

Article

Phenotypic characterization of Boer and Jamunapari goat under farming condition in Bangladesh

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Abstract: The objective of the study was to characterize of Boer goats and the Jamunapari goat available in Bangladesh under on-station condition. The study was conducted at Goat and Sheep Research farm of BLRI, Savar, Dhaka from January 2014 to June 2015 and animals were reared under standard intensive management system. The collected data was analyzed by SPSS 17.0 Statistical computer programme. The body coat color of Boer goat was white with reddish-brown head, ears and neck and the body coat color of Jamunapari goats was variety of colors. Both of them had horns but polled Jamunapari goats were also found. The body weight significantly ($p < 0.001$) differed between Boer goat (52.36 ± 5.97 kg) and Jamunapari goat (39.26 ± 3.00 kg). Horn length of Boer goat (19.01 ± 1.29 cm) was significantly ($p < 0.001$) higher than Jamunapari goat (7.98 ± 0.71 cm). Head width and teat length of Jamunapari goat (33.82 ± 0.85 cm and 9.15 ± 0.89 cm) were significantly higher ($p < 0.05$) than Boer goat (30.23 ± 0.63 cm and 5.80 ± 0.87 cm). Rump width significantly ($p < 0.05$) differed between Boer goat (17.87 ± 0.61 cm) and Jamunapari goat (15.19 ± 0.59 cm). The body length, height at wither, chest girth and ear length of Boer goat were 69.96 ± 2.09 cm, 67.98 ± 1.19 cm, 78.39 ± 2.04 cm and 19.43 ± 0.90 cm, respectively where as body length, height at wither, chest girth and ear length of Jamunapari goat were 72.13 ± 1.63 cm, 69.69 ± 1.29 cm, 79.18 ± 2.04 cm and 21.23 ± 0.66 cm, respectively. Phenotype wise Boer goats have distinct meat characteristics than the Jamunapari goats.

Keywords: Boer goat; Jamunapari goat; phenotypic; characterization

1. Introduction

Goat is a multi-functional animal and contributes greatly to the agrarian economy, especially in areas where crop and dairy farming are not economic. Thus, goat plays an important role in the livelihood of a large proportion of small farmers particularly women, landless and marginal farmers inhabiting geographically isolated areas, who seldom have other means of survival (Choudhury *et al.*, 2012). The total livestock population composed of 25.93 million goats, 23.94 million cattle, 1.48 million buffaloes and 3.4 million sheep (DLS, 2017). Among the livestock sector goats are a very important species of livestock in Bangladesh, mainly on account of their short generation intervals, higher rates of prolificacy and the ease with which the goats and their products can be marketed. Goat is perhaps one of the most important amongst the domestic species in the tropics performing a variety of functions and in comparison to other ruminants, displays a unique ability to adapt and maintain themselves in harsh environments. Goats play an important role in livelihoods of smallholder farmers in Bangladesh as they serve as assets that can be easily liquidated to provide cash in times of need (Akhter *et al.*, 2006). The Jamunapari goat is one of the ancestors of the American Nubian. They were derived from crossing Jamunapari from India and Egyptian Zairaibi with native English goats, when they arrived in England on merchant boats as part of every cargo. This produced the Anglo-Nubian breed. The Jamunapari is known as the best dairy goat in India. It is also the tallest breed and commonly known as the "Pari" in its area of

