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Article

The production and reproductive traits among different goat breeds in southwestern region of Bangladesh

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Abstract: In Bangladesh, a comprehensive study was conducted over one year to compare the reproductive and productive performance of Black Bengal, Jamunapari, and crossbred goats. The study involved a sample size of 226 goats and provided insightful information on the distinctive capabilities of each type of goat breeds. Most of the doe were 21–30 months of age, and their weight was 21–30 kg. The feed supply for the doe was concentrated green grass, whereas the kids got supplementary feed like rice bran. Among the reproductive traits, age at puberty, age of first kidding, and age of the first conception were significantly (P<0.001) higher in Jamunapari goats, whereas aerial kidding intervals were found in 263.77 ± 54.26 days in crossbreeds. Postpartum heat periods were highest at 68.50 ± 5.53 days in Jamunapari goats at 1st and 2nd parity, though at 3rd parity, 22.96 ± 26.66 days were uppermost in Black Bengal. There was no significant effect of parity on lactation length or milk production. Though Jamunapari goats show the highest lactation length at 1st and 2nd parity, at 3rd parity, 2.56 ± 2.89 kg was the largest in Black Bengals. The mortality of kids was high in the second parity in Black Bengal and crossbreeds, whereas in Jamunapari, it was higher in the first and second parities. The mortality rate of kids under 20 days was high, which gradually decreased with the advancement of age. Different periparturient and postpartum diseases, like abortion, dystocia, retained placenta, etc., decreased the reproductive performance of goats. The Black Bengal goat exhibited superior productive and reproductive performance to Jamunapari and crossbred goats. The study's findings suggest that, in the southwestern region of Bangladesh, prioritizing Black Bengal goats for breeding programs could potentially enhance both productive and reproductive traits compared to Jamunapari and crossbred goats.

Keywords: feeding; crossbreeds; mortality rate; Black Bengal goat; Jamunapari goat

1. Introduction

Goats have been linked to humans for over 10,000 years and were the first animals to be domesticated (Monteiro *et al*., 2017). Due to their ability to thrive in harsh environments, goats are crucial nutrition providers

in the form of meat and milk, and they play a vital role in ensuring food security, self-employment, and socio-economic development in many low-income populations of the developing world. Goats in Bangladesh are recognized for their significant contributions to the national economy through various means. The benefits of livestock farming in developing countries are numerous. Livestock farming provides meat for human consumption, produces leather for foreign currency earnings, helps small-scale farmers increase their income and reduce poverty, generates employment opportunities in rural regions, and empowers women to earn cash income (Banda and Tanganyika, 2021). The goat population in Bangladesh was estimated to be 26.604 million for the years 2020–2021, comprising 90% Black Bengal, 8–9% Jamunapari, and the remaining being other exotic breeds such as Sirohi, Beetal, and their crosses (Siddiki, 2017). Small, marginal, and landless village farmers own approximately 98% of the goats. Islam *et al*. (2009) conducted a study in Bangladesh that sheds light on goat farming practices among smallholder farmers. According to their findings, 80.5% of farmers use semi-intensive farming techniques, while only 7.3% and 12.2% use confinement and free-range systems, respectively. Moreover, the study reveals that the majority of farmers (96%) feed their indigenous goats with roadside grass and tree leaves, with only a tiny fraction (4%) employing cultivated fodder as feed (Kumar *et al*., 2018). The contribution and the growth rate of animal farming to overall GDP at constant prices are 1.44% and 3.80%, respectively, in Bangladesh (Chowhana *et al*., 2023).

Dairy goats are often called "poor man's cows" because they can produce a remarkable amount of milk considering their size and feed intake (Akinmoladun *et al*., 2019; Gwaze *et al*., 2009). Goats require less food, which makes them a cheaper option. Additionally, they are smaller and easier to handle, making them suitable for women and children (Miller and Lu, 2019; Montiel *et al*., 2014). A single goat can produce enough milk to sustain an average family. In contrast, their size makes cows more challenging to maintain at home and have higher maintenance costs. The Black Bengal goat reigns supreme as the sole goat breed in Bangladesh. Renowned for their versatility, fecundity, delectability, and superior meat and skin, these goats can be spotted all over the nation (Hossain, 2021; Rakib *et al*., 2022). They leisurely graze on desolate roadside terrain and subsist on locally sourced fare such as rice gruel (Miah *et al*., 2016). Additionally, they consume a diverse array of tree leaves, including mango and jackfruit leaves (Khan and Naznin, 2013). Farmers commonly provide Jamunapari goats with a diet of wheat bran, motor bran, gram chuni, and banana residues, among other feeds. Meanwhile, in Bangladesh, the Black Bengal goat is the sole recognized breed raised explicitly for meat production, emphasizing body weight during birth and maturity (Rakib *et al*., 2022). When choosing a goat, key factors include age, body weight, mortality rate, and average weight during kidding and maturity (Hasan *et al*., 2015).

