

UNIVERSITI PUTRA MALAYSIA

MATURING PATTERN FOR BODY SIZE, DOE REPRODUCTIVE PERFORMANCE AND KID MORTALITY RATE OF SAVANNA AND RED KALAHARI GOATS

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By

MOHAMAD HIFZAN BIN ROSALI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

September 2015



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

MATURING PATTERN FOR BODY WEIGHT, DOE REPRODUCTIVE PERFORMANCE AND KID MORTALITY RATE OF SAVANNA AND RED KALAHARI GOATS

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The domestic production level of chevon only able to meet 13% of the demand. Savanna and Red Kalahari goats were brought from South Africa to evaluate their potential under Malaysian environment thus, can fulfill the local demand of chevon meat. Growth and reproduction are among the aspects being looked at to determine the economic merits. The objective of this study was to evaluate the performance of Savanna and Red Kalahari goats in terms of mature size, reproductive performance and kid mortality rates under Malaysian conditions.

Brody, Gompertz, von Bertalanffy, and Logistics models were used to determine the mature size (A) and maturation rate (k) of Savanna and Red Kalahari does. The goodness of fit of the models was determined by the highest coefficient of determination (R^2). The estimated mature weight of Savanna goats as derived from Brody, Gompertz, von Bertalanffy, and Logistic model was 52.57 kg, 52.06 kg, 52.18 kg, and 51.89 kg while for Red Kalahari goats was 52.96 kg, 48.88 kg, 49.81 kg, and 47.24 kg respectively. All the parameters taken fit in the model excellently (R^2 above 90%). The best fit model for estimated mature weight of Savanna and Red Kalahari goat were von Bertalanffy Model (94.7%) and Brody Model (97.7%). An estimated asymptote for body length and height at withers derived from Brody, Gompertz, von Bertalanffy, and Logistic models showed that Red Kalahari were longer (P<0.05) and taller (P<0.05) than Savanna goats. The correlation coefficients between the mature size and rate of maturing for their body weight, body length, and height at withers were negative.

The conception rate, fertility rate, kidding rate and prolificacy rate of Savanna does were higher compared to Red Kalahari goats (92.4 vs. 90.6, 89.9 vs. 86.8, 137 vs. 125.6 and 152.3 vs. 144.6) but there was no significant difference. Litter size at birth and litter size at weaning was higher for Savanna compared to Red Kalahari goats (1.55 vs. 1.49, 1.26 vs. 1.16). There was no significant difference in Savanna and Red Kalahari does with average weaning rate (113 vs. 100) and multiple births (48.6 vs. 40.2)

The pre-weaning mortality rate among Red Kalahari kids was higher than Savanna kids (19.7 vs. 17.5%) and it makes the survivality rate of Savanna kids higher (82.5%) compared to Red Kalahari kids (80.3%). Red Kalahari also had a higher post-weaning mortality than Savanna goats (14.3 vs. 13.0%). Considering the overall performance in reproduction and growth, Savanna and Red Kalahari goats had a good potential to meet a demand as a good breeding stock goats in Malaysia. It is recommended that further study using a larger sample and a longer period of time should be done.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

CORAK PERTUMBUHAN, PRESTASI REPRODUKSI BETINA DAN KADAR KEMATIAN ANAK KAMBING SAVANNA DAN KALAHARI MERAH

Oleh

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Tahap pengeluaran domestik daging kambing hanya memenuhi 13% daripada permintaan tempatan. Kambing Savanna dan Kalahari Merah yang dibawa dari Afrika Selatan adalah untuk dinilai potensi baka ini dalam persekitaran Malaysia dan seterusnya dapat memenuhi permintaan tempatan terhadap daging kambing. Prestasi pertumbuhan dan pembiakan adalah antara aspek yang menjadi fokus dalam menentukan merit ekonomi sesuatu baka. Objektif kajian ini adalah untuk menilai prestasi kambing Savanna dan Kalahari Merah dari segi saiz matang, prestasi pembiakan dan kadar kematian anak di dalam persekitaran Malaysia.