origin-the "home tract"-because of its majestic appearance. Its home tract and natural habitat is the Chakarnagar area of the Etawah district in the State of Uttar Pradesh, along the delta of the Jamuna and Chambal Rivers, and the Bhind district of the State of Madhya Pradesh along the Kwari River, east of New Dehli and not far from the famous Taj Mahal at Agra. The Jamunapari is well adapted to the unique ravines of this area with its dense bush and shrub vegetation (Rout *et al.*, 2002). The number of this breed in Bangladesh is not known, but most are found in Chuadanga, Meherpur, Kushtia, Jhenidah, Pabna, and Jessore districts (Faruque and Khandoker, 2007). Ten percent (10%) of Jamunapari and their crossbred goat are available throughout the country. They usually reared by small, marginal and landless farmers for meat and milk purpose. Their mature weight is 30-50 kg and growth rate is 70-80 gm/day. The overall litter size of Jamunapari goat was nearly two (1.75). On the other hand, the average postpartum heat and days open were 51 and 69 days, respectively (Annual Report; BLRI, 2010). Boer goat is considered to be one of the most desirable goat breeds for meat production. It has gained worldwide recognition for excellent body conformation, fast growing rate and good carcass quality. It's popularity increased as a meat type goat breed during the last decade in Australia, New Zealand and later in North America and other parts of the world. The name is derived from the Dutch word "boer" meaning farmer (Lu, 2002). Mature weights of Boer bucks and 'does' are 90-130 kg and 80-100 kg, respectively. Boer goats are known to have a fast growing rate compared to other goat breeds. Growth rate of the first 12 months can be 200 g/day under good pastoral conditions. Faster growing rate implies that Boer goats can potentially reach marketing and breeding weight earlier. Birth weight of Boer kids ranges from 3 to 4 kg. Prolificacy is another major distinction of Boer goats. Average litter size is close to 2. About 50% of 'does' produce twins and another 10 to 15% produce triplets' kids. Boer goat female kids can reach puberty at 6 months of age and are considered as early breeders. Male kids can be used for breeding at 5 to 6 months of age. Milk production of Boer goats is generally considered adequate for rearing multiple kids (Campbell, 1984). Thus, introduction of Boer goat can be promising goat breed to meet up the increasing demand of meat and milk production in the country. But, before its extension to farmer level, it is necessary to evaluate the phenotypic, productive, reproductive performance and economic potential of Boer goat in Bangladesh condition.

2. Materials and Methods

The research was conducted at Goat and Sheep Research farm of Bangladesh Livestock Research Institute, Savar, Dhaka from January 2014. *Bengal Livestock & Fodder*, a sister concern of *Bengal Meat* supplied four Boer does and one Boer buck to BLRI for conducting this performance trial. Animals were reared at the Goat and Sheep Research Farm of BLRI and their performance in terms of productive, reproductive and cost effectively were measured against the Jamunapari breed. Accordingly, an equal number of Jamunapari 'does' and bucks were also reared under the same management system and same location. All the 'does' and buck were kept in permanent house with slated floor raised above the ground level with sufficient space to keep them comfortable. Buck was always kept separately from 'does' to avoid unplanned mating. Green grass was supplied as *ad libitum* basis and concentrate (17% CP, 11MJ/kg DM) was offered twice daily (morning and evening) at the rate of 300g (100 kg concentrate mixture contain 30 kg crushed maize, 50 kg wheat bran, 19 kg mustard oil cake, the diet were fortified with vitamin mineral premix at the rate of 0.1 kg per 100 kg and 1 kg salt were used, mixed up uniformly) per head per day. All the phenotypic measurements were collected by measuring tape and hanging digital balance according to FAO guide lines. The pure breeding (Boer goat male×Boer goat female and Jamunapari goat male×Jamunapari goat female) program was conducted initially at BLRI was designed in such way which minimized inbreeding at the progeny generation. The collected data was analyzed by SPSS 17.0 Statistical computer programme.

3. Results and Discussion

3.1. Phenotypic characteristics of Boer and Jamunapari goat

Table 1 shows different phenotypic characteristics of Boer and Jamunapari goat. A typical picture of Boer and Jamunapari goat (both Buck and Doe) are presented in Figures 1 and 2. The coat color pattern of both Boer and Jamunapari goat were plain (Figures 1 and 2). The body hair coat color of Boer goat was white and neck to head region brown and the body hair coat color of Jamunapari goat was variety of color. Boer goat had horn and horn present in Jamunapari goat also but polled Jamunapari goat was found. Horn shape of Boer goat was curve but horn shape of Jamunapari goat was curve and straight. Horn, ear orientation and facial (head) profile of Boer and Jamunapari goat were lateral, pendulous and convex, respectively. Tail type and tail shape of Boer and Jamunapari goat were thin and cylindrical and turned up at end, respectively. Only male of Boer goat had beard. Both male and female of Jamunapari goat had beard. Boer goats are large, long-legged goats with short, soft hair and long lop ears. They were white with reddish-brown heads, ears and necks. The Boer goat's head was

