PHENOTYPIC VARIATIONS IN BIRTH AND BODY WEIGHT OF THE LOCAL SHEEP AT EARLIER AGE

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Abstract. The aim of this study was to investigate the phenotypic variations in birth and body weights at various ages of local sheep, total of 37 heads, born as singletons n =13, twins n = 19, triplets n =5. The lambs were reared at two locations Purwakarta and Jatinangor under extensive feeding system and grazing. All animals were weighed monthly till six months of age by hang scale (kg). Data analyzed by SAS (version 9.0). Means ± SE for the birth and body weights were performed. Analysis of variance GLM was done to examine the effects of sex, type of birth and location on the measured variables. Results shown that birth weight ranged between 1.50 to 3.50 kg, the overall means of the type of birth are: single, twins and triplets were 2.69±0.12, 2.24±0.11 and 1.96±0.20 respectively, male weight were 2.355±0.122, females were 2.220±0.126, also birth weight at Purwakarta is of 2.218±0.106 and Jatinangor is of 2.447±0.156. Males heavier than females but there are no significant differences among locations, sex, and interaction between them, however; the type of birth was significantly affected by birth weight. The logistic growth model is given highest correlation (R = 0.98) for the body weight–age relationship of local asheep and the inflexion point of growth was happening at the first month of age.

Keywords: local Sheep, body weight, birth weight and earlier age.

INTRODUCTION

Early growth traits are important factors influencing profitability in any meat producing enterprise. Sheep is the fourth meat producer after poultry, cattle and swine. Currently, the sheep contributes 16.12% for national meat productions while the population almost 59.52% in West Java (Agriculture Ministry/Deptan, 2013). Padjadjaran Sheep is a local sheep that have undergone purification maternal lineage, ie the dam line search using mitochondrial - DNA analysis proved to have a variation in the form of mt - DNA 75 bp deletion, at position 1447 bp, Other qualitative characters are white color, wide ear, males are horned and triangular shaped tail (Bandiati 2012). In mammalian species, maternal effects contribute complexity to phenotypic measurements for many traits, and especially those measured early in life (Wolf et al., 1998). Maternal effects are unre-lated to the offspring's own genotypes and have their own genetic and environment origins. For example, in mammals, lactation has a critical effect on offspring growth rate and performance and may be determined by both the mother's genotype and her environment. To obtain accurate estimates of heritabilities, the contribution of maternal effects to phenotypic variation of interested traits should be quantified (Ghafouri-Kesbi et al., 2011). Growth usually defined as the increase in size or body weight at a given age is one of the important selection criteria for the improvement of meat animals such as sheep, the growth influenced by genetic and environmental factors, is explained by Brody, Gompertz, Logistic, Richard's, and Bertalanffy growth models, each of which is defined as a non-linear function (Kum et al., 2010). These non-linear growth models used to describe relationship between lifetime weight and age allow us to determine managerial problems and ideal slaughtering age in sheep. Parameters of these growth models presents are estimated for genetically improving the growth in selection program. During the recent years, some authors (van Wyk et al., 2003; Abegaz et al, 2005; Ekiz, 2005; Abbasi et al., 2012; Mohammadi et al., 2013) included the maternal temporary environmental effect in animal models and found it significant for growth traits of sheep. Moreover, it was reported (Yazdi et al., 1997; Maniatis and Pollott, 2002; Safari et al., 2005; Kushwaha et al., 2009) that maternal influences tend to decrease with age of lambs, but they never disappeared completely after weaning. The purpose of this paper was to study the phenotypic variations in birth weight and body weights for six months of age to the local sheep.

MATERIALS AND METHODS

Animals of Experiment and Management

Data were collected from total (37 heads) of local sheep, n=21 males and n=16 females. Lambs were tagged and identified to their dams and were born as singleton (n =13), twins (n = 19), triplets (n =5), Age of the ewes was not recorded, so could not be included in the statistical analyses. The lambs were kept into two locations, birth and body weight of n= 8 Heads taken at breeding station -faculty of animal husbandry- (Jatinangor), and 29 Heads at Purwakarta. The animals were indoors all year at the farm under extensive feeding system and grazing. Birth weight had taken two an hour after parturition. Body weight (BW) of all animals was weighted in the morning before feeding the lambs used hang scale (kg), the relevant information about the newborn lambs such as birth type, birth date, sex and birth weight, furthermore, body weights were recorded monthly from birth until 6 months of age. Animals were fed twice daily with two equal amounts. Data analyzed by statistical package SAS (version 9.0). least square analyses (Means ± SE) were conducted using the GLM with a model including fixed effects of birth weight, sex, type of birth and location, and body weights were calculated used curve expert program.

RESULTS AND DISCUSSION

Table 1: Least squares means ± S.E. of birth weights

Sex	Mean +std. error
Male	2.36±0.12
Female	2.22±0.13
type of birth	
Single	2.67±0.12
Twin	2.24±0.11
Triplet	1.96±0.20
Location	
Purwakarta	2.21±0.11
Jatinangor	2.45 ±0.16

Table 2. General linear model of birth records

Source	DF	SS	MS	F Value	Pr> F
Location	1	0,213	0,214	1,18	0,285
Sex	1	0,149	0,149	0,83	0,370
type of birth	2	2,680	1,340	7,43	0,002
location*sex	1	0,230	0,230	1,27	0,268
sex* type of birth	2	0,254	0,127	0,70	0,502

Dependent Variable is birth weight.

