CARCASS CHARACTERISTICS OF THE ASHANTI BLACK PIG

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ABSTRACT
This study aimed at providing data on the carcass characteristics of the Ashanti Black pig (ABP). Nineteen pigs within liveweights ranges of 40-70 kg were categorised into three live weight groupings as follows: Group I: 40-49.9 kg; Group II: 50-59.9 kg and Group III: 60-70 kg. Animals in group III recorded a significantly higher mean carcass weight (46.4 kg) than Group I (32.7) (P. 0<0.05), but not those in Group II (40.9). Despite the higher mean carcass weight for group III, the dressing percentage was not significantly different from the other groups (P > 0.05). The weights of the main carcass components were also relatively similar in most cases for all the groupings. Generally carcass weight was highly and positively correlated (0.84) with the liveweight. The thigh had a high positive correlation with both liveweight (0.77) and carcass weight (0.74) for the overall grouping (40-69.9 kg). Regression models were developed for the estimation of live and carcass weights of the animals using carcass components (thigh, head, empty intestines and belly) that had higher positive correlations with either live or carcass weights.

Keywords: *Ashanti Black pigs, live weight, carcass weight, carcass components*

INTRODUCTION
Pigs are found throughout the world especially in areas where no religious edicts prevent their rearing. They are raised for various reasons ranging from social to economics, but the ultimate purpose of rearing pigs is to provide human food in the form of fresh or processed pork to satisfy the protein needs of human beings. The Food and Agricultural Organisation (FAO, 1982), reported that pork from indigenous pigs form approximately 42% of the total meat production in developing countries. The recommended dietary protein requirement per day for an adult male and a female is 55g and 45g respectively (FAO, 1991). However, per capita meat consumption in Ghana as at 2003 was 9.2 kg/capita/year (Speedy, 2003). Karbo and Bruce (2000) also indicated that the average daily meat consumption of Northern Ghana is between 3.8g and 5.1g per capita.

The ABP is a typical tropical indigenous breed, which is small in size with an average mature weight of about 40-60 kg (Holness, 1991). It is very hardy, tolerant to most common diseases and survives under poor management (Jollans, 1959; Fetuga *et al*, 1976; Darko and Boadu, 1998). This pig is found in all the regions of Ghana where they are kept as scavengers. It is however predominant in the Northern sector of the country where it forms about 50% of the national pig population (Barnes, 1994)

Although an animal of economic importance, there is dearth of information on its carcass characteristics or features, which could aid in selection for upgrading. This study was aimed at providing data on the carcass characteristics of the ABP and to assist commercial meat producers and meat processors to be able to predict and estimate the revenue they may obtain from the carcass of Ashanti black pigs.

MATERIALS AND METHODS

Nineteen pigs of mixed sexes within the live weights ranges of 40-70 kg were obtained from the Babile Ministry of Food and Agriculture Pig Breeding Station. They were categorised into three liveweight groupings as follows: Group I made up of 7 animals were within 40-49.9kg; Groups II and III consisted of 6 animals each and were within live weights ranges of 50-59.9 kg and 60-70.0 kg respectively.

Slaughtering

The pigs were gently driven on foot from the lairage to the slaughter hall, where they were rested for about 5-10 minutes before slaughtering. They were stunned mechanically using the direct blow method with a hammer to render the animals unconscious. The pigs were bled immediately after stunning by sticking the neck in the mid-line to sever the anterior vena cave and bicarotid trunk. Scalding was done using hot water of temperature between 65-75°C. Knives and bell scrapers were used for dehairing. The carcass was eviscerated and dressed according to the normal commercial practice.

Parameters measured

Live and carcass weight of each animal were recorded .The weights of primal and other parts such as the thigh, belly, chop, head, trotters, inner fat, and fillets were taken. Weights of the liver, heart and empty intestines were also taken. Parameters taken after boning included the weights of the *triceps, quadriceps femoris, biceps femoris, semimembranosus, and semitendinosus and longissimus dorsi* muscle.

The data generated were analysed using a general linear model (GLM) of analysis of variance (ANOVA) of MINITAB (2000) version 13.0 (MINITAB, PA, USA). Pearson correlation (r) and regression analyses were also performed between live weights and carcass weights.

RESULTS AND DISCUSSION

Mean live and carcass weights and the dressing percentages of the three live weight groupings are presented in Table 1. There were significant differences between the mean live weights for the 3 groupings, with those in GPIII as expected, being the heaviest followed by GPII and GPI in that order ($P < 0.05$). Though the mean carcass weights followed a similar pattern to that of the live weights, there was a significant difference between the mean carcass weights for GPIII and GPI only ($P < 0.05$). This indicates a trend of increasing carcass weight with increasing live weight. In contrast, the dressing percentages were not significantly different from each other ($P > 0.05$). Group II recorded a relatively higher dressing percentage than groups III and I. This suggests that, a higher live weight of an animal does not necessarily result in a higher dressing percentage perhaps due to higher amount of inedible or valueless components that must be trimmed.

