Use of Body Measurements to Predict Intermuscular Fat in Thin-Tailed Lambs

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Use of Body Measurements to Predict Intermuscular Fat in Thin-Tailed Lambs

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Abstract

The objective of this study was to evaluate the using of body measurements to predict intermuscular fat in Thin-tailed lambs. Live body measurements (chest girth, depth of body, body length) and intermuscular fat were performed in twenty-two Thin-tailed lambs with an average age of 7 to 8 months and an average slaughter weight of 24.28±2.43kg. Intermuscular fat was weighed after carcasses were chilled at 18^{o}C for 10 hours. The study revealed a strong correlation between chest girth and intermuscular fat (r = 0.64, p<0.01), while the depth of body and body length showed low correlations with intermuscular fat (r = 0.24 and 0.20). The results of this study indicated that chest girth had favorable correlations with intermuscular fat. Thus, intermuscular fat prediction using chest girth is a valuable tool to evaluate the carcass quality and quantity in Thin-tailed sheep.

Keywords: body measurements, intermuscular fat, prediction, thin-tailed lambs

Introduction

In recent years, the interest to manipulate the fat composition has been increasing. This is because meat is seen to be a major source of fat in the diet and especially of saturated fatty acids, which has been implicated in diseases associated with modern life, especially in developed country (Wood et al., 2003). For consumers in many countries, fat is an unpopular component of meat because being considered unhealthy. Dietary fat has been hypothesized to increase the risk of colorectal cancer and cardiovascular disease (Webb and O'Neill, 2008). In the other side, fat becomes central to the nutritional value of meat and contributes importantly to the meat quality and price. Fat determines the flavour, smell, juiciness, and tenderness, which have a direct impact on the meat value (Wood et al., 2008), but an excessive increase in fat deposits has low commercial value because it reduces carcass quality, and there may be consumer rejection (Costa et al., 2017).

Among ruminants, it is observed that sheep have a high ability to accumulate internal fat, which acts as an energy reverse for times of food and water scarcity. The body fat in sheep is distributed in the form of visceral, subcutaneous, intermuscular, and intramuscular fat deposits (Costa et al., 2017). Many studies have been trying to evaluate the quality and quantity of these deposits on the live animals using different methods such as modern image analysis techniques, live animal allometric measurements, and neural modeling methods (Slosarz et al., 2001; Font-i-Furnols et al., 2014; Ermias and Rege, 2003; Stelzleni et al., 2003). This evaluation will become

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increasingly important to seed stock and commercial beef producers for producing a consistently high-quality meat (Stelzleni et al., 2003).

However, the use of sophisticated evaluation, usually high cost, has become the methods of choice for providing levels of accuracy and precision that are acceptable for most purposes. Nonetheless, cost, operational complexity and lack of widespread availability limit the use of the techniques in developing countries. Thus, there is need to develop techniques which combine cost-effectiveness, acceptable precision, local availability and ease of application (Ermias and Rege, 2003). Nogalski et al. (2017) reported that body measurements reveal a positive correlation with subcutaneous and intramuscular fat depositions, and can be a valuable tool in the process of selecting young beef quality traits and determining the slaughter value of young beef cattle. The prediction of intermuscular fat deposition in lambs is better than intramuscular fat because visceral and subcutaneous fat as a non-edible fat has been deposited, while the intramuscular fat has not been excessively grown. There is limited information about the correlation between body measurements and intermuscular fat deposition in lambs, the objective of this study, therefore to evaluate the using of body measurements to predict intermuscular fat in Thin-tailed lambs, which are the commonest sheep for meat production in the northern dry tropics and western humid areas (Food and Agriculture Organization of the United Nations, 1991).

Methodology

The experiment was carried out at the Faculty of Animal and Agriculture Sciences, Diponegoro University, Semarang, Indonesia. Twenty-two Thin -tailed lambs were used with an average age of 7 to 8 months and an average slaughter weight of 24.28±2.43kg. Two lambs were slaughtered every day. Before slaughtered, lambs were fasted for 6 hours and weighed to get the average slaughter weight. Chest girth (CG) was measured behind the scapula by measuring tape. Body length (BL) was measured as the distance between the point of shoulder and the pin bone. The depth of body (DB) was measured as the vertical distance from sternum to withers (Riva et al., 2004). Slaughter was performed according to standard procedures. After slaughtering and dressing, carcasses were chilled at $18^{\circ}C$ for 10 hours. Later on, intermuscular fat (ITF) was removed from the carcass and weighed. The data was analyzed by correlating each body measurements (x) with ITF (y). Based on Christmann and Badgett (2009), the formula was equated as $y = ax + b$, while coefficient of correlation was interpreted as very weak (0.000-0.200); weak (0.201-0.400); moderate (0.401-0.600); strong (0.601-0.800) and very strong (0.801-1.000).

