

Slaughter and Carcass Characterization, and Sensory Qualities of Native, Pure, and Upgraded Breeds of Goat Raised in the Philippines

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Abstract—Goat production is one of the activities included in integrated farming in the Philippines. Goats are raised for its meat and regardless of breed the animal is slaughtered for this purpose. In order to document the carcass yield of different goats slaughtered, five (5) different breeds of goats to include Purebred Boer and Anglo-nubian, Crossbred Boer and Anglo-nubian and Philippine Native goat were used in the study. Data on slaughter parameters, carcass characteristics, and sensory evaluation were gathered and analyzed using Complete Random Design (CRD) at 5% level of significance and the results of carcass conformation were assessed descriptively. Results showed that slaughter data such as slaughter/live weight, hot and chilled carcass weights, dressing percentage and percentage drip loss were significantly different ($P>0.05$) among breeds. On carcass and meat characteristics, pure breed and upgraded Boer were found to be moderately muscular while Native goat was rated as thin muscular. The color of the carcass also revealed that Purebred and crossbred Boer were described dark red, while Native goat was noted to be slightly pale. On sensory evaluation, the results indicated that there was no significant difference ($P>0.05$) among breeds evaluated. It is therefore concluded that purebred goat has heavier carcass, while both purebred Boer and upgrade are rated slightly muscular. It is further confirms that regardless of breed, goat will have the same sensory characteristics. Thus, it is recommended to slaughter heavier goats to obtain more carcasses with better conformation and quality.

Keywords—Carcass quality, goat, sensory evaluation, slaughter.

I. INTRODUCTION

SMALL ruminants especially goat raising is regarded as one of the components of farming system in the Philippines. This is due to the animal's ability to utilize low cost feed materials, high fertility and reproductive rates, and the small capital requirement. Because of these attributes, goat makes a valuable contribution especially to the poor in the rural areas [1]. At present, the country's goat industry is composed of ninety-nine percent (99%) backyard farming, wherein five to 25 does were raised. These farms are owned

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by small hold farmers, whose knowledge, skills and capability to improve production management are very limited. As the government recognize the importance of the animal known as "rural asset", different programs were implemented to improve production management. As observed, one of the factors that hinder full attainment of the benefits that can be derived from goat production is its poor genetic quality. To solve this problem, importation of quality breeders under the Genetic Improvement Program (GIP) of the Department of Agriculture was done. At present, the country is still importing breeder animals composed of meat-type Boer and dairy-type Anglo-nubian or Saanen. These animals are distributed in different government and private breeder, multiplier and nucleus farms and then loaned by either commercial or backyard raisers. Because of this initiative, there is a gradual improvement on the genetic quality of the stocks. However, goats in the rural areas are grown primary for meat purposes and regardless of the breed, these animals were slaughtered. Thus, the objective of this study is to describe the slaughter and carcass characteristics and the sensory attributes of five (5) breeds of goat popularly grown in the country.

II. MATERIALS AND METHODS

A. Slaughtering Procedure

Five (5) different breeds of goats to include native, pure breed Boer and Anglo-Nubian, and its upgrades at eleven (11) months of age, produced under the same management in a farm were slaughtered at the Animal Products Development Center (APDC) in Marulas, Valenzuela, Metro Manila. Three (3) heads of goat served as replicate per treatment breed were used in the study. The slaughter method used includes scalding, dehairing, singeing, and flaying. The resulting hot carcasses were chilled overnight ($4-0^{\circ}\text{C}$), before the fabrication of prime cuts were done.

B. Data Gathered

Different slaughter data such as slaughter weight, hot carcass weight, chilled carcass weight dressing percentage and percentage drip loss were gathered. The carcass of breeds under study were evaluated based on conformation, color of the flank lean, texture of the lean and external fat covering. Chilled carcasses were weighed to determine the percent drip loss. Moreover, loin muscle from each sample was cut into a specific size of uniform thickness, placed inside a

polyethylene bag, and cooked for 30 minutes at 80°C before it is subjected to sensory evaluation by trained panelists. A Nine-Point Hedonic Scale was used in evaluating color, flavor, and general acceptability and a five-point rating scale was used for juiciness, tenderness, spiciness, odor and other sensory attributes. The data on slaughter parameters and sensory evaluation are evaluated statistically using Complete Random Design (CRD) at 5% level of significance; while the results obtained on carcass conformation are assessed descriptively.

