

Comparative performance of Landrace, Yorkshire and Duroc breeds of swine

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Received January 05, 2017; Accepted February 23, 2017

ABSTRAK

Penelitian bertujuan untuk menganalisis perbedaan kemampuan genetik ternak babi dari bangsa Landrace, Yorkshire, dan Duroc dengan melakukan evaluasi terhadap produktivitas yang memiliki nilai ekonomi yang sangat penting. Ternak babi sebanyak 49 ekor yang terdiri dari 15 ekor jantan dan 34 ekor betina dengan bobot badan awal 18,50-21,50 kg dipelihara dalam kondisi lingkungan yang sama. Rancangan yang digunakan adalah Rancangan Acak Lengkap dengan perlakuan 3 bangsa (Landrace, Yorkshire, dan Duroc). Data dianalisa menggunakan analisis peragam (Ancova) dan uji Least Square Means. Hasil penelitian menunjukkan bahwa penampilan produksi bangsa Landrace, Yorkshire, dan Duroc berbeda signifikan terhadap konsumsi ransum harian, penambahan bobot badan harian, konversi pakan, tebal lemak punggung, indeks seleksi, dan umur pada saat mencapai bobot 90 kg, kecuali konsumsi ransum harian pada jantan. Berdasarkan kondisi lingkungan pemeliharaan, Yorkshire dan Landrace memiliki potensi unggul dalam laju penambahan bobot badan, konversi pakan, indeks seleksi, dan umur pada saat mencapai bobot 90 kg yang lebih singkat dibanding Duroc. Duroc berpotensi menghasilkan lemak punggung yang lebih tipis yang berpengaruh dalam kualitas daging dibanding Yorkshire dan Landrace.

Kata-kata kunci: babi, bangsa, nilai produksi

ABSTRACT

The objectives of this study was to analyze the comparative ability of animal genetic, using evaluation of production that has important economic traits including Landrace, Yorkshire, and Duroc breeds of swine. A total of 49 swine consist 15 boars and 34 gilts, with average body weight of 18.50-21.50 kg were used in this research. All of samples were raised in the same pen and feeding management. This research used the experimental method of Completely Randomized Design involving three treatments of animal breeds including Landrace, Yorkshire, and Duroc breeds. The data were analyzed by using analysis of covariance procedur General Linier Model and Least Square Means test. Boars and gilts were analyzed in separated data. The result showed that the effect of breed was significantly associated for all traits, but not for boars feed intake. The overall, Yorkshire and Landrace performed better than Duroc for average daily gain, feed conversion ratio, selection index, and age at 90 kg body weight. However, Duroc boars and gilts had the thinnest backfat followed by Yorkshire and Landrace.

Keywords :breed, production traits, swine

INTRODUCTION

Landrace, Yorkshire, and Duroc are the popular breeds in Indonesia that have excellent genetic potential for high production. These breeds have the most desirable level of production traits, and therefore assure highest economic gains. Growth rate, feed conversion efficiency, and backfat thickness are considered the most important economic traits of swine. According to Sihombing (2006), pig is included to monogastric animals that has the prolific genetic potential to be developed, high litter size, and can utilize all types of agricultural waste. Moreover, Hoque *et al.* (2007) also proposed as feed constitutes a large portion (60-70%) of pig enterprise costs, this has desirable implication on enterprise profit. However, the consumers of the pig in Indonesia are limited in adequate maintenance system.

Recently, some studies discussed the comparative performance of breeds of swine and effect of breed on production traits (Siagian, 1984; Mijatovic *et al.*, 2005; Ramesh *et al.*, 2009). Mijatovic *et al.* (2005) analyzed the effect of breed among boars of the three different swine breeds. Breed effect was highly significant ($P < 0.001$) for growth and feed efficiency traits. Furthermore, Hermes *et al.* (2000), using data for Yorkshire and Landrace breeds, established the effect of breed for traits of carcass composition and meat quality are significant.

Study performance is important to know the ability of individually of livestock. Rózycki (2003) proposed that result of the performance test was one of the main criteria in the selection of pig for breeding and livestock production. Some author use performance traits for the evaluation of growth ability, others use parameters from testing stations (Bečková *et al.*, 2005; Kernerová *et al.*, 2006; Michalska *et al.*, 2014). Therefore, an evaluation of the livestock in advance is very important to know the conditions in which animal are kept before any definite recommendations can be made.

The objectives of this study was to analyze the comparative ability of animal genetic using evaluation of production that has important economic traits including Landrace, Yorkshire, and Duroc breeds of swine.

MATERIALS AND METHODS

Animals

This study was located in Animal Breeding

Center [BBTU-HPT] Siborongborong, Siborongborong Regency, North Tapanuli District, North Sumatera Province in the period of February 2016 until June 2016. A total of 49 swine of three different breeds; pure Landrace (5 boars and 12 gilts), pure Yorkshire (5 boars and 12 gilts), and pure Duroc (5 boars and 10 gilts) were used in this study.

