MORPHOMETRIC CHARACTERIZATION OF MALAYSIAN KATJANG GOAT

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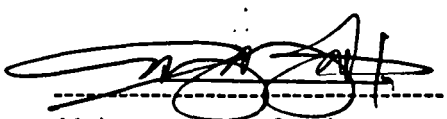

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ABSTRACT

Morphometric characterization of Katjang goat in Malaysia is vital for discussion and in addition for genetic improvement. This study was attempted for the morphometric characterization of indigenous Katjang goat and the relationship among the important morphometric traits was also performed. The study was conducted at the Faculty of Sustainable Agriculture (FSA), surrounding area of FSA Sandakan, Sabah and Batu Pahat, Johor. Characteristics of body weight (BW), body length (BL), heart girth (HG), wither height (WH), hip height (HH), fore leg length (FLL), hind leg length (HLL), head length (HeL), head width (HW), ear length (EL), ear breadth (EB), tail length (TL), scrotal length (SL) and scrotal circumference (SC) were gathered from Katjang goat. In a single parameter as body weight of Katjang at underneath 1 year age in bucks and 1 to 2 years in does were observed to be 7.41 ± 0.27 and 12.41 ± 0.41 kg respectively. While, all findings gradually increased for all parameters according to increment of the age, scrotal length and scrotal circumference in Katjang goat. Almost all the parameters contemplated found similarly higher in bucks than that of does.

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PERINCIAN MORFOMETRIK TENTANG KAMBING KATJANG MALAYSIA

ABSTRAK

Pencirian morfometrik dari kambing Katjang di Malaysia adalah penting untuk perbincangan dan sebagai tambahan untuk penambahbaikan genetik. Kajian ini untuk mengetahui pencirian morfometrik daripada kambing Katjang dan hubungan antara ciri-ciri morfometrik yang penting. Kajian ini dijalankan di Fakulti Pertanian Lestari, kawasan sekitar di Sandakan, Sabah dan Batu Pahat, Johor. Ciri-ciri daripada berat badan (BB), panjang badan (PB), ukur lilit jantung (ULJ), layu ketinggian (LK), ketinggian belakang (KB), panjang kaki hadapan (PKH), ketinggian pinggul (KP), panjang kepala (PK), lebar kepala (LK), panjang telinga (PT), lebar telinga (LT), panjang ekor (PE), panjang buah zakar (PBZ) dan lilitan buah zakar (LBZ) dikumpulkan dari kambing Katjang. Dalam parameter tunggal, berat badan kambing Katjang di bawah umur 1 tahun untuk jantan dan 1 hingga 2 tahun untuk betina yang diperhatikan adalah 7.41 ± 0.27 dan 12.41 ± 0.41 kg secara berasingan. Sementara, semua pencarian beransur-ansur meningkat untuk semua parameter mengikut tempoh umur khusus mereka. Berat badan mempunyai hubungan positif yang kuat dengan lilitan jantung, panjang badan, layu ketinggian, panjang buah zakar dan lilitan buah zakar pada kambing Katjang. Hampir semua parameter yang dipertimbangkan didapati tinggi pada jantan dan betina.

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LIST OF UNITS, SYMBOL AND ABBREVIATION

BL	Body length
AnGR	Animal Genetic Resource
BSE	Breeding soundness examination
BW	Body weight
cm	Centimeter
DVS	Department of Veterinary Services
EB	Ear breadth
EL	Ear length
FLL	Fore leg length
FSA	Faculty of Sustainable Agriculture
HeL	Head length
HG	Heart girth
HH	Hip height
HL	Horn length
HLL	Hind leg length
HoL	Hock length
HW	Head width
kg	Kilogram
NC	Neck circumference
NIVB	National Institute of Veterinary Biodiversity
PG	Paunch girth
PKC	Palm kernel cell
PKM	Palm kernel mash
RH	Rump height

RL	Rump length
RLL	Rear-leg length
RW	Rump width
SC	Scrotal circumference
SL	Scrotal length
SPSS	Statistical Package for the Social Science
SW	Shoulder width
TL	Tail length
WH	Wither height

