



Use of Some Linear Body Measurements to Characterize the Ashanti Black Pig Under Intensive Rearing in Ghana

KEYWORDS

Linear body measurement, Ashanti black pig, correlation

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ABSTRACT *The preservation and improvement of local animal breeds has aroused the interest of Sub Sahara African governments in recent years. These local breeds survive in the environment and perform better than the foreign breeds do under the same conditions. The Ashanti Black pig (ABP) is one such local breed and is undergoing genetic improvement in a government station in northern Ghana. However, there is little done to characterize this pig especially under intensive management. A physical characterization of 129 ABP (65 weaner/growers and 64 adults) was done using body length (BL), height at withers (HW), heart girth (HG), width of waist (WW), ear width (EW), ear length (EL), length of face (LF) and width of thigh (WT) as key linear body measurements..Data collected were subjected to Analysis of variance (ANOVA) using SPSS.and interrelationship of linear body measurements were estimated by simple correlation. Only HG showed significant difference between male and female weaner/grower pigs. For adults, HG was significantly different in favour of males; while HW, WW, EW and WT differed significantly in favour of females. From this study, the most fitting linear body measurements (LBMs) to describe the ABP weaner/grower was the HG; while for adults, it was BL, LE and HW.*

INTRODUCTION

About (50-60) % of pigs in Ghana are concentrated in five regions constituting the northern half of Ghana and over 90% of these are Ashanti Black Pigs (Barnes, 1994). According to Ahunu et al. (1995), the Ashanti Black Pig (ABP) constituted (70-90) % of the pig breeds used under the traditional system of producing pigs in Ghana.

The low productivity of the ABP is revealed through its low litter size of 5-7 piglets at birth, average litter size of 4 at weaning, mature body weight of 60 kg and pre-weaning mortality of 22.3% (Baffour-Awuahet al, 2005). Documentation of the performance and accurate characterization of the physical characteristics of the breed is inadequate.

In recent times, the interest to improve the performance of indigenous livestock breeds in Sub-Saharan Africa has increased. The Animal Production Directorate (A.P.D) of the Ministry of Food and Agriculture established nucleus breeding stations for the improvement of some local breeds of animals in 1992.

One of such stations was to improve the Ashanti Black Pig (ABP) through selection as the main breeding technique. So far, the largest concentration of ABPs under intensive management in Ghana is on this station in Babile in the Upper West region.

Characterizing the ABP with accurate physical characters will play a major role in easy identification and conservation of this genetic resource as the basis for future improvement at production and genetic levels (Birteeb, 2012).

Documentation of the performance and physical characterization of the ABP is inadequate especially under intensive management

1.2 Objective

The objective of this study was to physically characterize the Ashanti Black Pig under intensive management by us

of some key Linear Body Measurements.

MATERIALS AND METHODS

2.1. Data Collection

Data on 129 Ashanti Black Pigs (ABP), were taken.. The break-down was as in Table 1.

Table 1. Category and Sex Distribution of experimental Animals

Category	Age (months)	Males (№)	Females (№)	All (№)
Weaner/growers	2 – 3	34	31	65
Adults	8 -18	12	52	64
Total		46	83	129

Pregnant females in their second trimester of gestation (70 days) or beyond and lactating sows were excluded since their body physiology at these stages could greatly affect the results of the study.

Variables measured

Eight (8) linear body measurements (LBMs) were taken for each animal. These were body length of pig (BL), height at withers (HW), heart girth (HG), width of waist (WW), ear width (EW), ear length (EL), length of face (LF) and width of thigh (WT)

Brief description of the Linear Body Measurements

Body length (BL): This is the distance from the base of the tail to the poll of the head of the pig. The tailor's tape was stretched along the curvature of the animals mid back line

Height at withers (HW): A flat platform was used upon which the animal was placed. The height at wither was measured as the distance from the surface of the platform to the withers using a measuring tape.

Heart girth (HG): The Heart girth was measured by taking

the measurement of the circumference of the chest with a measuring tape. This is the measure across the region just behind the forelimbs. The tape is wrapped tightly and neatly around the region and reading done just behind the shoulder.

Width of waist or Pin bone to pin bone (WW): The distance between the two iliac crests (pin bone) on either side of the waist. The tape is placed to take the arc shape of the region and reading is done at one end.

