MORPHOMETRIC TRAITS AND BODY WEIGHT AT DIFFERENT AGE OF BATUR SHEEP IN BANJARNEGARA

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Abstract. The aim of study was to explore the possibility of genetic diversity within Batur sheep to find indirect parameters for meat production that potentially could be used for selective purposes. The trial was carried out at Banjarnegara under the control of 13 owners with total 69 heads aged between 0.5 and 3 years, depending on age group: 6 months, year and adult. Body weight was recorded in the kilogram, whereas, body measures were taken by tape in the centimeter were Height at withers, Chest Girth and Body Length. Data were analyzed using simple descriptive analyses, GLM, and Correlation procedures by SPSS version 16. Body weight of three age groups were 27.28±1.76, 48.87±1.55 and 69.10a±2.80 kg respectively. Mean of morphometric traits of body dimension performed as follow; length was of 54.10±1.19, 67.28±1.05 and 71.70a±1.91, height at withers was of 53.55±1.30, 60.15±1.14 and 61.50a±2.06, and the chest girth was of 69.26±2.09, 82.28±1.84 and 94.90a±3.33 (cm) respectively for three age groups. Body weight had highest correlations with length of (r = 0.84), and good correlations with chest girth (r = 0.75), whilst lowest and weak correlation between body weight with height of (r = 0.58) and age of (r = 0.45) at any age groups.

Keywords: morphometric, body weight, age and Batur sheep

INTRODUCTION

Batur sheep are the predominant breed in the upland areas of Banjarnegara where they are well adapted to the local cold humid environment. This breed developed by crossing between local breeds (Fat and Thin Tailed Sheep, Garut sheep) and imported breed (Merino) (Prayitno, 2010). Sheep reared in Batur village has similar morphological features as well as Merino and a mix of Merino and local sheep. Batur sheep genetic status is unknown because they do not have a clear pedigree record. Batur sheep has been taking place on upland areas and has made a major contribution to environmental and social development in those areas. They are reared as a vital component of integrated farming activities, especially by small holders of horticulture farming. Commonly, raising sheep for producing meat and lamb, and also producing dung for providing compost (Sodiq et al. 2011). Population of Batur sheep has increased by nine percent over the pass one year (Dinas Pertanian, Perikanan dan Peternakan Kab. Banjarnegara, 2010) with the population dynamic in terms of net rate of numerical growth ranged from -75 up to 400% (Sodiq, 2011). Those figures indicating the vital roles of Batur sheep to the livelihood of rural communities particularly in Batur and Pejawaran sub-districs. At present many countries are losing their genetic resources which may have lasting effects on food security and sustainable development especially in light of global warming changes. More than 20% of documented breeds are classified as at risk of extinction and in the last five years over 60 breeds were lost, approximately one per month (FAO, 2007). Further, an estimated 70% of breeds which do not have information on their extinction risk are to be found in developing countries (Kenene et al., 2009). The use of quantitative information in livestock breeding programmes has become more sophisticated over time. This allows breeders to make faster progress in a

chosen set of traits. Phenotypic information was initially used in mass selection, whereby individuals with better trait values were chosen to be parents of the next generation. This model has worked remarkably well and has allowed much progress in genetic merit (Dodds et al., 2007). According to Rodero and Herrera (2000), studies are necessary to characterize, identify and differentiate populations, while origin and history of breeds should be documented, as well as their geographical distribution, qualities and aptitudes, phenotypic description and morpho-structural traits (Mariante and McManus, 2004). This is highlighted by (Phillling et al. 2008) in relation to Production Environment Descriptors (PEDs) and the need to combine production and environmental information on all breeds available worldwide so that informed management decisions about breed choice and substitution can be made. Morphological diversity is a good reflector of ecological selection regimes and history of a breed (González et al., 2011). In addition, phenotypes are an expression of genetic characteristics, modified by environmental conditions and variance in both genetics and environment may affect phenotypic variance (Yakubu et al.,2010; Kunene et al., 2014). Body size has been used to differentiate Indonesia local sheep (Suparyanto et al., 1999; Mansjoer et al., 2007), goat (Lanari et al., 2003), and duck (Brahmantiyo, 2003). Another technique that can be used to estimate the diversity and genetic distance is blood protein polymorphisms (Shahrbabak et al., 2010).