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Over the years, goats have provided mankind with useful products like meat, milk and skin. As indicated by the archaeological evidence, they have been associated with man in a symbiotic relationship for up to 10,000 years (Ensminger and Parker, 1986). Scientifically, goats (*Capra hircus*) are a small ruminant animals were placed in the family of *Bovidae* and the sub-family of *Caprinae*. According to FAOSTAT (2008), the total number world goat population is 861.9 million with the highest number in Asia (514.4 million), followed by Africa (291.1 million), South America (21.4 million), Europe (18.0 million), Central America (9.0 million), Northern America (3.0 million) and Oceania (0.9 million). Goats disseminated all over the world because their great adaptability to varying environmental conditions and the different nutritional regimes under which they were evolved and subsequently maintained. However, it is easier to adapt the region which is hotter than the cold weather. They proved useful to man throughout the ages due to their productivity, small size, and non-competiveness for food. In the developing countries, goats make a very valuable contribution, especially to the poor in the rural areas.

Malaysia has only one indigenous goat breed of its own, known as Katjang goat. It is found in small populations in several parts of Malaysia, and it is considered to be at risk (DVS, 2006). Boer goat also introduced in Malaysia and it is an improved breed with the infusion of European, Angora and Indian goat breeding many years ago. Several researchers agreed that the indigenous populations were probably from the Namaqua Hottentots and from southward migrating Bantu tribes. Other than that, they rearing

Jamnapari that is originated from the frontier of India and Pakistan, it has been imported from India to Indonesia since 1953. After years of breeding, Jamnapari has become the highest quality breed in Indonesia. Rather than that, Anglo Nubian is not pure breed otherwise it is the result from hybrids of Asia's Jamnapari and Europe's Toggenburg. The pure Anglo Nubian is too rare in Malaysia but the hybrids goat which is crossbreeding with Katjang goat can easily found (Anonymous, 1995).

Katjang goat is a meat-type of animal and as described by DVS (2006), it possesses the morphological characteristics of a thin, black-coloured coat, sometimes with white patches. Individual goats are also found with black and brown coat colouration (DAD-IS, 2010). Average birth weight is 1.5 kg with mature weight of 25 kg for males and 20 kg for females. The average daily weight gain of the Katjang goat is 55 g/d (Devendra and McLeroy, 1982). As an indigenous goat, Katjang possesses the natural characteristics of heat and tick tolerance under the local climate. Although their meat production may be relatively low compared to exotic goat breeds in Malaysia, they are highly adapted to the local equatorial environment (FAO, 1992).

In 2009, Department of Veterinary Services has established *in-situ* conservation facilities supported by *ex-situ* conservation through maintaining a semen and embryo bank at the National Institute of Veterinary Biodiversity (NIVB) in Jerantut, Pahang (DVS, 2014). The centre accommodate 50 females and 10 males as their target to produce 350-500 purebred of Katjang goat under conservation. For genetic variability, the animals will be procured from throughout the country. All the goats will be tagged and their production and reproductive performance were recorded. Breeding management was carried out throughout the year, whereby the ratio of male to female is maintained at 1:20. The males used for breeding will be at least 12 months of age with 25 kg of bodyweight.

Knowledge of morphometric characteristics marks the first step in classification of Animal Genetic Resource (AnGR) (Delgado *et al.*, 2001). In general, the observed morphometric characteristics of the goats' genetic resources with the characterization at molecular level will contribute to designing of improvement strategies for these goat populations, which will need to be complemented with performance data. The importance

of this valuable genetic resource is underestimated and its extent of contribution to the livelihood of the poor is inadequately understood. Research and development investments to improve the relatively low level of goat's productivity do not match their potential importance, resulting in many goat breeds that are not genetically explored, especially in the developing countries. Nevertheless, goats are going to be more important source of livelihood for many more people in coming years and, thus, they deserve greater attention at both the micro and macro levels. Now, it is the time to consider and pay attention to the value and capacity of goats for producing food.