In this farm the boars were reared individually in performance-testing pens. Gilts were reared in growing pens and animal group were fed with three until four pigs per pen. The piglets in each group were fed *ad libitum* using concentrate feed. Boars and gilts were analyzed in separated data and did not compare between boars and gilts. Selection of piglet is made on the basis of performance of each pig tested, with equivalent age in the herd, fed, and managed under the same conditions.

Variables of Study

The variables that measured were average daily feed intake, average daily gain, feed conversion ratio, backfat thickness, selection index, and age at 90 kg body weight. Feed intake was recorded every day from the start to finish body weight. Daily gain was calculated as the difference between the start and finish body weights divided by the number of days. Feed conversion ratio was calculated as feed intake divided by daily gain. Backfat thickness was measured on all live animals at ± 90 kg on the left side at half body length in three sites including shoulder-just behind the shoulder directly above the elbow joint, mid-back-where the last rib meets the back; and loin-directly above the stifle joint.

Selection index (SI) used the formula from de Baca (1962):

$$SI = 240 + 110 ADG \text{ (kg)} - 50 FCR - 19.7 BT \text{ (cm)}$$

where :

SI : Selection Index

ADG : Average Daily Gain (kg)

FCR : Feed Conversion Ratio

BT : Backfat Thickness (cm)

Age at 90 kg body weight represents the number of days from birth to reach about 90 kg live weight. The initial record were divided into two data sets classified according to sex and analyzed separately because boars were performance-tested individually while gilts were group-tested.

Data Analysis

The data were analyzed by analysis of covariance (ANCOVA PROC GLM) and Least Square Means test procedure of SAS 9 (SAS Inst., 2008). This research used the experimental method of Completely Randomized Design with the statistical model based on Matjik and Sumertajaya (2002) as follows:

$$Y_{ij} = \mu + \alpha_i + \beta(x_i - \bar{x}_{..}) + \varepsilon_{ij}$$

Where

- Y_{ij} : the mean value of the trait
 μ : the general mean; α_i is the fixed effect of breeds
 β_i : the regression coefficient indicates the dependence Y_{ij} to X_{ij}
 X_{ij} : the measurement concomitant variables from breeds and frequency
 \bar{x} : the measurement concomitant variables from breeds and frequency
 ε_{ij} : the random error

RESULTS AND DISCUSSIONS

Production Performance of Landrace, Yorkshire and Duroc Boars

Performance production of Landrace, Yorkshire, and Duroc boars is presented in Table 1. There was no effect of breeds ($P>0.05$) for average daily feed intake. The effect of breeds was highly significant ($P<0.01$) for average daily gain, feed conversion ratio, backfat thickness, selection index and significant ($P<0.05$) for age to

reach 90 kg body weight.

The result showed that there was no effect of breeds ($P>0.05$) for boars average daily feed intake (Table 1). Landrace and Yorkshire consumed an average 2.15 kg a day, and Duroc consumed 2.16 kg a day. The results agree with those of Mijatovic *et al.* (2005) who found that the effect of breed was no significant ($P>0.05$) for boars daily feed intake.

The highest average daily gain was observed in Yorkshire boars (0.72 kg), followed by the Landrace (0.66 kg) and Duroc (0.55 kg). Breed had a highly significant effect on this trait (Table 1). However, Ramesh *et al.* (2009) reported that the average daily gain was significantly ($P<0.01$) higher in Landrace than Yorkshire. This is caused by different effect of environment on performance.

The Yorkshire (3.01) and Landrace (3.26) had significantly better feed conversion ratio than Duroc (3.94). Breed had a highly significant effect on this trait. Mijatovic *et al.* (2005) also reported that breed had a highly significant effect to feed conversion. Substantial individual differences in feed intake exist and approximately 30% of these are explained by genetics (Cai *et al.*, 2008; Hoque *et al.*, 2008, 2009). Furthermore, it has been previously demonstrated that traits contributing to feed conversion are genetically related to economically important traits such as back fat (Cai *et al.*, 2008; Hoque *et al.*, 2009).

The Landrace, Yorkshire, and Duroc breeds had the average backfat thickness of 2.12 cm, 2.19 cm, and 1.81 cm respectively. Hoque and Suzuki (2008) reported that Duroc (1.62 cm) and

Table 1. Performance Production of Landrace, Yorkshire, and Duroc Boars

Trait	Breeds		
	Landrace	Yorkshire	Duroc
Average daily feed intake (kg/d)	2.15±0.01	2.15±0.01	2.16±0.01
Average daily gain (kg/d)**	0.66±0.02 ^B	0.72±0.02 ^A	0.55±0.02 ^C
Feed conversion**	3.26±0.11 ^B	3.01±0.10 ^B	3.94±0.10 ^A
Backfat thickness (cm)**	2.12±0.07 ^B	2.19±0.07 ^B	1.81±0.07 ^A
Selection index**	107.61±7.55 ^A	125.70±7.21 ^A	68.36±7.11 ^B
Age at 90 kg body weight (days)*	177.46±4.40 ^{ab}	165.60±4.20 ^a	188.94±4.14 ^b

Different superscript in the same row indicate significantly different at test level 5% and 1%; * Significant at 5% level; ** Significant at 1% level

Landrace (1.81 cm) boars had thinner backfat thicknesses than those in the present results. The highest daily gain tended to be fatness. The result showed that Yorkshire had the highest daily gain and backfat thickness than those of other breeds.

