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REVIEW

The Effectiveness of Reproductive Hormone Use in the Farm: Application and Impact on the Fertility of Small Ruminants

Efektivitas Penggunaan Hormon Reproduksi di Peternakan: Penerapan dan Dampaknya terhadap Fertilitas Ternak Ruminansia Kecil

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ABSTRAK

Efisiensi reproduksi menjadi salah satu kunci penting peningkatan produktivitas ruminansia kecil dalam pemenuhan kebutuhan protein hewani. Kendala seperti deteksi berahi, jarak kelahiran yang terlalu lama, fertilitas yang tidak optimal, dan tingginya tingkat kegagalan kebuntingan yang masih sering dijumpai pada peternakan tradisional. Kendala tersebut biasanya dipicu oleh keterbatasan manajemen dalam deteksi berahi dan pemenuhan nutrisi, serta dapat diatas melalui penerapan teknologi pemanfaatan hormon dalam upaya peningkatan fertilitas. Review ini bertujuan untuk mengevaluasi efektivitas penggunaan hormon reproduksi di lapangan serta dampaknya terhadap fertilitas ruminansia kecil. Data beberapa referensi dikumpul baik dari jurnal Internasional dan jurnal nasional bereputasi yang terkait dengan penggunaan hormon prostaglandin, progesteron, dan PMSG/eCG dalam sinkronisasi berahi. Hasil menunjukan bahwa penerapan protokol hormonal yang efektif dengan penyuntingan PGF2α, pemasangan CIDR atau sponge progesteron dengan eCG, serta kombinasi pemanfaatan PMSG dapat meningkatkan respons estrus hingga 100% dan kebuntingan diatas 90% pada kondisi tertentu. Variasi tersebut dipengaruhi oleh beberapa hal, diantaranya: bangsa ternak, manajemen, dan lingkungan. Pemanfaatan teknologi hormon reproduksi efektif dalam meningkatkan efisiensi reproduksi pada ruminansi kecil dengan syarat didukung manajemen pemeliharaan, nutrisi yang memadai dan pelatihan teknis. Sehingga dapat direkomendasikan untuk pengembangan protokol lokal berbasis sumber daya yang tersedia serta penelitian lanjutan untuk optimasi dosis yang tepat serta kombinasi hormon.

Kata Kunci: hormon reproduksi, fertilitas, ruminansia kecil, sinkronisasi berahi.

ABSTRACT

Reproductive efficiency is one of the key factors in improving the productivity of small ruminants in meeting animal protein needs. Challenges such as oestrus detection, excessive calving

intervals, suboptimal fertility, and high rates of pregnancy failure are still commonly encountered in traditional livestock farms. These obstacles are usually triggered by limitations in management in detecting oestrus and fulfilling nutritional needs, and can be overcome through the application of hormone utilisation technology in an effort to increase fertility. This review aims to evaluate the effectiveness of using reproductive hormones in the field and their impact on the fertility of small ruminants. Data from several literature sources were collected, including international and reputable national journals related to the use of prostaglandin, progesterone, and PMSG/eCG in oestrus synchronisation. The results show that the application of an effective hormonal protocols such as PGF2α administration, CIDR or progesterone sponge implantation with eCG, and the combination of PMSG use can increase oestrus response up to 100% and pregnancy rates above 90% under certain conditions. These variations are influenced by several factors, including livestock breed, management, and environment. The use of reproductive hormone technology is effective in improving reproductive efficiency in small ruminants, provided it is supported by proper husbandry management, adequate nutrition, and technical training. Therefore, it is recommended to develop local protocols based on available resources and conduct further research to optimise appropriate doses and hormone combinations under specific regional conditions.
Keywords: reproductive hormones, fertility, small ruminants, oestrus synchronisation.

PENDAHULUAN

Small ruminant livestock such as goats and sheep play an important role in smallholder farming in Indonesia. In addition to being a source of animal protein from meat and dairy products, these animals have high economic value in some regions. Furthermore, they are used in various social, traditional, and religious activities, and serve as a form of savings for rural smallholder farmers. Their ability to adapt quickly and easily to tropical environments makes small ruminants, such as goats and sheep, a potential commodity to support the national food security programme.