Model Brody, Gompertz, von Bertalanffy, dan Logistik digunakan bagi menentukan saiz matang (A) dan kadar kematangan (k) kambing betina Savanna dan Kalahari Merah. Kebaikan penyesuaian model ditentukan dengan pekali penentuan tertinggi (\mathbb{R}^2). Anggaran berat matang kambing Savanna yang diperolehi daripada model pertumbuhan Brody, Gompertz, von Bertalanffy, dan Logistic adalah 52.57 kg, 52.06 kg, 52.18 kg, dan 51.89 kg manakala kambing Kalahari Merah pula adalah masing-masing 52.96 kg, 48.88 kg, 49.81 kg, dan 47.24 kg. Kesemua parameter yang diambil dapat memenuhi model dengan cemerlang (90% keatas). Model von Bertalanffy (94.7%) dan Brody (97.7%) paling cemerlang dalam mentafsirkan berat matang kambing Savanna dan Kalahari Merah. Berdasarkan anggaran asimptot bagi panjang dan tinggi badan yang diperolehi dari model Brody, Gompertz, von Bertalanffy, dan Logistik menunjukkan Kalahari Merah mempunyai susuk tubuh yang lebih panjang (\mathbb{P} <0.05) dan tinggi (\mathbb{P} <0.05) berbanding kambing Savanna. Korelasi di antara saiz matang dan kadar kematangan untuk berat badan, panjang badan dan tinggi badan adalah negatif.

Purata kadar beranak, kadar kesuburan, peratusan anak lahir dan kadar prolifik kambing Savanna adalah lebih tinggi berbanding kambing Kalahari Merah (92.4 vs. 90.6, 89.9 vs. 86.8, 137 vs. 125.6 dan 152.3 vs. 144.6) namun tiada perbezaan signifikan ditemui. Saiz bilangan anak sebelum sapih dan saiz bilangan anak selepas sapih kambing Savanna adalah lebih baik berbanding kambing Kalahari Merah (1.55 vs. 1.49, 1.26 vs. 1.16). Tiada perbezaan signifikan ditemui di antara purata kadar sapih

(113 vs. 100) dan kelahiran kembar (48.6 vs. 40.2) kambing Savanna dan Kalahari Merah.

Kadar kematian sebelum sapih anak kambing Kalahari Merah adalah lebih tinggi berbanding kambing Savanna (19.7 vs. 17.5%). Kambing Kalahari Merah juga mempunyai kadar kematian selepas sapih lebih tinggi berbanding kambing Savanna (14.3 vs. 13.0%). Melihat kepada prestasi keseluruhan reproduksi dan pertumbuhan, kambing Savanna dan Kalahari Merah mempunyai potensi yang besar sebagai induk pemula di dalam memenuhi permintaan pasaran Malaysia. Dicadangkan agar kajian lebih lanjut dijalankan dengan menggunakan bilangan sampel yang lebih besar dan masa yang lebih panjang.



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LIST OF ABBREVIATIONS

Cm	Centimetre
Df	degrees of freedom
DVS	Department of Veterinary Service
На	Hectare
Kg	Kilogram
LSM	Least square means
М	Meter or metre
MARDI	Malaysian Agricultural Research and Development
	Institute
MS	Mean squares
R^2	Coefficient of determination
SEA	Small East African
WAD	West African Dwarf

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CHAPTER 1

INTRODUCTION

1.1 Introduction

One of the constraints in developing the meat goat industry in Malaysia is the supply of quality breeding stocks. Goats and sheep are small ruminants reared mainly on a small-scale operation by smallholders to supply fresh goat meat in wet markets or for religious purposes in Malaysia. They are kept mainly for meat production and to a lesser extent for their milk and manure. Goats make up the highest number of domesticated ruminant species in the world because they can adapt well to any climatic and environmental condition (Casey and Webb, 2010). Their distribution across the world and the range of breeds with distinct morphological and physiological traits exceeds that of any other livestock species (Galal, 2005).