Very less information on the production aspects of morphometric and body weight of Batur sheep. Hence, Native sheep genetic resources are a large source of income and are of great cultural value in many countries including Indonesia. In this study, we analyzed only four body measurements in Batur sheep to find indirect parameters for meat production that potentially could be used for selective purposes in Batur sheep population, this general aim was to explore the possibility of genetic diversity within Batur sheep.

MATERIALS AND METHODS

Animals

The trial was carried out on a sheep farm at Banjarnegara area -Central Java province of Indonesia- under the control of 13 owners with total of 69 heads and random mating system. The altitude of regions around 800-1200 m above sea level with the annual rainfall average 2867 mm. Batur sheep are housed at night in elevated pens with slatted floors and are provided with feed cut and carried from roadsides, fallow land, and also from special land for growing forages. Some family flocks are permanently housed, while in others they graze under supervision and tethering during part of the day. They are maintained in family flocks of ranged from 2 to 70 heads and an average 9 head (Sodiq, 2011).

Measures

Over the course of two years (2016 – 2017), all the animals of the flocks, aged between 0.5 and 3 years at start of test weighed and measured, depending on age: 6 months (young), 12 months (year) and 24 months (adult), but the adult male data were not sufficient so that it is ignored. Each animal was then submitted to a number of measures varying from six months till adults, measured one at the time, body weight was recorded in kg, while body measures were taken by tape in cm. The linear measurements were: 1) Height at withers (HW) from the top of withers to the ground. 2) Chest Girth (CG) behind the posterior edge of the shoulders at the point of least perimeter. 3) Body Length (BL) from the anterior edge of shoulder to the posterior edge of ischium).

Statistical analysis

Phenotypic data were analyzed using simple descriptive analyses (mean, standard deviation), analysis of variance, and principal component relations using GLM, Correlation

procedures of Statistical package (SPSS version 16). Data were then split into three sets based on sheep age (dentition). The age range used for sheep was according to the method of (Salako 2006) for classifying extensively raised sheep whose actual ages are not known into age groups for the purpose of research.

RESULT AND DISCUSSION

Means, standard errors of age and sex effects on each morphological trait measured in Batur sheep are presented in Table 1. The measure of sexual dimorphism (male/female) has also been included in the same table to express differences between morphometric measurements of different age groups males and females but the adult male data were not sufficient so that it is ignored. Body weight of three age groups (yang, year and adult) were 27.28±1.76, 48.87±1.55 and 69.10a±2.80 kg respectively. Mean of morphometric traits of body dimension (length, height and chest girth). The mean of length was 54.10±1.19, 67.28±1.05 and 71.70a±1.91 (cm). The mean of height at withers was of 53.55±1.30, 60.15±1.14 and 61.50a±2.06 (cm). The chest girth was 69.26±2.09, 82.28±1.84 and 94.90a±3.33 (cm) respectively for three age groups. Body weight and morphometric traits at six months grew up fast than yearling and adult age.

Table 1. Means and standard error of age and sex effects on morphometric traits in Batur sheep

Trait		**Mean ± std err.**			**Male**			**Female**	
Age	Young	year	Adult	Young	Year	adult	Young	Year	Adult
BW	27.28±1.76	48.87±1.55	69.10a±2.80	29.09±5.80	50.07±9.02	-	25.45±5.96	47.67±8.11	69.1±14.68
BL	54.10±1.19	67.28±1.05	71.70[a]±1.91	56.55±5.07	68.00±5.24	-	51.67±5.05	66.56±5.91	71.7±9.00
BH	53.55±1.30	60.15±1.14	61.50[a]±2.06	55.55±5.39	61.13±6.29	-	51.47±7.95	59.17±5.25	61.5±7.65
CG	69.26±2.09	82.28±1.84	94.90[a]±3.33	68.73±10.78	83.07±12.06	-	69.80±4.95	81.5±10.84	94.9±13.21

BW = Body weight (kg), BL = Length (cm), BH = Height (cm), CG = Chest girth (cm).