The Jamunapari breed of dairy goats is highly prized in India, according to research by Miah *et al*. (2016). These goats, known as the Pari (Angel), are recognized for their impressive height and stature, making them the tallest breed of goats. Although the exact population of Bangladesh is unknown, study reports of Samad (2021) suggested this breed is primarily found in the Chuadanga, Meherpur, Kushtia, Jhenidah, Pabna, and Jashore districts. The Jamunapari breed is renowned for its milk production, which is utilized in various dairy products, including cheese, butter, and yogurt. Their gentle disposition also makes them an excellent choice for domestication and farm life (Pandya and Ghodke, 2007). In western Bangladesh, the private sector imports exotic breeds of bucks from India for crossbreeding purposes, focusing on the Jamunapari breed (Hassan *et al*., 2010; Zaman, 2017). The reason for importing these exotic breeds is that the unique ravines of the area, with their dense bush, are well-suited to the Jamunapari breed. These goats are highly valued for their versatility in production and their ability to provide valuable contributions like meat, milk, and industrial raw materials, such as skin, fiber, and manure (Hossain, 2021; Bhowmik *et al*., 2014). In the southwestern region of Bangladesh, we hypothesized that Black Bengal goats exhibit superior reproductive and productive traits compared to Jamunapari and crossbred goats. This hypothesis posits that factors such as age at puberty, age of first kidding, aerial kidding intervals, postpartum heat periods, lactation length, milk production, and mortality rates of kids are significantly influenced by the goat breed, with Black Bengals demonstrating enhanced performance in these aspects. However, to prove the hypothesis we coined the current study evaluates and compares the productive and reproductive performance of crossbred goats, Black Bengal goats, and Jamunapari goats. This study seeks to provide detailed insights into the performance of these different breeds of goats and their suitability for different purposes, such as meat, milk, and industrial raw materials. The results of this study can be of great value to the goat farming industry in the region and help farmers make informed decisions regarding the breeding, raising, and management of different goat breeds.

2. Materials and Methods

2.1. Ethical approval

Ethical approval was not required for this study.

2.2. Study area, periods, and sampling pattern

This study was conducted at Abhaynagar upazilla, Jashore, Bangladesh (Figure 1). The study was carried out from December 2020 to December 2021. Then the farmers were selected randomly and located at Noapara paurasava, Prambag, Sundoli, Chalishia, Payra, Sreedharpur, Baghutia, Shubharara and Siddhipasha Union of Abhaynagar upazila of Jashore districts.

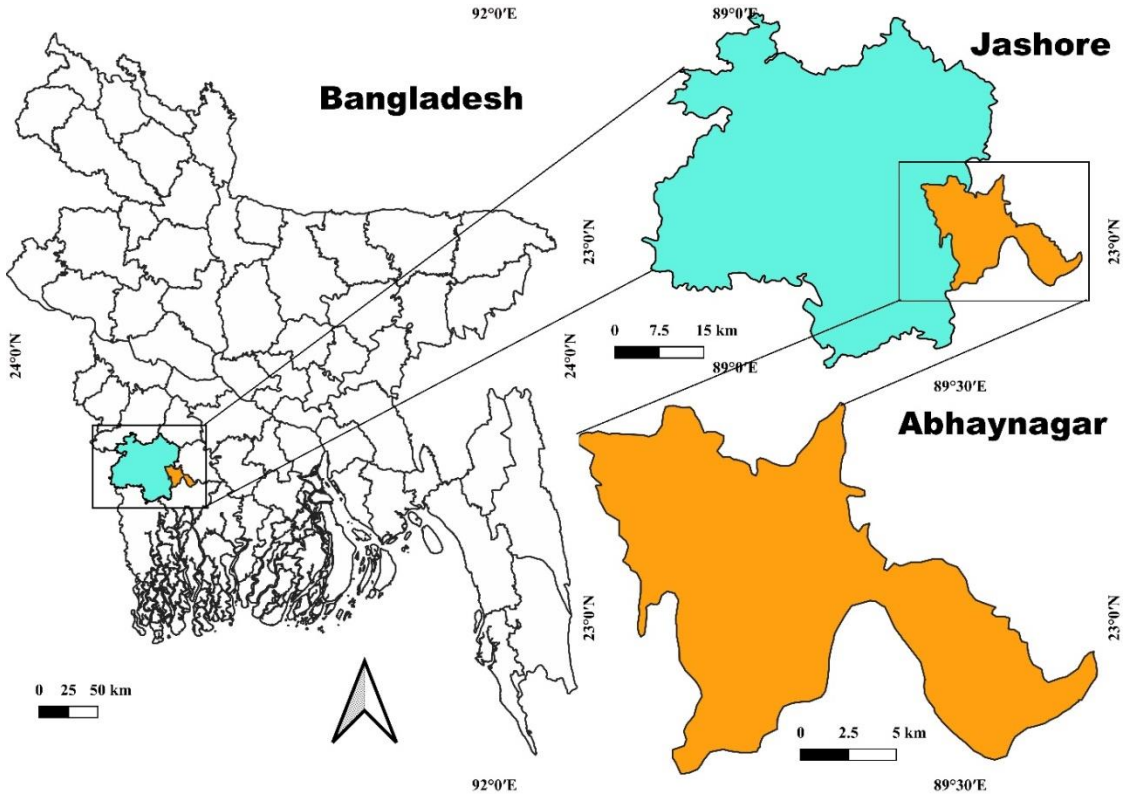

Figure 1. Map showing the study area of Abhaynagar upazila, Jashore.