The local goat which is known as Katjang can be found mainly in Indonesia, Southern Thailand and Peninsular Malaysia. Katjang goats are small in size and are known for their hardiness (Abdul Rashid, 2008; Devendra, 1986). The availability of Katjang and other dairy x meat crossbred breeding stocks is low. Over the years, the body size of Katjang goats in terms of live weight had declined. This may be due to the absence of a strong breeding program and lack of good or proper feeding management program. The mature live weight of Katjang goats is about 18-25kg for doe and 24-35kg for buck (Abdul Rashid, 2008). To initiate the establishment of a viable local meat goat industry a number of farms have imported several meat goat breeds from South Africa and Australia. In 2004, Boer goats were imported from South Africa and quite recently Savanna and Red Kalahari have been bought in as alternative breeds as breeder goats (Hifzan et al., 2014). There is very limited information on growth, breeding, production system, feeding and reproductive performance of Savanna and Red Kalahari goats in Malaysia. With the availability of new goat breeds in the industry, it is necessary to do an evaluation of their genetic and reproductive ability under Malaysian conditions. Furthermore, the recent interest in establishing foundation stocks based on these breeder animals from foreign countries has heightened the need to establish some basic genetic parameters of economic importance using performance data of these population and their filial generations.

The Savanna goat was developed from indigenous goat breeds in the southern region of Africa (Visser *et al.*, 2004). It was popularly known as white Boer goats by African people. One of the advantages of these white goats is the dominant white color of its coat. Many local producers in South Africa have observed that these white goats have superior carcass quality (Campbell, 2003). These goats have been selected mainly for high fertility, easy-care and heat and drought resistance. The informal rural sector farms raised mostly Savanna goats that conform to the criteria of robustness for extensive rangeland conditions and resistance to endemic diseases, with high fertility and fecundity (Casey and Webb, 2010).

Red Kalahari goats have been selected from lop-eared animals that migrated with tribes of the Black Nations or Khoikhoin from the districts around Lake Victoria to the southern parts of Africa more than 2000 years ago (Epstein, 1971). Kalahari goats are reported to be well adapted to the arid and semi- arid savannah environment. They have good foraging abilities and excellent mothering abilities. According to Ramsay *et al.*

(2001) Red Kalahari was known as 'easy care and maximum benefit' goat breed. Their carcass size is similar to that of the Boer goats (Hifzan *et al.*, 2014; Hifzan and Musaddin, 2013; Casey and Webb, 2010). Average birth weight of Savanna kids is around 2.40 to 3.30 kg (Shuib *et al.*, 2013). The breed standards of Red Kalahari and Savanna are similar to some extent to that of the Boer goats (Visser, 2004).

Ability of goats to breed and grow must be taken into account when evaluating a breed in new environments (Browning *et al.*, 2006). Animal production is influenced by genotype and genotype-environment interactions. The productivity of animals can be evaluated based on their survival rate, growth rate and reproductive performance in a given environment. The performance of an animal can be increased by improved or controlled environmental conditions such as nutrition, management and healthcare. Reproduction and survivability are fitness traits that are influenced strongly by the environment and associated selection pressures (Van der Waaij, 2004). Evaluation of the productive performance as well as understanding of the environmental factors affecting the economic traits of goats is important.

Information of growth pattern of meat goat breeds would reveal points of intervention for producers to capitalize on genetic variability for growth at different phases of market production. Identifying the phases of fastest growth could facilitate in the formulation of feeding strategy in the growing and fattening of weaned kids destined for the slaughter market. Another use of growth parameters is the prediction of live weight at various ages for specific goat breeds (Adeyinka and Mohammed, 2006). These growth parameters can be incorporated in the growth curve function to estimate the maturing pattern of several animal species such as cattle (Beltran *et al.*, 1992), pigs (Koops and Grossman, 1991) and rabbits (Larzul and deRochambeau, 2004).

Evaluation of the performance of Savanna and Red Kalahari goats under local conditions is importance to the implementation of an effective mass breeding and management program aiming to improve and optimize their potential. However, information on the local performance of these goats is scarce. Thus, this study will document the reproductive performance and maturing pattern of Savanna and Red Kalahari goats to provide essential information for the small ruminant producers to decide on optimal feeding strategy for the production of market goats.

1.2 Objective of Study

General objective

To evaluate the performance of Savanna and Red Kalahari goats under Malaysian conditions.

The specific objectives of this study were:

- 1) To examine the growth pattern parameters for body weight, body length and height at withers of Savanna and Red Kalahari goat raised semiintensively.
- 2) To evaluate the reproductive performance of Savanna and Red Kalahari goats.
- 3) To determine the mortality rate of the Savanna and Red Kalahari kids goats.

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