powerful with a compressed nose and strong horns with a gradual backward curve. They had fleshy, well-developed broad briskets, well-sprung ribs, broad backs and muscular legs (Sambraus, 1992). The Boer goat had a broad rump with a slight incline, well fleshed buttocks and thighs. The Boer goat had bearded. The pelvic was the highest for the breeds and the goats was of medium height (Pieters, 2007). The Jamunapari had white, short hair except for long hair on the thigh and back leg. It had a strongly arched Roman nose and long pendulous ears were the major breed characteristics. The neck was long, muscular and set erect. The loin was strong but usually arched; the tail was short and typically curved upward. Ear length was about 8 inches for 3-to-6-month old kids, growing to 12 inches on adults. Horns project backwards and their length reaches about 9 inches on adults. The udder was relatively capacious, compared to other Asian "dairy" goats, but pendulous. While the ears in adult Jamunapari are about 12 inches long, the face, including the mouth, was shorter than the ears by about two or three inches (Rout *et al.*, 2002).

Table 1. Phenotypic characteristics of Boer and Jamunapari goat.

Parameter	Boer Goat	Jamunapari Goat
Coat color pattern	Plain	Plain
Body hair coat color	White with reddish-brown heads, ears and necks	Distinct color
Horn	Horned	Horned and polled
Horn shape	Curve	Curve, Straight
Horn orientation	Lateral	Lateral
Ear orientation	Pendulous	Pendulous
Facial (Head) Profile	Convex	Convex
Tail type	Thin	Thin
Tail shape	Cylindrical and turned up at end	Cylindrical and turned up at end
Beard	Only male	Both male and female

Table 2. Morphometric measurement of Boer and Jamunapari goat.

Parameter	Boer Goat (Mean±SE)	Jamunapari Goat (Mean±SE)	Level of Significance
Body weight (kg)	52.36 ^a ±5.97 (7)	40.47 ^b ±2.65 (16)	*
Body length (cm)	69.96±2.09 (7)	72.13±1.63 (16)	NS
Height at wither (cm)	67.98±1.19 (7)	69.69±1.29 (16)	NS
Chest girth (cm)	78.39±2.04 (7)	79.18±2.04 (16)	NS
Ear length (cm)	19.43±0.90 (7)	21.23±0.66 (16)	NS
Horn length (cm)	19.01 ^a ±1.29 (7)	7.98 ^b ±0.71 (12)	***
Head length (cm)	22.29±0.52 (7)	23.31±0.51 (16)	NS
Head width (cm)	30.23 ^b ±0.63 (7)	33.82 ^a ±0.85 (16)	*
Rump length (cm)	13.87±1.28 (7)	11.28±0.69 (16)	NS
Rump width (cm)	17.87 ^a ±0.61 (7)	15.19 ^b ±0.59 (16)	**
Tail length (cm)	13.91±0.71 (7)	15.30±0.52 (16)	NS
Udder length (cm)	21.83±5.15 (5)	16.22±1.22 (11)	NS
Udder diameter (cm)	30.33±4.41 (5)	28.48±1.11 (11)	NS
Teat length (cm)	5.80 ^b ±0.87 (3)	9.15 ^a ±0.89 (11)	*
Scrotum length (cm)	15.10±1.10 (2)	14.26±0.94 (5)	NS
Scrotum circumference (cm)	22.25±1.25 (2)	23.46±1.73 (5)	NS

Means with uncommon superscripts differed along the row significantly. Figures in the parenthesis indicate the number of observation, *= Significant at 5% level of probability ($p < 0.05$), **= Significant at 1% level of probability ($p < 0.01$), ***= Significant at 0.1% level of probability ($p < 0.001$), NS= Not significant ($p > 0.05$).



