since PMSG is needed to stimulate the follicular growth leading to higher ovulation rate (14).

Litter size was increased in treated groups and mainly in T3 group (600 IU/PMSG) due to increased rate of ovulation and this causes an increase in litter size (17).

Biochemical indices analyzed in the present study showed increased AST, ALT and ALP activities during estrus phase, but it was less than that observed by (18). This may be due to differences in animal's age, breed and season. There was no significant effect of hormonal treatment on the enzyme activities (AST, ALT and ALP), but the pregnancy was influenced on concentration of AST and ALT enzymes (19) and mostly in the second period of gestation (20) and during first week of parturition (19). The increased activity of AST and ALT enzymes may be due to more requirement for amino acids in milk production (21). There was wide variation in the activity of ALP enzyme during pregnancy, the highest value for serum ALP was noted at the second and third months of pregnancy, and decreased at late stage of pregnancy due to formation skeleton bone tissues of the fetus (22). The serum protein studies indicated an increasing in total protein and albumin values during pre-parturition stage and decreased non-significantly at post-parturition stage. Hence it can be stated the marked decreased in plasma protein during post-parturition may be due to transfer of protein into colostrums (23). Total cholesterol concentration in blood serum was

increased significantly during pregnancy period this may be due to enhanced progesterone synthesis in the placenta (24), and it's decline after parturition due to estrogen which decreased the plasma LDL (25).

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