

Estrous Synchronization Trials to improve Reproductive Performance of Hejazi goats in Western Libya

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تجارب توحيد الشبق لتحسين الأداء التناسلي للماعز الحجازي في غرب ليبيا
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الملخص:

الهدف من هذه الدراسة هو تقييم الأداء التناسلي للماعز الحجازي في غرب ليبيا، حيث تم استخدام برنامجين تستخدم فيه الهرمونات لتوحيد الشبق. تم تخصيص ثلاثين ماعز غير عشار وستة ذكور من سلالة الماعز الحجازي في ثلاث مجموعات متساوية (10 إناث و2 ذكور لكل مجموعة). كل الإناث (بما في ذلك المجموعة الضابطة) تلقت جرعتين 125 ميكروغرام من $PGF2\alpha$ بينهما 11 يوم. تم اعتبار تاريخ الجرعة الثانية هو اليوم صفر. تلقت كل أنثى في المجموعة 1 جرعة 0.004 ميكروغرام من GnRH الاصطناعي في اليوم السابع، وفي اليوم الرابع عشر تم حقنهم ب 125 ميكروغرام من $PGF2\alpha$ والجرعة الثانية من GnRH الاصطناعي 0.004 ميكروغرام. أما المجموعة 2 فقد تم حقنها ب 125 ميكروغرام من $PGF2\alpha$ في اليوم الرابع عشر. المجموعة الثالثة لم يتم حقنها بشيء واعتبرت المجموعة الضابطة. تم ادخال إثنان من ذكور الماعز لكل مجموعة في اليوم الرابع عشر، وذلك للكشف على حدوث الشبق ولغرض التزاوج. بالنسبة للمجموعات الثلاث، كان معدل الاستجابة للشبق 100، 90، و80%، بينما كانت مدة الشبق 23.7، 24.6 و 22.0 ساعة. وبلغ معدل عدم العائد 90 و 88.8 و 100% على التوالي. كل الماعز المشارك في التجربة استجاب لحقن $PGF2\alpha$ بغض النظر عما إذا كان موسم تزاوج أم لا. كان معدل الإنجاب للمجموعات المذكورة أعلاه 1.8 و 1.2 و 1.5 على التوالي. مما تقدم نستنتج أن الماعز الحجازي لا يتكاثر موسمياً، ويتزاوج على مدار العام في منطقة غرب ليبيا. البحوث المنشورة المتاحة حول الأداء التناسلي للماعز الحجازي قليلة وبحاجة إلى مزيد من العمل البحثي لتجميع معلومات أكثر.

الكلمات المفتاحية: الماعز الحجازي، الأداء التناسلي، توحيد الشبق، البروستاجلاندين، GnRH.

Abstract:

The aim of this study was to evaluate the reproductive performance of Hejazi goats, in Western Libya, subjected to two administration schemes of hormones to synchronize estrus responses. Thirty non-pregnant does and six bucks of Hejazi breed were allocated in three equal groups (10 does and 2 bucks each). All does (including the control group) received two doses of 125µg Cloprostenol 11 days apart. Time of second dose considered day zero. Each doe in group 1 received a dose of 0.004 µg synthetic GnRH analogue on day 7, followed by an injection of 125 µg $PGF2\alpha$ and second dose of synthetic GnRH analogue 0.004 µg on day 14. For the second group, each doe received a

dose of 125 µg Cloprostenol on day 14th. The third group received nothing and considered as control. Two bucks for each group were introduced to the does on day 14 of last injection, to stay for detecting estrus and mating. For the three groups, respectively, estrous response rate was 100, 90 and 80% , while duration of estrus was 23.7, 24.6 and 22.0 hrs. and non-return rate was 90, 88.8 and 100%. All does responded to the Cloprostenol injection regardless to breeding season. Litter size for the above groups was 1.8, 1.2 and 1.5, respectively. It may conclude that Hejazi goats breed is not seasonally breeder, and reproduce over the year in western Libya. The available published research data on reproductive performance of Hejazi goats are very few. More research work is needed to clarify the knowledge.

