



**UNIVERSITI PUTRA MALAYSIA**

***EFFECT OF BACKFAT THICKNESS AND OESTRADIOL BENZOATE ON  
REPRODUCTIVE PERFORMANCE OF DORPER EWES***

**HAZLINDA BINTI HASIM**

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**By**

**HAZLINDA BINTI HASIM**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra  
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Science**

**April 2017**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in  
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## **EFFECT OF BACKFAT THICKNESS AND OESTRADIOL BENZOATE ON REPRODUCTIVE PERFORMANCE OF DORPER EWES**

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**April 2017**

**Chair : Assoc. Prof. Halimatun Binti Yaakub, PhD**  
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Application of oestrus synchronisation had been implemented widely in order to improve farm husbandry. However, information regarding application of intravaginal pessary FGA in sheep especially for Dorper breed reared in Malaysia is lacking. In addition, backfat thickness will be examined to have a better picture on the oestrus synchronisation of sheep production. Two experiments were carried out in this study, the first experiment consisted of 34 Dorper crosses ewes, randomly allocated into three groups where all ewes received intravaginal pessary FGA with Corn oil (CO; n=11), low doses OB (LOB; n=11) and high doses OB (HOB; n=12). A day before pessary removal, 1 ml of PG was injected all ewes regardless of their treatment. Natural mating and oestrus signs observation was conducted using four rams (alternate) after 24 h post pessary removal and OB injection. Results showed 100% of ewes in LOB and HOB groups had oestrus within 60h observation while only 36.36% of ewes in CO group. Meanwhile, standing of oestrus in both LOB and HOB groups shown shorter interval compared to CO group. In second experiment, two factors that are backfat thickness (BFT) and OB doses was analysed with factorial design. This experiment consisted of 71 ewes allocated to two BFT (Thin: T<sub>n</sub>=37; Thick: T<sub>k</sub>=34) and three doses of OB (Corn oil: CO=25; Low dose of OB: LOB=24 and High dose of OB: HOB=22). Synchronisation protocols were same as previous experiment. Results of oestrus observation showed that there is no interaction between BFT and OB doses, thus main factors was analysed separately. Group that received LOB and HOB had earlier onset of oestrus (LOB=24.5±0.2 h; HOB=26.1±2.1 h) and standing of oestrus (LOB=26.8±1.2; HOB=31.2±2.6 h) compared to CO group (onset of oestrus=39.4±2.6 h; standing of oestrus=44.6±2.3 h). The mean concentration of P4 after 24 h of post pessary removal in all groups showed no significant difference (p>0.05). There was no significantly different (p>0.05) on the pregnancy rate among the groups. There was an interaction between BFT and OB doses for the lambing rate. Ewes that received CO and T<sub>k</sub> had the highest (50%) lambing rate compare to other groups. The concentration of leptin

between Tn and Tk showed no significant different ( $p>0.05$ ) during oestrus synchronisation. As conclusion, regardless of OB doses able to synchronised ewes. Further research on BFT is needed to determine best parameter during oestrus synchronisation.



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sebagai memenuhi keperluan untuk ijazah Master Sains