This result indicates that GP II had the best carcass yield which confirms the observations made by Barnes *et al.* (1997) that the ABP should not be fattened beyond 50-55 kg live weight.

Mean weights of the main carcass components were relatively similar in most cases among the live weight group (Table 2). The

Table 1. Mean live and carcass weights and dressing percentages

	GP I	GP II	GP III	±SEM
Live weight (kg)	44.5^{a}	54.2^{b}	63.3^{c}	3.07*
Carcass weight (kg)	32.7^{a}	40.9^{ab}	46.4^{b}	4.14*
Dressing percentage	73.5	75.3	73.3	1.50^{ns}

*^{a,b,c} means in a row with different superscripts are significantly different (*P <0.05)*
ns-not significant
GPI: 40-49.9kg; GPII: 50-59.9kg; GPIII: 60-70.0kg.

	Weight of carcass components (kg)				As % of carcass weight			
	GPI	GPII	GPIII	±SEM	GPI	GPII	GPIII	± SEM
Shoulder	6.2	6.8	6.4	0.93^{ns}	18.7^{c}	16.7^{b}	13.7^{a}	0.68**
Thigh	8.6^{a}	10.1^{ab}	11.5^{b}	1.17*	26.2	24.6	24.7	0.90^{ns}
Belly	6.0	8.0	8.3	1.83^{ns}	18.2	19.5	18.4	0.71^{ns}
Chop	3.1^{a}	4.9^{b}	4.5^{ab}	0.73*	9.5^{a}	12.0^{b}	9.8^{a}	0.74*
Head	4.1	4.7	5.3	0.99^{ns}	12.6^{b}	11.5^{a}	11.4^{a}	0.48*
Trotters	0.9	1.1	1.1	0.20^{ns}	2.7	2.6	2.4	0.38^{ns}
Liver	0.9	0.9	1.1	0.27^{ns}	2.6	2.3	2.4	0.42^{ns}
Empty intestines	1.4^{a}	1.5^{ab}	1.9^{b}	0.21*	4.2	3.8	4.2	0.35^{ns}
Heart	0.2	0.2	0.3	0.09^{ns}	0.7	0.4	0.6	0.33^{ns}
Inner (flare) fat	0.8	0.9	0.7	0.37^{ns}	2.5	2.3	1.8	0.40^{ns}

^{a,b,c} means in a row with different superscripts are significantly different
*(*P <0.05; **P<0.01)*
ns-not significant (P>0.05)
GPI: 40-49.9kg; GPII: 50-59.9kg; GPIII: 60-70.0 kg.

percentages of shoulder weights decreased significantly with increasing carcass weights (P<0.01). These results suggest that the shoulder weight was independent of the live weight since it did not correspond to the increasing live weights. Though the mean thigh weights increased significantly with increasing live weight (P<0.05), the corresponding percentages were relatively the same. This means that there is a linear relationship between thigh and carcass weights. The mean belly weight indicated a trend of heavier bellies with higher live weights, consequently there were no differences in their percentages. GPII had the highest mean chop weight and its corresponding percentages (P<0.05) indicating a maximum yield of a high value cut within GPII

The percentage head weight was highest for Group I (P<0.05), which suggests that the trend of increasing head weights with live weight is not proportional. This should be expected since the head becomes physiologically matured at an early age and ceases to grow with the development of other body parts (Hamond, 1940).

Weights of the major thigh muscles (*biceps femoris, quadriceps femoris, semitendinosus and semimembranosus*) increased marginally with increasing live weight (Table 3), however, the differences were not significant (P>0.05). This trend did not reflect the differences in the mean thigh weights (Table 2), which suggests that much of the change in thigh weight with increasing live weight

Table 3. Mean weights of some selected muscles and their percentages of carcass weight

Muscle type	Weight of carcass components (kg)				As % of carcass weight			
	GPI	GPII	GPIII	±SEM	GPI	GPII	GPIII	±SEM
Biceps femoris	1.0	1.2	1.6	0.30ns	3.1	2.9	3.5	0.49ns
Quadriceps femoris	1.1	1.2	1.5	0.25ns	3.3	2.8	3.1	0.4ns
Semimembranosus	0.4	0.4	0.5	0.18ns	1.3	1.1	1.1	0.16ns
Semitendinosus	1.2	1.3	1.5	0.23ns	3.6	3.2	3.3	0.36ns
Triceps	1.0	1.3	1.7	0.62ns	3.0	3.8	3.6	0.79ns
Longissimus dorsi	1.6	1.8	2.7	0.66ns	4.8	4.9	5.7	0.66ns

ns-not significant (P>0.05)
GPI: 40-49.9kg; GPII: 50-59.9kg; GPIII: 60-70.0 kg.

could be attributed to bigger thigh bones, (femur) or accumulation of adipose tissues. The *biceps femoris, semimembranosus, semitendinosus and quadriceps femoris* determine the total value of the thigh that a retailer/processor can obtain from the carcass. Though the percentages of shoulder weights reduced with increasing live weight, this was not reflected in the weights of triceps (the major) muscle of the various groups which rather increased marginally. This implies that whilst there was active muscle accretion with increasing weight, there was less development of the shoulder bones (the scapular and humerus) and also less or no accumulation of adipose tissue in the foreleg of the ABP.