Results and Discussions

The body measurements and intermuscular fat statistics are presented in Table 1. The intermuscular fat was significantly varied and had the highest coefficient of variants (CV) among the variables, which can be attributed mainly to the growth rate. Body measurements grow earlier, so if the body measurements reach their inflection point, they will grow slower. Fat grows later in life and affected by feed consumed between the examined animals (Owens et al., 1993). The feeding system, whether using concentrate feeding or pasture feeding or both, influence the growth and carcass characteristic of animals. Animals fed concentrate diets tend to have higher fat value compared to range-fed animals (Webb and O'Neill, 2008).

Table 1. Body measurements and intermuscular fat of twenty-two Thin-tailed lambs

Variables	Mean	Range	SD	CV (%)
CG (cm)	63.76	58.60-69.40	3.01	4.73
BL (cm)	56.11	53.00-60.95	1.94	3.46
DB (cm)	24.33	20.10-25.80	1.34	5.49
ITF (g)	1,336	589.9-3,669	658.3	49.27

CG = chest girth; BL = body length; DB = depth of body; ITF = intermuscular fat

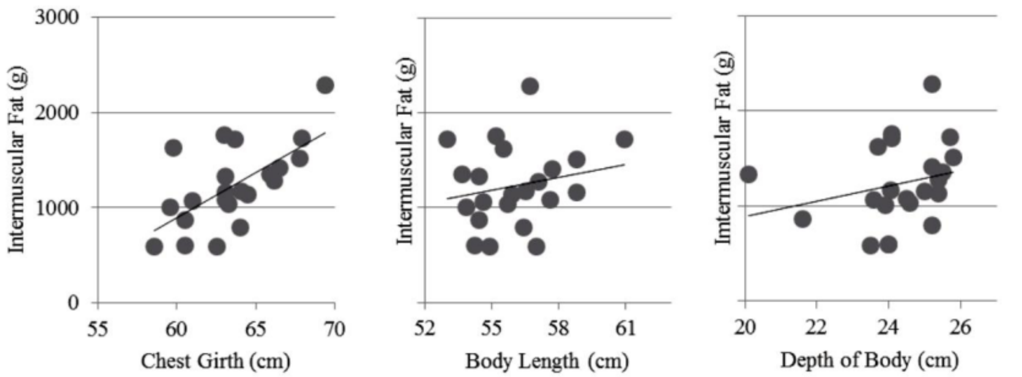

Figure 1. Correlation between body measurements and intermuscular fat

Figure 1 shows the correlation between body measurements and ITF, while the data in Table 2 represents the coefficient of correlation (r), the coefficient of determination (R^2), and equation (y) from regression analyses involving body measurements and ITF in Thin-tailed lambs. It was observed that CG had strong positive correlations with ITF (r = 0.64, p<0.01). BL and BD were poorly related (0.20 and 0.24) to ITF. CG contributed 41%, while each BL and DB only represented 4% and 6% of the variation in ITF deposit of Thin-tailed lambs. Nogalski (2017) also reported that thickness of subcutaneous back fat and thickness of subcutaneous rump fat were best estimated by CG rather than by other body measurements.

Table 2. Coefficient of correlation (r), coefficient of determination (R^2), and equation (y) from regression analyses involving body measurements and intermuscular fat in Thin-tailed lambs

Independent variables (x)	Y	r	R^2	Level of significance
CG	y = 94.79x – 4793	0.64	0.41	*
BL	y = 45.83x – 1338	0.20	0.04	ns
DB	y = 79.70x – 705.0	0.24	0.06	ns

CG = chest girth; BL = body length; DB = depth of body; * = p<0.01; ns = Not-significant

CG became the independent variable with the highest coefficient of correlation because it represents ITF deposit that covers the entire chest of the animals. The size of CG will vary based on the fat deposit of the body. The greater the number of ITF deposit, the larger the size of CG. BL had the lowest influence on ITF because it reflects the body frame, not the fat deposit of the animals. This agrees with that obtained by Agamy et al. (2015) who reported that bone weight of Ossimi ram-lambs showed significant correlation with BL. The increased BL is due to skeletal growth, while increases in girth are due to muscle development plus the accumulation of adipose

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tissue (Assan, 2013). Since DB can determine either increment or impairment of the intermuscular thickness in the chest of the lambs, it had the higher coefficient of correlation rather than BL.

Conclusion

The results of this study indicated that chest girth had favorable correlations with intermuscular fat. Thus, intermuscular fat prediction using chest girth is a valuable tool to evaluate the carcass quality and quantity.

Acknowledgements

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