Keywords: *Hejazi goats, Reproductive Performance, estrus synchronization, Prostaglandins, GnRH.*

Introduction:

In most developing countries, Goats continue to provide nutritional, economic and social benefits (Lohani and Bhandari, 2021). It considered the world's most beneficial animals, providing meat, milk, fiber, fertilizer. Reproductive performance is one of the most imperative economic traits in terms of livestock production (Alexandre et al., 2010; Argüello, 2011; Aljumaah et al., 2012). Goat researches needs progress rapidly to reach the level of knowledge of other species like cattle or sheep, especially in milk and meat production.

Reproductive biotechnologies should be adopted to improve the overall efficiency of goat production systems. Synchronization of estrus and ovulation, using hormonal treatment, in combination with Artificial Insemination or Natural Mating facilitate out-of-season breeding and the grouping of the kidding period (Argüello, 2011).

During last few decades, the Assisted Reproductive Technologies (ARTs) played a major role in animal reproduction and production. Estrous synchronization, superovulation, and embryo transfer techniques already become one of the popular ARTs in goat industry, and several protocols for estrous synchronization have been extensively studied in sheep and goat (Ishwar and Memon, 1996; Ganaie et al., 2009; Simões, 2015; Fonseca et al., 2016; Omontese et al., 2016).

In the world, there are over 1,153 goat breeds (FAO, 2018). Several investigations, on the reproductive physiology of goats, have been published, and several protocols have been developed to meet the needs and expectations of producers. However, Hejazi goats breed has very little attention, and there is a great lack of published data about reproductive performance in Hejazi goat's breed. So, the aim of this study is to show some of these reproductive performances.

Material and Methods:

Thirty healthy mature fertile non-pregnant Hegazi does (1.5 - 4 years of age and 40 - 60 kgs weight) and six bucks (50 -70 kgs weight) were chosen for this study. After complete history taken, and to insure their fitness full clinical gynaecological and general health examinations were performed for all. They were divided into three equal groups (10 does and two bucks each). Groups 1 and 2 were for the experimental use, while the third group kept as control. All were marked using ear-tags and kept in semi-open housing. The bucks were maintained at the same places, separated from the does by fences. Feeding (supplemented with concentrates, green alfalfa and hay) and management were handled similarly to all animals, with free access of water and mineral salt blocks.

After the ensure that all does, used in this study, were non-pregnant, in good general and gynaecological health, a dose of 125µg Cloprostenol (*Alfaglandin C, Cloprostenol, PGF_{2α} analogue, im Juramate, Jurox Pty Ltd, Australia*) was injected i.m for each doe, then the same dose was repeated on day 11 from the first dose. This second dose's day was considered as (Day 0).

For group 1, each doe was injected a dose of 0.004 µg synthetic GnRH analogue (*Receptal, Intervet International GmbH Feldstrasse 1a D-85716 Unterschleißheim, Germany*) on day 7. Then, a dose of 125 µg PGF_{2α} (Cloprostenol) followed by 0.004 µg synthetic GnRH analogue were injected on day 14th. Does of the group 2 received another dose of 125 µg Cloprostenol, each on day 14th. The control group received nothing after day 0, and their related two bucks (supplied canvas) were introduced to them on day 14th, while the related bucks of both groups 1 and 2 were introduced to their does on the last hormonal injection, to stay for detecting estrus and mating.

The three groups were kept under observation, twice daily, and recording cameras were in action continuously, which were reviewed daily to detect and ensure estrus and mating. Pregnancy diagnosis was applied on day 35 post-mating, using ultrasonography (V9, EMP, Shenzhen Emperor Electronic Technology Co, Ltd, China).

The experiment was conducted and repeated 3 times, in the rate of 3, 3, 4 goat from each groups each time.

All data was expressed as mean and standard deviation. SPSS 15.0 software for windows was used for statistical analysis and the significancy was declared at $P < 0.05$. ANOVA one way test and Tukey tests were used for comparison the differences of group's parameters.

Results

Data obtained for estrus response rate and time, and estrus duration were represented in the Table 1. No significant differences were found between the three groups.