## **KESAN KETEBALAN LEMAK BELAKANG DAN OESTRADIOL BENZOATE TERHADAP PENCAPAIAN PERANAKAN BEBIRI BETINA BAKA DORPER**

Oleh

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Aplikasi sinkronisasi estrus telah diterapkan untuk menambahbaik pengurusan ladang. Tetapi, maklumat berkenaan aplikasi span infraraj FGA dalam bebiri terutamanya baka Dorper di Malaysia adalah sedikit. Ketebalan lemak belakang (BFT) sewaktu sinkronisasi estrus akan dikaji untuk mengetahui peranannya keatas produksi bebiri. Dua kajian telah dijalankan; kajian pertama menggunakan 34 bebiri kacukan Dorper yang dibahagikan kepada tiga kumpulan dimana kesemua bebiri menerima span infraraj FGA dengan minyak jagung (CO;n=11), sukatan rendah OB (LOB;n=11) dan sukatan tinggi OB (HOB;n=12).Sehari sebelum penanggalan span infraraj FGA, 1 ml PG disuntik pada setiap bebiri. Mengawan secara semulajadi dan pemerhatian estrus dijalankan dengan penglibatan 4 ekor penjantan Dorper secara bergilir-gilir selepas 24 jam penyingkiran span dan suntikan OB. Keputusan menunjukkan 100% bebiri betina dalam kumpulan LOB dan HOB menunjukkan estrus dalam tempoh 60 jam pemerhatian. Hanya 36.36% bebiri betina dari kumpulan CO menunjukkan estrus dalam tempoh pemerhatian. Manakala kumpulan LOB dan HOB lebih cepat menunjukkan estrus berdiri berbanding kumpulan CO. Kajian kedua pula melibatkan faktor BFT dan sukatan OB dan dianalisa menggunakan bentuk faktorial. Kajian kedua melibatkan 71 bebiri betina dibahagikan kepada dua faktor; dua BFT (Nipis:Tn=37; Tebal:Tk=34) dan tiga sukatan OB (Minyak jagung:CO= 25 ;sukatan rendah OB:LOB= 24; sukatan tinggi OB:HOB= 22). Protokol sinkronisasi estrus adalah seperti kajian pertama. Keputusan dari pemerhatian, tiada kaitan diantara BFT dan sukatan OB. Maka analisa akan dijalankan berdasarkan faktor tanpa penglibatan kaitan antara faktor. Kumpulan LOB dan HOB mempamerkan estrus pertama (LOB=24.5±0.2j; HOB=26.1±2.1j) dan estrus berdiri (LOB=26.8±1.2j; HOB=31.2±2.6j) lebih cepat berbanding kumpulan CO (estrus pertama=39.4±2.6j; estrus berdiri=44.6±2.3j). Kepekatan P4 menunjukkan tiada perbezaan antara kumpulan. Kadar kebuntingan juga tidak menunjukkan berbezaan. Kadar kelahiran bebiri menunjukkan interaksi antara BFT dan sukatan OB. Kumpulan CO dan Tk mempunyai kadar kelahiran tertinggi (50%)

berbanding lain. Tiada perbezaan kepekatan leptin diantara kumpulan Tn dan Tk semasa sinkronisasi. Kesimpulannya, jumlah OB tidak kira sukatan mampu menginkronisasi bebiri. Kajian lanjut mengenai BFT perlu dilakukan untuk mengetahui nilai yang terbaik semasa sinkronisasi estrus.



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## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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## LIST OF ABBREVIATIONS

BCS	Body Condition Scoring
BFT	Backfat thickness
C	Celsius
CO	Corn oil
DVS	Department of Veterinary Services
eCG	equine Chorionic Gonadotropin
FGA	Fluorogestone acetate
FSH	Follicle Stimulating Hormone
G	Gauge
H	Hour
HOB	High dose of Oestradiol benzoate
HRP	Horseradish peroxidase
Kg	kilo gram
LH	Lutenizing hormone
LOB	Lower dose of Oestradiol benzoate
Mg	mili gram
ml	mili litre
Ng	nano gram
Nm	nano meter
OB	Oestradiol benzoate
OS	Oestrus synchronization
PG	Prostaglandin
P4	Progesterone

SSL self- sufficiency level

$\mu\text{g}$  micro gram

$\mu\text{l}$  micro litre



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Oestrus synchronisation (OS) is used for the manipulation of oestrous cycle. In sheep, it is easier to control at the luteal phase as this phase is longer and receptive to manipulation (Wildeus, 2000). There are a number of OS methods, such as the use of prostaglandins, melatonin implants, progesterone and its analogues (progestagens) (Abecia *et al.*, 2011). However, all the OS methods may not suitable for all sheep breeds. In addition, differences in animal management, animal nutritional status, animal body condition status and interval of hormone administration may also affect the manipulation of OS. Administration of intravaginal fluorogestone acetate (FGA) pessary in conjunction with equine Chorionic Gonadotropin (eCG) is widely used in OS protocols. Even though eCG is widely used in research, the development of anti-eCG antibodies may occur (Santolaria *et al.*, 2011). Thus, Oestradiol Benzoate (OB) had been used to substitute eCG as it is able to induce the release of LH and ovulation (Valenzuela-Jimenez *et al.*, 2004). Despite, extensive administration of OB in cattle, it is not commonly used in sheep. Other than OS method, information regarding the relationship of backfat thickness (BFT) with reproduction aspects in sheep is not well published. Most of the information regarding BFT is well explained in meat science, particularly in carcass evaluation, and swine reproduction (Notter *et al.*, 2004; Beckova *et al.*, 2005). According to Abdel-Mageed and Abo El-Maaty (2012), backfat thickness does affect the reproductive traits. However, reduction in body fat may influence the energy balance of sheep and sequentially affect reproduction performance. In recent years, the leptin hormone has been highlighted in research due to its correlation with body fat tissue and influence on reproduction of livestock (Barb and Kraeling, 2004; Altmann *et al.*, 2006; Daix *et al.*, 2008). Dorper sheep breed had been imported into Malaysia in 2008 due to its outstanding performance as meat producer under harsh condition. Malaysian government have taken an action by rearing Dorper sheep breed in large number at Pahang under ECER program. Numerous actions and strategies of promoting this breed had been implemented such as auction during MAHA program. In return of huge effort from government to increase this breed population, local farmers have started to introduce this breed in their farm.