Through some sort of work so far been done on Katjang goat still we need to do a lot of work on it. However Sabah still the unexplored area and if we take specific program to develop indigenous breed we need have to start work in this region. Solomon Abegaz, director of Ethiopia's Institute of Biodiversity Conservation said, "For further resources to contribute to security goals, we need to know what we have, be able to improve them, be able to prioritize to effectively utilize them, and conserve them for the next generation" (Ballantyne, 2013). The morphometric characterization before further research about molecular characterization of indigenous goat breed because it has good utilization potential which the animals are put, as well as social and economic factors such as market orientation, niche- marketing opportunities and gender issues. Other than that, through this characterization we can reduce revenue to farmers, reduce revenue from the sale of animals, as well as their products and the animals slaughtered specifically for meat production are of varying quality. In essence, morphometric and molecular characterization are used to measure and describe genetic diversity in these resources as a basis for understanding them and utilizing them sustainably.

During selection of goat, attention should be given on the age, growth rate, body weight, heart girth, body length, height at wither and soundness of sexual organ. Body length and heart girth may be used as good reliable predictors to assess live weight according to Bhattacharya *et al.* (1984) and Islam *et al.* (1991). Correlation of body weight with heart girth was highest and that was followed by length and height, respectively. Scrotal circumference has great value as indicator of genetic trait, puberty and total spermatozoa production (Ott, 1986). Determination of scrotal length and circumference is

an important aspect of breeding soundness examination (BSE). It is known that there are several important quantitative traits for goat. Among these birth weight and body weight of goats are considered as important. There is a positive correlation between birth weight and rate of growth, age at maturity and mature body weight which influence the future productive and reproductive performance of the animal (Banerjee, 1989). Husain *et al.* (1995) demonstrated that poor pre-weaning kid survivability could be improved by increasing birth weight of kids and milk yield of dam.

1.2 JUSTIFICATION OF STUDY

There are two types of characterization as the basic information in genetic characterization that very important which are morphometric characterization and molecular characterization. In Malaysia, there is lack of information so far been found on the morphometric characterization of Katjang goat. This research will open the overview to do future research on molecular characterization of Katjang goat. Therefore, the morphometric characterization is essential for conservation strategy as well as genetic improvement of local indigenous Katjang goat.

1.3 OBJECTIVE

The objective of this study are :-

I. To study the basic morphometric information of indigenous goat available at the Faculty of Sustainable Agriculture (FSA), FSA surrounding area of Sandakan, Sabah and Batu Pahat, Johor region.

II. To find out the relationship among the important morphometric parameters.

1.4 HYPOTHESIS

H_0 : There is no relationship among the important morphometric parameters

H_a : There is relationship among the important morphometric parameters

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

There were several researches have been carried out throughout the world related to characterization of indigenous goat which contribute further study on genetic and breeding purpose. The related findings of research work carried out in different countries of the world are reviewed in this chapter.

2.2 KATJANG GOAT

Figure 2.1 Katjang goat.

Katjang goat (*Capra aegagrus*) is the only indigenous breed of goat in Malaysia (Figure 2.1). It is also known as *Kacang*, *Katchang* and *Kambing Kampung*. Katjang goat is a meat-type animal and possesses morphological characteristics of a thin, black coloured coat, sometimes with white patches. Katjang males have an average height at withers of 63 cm and females of 56 cm, with mature weight of 25 kg and 20 kg respectively. Average daily weight gain of Katjang goat is 55 gm/day. The milk production is 300-500 ml per day. Katjang goats are found in small pockets in several parts of Malaysia and are considered to be at risk (FAO, 1992). Most indigenous goats in developing countries also are used for meat production. The relative importance of goat meat is related with the wide distribution of goats in small holder farms. To date, no comprehensive study of the characterization of Katjang goat has been undertaken.

According to Ernie Muneerah *et al.*, 2010, as an indigenous goat, Katjang possesses the natural characteristics of heat and disease tolerance in an equatorial, hot-humid climate. It is also well adjusted to the local ecosystem and requires low inputs. The Katjang goat is undergoing genetic erosion through crossbreeding with imported and synthetic breeds, mainly due to preference for a larger sized goat. Katjang goats are a national heritage. With climate change and increasing pressures on land use, the Katjang goat may become the goat of choice for future challenging production environments. Katjang goat also has good utilization potential to meet niche market demand,such as for *korban* and *aqiqah*.