Ear length (EL): Ear length is the distance between the tip of the ear and the base of the ear or point of attachment of the ear.

Ear width (EW): The width is the distance between the two sides of the ear through the middle of the ear.

Length of face (LF), Is the distance from the tip of the snout to the poll.

Width of thigh (WT). Distance across the middle of the thigh.

All measurements were taken in the morning before the animals were fed.

Data analysis

The data collected was subjected to Analysis of variance (ANOVA) using SPSS. and interrelationship of linear body measurements were estimated by simple correlation.

3, RESULTS

3.1. Means of linear body measurement of the Ashanti Black Pig

3.1.1. Weaner/growers (2 – 3 months)

The means of the linear body measurements of weaner/growers are presented in Table 2.

Table 2. Linear body measurements of weaner/grower ABP

Parameter	Male	Female	Overall means	P-Value
BL	37.0 ± 2.7	38.9 ± 2.9	38.0 ± 2.0	0.630
HW	30.7 ± 0.7	31.6 ± 0.7	31.2 ± 0.5	0.361
HG	29.7 ± 0.4 ^a	35.2 ± 0.4 ^b	32.4 ± 0.3	0.000
WW	10.1 ± 0.4	10.9 ± 0.4	10.5 ± 0.3	0.214
EL	9.5 ± 0.3	9.7 ± 0.4	9.6 ± 0.2	0.722
EW	8.3 ± 0.3	8.6 ± 0.3	8.4 ± 0.2	0.506
LF	22.6 ± 1.8	22.8 ± 1.9	22.7 ± 1.3	0.926
WT	17.0 ± 0.7	17.7 ± 0.7	17.4 ± 0.5	0.475

Rows with different super scripts are significantly different Except HG, there was no significant difference in the linear body measurements between male and female weaner pigs. On the average, females had higher, but marginal linear body measurements than males in the rest of the parameters.

3.1.2. Linear body measurements of adult ABPs

The means of the linear body measurements of adult ABPs are presented in Table 3.

Table 3. Linear body measurements of adult ABPs.

Parameter	Male	Female	Overall means	P-Value
BL	75.6 ± 3.3	74.9 ± 1.6	75.2 ± 1.8	0.854
HW	52.6 ± 2.4 ^a	59.5 ± 1.2 ^b	56.0 ± 1.4	0.013
HG	46.8 ± 0.6 ^a	38.7 ± 1.3 ^b	42.8 ± 0.7	0.000
WW	16.4 ± 2.3 ^a	25.4 ± 1.1 ^b	20.9 ± 4.5	0.001
EL	14.4 ± 0.7	14.9 ± 0.3	14.7 ± 0.4	0.486
EW	12.3 ± 0.5 ^a	13.6 ± 0.2 ^b	13.0 ± 0.3	0.025
LF	24.5 ± 1.0	25.3 ± 0.5	24.8 ± 0.5	0.487
WT	29.8 ± 1.9 ^a	35.2 ± 0.9 ^b	32.5 ± 1.1	0.014

Rows with different super scripts are significantly different

For adults, HG was significantly different in favour of males; while HW, WW, EW and WT differed significantly in favour of females as shown in Table 3

Proportion of sample attaining the mean performance

Table 4 gives a sex segregated picture of the percentage of the sample attaining the mean performance and above in linear body measurements (LBM) for the various parameters.

Table 4. Percentage of pigs attaining the mean LBM and above under each parameter.

LBM	Weaners/growers				Adults			
	Females (31)		Males (34)		Females (53)		Males (12)	
	No	%	No	%	No	%	No	%
BL	22	71.0	24	70.6	33	63.5	7	58.3
HW	17	54.8	21	61.8	33	63.5	7	58.3
HG	19	61.3	18	52.9	25	48.1	9	75.0
WW	15	48.4	20	58.8	16	30.8	9	75.0
EL	16	51.6	21	61.8	29	55.8	9	75.0
EW	19	61.3	18	52.9	30	57.7	8	66.7
LF	7	22.6	10	29.4	33	63.5	3	25.0
WT	31	100	19	55.9	29	55.8	8	66.7

Most (over 50 %) of the pigs attained the mean or above of each linear body measurement except WW of all weaner-growers and LF of adult males.