### 1.2 Problem Statement

The Dorper sheep breed was first developed in South Africa in the late 1930's and has been imported into Malaysia in 2008. This breed was imported due to its well growth as meat producer. This breed have high potential as meat producer and able to meet demand in Malaysia especially during festive

seasons such as Aidil Adha. Many farmers have started to rear this breed in their farm due to its ability to sustain even in harsh condition. However, the breed has not been evaluated extensively in Malaysia. Thus, major references of this breed are cited from other sphere. Information of Dorper ewe's reproductive performance in conjunction to oestrus synchronisation approaches in Malaysia is still lacking (Shanmugavelu, 2008). Investigation on OB doses is needed for the development of practical application of this in OS (Martemucci and Alessandro, 2010). In addition, its use in combination with intravaginal pessary FGA is lacking in ewes. Other than that, effect of backfat thickness of Dorper ewe on reproductive performance is lacking; available research is only in association with Body Condition Scoring (BCS) (Aliyari *et al.*, 2012). Furthermore, association of ewe's backfat thickness and leptin hormone during the early stages of OS that may influence the reproductive performance is less documented and poorly understood by researchers.

### **1.3 Significance of study**

Synchronisation techniques in ewes had been extensively develop in order to obtain maximum results. However variuos synchronisation protocols may not be suitable for different breeds, seasons and farm management. Furthermore, application of OB in conjunction with FGA pessary may contribute some knowledge on dosage and time of OB administrated during OS protocol to Dorper cross ewes. On the other hand, information regarding BFT associated with synchronised Dorper cross ewes are able to be evaluted to obtain a clearer picture of this parameter to reproductive aspects. Moreover, Abdel-Mageed and El-Maaty (2012) had suggested that BFT can be another factor to be used as an alternative method for BCS. Ptacek *et al.* (2014) confirmed the factor of BFT at mating may contribute to the efficacy of sheep reproduction. Other than that, the relationship of the hormone leptin and BFT during the early stage of oestrus synchronisation was also analysed in order to determine its effect on Dorper cross ewes's reproduction aspect. Through this finding, the effect of BFT during mating which may enchanced the oestrus synchronisation in conjunction with OB doses, may thus contribute to a positive impact towards the reproduction aspect of Dorper crosses ewes reared in Malaysia.

### **1.4 Justification**

Preliminary study was conducted in order to evaluate the effect of different OB doses in conjunction with oestrus synchronisation in Dorper cross ewes. Three doses proposed are i) control:corn oil ii) lower dose: 0.05 mg and iii) higher dose: 0.25 mg. Lower dose of OB were based on research conducted by Ungerfeld *et al.* (2004) and higher dose of OB are based from the finding's of Valenzuela-Jimenez *et al.* (2004). Adjustment were made on the type of progestagen and time of OB administrated during oestrus synchronisation in order to achieve better results and less handling of animals.

Second study was conducted as a continuation on selection of oestrus synchronisation protocols combine with different doses of OB. In order to enhance the oestrus synchronisation protocols, BFT of Dorper cross ewes during mating were also taken into consideration. Classification of BFT are decided based on Ptacek *et al.*(2014), Abdel-Mageed and El-Maaty (2012) and thickness of backfat available in the farm. Rearrangement of BFT group need to be conducted due to the differences on breed and body weight of ewes used in previous research. In addition, interaction between different levels of ewe's BFT during mating and different doses of OB in oestrus synchronisation protocols were also evaluated.

### **1.5 Objectives**

The general aim of this study was to determine the suitable BFT during mating and doses of OB in conjunction with OS protocol in Dorper cross ewe reared in Malaysia. The specific objectives were:

1. To evaluate oestrus response during synchronisation using FGA pessary with three doses of OB.
2. To determine the effects of BFT and three OB doses on oestrus response, reproductive performance and progesterone hormone of synchronised ewes.
3. To determine the leptin hormone concentration in Dorper crosses ewes from two BFT groups during early stage of oestrus synchronisation and its influence on lambing rate.

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