III. RESULTS AND DISCUSSION

A. Slaughter Characteristics

The results showed that the pure breed Boer had the highest slaughter weight, while the native had the least. Goats with exotic breed has better slaughter weight ($p > 0.05$) as compared to the native. It can be concluded that the goat's slaughter weight can directly be attributed to the size of the animal [2]. On the weight of both hot and chilled carcass, highly significant difference ($p > 0.05$) was found among breeds used. Data revealed that pure breed Boer had the highest hot carcass and chilled carcass weights, which was found comparable to upgraded Boer. Weights of pure and upgraded Anglo-nubian has no significant difference to upgraded Boer, however when compared to native, highly significant difference was found. On dressing percentage, upgraded Boer has the highest while the native has the least. Dressing percentage of animals with exotic breeds has no significant difference, but when compared to the native breed, highly significant difference was found. On percentage drip loss, native had the highest while pure breed Boer had the least. Highly significant

difference was found when native breed was compared to animals with exotic breeds, which shows that poor subcutaneous cover and leggy conformation of goat carcasses are susceptible to high moisture losses during chilling [3]. Moisture losses tend to be higher for smaller carcass as compared to larger carcass., wherein it is expected that goats with weight less than 35 kg has about 3 percent losses, while losses in heavier goats is only 2.3 percent. These results further confirm higher drip loss for the native than the pure breeds and upgrade goats.

B. Carcass Quality

The result of carcass conformation evaluation showed that pure and upgraded Boer were rated as moderately muscular. The given description is attributed to the trait of having good carcass quality and often used for meat production [4], [5]. On the other hand, pure and upgraded Anglo-nubian were rated slightly muscular while the native breed was described with thin muscling carcass. Upgrading of stocks was conducted to improve the carcass conformation of native and Boer which has been popularly used as breeder on this purpose [6]. On flank lean color, pure breeds have intense dark red color, while upgrades have medium dark red color and the native had light grayish red. Based on these results it is concluded that the increase in carcass weight can influence the chroma or color of meat, which can be attributed to the compactness of myofibril tissues of the muscle [7], [5]. Moreover, paleness of carcass among native is due to the limited amount of myoglobin [8] as influenced by its thin muscling ability. On the other hand, all breeds of goat used had uniform fine texture of the leanness.

TABLE I
SLAUGHTER WEIGHT, HOT CARCASS WEIGHT, CHILLED CARCASS WEIGHT AND DRESSING PERCENTAGE OF NATIVE, PURE BREED AND UPGRADED GOATS AT ELEVEN MONTHS OF AGE

Parameters	Native	Boer	Anglo-Nubian	Crossbreed Boer	Crossbreed Anglo Nubian	Result
Slaughter weight (kg)	9.00 ^a	62.67 ^c	41.67 ^b	45.00 ^b	37.00 ^b	**
Hot carcass weight (kg)	4.60 ^a	39.33 ^c	25.53 ^b	29.47 ^{bc}	22.60 ^b	**
Chilled carcass weight (kg)	4.27 ^a	38.10 ^c	24.60 ^b	28.37 ^{bc}	21.70 ^b	**
Dressing percentage (%)	50.72 ^a	62.40 ^b	61.07 ^b	65.57 ^b	61.00 ^b	**
Percentage drip loss (%)	7.72 ^a	3.18 ^b	3.59 ^b	3.73 ^b	3.90 ^b	**

** Highly significant at 5%.

C. Sensory Evaluation

The result of the sensory evaluation was presented in Table III. The color of pure breeds and its upgrades are rated "like moderately", wherein the color of meat is influenced by tissue formation while flavor depends on the quantity and composition of fat in meat [9]. In this study, upgraded Anglo-Nubian had highest mean score of 6.51, with a descriptive rating of "like moderately", while pure breed Boer had the lowest score of 5.58 with descriptive rating of "like slightly." The low acceptability score is due to the "goaty" flavor attributed to branch chain fatty acid (BCFA) [10], known as 4-ethyl octanoic acid [11]. The flavor is noted to be more concentrated among fat goats. Meat juiciness is directly related to the intramuscular lipids and moisture content of the