A comprehensive programme is being initiated at the National Institute of Animal Biotechnology for the conservation and sustainable use of Katjang goat for present and future generations. A random survey has been done in Peninsular Malaysia. Department of Veterinary Services' personnel from ten (10) states of Peninsular Malaysia were appointed to lead the survey for their state. The in-situ conservation design is as described by Ernie Muneerah *et al.* (2010). In-situ conservation facilities have been established at the National Institute of Veterinary Biodiversity (NIVB) at Jerantut, Pahang. Selected males from animals under in-situ conservation were trained for semen collection and processed semen is to be kept in the semen bank at NIVB, Jerantut, Pahang for conservation purposes. Based on the survey, the small farmers prefers the small build since it is easier

to market and the cost of feeding for Katjang is also low as compared to other goat breeds. On the other hand, the commercial farmers prefer to breed larger goat breeds such as Boer and Jamnapari and some use Katjang goat as a foundation goat breed to capitalize on the disease tolerance characteristics. Higher density of morphologically pure Katjang goat was found in Kuala Pilah, Negeri Sembilan. There are also cases of inbreeding at most places since most of the farmers use the same male for a few generations.

The systematic information on genetic and phenotypic parameters in Katjang goat is very limited (Ernie Muneerah *et al.*, 2010). No substantial work has been yet been done on the morphometric characterization and genetic evaluation of Katjang goat. It seems essential to be identify and quantify the parameters by which Katjang goats can be described distinctively from others. The present work, therefore, was undertaken to study some basic morphological information of Katjang goats, relationship of body weight with heart girth, body length and height at wither and were also performed.

2.3 CHARACTERIZATION

The characterization of indigenous goat is essential to meet future needs in Malaysia in general. Comparison or characterization based on morphological properties can provide to some extent a reasonable representation of the differences among the breeds, though not exhaustive, it serves as the foundation upon which DNA analysis can be built. An indigenous goat is critical for food security and essential to meet unpredictable future demand of population increase, climate change and more virulent disease pathogens.

It can be said morphometric measurements have been used to evaluate the characteristics of various breeds of animals, and could provide first hand information on the suitability of animals for selection (Nesamvuni *et al.*, 2000; Mwacharo *et al.*,2006; Martins *et al.*, 2009; Yakubu, 2010) and for further characterization studies using modern molecular methods. Anatomic reference points for the measurements are as described by Salako and Ngere (2002). Seventeen metric traits were measured on each animal using the identification marks already documented; rump width (RW), rump length (RL), tail

length (TL), Wither Height (WH), heart girth (HG), paunch girth (PG), rump height (RH), ear length (EL), foreleg length (FLL), rear-leg length (RLL), body length (BL), shoulder width (SW), neck circumference (NC), head length (HeL), head width (HW), horn length (HL) and hock length (HoL) were the traits measured.

According to Amin (2000) observed the average kidding interval, litter size and service per conception of Black Bengal Goats were 193±9.80 d, 1.94±0.56 and 1.5±0.69, respectively which strongly support the present study. Mamabolo *et al.* (2010) reported average kidding interval of goats in South Africa at village level was 145-148 . Mamabolo *et al.* (2010) reported average litter size of goats in South Africa at village level as 1.5. Body weight, body length, chest girth and wither height of adult females were found higher than other age groups. Litter size was higher in solid black goats. Less service was required for replacement females. The body weight, body length, chest girth and wither height of adult females were higher than other age groups. Variation in age, coat color and location had a great effect on the morphometric and production of Black Bengal goats. Amin (2001) indicated an opportunity for improvement of rural Black Bengal goats through a pure breeding program.