However, one of the challenges faced in the field is related to the productivity of small ruminant livestock, particularly in terms of reproduction. Common issues include low oestrus detection rates, prolonged calving intervals, suboptimal fertility, and high rates of pregnancy failure. External factors such as inadequate husbandry management, improper nutrition, and limited access to superior breeding stock further impair natural reproductive efficiency.

Therefore, the application of hormone-based reproductive technology is considered a strategic and appropriate approach to improve reproductive efficiency and synchronisation in order to obtain mass offspring of goats or sheep in a single production period. The use of hormones such as prostaglandin, progesterone,

PMSG/eCG, and GnRH has been widely applied in various programmes such as oestrus synchronisation and artificial insemination. This technology is useful for controlling the reproductive cycle of livestock, enabling the timing of mating to be determined and resulting in more optimal reproductive outcomes.

The objective of this article is to systematically review the effectiveness of using various reproductive hormones commonly used in goat and sheep farming in Indonesia.

MATERI DAN METODE

Reproductive hormones play a crucial role for refulating estrus and improving fertility in small ruminants. Table 1 provides an overview of the three main hormones commonly used. From Table 1 outlines the three main hormones commonly used in small ruminant reproduction along with their application characteristics.

Table 1: Application of Reproductive Hormones in Small Ruminants

Hormone	Funcion	Application Form	General Protocol	References
PGF2α	Causes luteolysis, stopping the production of the hormone progesterone, thereby inducing oestrus	Intramuscular injection	Two injections with an interval of 9 to 14 days	Duan et al., 2025; Mohan and Kumar, 2023; Cadena-Villegas et al., 2018
PMSG/eCG	Stimulates folliculogenesis and the ovulation process	Intramuscular injection	Dose of approximately 400-500 IU	Wondim et al., 2022; Habib and Kutzler, 2021; Al-Zubaidi et al., 2024
Progesteron (*via device*)	Controls the oestrus cycle by creating a luteal phase, delaying ovulation	Intravaginal dengan *sponge*, CIDR (*Controlled Internal Drug Release*), PRID	CIDR can be reused after sterilisation and storage for 24 hours. It is inserted intravaginally with a sterile applicator, and the perivulval area is disinfected. Upon removal, 300–400 IU of eCG is administered intramuscularly.	López-García, 2021

PGF2α functions to induce luteolysis and oestrus through intramuscular injection at intervals of 9–14 days (Duan et al., 2025; Mohan and Kumar, 2023). PMSG/eCG, administered at a dose of 400–500 IU, plays a role in folliculogenesis and ovulation (Wondim et al., 2022; Habib and Kutzler, 2021). Meanwhile, progesterone applied via intravaginal sponge or CIDR is effective in controlling the oestrus cycle, with a protocol that includes sterilisation of the device and is often combined with eCG for optimal results, as explained by López-García (2021). These data indicate that each hormone has a specific mechanism of action, and the combination of multiple hormones tends to yield better results than single-hormone use, although success is highly dependent on the accuracy of dosage and application method.

HASIL DAN PEMBAHASAN

Reproductive hormone protocosl have been widely evaluated in goats and sheep, with varying levels of effectiveness. Table 2 summarises the results of field studied the applied different hormone treatments. Table 2 presents the results of various field studies that applied reproductive hormones to small ruminants, particularly goats and sheep, to improve reproductive efficiency. The use of prostaglandin F2 alpha (PGF2α) in local goats

in Yogyakarta resulted in a pregnancy rate of 75% (Budiyanto et al., 2020), consistent with previous research highlighting the effectiveness of PGF2α in synchronising the oestrus cycle in goats (Erubun et al., 2024).

Table 2: The Effectiveness of Application Reproductive hormone in Small Ruminants.