meat [12]. An increase in the intra-muscular fat also increases the juiciness and flavor of meat [13]. Fat grow thicker as the animal matures [14], [7]. It was noted in this study that Native goat has highest mean score of 3.94 with a descriptive rating of "moderate" while juiciness of animals with exotic breeds were rated as "slightly". For the result of tenderness, the native goat had a descriptive rating of "moderate", while animals with exotic breeds have rating of "slightly tender". The result can be attributed to muscle fibers which develop firm as animal grow bigger like Boer breeds. It could be noted that of the five animals slaughtered, the Native breed had the thinnest conformation; hence the muscle became finer that contributes to better tenderness of the meat. Moreover, tenderness is also influenced by the goat's collagen content

and its solubility. Boer goats have higher collagen, and thicker and larger myofibril bundles [15], hence was given lower tenderness rate. In terms of odor, native, pure breed Anglo-Nubian, and upgraded Boer and Anglo-Nubian had “perceptible” odor with mean scores of 3.91, 3.95, 4.21 and 4.12, respectively, while pure breed Boer obtained a mean score of 3.42, descriptively rated as “slight”. Odor is related to flavor, which is attributed by fatty acid, which is concentrated in fat the animals. Among the five breeds slaughtered, the pure breed Boer was the fattest thus “slight” odor can be perceived. On general acceptability, upgraded Boer had a mean score of 6.60 with a descriptive rating of ‘like moderately’, while native, Pure breed Boer and Anglo-nubian, and upgraded Anglo-Nubian had mean scores of 6.27, 5.75, 6.46 and 6.38, respectively, with descriptive rating of ‘like slightly’. Relative

to other sensory characteristics, pure breed Boer had garnered numerically the lowest score which means “least” acceptable. However, the analysis of variance revealed no significant difference among the different breeds of goat.

TABLE II
CARCASS EVALUATION AND CUTTING TEST OF NATIVE, PURE BREED AND UPGRADED GOATS AT ELEVEN MONTHS OF AGE

Parameters	Native	Boer	Anglo-Nubian	Crossbreed Boer	Crossbreed Anglo-Nubian
Carcass conformation	Thin muscling	Moderately muscular	Slightly muscular	Moderately muscular	Slightly muscular
Color of the flank lean	Light grayish red	Dark red	Dark red	Medium dark red	Medium dark red
Texture of the lean	Fine	Fine	Fine	Fine	Fine

TABLE III
SENSORY CHARACTERISTICS OF THE MEAT OF NATIVE, PURE BREED AND UPGRADED GOATS AT ELEVEN MONTHS OF AGE

SENSORY ATTRIBUTES	Average Scores				
	Native	Purebred Boer	Purebred Anglo-Nubian	Cross-Bred Boer	Cross-bred Anglo
Color	6.11 (LS)	6.78 (LM)	7.00 (LM)	6.78 (LM)	6.77 (LM)
Flavor	5.80 (LS)	5.58 (LS)	6.42 (LS)	6.43 (LS)	6.51 (LM)
Juiciness	3.94 (M)	2.78 (S)	3.25 (S)	3.33 (S)	3.04 (S)
Tenderness	4.05 (M)	2.67 (S)	3.14 (S)	3.11 (S)	2.75 (S)
Odor	3.91(P)	3.42 (S)	3.95 (P)	4.21(P)	4.12 (P)
General Acceptability	6.27(LS)	5.75 (LS)	6.46 (LS)	6.60 (LM)	6.38 (LS)

^{ns} - no significant difference ($p > 0.05$) Single Factor (Microsoft Office Excel 2003), **Legend:** LM- Like Moderately, LS – Like Slightly, M- Moderately, S – Slight, P – Perceptible.

IV. CONCLUSION

The study was conducted to characterize the carcass of the five (5) breeds of goat popularly grown in the Philippines and to determine their sensory attributes. On slaughter parameters, results reveal that pure breed Boer significantly differs in terms of live weight, hot carcass and chilled carcass among the other breeds evaluated, while in terms of dressing percentage, upgrades obtained the same result with the purebred, while native goat consistently obtained the lowest in all the slaughter data. On carcass conformation, pure breed Boer and its upgrade were rated “moderately muscular” while pure breed Anglo-Nubian and its upgrade were rated “slightly muscular”. The native was described as “thin muscling”. These results suggest that pure breeds and their upgrades are excellent source of chevon, and thus economical to be raised and slaughtered for meat purposes. The result of sensory evaluation showed no variation between breeds in terms of the meat quality in color, flavor, tenderness, odor and general acceptability. Although descriptive rating revealed a perceptible goaty odor on the pure breed Boer, there was no significant difference among the different breeds evaluated. This confirms that regardless of breed, goat will have the same sensory characteristics.

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