Table 2. Significance of Variance analysis of Batur sheep

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	24.497a	5	4.899	39.606	0.00
Intercept	0.005	1	0.005	0.040	0.84
Body weight	3.684	1	3.684	29.779	0.00
length	0.125	1	0.125	1.009	0.32
height	0.081	1	0.081	.655	0.42
girth	0.010	1	0.010	.078	0.78
Sex	0.483	1	0.483	3.903	0.05
Error	7.793	63	0.124		
Total	248.0	69			
Corrected Total	32.29	68			

a. R Squared = .759 (Adjusted R Squared = .739), Dependent Variable: age

The univariate significant test presented in Table 2. All morphometric traits were not significantly at any age. Nevertheless; sex and body weight were significant (P = 0.05), males outgrew the females at all different three ages. The description of the Batur sheep given in the present study shows that the breed is approximately equal bodied compared to other breeds described elsewhere (Dossa et al., 2007; Traoré et al., 2008b). For instance, mature Doper sheep described by (Fourie et al. 2002) had an average height at withers of 63.7 and 62.9 cm, heart girth of 92.8and 88.3 cm and live weight of 57.5 and 50.8 kg,

respectively. Overall, the Dorper described was not far to the Batur sheep shown in Table 1 in Batur area with height at withers of 61.50±2.06 cm, chest girth of 94.90±3.33 cm, who's finding the present study confirmed. In spite of, the body weight of Batur sheep is greater than Dorper sheep in this study. Differences between females and males in Height at Withers were not significant at any age. This is opposite to data recorded by (Da Costa et al. 2014) on Santa Ines sheep, in which males were always taller than females. The evaluation of body measurements for meat producers is important as they indicate carcass production as well as respiratory and digestive capacity in animals (Santana, 2001). Nevertheless, according to (Costa et al. 2006), it is not certain whether larger or smaller animals determine greater productivity, but there is consensus that certain types or sizes are more adequate for specific management conditions.

Table 3. Coefficients of correlation among morphometric traits in Batur sheep

Trait	Age	BW	length	height	Chest girth
Age	1.000	0.86**	0.73**	0.45n.s	0.65**
BW	0.86**	1.000	0.84**	0.58**	0.75**
Length	0.73**	0.84**	1.000	0.63**	0.62**
Height	0.45n.s	0.58**	0.63**	1.000	0.58**
C.girth	0.65**	0.75**	0.62**	0.58**	1.000

BW= body weight, n.s = no significant

Pearson correlations among various morphometric variables are shown in Table 3 body measurements were positively significant and Height with age were not significant. Coefficients of correlation were relatively higher for all the body measurements in young sheep than those for adult sheep. Body weight had highest correlations with length of (r = 0.84), and good correlations with chest girth (r = 0.75), whilst lowest and weak correlation between body weight with height of (r = 0.58) and age of (r = 0.45) at three differences age groups. There is no significant correlation between age and height at withers. The length accounted for close to 84% of the body weight in this study, it was found to predict body weight with higher precision, also better than the other measurements (e.g. body height and chest girth) in estimating live weight. The finding that young sheep had relatively higher correlation coefficients amongst body measurements than adult sheep is a reflection of predominant metamorphic growth at this stage (Salako, 2006). A confirmation of this finding can be seen in significance of morphometric differences between younger age groups. Some of the body parameters are earlier maturing than others. Size and body conformation are critically important traits to most sheep producing farmers and are presumably under strong selection in most breeds. However; Batur sheep have not been subjected to intense selection program.

CONCLUSION

It can be concluded that the study of the morphometric indexes was able to evaluate and emphasis the importance of specific body measures, such as height, length and chest girth which is functional to meat production to achievement a selection plan for Batur breed.

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