Table 1: Estrus response rate, time, and estrus duration in Hejazi goats does.

| Group (No. = 10 each) | Estrus response rate (No) / (%) | Time of estrus response (hrs) | Estrus duration (hrs) |
|-----------------------------|------------------------------------|----------------------------------|--------------------------|
| GnRH | (10) / (100) | 22.3 ± 2.4 | 23.7 ± 3.1 |
| PGF _{2α} | (9) / (90) | 22.8 ± 2.2 | 24.6 ± 3.0 |
| Control | (8) / (80) | - | 22.0 ± 4.0 |

The number of does returned to estrus were only one in each experimental groups 1 and 2, while none of the control group's does returned (Table 2). The litter size of GnRH group was Numerically higher than PGF₂ group 1.8 ± 0.9 Vs 1.2 ± 0.8 .

Table (2): Non-return rate and Litter size in Hejazi goats does.

| Group (No.) | Non return rate (No.) (%) | Litter size | Pregnancy Rate (%) |
|-------------------|------------------------------|-------------|-----------------------|
| GnRH | (9/10) 90 | 1.8 ± 0.9 | 90 |
| PGF _{2α} | (8/9) 88.8 | 1.2 ± 0.8 | 80 |
| Control | (8/8) 100 | 1.5 ± 0.7 | 80 |

The number of kids born in each group were demonstrated in Table 3. No significant differences were found between the three groups.

Table (3): Pregnancy rate and number of kids born in Hejazi goats.

| Group (No.) | Pregnancy (No.) / (%) | Total Kids (No.) | Single (No.) / (%) | Twins (No.) / (%) | Triplet (No.) / (%) |
|------------------------------|--------------------------|---------------------|-----------------------|----------------------|------------------------|
| 1. GnRH (10) | (9) / (90) | 18 | (2) / (22.2) | (5) / (55.5) | (2) / (22.2) |
| 2. PGF _{2α} (10) | (8) / (80) | 12 | (4) / (50) | (4) / (50) | 0 |
| Control (10) | (8) / (80) | 13 | (4) / (50) | (3) / (37.5) | (1) / (12.5) |

All does respond to the PGf2α injection, either in the pre synchronization injection or during experiment, and showed estrus signs.

Discussion:

According to the current data, all does responded to the luteolytic action of PGf2α, and expressed estrus during presynchronization period or during period of experiment, which conducted during different climate season of the year (during and out of the breeding season). These results confirm that Hejazi goat breed is not seasonally breeder, and the seasonality is not noticed in the Hejazi goats Libya.

in the present study, the most common results noticed, concerning Estrous observation {estrus response rate and time, and estrus duration data (Table 1)} cleared that no significant differences between the experimental groups (1 & 2) were near to each other.

The above results, for Response to estrous, in group 1, which showed 100% , came in agreement with other recent publication on Sapera goat in Indonesia (Anggraeni et al., 2021) which had less response to estrous (62.5%), while estrous duration of our results (23.7 ±3.1 hrs.) is much less than the other publication (33.75 ± 3.11 hrs.). Our results from group 2 showed higher response to estrous (90%) and 24.6 hrs estrous duration in comparison to the same published paper (Anggraeni et al., 2021) which reported just 62.5% and 18.75 hrs., respectively. Some previous research which had been done on other breeds of goats noted and cited results which came in agreement or disagreement with our above results as well as other results cleared in tables 2 and 3 (Husein et al., 2005; Holtz et al., 2008; Titi et al., 2008; Al Yacoub et al., 2011; Nur et al., 2013).

The results of current research showed improvement of litter size, and triplet pregnancy in GnRH group comparing to PGF_{2α} group and control 18, 12, and 13 kids respectively, which may due to the role action of GnRH in stimulation of new follicular wave, and then induction of ovulation.

It could be concluded that Hejazi goats breed is not seasonally breeding animal. Also using PGF_{2α} with or without GnRH, as synchronization protocol, in Hejazi goats could be useful to improve their reproductive performance, but it looks that more research trying different protocols to find the more effective one.

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