Relationship between live weight, carcass weight, and some carcass components

The carcass weights for the various groups had very strong positive correlations with their corresponding live weights (Table 4) indicating that, carcass yield tends to be higher with increasing live weight. However, there appears to be an upper limit for this positive linear relationship between live and carcass weights since the correlation coefficients for groups II and III are of the same magnitude ($r = 0.92$). The belly and thigh weights had moderate to strong positive correlations with carcass weight respectively. The strong positive correlation between the thigh and live weight is an indication that as the weight of the animal increases, the weight/yield of the thigh also increased. This conclusion is supported by the moderate to strong positive correlation between the thigh and carcass weights. There was a clear indication that heavier carcasses yield heavier bellies probably due to the rate of fat deposition in this part of the body. The correlation between the empty intestines and both live and carcass weights were positive though weak to moderate for the groupings. These positive correlations could be due to adaptation of the indigenous pigs to ingestion of fibrous feed, which constitute the bulk of their diet. In contrast, the correlations between shoulder and carcass weights was either a weak positive or a negative one which confirms the earlier observation that the shoulder weight appears to be independent of the live weight. This suggests that the shoulder probably ceases to develop at some stages of growth or not at the same rate as other body parts.

The head weight did not show any clear-cut trend of relationship, however, the overall groupings indicated a moderately positive correlation with live and carcass weights.

The inner fat had strong positive correlation with the live weight of group I but low for the others. This trend could be due to reduced lipid to protein accretion rate at a constant level of available energy (de-Greef *et al*, 1994).

Regression model

Since the thigh, head and empty intestines weights for the overall group were strong and positively correlated with live weight, they

Table 4: Pearson correlation coefficients (r) between live weight, carcass weight and some carcass components

Weights of Components	Correlation coefficient (r) Live weight				Carcass weight			
	GPI	GPII	GPIII	Overall	GPI	GPII	GPIII	Overall
Carcass	0.84	0.92	0.92	0.84	-	-	-	-
Thigh	0.61	0.72	0.65	0.77	-0.19	0.63	0.52	0.74
Shoulder	0.57	0.14	-0.61	0.02	0.03	0.47	-0.45	0.03
Belly	0.30	0.92	0.53	0.48	0.93	0.76	0.79	0.80
Chop	0.31	-0.13	0.67	0.48	-0.16	0.46	0.47	0.51
Head	0.61	-0.09	0.67	0.58	-0.35	0.02	0.90	0.53
Trotters	0.32	-0.04	-0.68	0.47	-0.03	-0.53	-0.86	0.14
Empty intestine	0.22	0.83	0.37	0.73	0.68	0.21	0.20	0.46
Liver	0.02	0.46	-0.06	0.42	0.56	-0.69	-0.44	0.44
Heart	0.28	0.48	-0.13	-0.50	0.60	-0.59	-0.25	-0.13
Inner fat	0.15	0.15	0.05	-0.17	0.79	0.29	0.37	0.26

GPI: 40-49.9kg; GPII: 50-59.9kg; GPIII: 60-69.9kg

were used to develop models for the estimation of live weight. Similarly, the thigh, belly and head weights were also used to develop models for the estimation of carcass weight. The regression models for the various live weight groupings were as follows;

GPI: $Y=26.17+0.85x_1+1.82x_2+2.63x_3$

GPII: $Y=31.96+1.14\ x_1-0.13\ x_2+7.45\ x_3$

GPIII: $Y=76.87+6.7\ x_1-1.4\ x_2-42.6\ x_3$

Where

Y = live weight of the animal

X_1 = Thigh weight

X_2 = Head weight

X_3 = Empty intestines weight

The Regression models for the various groups' carcass weights were as follow;

GPI : $Y=-7.52+3.56\ x_1+1.49\ x_2+0.20\ x_3$

GPII: $Y=45.59+1.39\ x_1-0.079\ x_2-1.011\ x_3$

GPIII: $Y=3.98+2.89\ x_1+4.66\ x_2+5.76\ x_3$

Where

Y = Carcass weight

X_1 = Thigh weight

X_2 = Belly weight

X_3 = Head weight

CONCLUSION

The study showed that dressing percentages and the weights of the main carcass components for the various weight groupings were relatively similar despite differences in the mean live and carcass weights. The results suggest that meat producers and processors can make maximum profit from the ABP within a live weight range of 50-59 kg since animals in this range will cost less than those of higher live weights. The correlation coefficients indicate that the most important carcass components that contribute much to the carcass of ABP are the thigh and belly. Therefore, the most important carcass component that contributes much to the income of the processor is the thigh since the belly is of low value. The carcass and live weights of ABP can be predicted or estimated using the regression models developed when there is no suitable weighing scale to determine these weights.

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