2.4 RELATIONSHIP AMONG THE MORPHOMETRIC TRAITS

Among the traits, there has relationship between the traits. The research done by Halima *et al.* (2012), figure out and establish the relationship between live body weights with other body measurement traits of two goat populations found in Amhara Region of Ethiopia. Accordingly, correlation coefficients (r) between live weight and other body measurement traits were found positive with the presence of highly significant ($P<0.01$) associations of body weight with body length ($r=0.899$) and body weight with body length ($r=0.729$) fo west Amhara Region goat populations. These findings indicate that an increase of one cm of heart girth or body length resulted in an increase of 1.273 and 1.041 kg of live weight, respectively, which is in line with findings on goats elsewhere (Oztork *et al.*, 1994; Nsoso *et al.*, 2003; Atta and El Khidir, 2004).

Tesfaye (2009) found a body weight of 12.73±0.13 kg in indigenous goats in Ethiopia which is almost similar to the body weight of replacement females and bucks. Paul S. (2008) reported the body weight of bucks and does at 12 months of age as 14.20±0.20 and 12.40±0.41 kg respectively which are higher than the body weight of bucks and replacements females observed in the present study.

In conclusion, a lot of references so far been reviewed in this chapter related to characterization of indigenous farm animals. But information on morphometric characterization of Katjang goat in Malaysia has not been reported. So morphometric characterization of Katjang goat is important for conservation strategy and further genetic improvement program.

CHAPTER 3

METHODOLOGY

3.1 LOCATION OF STUDY

This study was carried out at the goat farm in Faculty of Sustainable Agriculture, Campus UMS Sandakan which is situated at Mile 10, Jalan Sungai Batang, 9000, Sandakan, Sabah with latitude 50 55' N and longitude 1180 02'E. It is about 20 kilometers away from Sandakan town. This study further conducted to some rural community area near the faculty and several areas around Sandakan area which is the second-largest town in Sabah after the Kota Kinabalu City, on the north-eastern coast of Borneo in Malaysia. As the number of goats obtained were less than minimum target, this study was further conducted to some farms in Batu Pahat which is situated in Johor.

3.2 ANIMAL MATERIALS

A total of 51 Katjang goat of different ages and sex were randomly selected to be taken in this study. The number of head to be taken from different farm is based on the number of Katjang goat which can be measured in each farm (Figure 3.1, 3.2 and 3.3). Katjang goats which morphometrically pure were selected in this study. The feeding, drinking and other management of the goats based on what farmers practiced. At FSA goat farm and most of the farmer give napier grass *ad libitium* besides *barachia decumbens* , twice a daily as per requirement using the cut and carry system. Other feeding like palm kernel cake (PKC) and palm kernel mash (PKM) were also given to the goat sampled.

3.3 MATERIALS

The materials need to use in this study is measuring tape, weighing balance and rope which supplied by FSA Field Laboratory.

3.4 DATA COLLECTION

The data collection were document using semi-structured along with visual appraisal of the appearance of the goat types and measurements following the descriptor lists of the Food and Agriculture Organization of the United Nations (FAO, 1986). Focus group discussions were held with the manager and knowledgeable key informants for generating general information regarding the history of the various goat types, special distinguished features of the targeted goats, production systems, and knowledge on the husbandry practices, challenges and opportunities of indigenous goats. Furthermore, data obtained from this study were based on the field survey taking rural community goat raisers' opinion, direct measurement and weighing of animals. Besides, as farmers did not have birth record of their animals, age of each sampled goat was estimated from dentition as suggested by Pace and Wakeman (2003). The researcher also calculated the number of horn ring to get the age of the sampled goats.

3.5 PARAMETER MEASUREMENT

All the goats (male and female) of different ages were used for morphometric characterization and were under study were separated from other breeds in one pen. The colour of each sampled goat was observed by researcher. The body weight of the individual goat was taken from all age classes and was recorded in the morning before the animals were fed. Goats were weighed using weighing scale. Body weight was recorded in kilogram. Body condition of goats was recorded according to the farmer's and observation. The following body measurements were considered for morphological study of Katjang goats have been extended on body length, heart girth, wither height, hip height, fore length, hind length, head length, head width, ear length, ear breadth, tail length, scrotal length and scrotal length. All measurements were taken by measuring tape.

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