The significant effect of sex of lambs on traits related to growth has been reported by (Dass et al. 2004), (Yilmaz et al. 2007) and (Al-Bial et al. 2012). The difference in body weights and growth rates of two sexes might explained by this fact that females allocate a high proportion of their resources to reproduction relatively early in life; males favor somatic investment for a longer period than females and generally are larger than females at different points of growth trajectory (Stearn, 1992). Arises from differences in nutrition and agro-climatic conditions which affect animals' growth. Regarding birth type, single lambs were heavier than twins and gained more weight during all growth phases in agreement with (Yilmaz et al. 2007) and (Al-Bial et al. 2012). Twins weighed less at birth compared to singles. In addition, competition between lambs for milk results in lower milk consumption and, consequently, lower weight gains during pre-waning period and lower weaning weights compared to singles (Baneh and Hafezian, 2009). One way to test the occurrence of variance compounding and compensatory growth processes is monitoring patterns of changes in causal variance components during ontogeny. Under variance compounding hypothesis, an increase in VA, VE, and VP with age is expected. In both the sexes, the results show an increasing trend for non-standardized additive genetic variance up to 6 months of age. This indicates that additive genetic variation may increase with age through addition of new variance (Atchley and Zhu, 1997).

Analysis based on standard birth records in tables (1 and 2), generally birth weight of this study ranged between 1.50 (twin) to 3.50 kg (single), the overall means of type of birth are: single, twins and triplets were 2.685±0.124, 2.242±0.111 and 1.957±0.204 respectively, and male lambs weight were 2.355±0.122, females were 2.220±0.126, also birth weight at Purwakarta is of 2.218±0.106 and Jatinangor is of 2.447 ±0.156. (Soeparna et al 2014) reported that birth weight of this local sheep ranged 1.8 to 3 kg, this in agreement with this observed result. Males heavier than females but there is no significant different between locations, sex, interaction between location, sex and type of birth, nevertheless, the type of birth was significantly different, the single lambs outgrew the multiples. This results in agreement with (Yilmaz and Altin, 2011) which reported that, in local cross bred sheep, this implies that litter size has a negative correlation with birth weight of lamb. Males lambs were higher (though not significantly except at birth) in weight than females lambs. This might partly be due to the pre-natal (Williams, 1968) and pre-weaning advantage in male as compared to female lambs as suggested by (Iyeghe et al. 1996). However, the maintenance of birth growth advantage to later ages (Tuah and Baah, 1985), as observed herein, is supported by the maternal ability of ewes when suckling heavier lambs which tend to be male (Newman et al., 1993) or of lamb's subsequent ability to eat grass. These differences between male and female lambs were similar to those reported in beef cattle (Afolayan et al., 2002a,b).

Table 3. Means and stander deviation of lamb's body weight

Month	Minimum	Maximum	Mean	Std. Deviation
Birth weight	1.50	3.50	2.33	0.504
1	2.58	10.00	5.60	2.05
2	4.80	13.00	7.68	1.90
3	6.70	13.40	9.52	2.14
4	5.92	15.30	9.004	2.30
5	6.70	12.00	9.37	1.53
6	8.00	18.50	12.44	3.06

Table 3. shown the overall mean of body weight ranges 5.60±2.05 at first month to 12.44±3.06 kg at sixth month of age for all lamb's males as well as females, with maximum body weight of 10 kg at first month and 18.50 kg at six months of age.

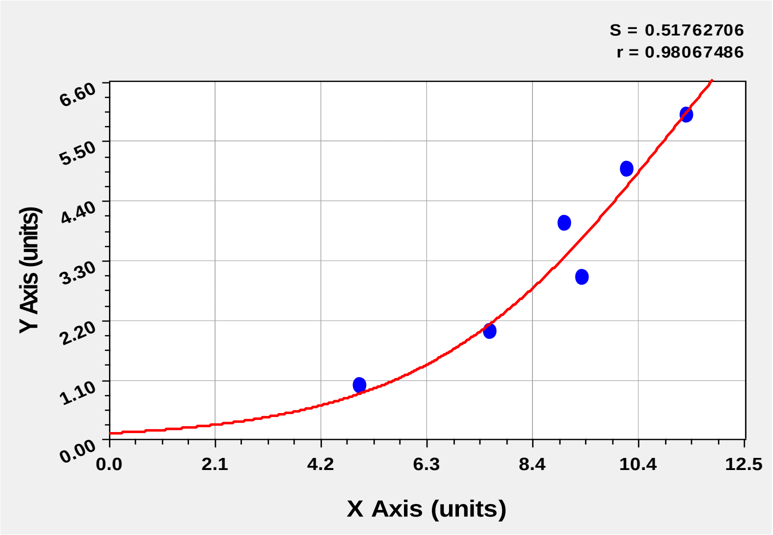

Figure 1: Logistic curve for body weight, Y axis = months, X axis = body weight.

Model: y = a/(1+b*exp (-cx)).
Where:
Y is the weight at time;
A is the asymptotic live weight for Logistic model
B: The rate of body weight gained after birth to mature body weight (point of inflection)
C= rate parameter or maturing index relating how quickly approaches A.

Root of Mean Square Error (RMSE) and Determination Coefficient (R) values of logistic growth model are given in figure1, as the result gave reliable (R = 0.98 for male and female) results for the body weight–age relationship of local sheep with coefficient data model: y = 11.46/(1+93.51*exp(-0.41X)), this model allows us to acquire beneficial information such as determination of fattening performance, optimum slaughtering age, and regulation of feeding regimes for local sheep. In present study, the highest increase of body weight was at first month which the inflection's point of growth happened. 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.

CONCLUSION

Location and sex has not effects on birth weight however; the type of birth was significantly effect on birth weight. Logistic growth model is reliable (R 0.98) for the body weight – age relationship of local sheep at early age and inflection point of growth was happen at first month of age. Moreover, further studies are needed on body weight until adult age.

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