Breed	Location	Hormone	Protocol	N	Estrus Response (%)	Pregnancy Rate (%)	References
Local Goats	Yogyakarta, Indonesia	PGF2α	Prostaglandin F2α hormone (Dinopros tromethamine 5.5 mg (PT. Caprifarmindo Labs) PGF2 dose of 8.25 mg per animal (intramuscular)	24	-	75%	Budiyanto et al., 2020
Etawa Grade Goat	Magelang, Indonesia	Progesteron	Progesterone implant (Depo Progestin) with a sponge containing 60 mg	20	-	83,33-90%	Supriyanto, 2014
Boer Goat	Malaysia	PGF2α (merk: Estrumate) Pregnant Mare Serum Gonadotropin (PMSG) FOLLIGON	CIDR insertion for 9–14 days followed by an injection of 0.5 ml Estrumet (Clorprostenol) after removal, then Pregnant Mare Serum Gonadotropin (PMSG) FOLLIGON 200 IU	127	80.95% estrus (CIDR 14 days + PGF2α); 100% estrus in the 9-day + PMSG group 97.15% estrus in the 9-day + PMSG group	-	Salleh et al., 2021
Etawa Grade Goat	Indonesia	Progesteron	Sponge medroxyprogesterone acetate 60 mg for 9 days or 14 days + zinc supplementation (20 mg)	6	Onset: 9 days → ~75 hours, 14 days → ~58 hours; oestrus quality (score ~8–8.33)	-	Ridlo et al., 2018
Sheep Crossbred	Brazil	eCG	CIDR 10-12 days + eCG (300-400 IU)	64	100%	~ 93.75% in 10 days with CIDR–300 IU eCG	López-García et al., 2021

The combination of CIDR, PGF2α, and Pregnant Mare Serum Gonadotropin (PMSG) in Boer goats in Malaysia resulted in an oestrus response of 100% (Salleh et al., 2021), indicating a hormonal protocol capable of optimally stimulating ovulation. Other studies also show that the use of progesterone, either alone or in combination, effectively increases pregnancy rates in Peranakan Etawa goats in Magelang, with rates ranging from 83.33–90% (Supriyanto, 2014). Additionally, the combination of progesterone with zinc supplementation has been proven to accelerate the onset of oestrus (Ridlo et al., 2018), consistent with the findings of Kundu et al. (2014), that zinc oxide (ZnO) can enhance oestrus response, with the study showing an increase in oestrus response rates from 66.66% (without ZnO supplementation) to 100% (with the addition of 100 ppm ZnO).

The most impressive results were recorded in the study by López-García et al. (2021) in Brazil, which used a combination of CIDR and equine chorionic gonadotropin (eCG) in crossbred sheep, resulting in a 100% oestrus response with a pregnancy rate of 93.75%. Salehi et al. (2010) found that the use of eCG after CIDR can improve follicle quality and ovulation in Chall sheep. One factor that can influence follicle quality is the impact of the environment on nutritional changes (Hernandez-Medrano, 2012). This factor is important because follicle health and growth can affect oestrus, ovulation, conception, and

litter size (Knox, 2019). Therefore, it is important to develop reproductive strategies based on the specific characteristics of the livestock and the farm management system, including considerations of nutritional aspects, health conditions, and the environment.

KESIMPULAN

The use of reproductive hormones to increase oestrus response and pregnancy rates in small ruminants (sheep and goats) has proven to be effective, especially when supported by optimal husbandry and nutrition management. Comparative findings across studies consistently demonstrate that combined hormonal protocols, such as CIDR or progesterone sponges supplemented with eCG or PMSG, yield higher oestrus responses (up to 100%) and pregnancy rates (above 90%) compared to single-hormone treatments. Prostaglandin-based protocols have also proven effective in synchronising oestrus, though their success rates are generally lower when applied alone. The implementation of appropriate protocols is an important strategy in improving the reproductive efficiency of small ruminants. Further research is needed to optimise dosage, hormone combinations and protocol adaptations.

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