The index values of the Yorkshire, Landrace, and Duroc breeds, were significantly different being 125.70, 107.61 and 68.36, respectively. Yorkshire boars was the highest selection index indicating this breed had also the highest average daily gain and the lowest feed conversion compared with the other breeds. Duroc was the lowest selection index than of another two breeds, indicating this breed had also the lowest average daily gain and highest feed conversion.

The Yorkshire boars were the youngest of the three breeds. The average age at 90 kg for Yorkshire, Landrace, and Duroc were 165.60, 177.46, and 188.94 days, respectively. The effect of breed was significant ($P < 0.05$) for this trait.

Production Performance of Landrace, Yorkshire and Duroc Gilts

Performance production of Landrace, Yorkshire, and Duroc gilts are presented in Table 2. The effect of breeds were highly significant ($P < 0.01$) for average daily gain, feed conversion, selection index and age at 90 kg body weight. The effect of breeds was significant ($P < 0.05$) for average daily feed intake and backfat thickness.

Breed had a significant different effect on average daily feed intake for gilts ($P < 0.05$). Duroc gilts gave the highest feed intake than that of Landrace gilts and Yorkshire gilts (Table 2).

The highest average daily gain was observed

in Yorkshire gilts (0.66 kg), followed by the Landrace (0.59 kg) and Duroc (0.54 kg). Breed had a highly significant effect on this trait (Table 2).

Feed cost represents 65-75% of the total production cost on a pig farm, with the grower-finisher feed contributing the majority of this cost (Mullan *et al.* 2011). According to McGlone and Pound (2003), feed was the largest variable cost in swine production, representing 50 to 85% of production costs. The Yorkshire breed had significantly better feed conversion of 3.29 compared with that of Duroc of 4.13 (Table 2). Breed had a highly significant effect on this trait ($P < 0.01$).

Landrace, Yorkshire, and Duroc breeds had the average back fat thicknesses of 1.55 cm, 1.99 cm, and 1.51 cm respectively. This result showed that Duroc breed had thinner back fat compared with that of Landrace and Yorkshire breeds. Research of many authors (Lonergan *et al.*, 2001; Chen *et al.*, 2002; Edwards *et al.*, 2006) showed the advantage of the Duroc breed for growth and feed utilization, and confirmed the advantage of this breed in term of meat quality.

The indices for the Yorkshire, Landrace, and Duroc breeds were significantly different of 109.14, 93.96 and 63.79, respectively. Yorkshire gilts was the highest selection index as indicated by the fact that this breed had also the highest average daily gain but the lowest feed conversion compared with that of the other breeds. Gilts of Duroc breed had the lowest weight gain and poorer feed conversion. Gilts selected for efficient lean growth had fewer body reserves available

Table 2. Performance Production of Landrace, Yorkshire, and Duroc Gilts

Trait	Breeds		
	Landrace	Yorkshire	Duroc
Average daily feed intake (kg)*	2.10±0.03 ^B	2.17±0.01 ^B	2.23±0.02 ^A
Average daily gain (kg)**	0.59±0.03 ^{AB}	0.66±0.01 ^A	0.54±0.03 ^B
Feed conversion**	3.60±0.20 ^{AB}	3.29±0.09 ^A	4.13±0.16 ^B
Backfat thickness (cm)*	1.55±0.17 ^{AB}	1.99±0.08 ^B	1.51±0.14 ^A
Selection index**	93.96±14.07 ^{AB}	109.14±6.36 ^A	63.79±11.15 ^B
Age at 90 Kg body weight (days)**	193.64±9.40 ^{AB}	171.50±4.25 ^A	200.86±7.44 ^B

Different superscript in the same row indicate significantly different at test level 5% and 1%; * Significant at five per cent level ($P < 0.05$); ** Significant at one per cent level ($P < 0.01$)

when feed intake was insufficient, resulting lighter weaning weights and longer wean-to-service intervals at the time of body reserves were mobilized (Lewis and Bunter, 2011).

The Yorkshire gilts were the youngest of the three breeds. The average ages at 90 kg body weight for Yorkshire, Landrace, and Duroc were 171.50, 193.64, and 200.86 days, respectively. Breed effect was highly significant ($P < 0.01$) on this trait.

CONCLUSION

The breed effect of Landrace, Yorkshire, and Duroc boars was highly significant for average daily gain, feed conversion, backfat thickness, and selection index. Moreover, the breed effect for gilts was highly significant for average daily gain, feed conversion, selection index, and significant difference for average daily feed intake and backfat thickness. Generally, Yorkshire and Landrace breeds had better performance than Duroc breed for average daily gain, feed conversion, and selection index. However, Duroc boars and gilts had the thinnest backfat followed by that of Landrace and Yorkshire breeds.

ACKNOWLEDGMENTS

The authors gratefully acknowledge Swine Breeding Center (PTU-HPT Siborongborong, North Sumatera Province, for providing all facilities and sample of swine used in this study.

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