Figure 1. Boer goat: Buck (left) and Doe (Right)



Figure 2. Jamunapari goat: Buck (left) and Doe (Right)

Table 2 shows the different morphometric measurements of Boer and Jamunapari goat. The body weight significantly ($p < 0.001$) differed between Boer goat (52.36 ± 5.97 kg) and Jamunapari goat (39.26 ± 3.00 kg). Horn length of Boer goat (19.01 ± 1.29 cm) was significantly ($p < 0.001$) higher than Jamunapari goat (7.98 ± 0.71 cm). Head width and teat length of Jamunapari goat (33.82 ± 0.85 cm and 9.15 ± 0.89 cm) were significantly higher ($p < 0.05$) than Boer goat (30.23 ± 0.63 cm and 5.80 ± 0.87 cm). Rump width of Boer goat (17.87 ± 0.61 cm) significantly ($p < 0.05$) differed with Jamunapari goat (15.19 ± 0.59 cm). The Body length, height at wither, chest girth and ear length of Boer goat were 69.96 ± 2.09 cm, 67.98 ± 1.19 cm, 78.39 ± 2.04 cm and 19.43 ± 0.90 cm, respectively where as body length, height at wither, chest girth and ear length of Jamunapari goat were 72.13 ± 1.63 cm, 69.69 ± 1.29 cm, 79.18 ± 2.04 cm and 21.23 ± 0.66 cm respectively. Head length, rump length, tail length, udder length, udder diameter, scrotum length and scrotum circumference of Boer goat were 22.29 ± 0.52 cm, 13.87 ± 1.28 cm, 13.91 ± 0.71 cm, 21.83 ± 5.15 cm, 30.33 ± 4.41 cm, 15.10 ± 1.10 cm and 22.25 ± 1.25 cm, respectively. Head length, rump length, tail length, udder length, udder diameter, scrotum length and scrotum circumference of Jamunapari goat were 23.31 ± 0.51 cm, 11.28 ± 0.69 cm, 15.30 ± 0.52 cm, 16.22 ± 1.22 cm, 28.48 ± 1.11 cm, 14.26 ± 0.94 cm and 23.46 ± 1.73 cm, respectively. The body weight of Boer goat was 34.9 ± 5.22 kg. The body length, chest girth, wither height and scrotal circumference of Boer goat were 64.4 ± 6.2 cm, 75.3 ± 4.87 cm, 62.6 ± 2.88 cm and 26.4 ± 2.59 cm, respectively reported by Keith *et al.* (2009) which are almost similar to the study. The body length, wither height, heart girth and ear length of Boer goat were 68.22 ± 0.80 cm, 56.49 ± 0.50 cm, 90.32 ± 1.04 cm and 21.40 ± 0.25 cm, respectively. The head length, head width, pelvic length, pelvic width and tail length of Boer goat were 17.16 ± 0.26 cm, 7.72 ± 0.18 cm, 19.68 ± 0.35 cm and 13.82 ± 0.28 cm and 12.16 ± 0.30 cm, respectively (Pieters, 2007) which are almost similar to the study. The body length, chest of girth, wither height, head length and head width of Jamunapari goat were 114.45 ± 7.6 cm, 79.00 ± 1.00 cm, 70.2 ± 2.2 cm, 20.5 ± 0.8 cm, 13.95 ± 1.75 cm, respectively. The horn length, tail length and ear length of Jamunapari goat were 14.65 ± 3.8 cm, 16.7 ± 0.7 cm and 23.7 ± 0.3 cm, respectively. The udder length, udder breadth, teat length and scrotum circumference of Jamunapari goat were 12.3 ± 1.6 cm, 31.5 ± 4.3 cm, 8.5 ± 1.5 cm and 42.4 ± 2.0 cm, respectively (Hassan *et al.*, 2010) which are very similar to the present study.

4. Conclusions

Phenotype wise Boer goats have distinct characteristics. The body weight significantly ($p < 0.001$) differed between Boer goat and Jamunapari goat. Horn length of Boer goat was significantly ($p < 0.001$) higher than Jamunapari goat. Head width and teat length of Jamunapari goat were significantly higher ($p < 0.05$) than Boer goat. Rump width significantly ($p < 0.05$) differed between Boer goat and Jamunapari goat.

Conflict of interest

None to declare.

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