The highest occurring linear body measurements that describe the ABP at weaner/grower stage are BL for females and males (71 and 70.6 % respectively) as well as WT for females (100 %). At adult age, BL, HW and LF of females were the most frequently occurring above the mean (63.5 % for these three); while among males, HG, WW and EL frequently occurred above (at 75 % for these three).

3.3. Phenotypic Correlation of Linear Body Measurements.

Besides HG that had no significant correlation with HW, WW, WT, EL and EW, there was significant correlation between all the other LBM at weaner/grower stage (Table 5).

Table 5. Phenotypic correlation of LBM of ABP at Weaner/grower stage.

	HW	LF	BL	HG	WW	WT	EL	EW
HW	1							
LF	-0.268*	1						
BL	0.535**	-0.884**	1					
HG	0.009	-0.326**	-0.278*	1				
WW	0.409**	-0.289*	0.463**	-0.019	1			
WT	0.572**	-0.510**	0.613**	0.011	0.346**	1		
EL	0.655**	-0.594**	0.757**	-0.205	0.453**	0.552**	1	
EW	0.730**	-0.583**	0.771**	-0.149	0.483**	0.697**	0.789**	1

** Significant at ($p < 0.01$), * significant at ($p < 0.05$).

HG = heart girth, BL = Body length, HW = wither height, LF=face length, WW=waist width, WT=thigh width, EL=ear length, and EW=ear width

Twelve of the 28 correlation pairings were not significantly different by adult age (Table 6). These included HG with all the other seven LBMs and BL with WT, EL and EW.

Table 5: Phenotypic correlation of LBM of Adults ABPs

	HW	LF	LB	HG	WW	WT	EL	EW
HW	1							
LF	0.319*	1						
BL	0.155	0.305*	1					
HG	0.050	-0.025	-0.158	1				
WW	-0.689**	0.046	-0.363**	0.120	1			
WT	0.700**	0.318*	-0.065	-0.181	-0.714**	1		
EL	0.534**	0.247*	0.081	-0.043	0.393**	0.461**	1	
EW	0.655**	0.338**	0.008	0.052	0.635**	0.614**	0.731**	1

** is significant at the 0.01 and ns correlation not significant. HG = heart girth, LP = pig length, HW = wither height, LF=face length, WW=waist width, WT=thigh width, EL=ear length, and EW=ear width

Body Shape of ABP

Figures 1 and 2 are the shape (top view of body outline) of the ABP at the various ages from the chest to the tail side. These are drawn on a scale of 1 : 7. The shapes at both age groups are trapezoids with the chest side being the wider part while the tail side is narrow side. At adult age, males became more rectangular since the difference between the chest and tail sides was minimized.

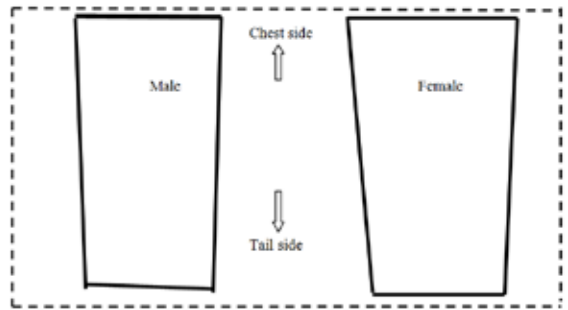


Figure 1. Sketch of the shape of weaner/grower ABPs

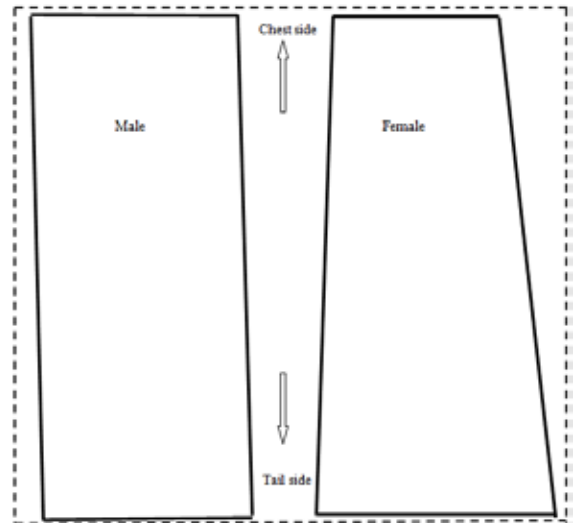


Figure 2. Sketch of the shape of adult ABPs

DISCUSSIONS.

4.1. Linear Body measurements

4.1.1. Weaner/grower ABP

Female weaners had higher but marginal linear body measurements in all eight parameters than males. Heart girth (HG) was the only parameter that showed significant difference between sex in favour of females. In an earlier study on Large white pigs in northern Ghana, HG and BL of young female pigs were (6 and 4. % respectively) greater than those of males. In the current study, young female ABPs were 10.5 and 5.1 % more at HG and BL respectively than males. Young females had a wider and longer body outline than young males.

A (top) view of the body shape of young ABPs (figure 1) gives the shape of a trapezium. The chest side is wider (1,96 times in females and 1,74 times in males) than the tail side. According to Lawrie (1985), neonatal growth in animals starts with the head and chest region and then slowly down to the extremities. This partly explains why HG had no correlation with most of the other LBMs.

4.1.2. Adult age

Linear body measurements of this category of ABPs showed significant difference between males and females. HG was significantly different in favour of males; while HW, WW, EW and WT differed significantly in favour of females. At sexual maturity, males tend to increase in heart girth and neck as this is necessary for fighting or defending themselves and their females during mating periods.

The females were higher in almost all the other parameters. Females had higher mean EL and HW than the males. Males had significantly higher HG than females and marginally higher BL than females. HG and BL are good indicators of body size (Sulabo *et al.*, 2006),

Adult males had greater HG and BL and were bigger in size and heavier in weight because these parameters have greater potential in determining the animal's body weight (Alenyorege *et al.*, 2013). This may be because at this stage the male produces hormones such as androgen including testosterone. These induce higher feed intake and utilization thereby increasing muscle development; while the female accumulates fat to stay in pregnancy and lactation. Fat is lighter than muscle. Dunshea (2010) noted that, the appetite in male pigs depended on the level of testosterone concentration in serum which is a primary hormone of androgen.

Any LBM that had a frequency of 50 % or over implies that the mean range of such LBM can be used as standard to identify the ABP.

With that, a pure ABP must possess at least five of the eight measured parameters attaining over fifty percent, if not, they are not typical ABP under the current (intensive) management

4.2. Correlation of linear body measurements

In all the age groups, the positive correlation coefficient values meant that, as one of a paired LBM increases; the other also increases. The negative correlation coefficient values indicate that, as one of a paired LBM is increasing; there is no corresponding increase expressed in the other. The values of the correlation coefficients also varied with different LBMs. This shows that, there is variation in the different LBMs of the animals. Normally, there is growth and differentiation in pigs. Growth (involves increase in body size), differentiation (is the formation of structures and organs) and differential growth (is the remodeling of structures and changing proportions of body parts). These all influence changes differently with age (Lawrence and Fowler 1997).

In the weaner age group, the best positive correlation coefficient values were with EL versus EW; BL versus EW; BL versus LE; HW versus EW; the WT versus EW and HW versus LE. The correlation coefficients were 0.789, 0.771, 0.757, 0.730, 0.697 and 0.655 respectively. With the above information, the ear is vital in the structure of the ABP. The LBMs that do not correspond to increase in age are; BL versus LF; EL versus LF; EW versus LF and WT versus LF with correlation coefficients of -0.884, -0.594, -0.583, and -0.510 respectively. Here it was noticed that, length of face did not correlate positively with any of the LBMs taken.

In the adults, positive correlation coefficient values were high with; LF versus HW, EW versus EL, WT versus LF, WT versus HW, WW versus HG, EW versus HW and EW versus BL with values; 0.776, 0.731, 0.719, 0.700, 0.670, 0.655 and 0.648 respectively. Again, the ear width corresponded positively with other LBMs. In general, the ear of the ABPs grows correspondingly to the other parameters and the length of face (LF) of the pig mostly does not respond to the growth of the other parameters.

CONCLUSION AND RECOMMENDATION

From this study, the linear body measurements that best describe the Ashanti Black Pig at the weaners/growers stage (2-3 months) are heart girth (HG) and. at adult stage (8-18 months) are: body length (BL), ear length (EL) and height at withers (HW)..

The study should be repeated with the inclusion of linear body measurements such as height at rump, knee height, tail length, snout and neck circumferences, Measurements should be on a set of ABPs from birth to their old age.

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