The pre-structured questionnaire did data collection. The information related to this study was collected directly with face-to-face contact with farmers and farm attendants. Two hundred twenty-six data was collected, including 103 crossbreeds, 103 Black Bengal, and 20 Jamunapari goats. The management system of dairy farms was appropriately observed during data collection.

2.3. Study approaches

The productive and reproductive performances of Black Bengal, Jamunapari, and crossbreed goats were measured using the following traits (Table 1).

Table 1. Traits and their descriptions in selection of productive and reproductive performances of Black Bengal, Jamunapari, and crossbreed goats.

Trait	Description
Litter weight of kids	The newborns were weighed using a balance within 1–24 hours after birth.
Mature weight of does	It was measured by weighing balance.
Type of birth/litter size	It refers to the number of kids born per birth per doe.
Parity	It was calculated based on how often a doe gives a kid.
Number of services per conception	The success of conception was measured by counting the number of times mating was required.

Table 1. Contd.

Trait	Description
Gestation period	It was calculated as the days between conception with the buck and parturition.
Postpartum heat period	The postpartum anestrous period is the interval between a doe's first kidding and her initial and subsequent mating.
Kidding interval	The time between two consecutive kidding's referred to as the kidding interval.
Age at puberty	Observing a wagging tail, swelling and watery discharge from the vulva, a jumping tendency towards others, and bleating are signs of a doe's first heat.

2.4. Statistical analysis

The collected data were analyzed using one-way ANOVA and SPSS 22, with a least significant difference test performed to determine different significance level, the map was prepared using QGIS software.

3. Results

3.1. Description of animal and management system

The age of the does exhibited variation across several parameters, with the highest proportion (42.50%) falling within the 21-30 months age range, while does aged over 40 months constituted the lowest percentage (2.70%). The weight of the does was recorded at 74.80%. In terms of nutritional status, 77.00% of the animals were classified as normal. The majority of farmers adopted a semi-intensive rearing approach (86.73%), while the remaining 13.27% practiced intensive rearing. Natural breeding methods were predominantly employed for this experiment (Table 2).

Table 2. Description of animal and management system.

Parameters	Indicators	Frequency (n)	Percentage (%)
Breed	Black Bengal	103	45.60
	Jamunapari	20	8.80
	Cross	103	45.60
Age of doe (months)	10 – 20	50	22.10
	21 – 30	96	42.50
	31 – 40	74	32.70
	> 40	6	2.70
Weight of doe (kg)	10 – 20	53	23.50
	21 – 30	169	74.80
	>30	4	1.80
Nutritional status	Malnourished	51	22.60
	Normal	174	77.00
	Fatty	1	0.40
Housing	Semi-intensive	196	86.73
	Extensive	30	13.27
Breeding method	Natural	226	100.00

3.2. Feeding of doe and kids

The quantity of green grass and concentrate provided showed variability across different variables. Notably, 27.20% of does received more than 2 kg of green grass, while only 3.70% were supplied with over 1 kg of concentrate. In terms of supplementary feeding, the majority of farmers provided milk (60.48%), and the remaining 39.52% supplied rice bran. However, a significant proportion of does (94.20%) produced insufficient milk, with only a small percentage (5.80%) yielding a sufficient amount (Table 3).

Table 3. Feeding system of doe and kids.

Animal	Parameters	Indicators (kg)	Frequency (n)	Percentage (%)
Doe	Green grass	< 0.5	17	4.00
		0.5 – 1	78	18.30
		1.1 – 2	15	3.50
		> 2	116	27.20

Table 3. Contd.

Animal	Parameters	Indicators (kg)	Frequency (n)	Percentage (%)
	Concentrate	< 0.3	29	6.80
		0.3 – 0.7	82	19.20
		0.8 – 0.9	99	23.20
		≥ 1	16	3.70
Kid	Supplementary feed for kid	Milk	150	60.48
		Rice bran	98	39.52
	Milk production for kid	Sufficient	13	5.80
		Insufficient	213	94.20

3.3. Reproductive traits of Black Bengal, Jamunapari, and crossbreed goats

The research findings highlight that Jamunapari goats demonstrate an earlier onset of puberty (357.85 ± 10.98 days) compared to the other breeds. However, they undergo a longer duration (403.65 ± 22.36 days) until their first conception, resulting in an extended age (551.50±18.65 days) for their initial kidding. Crossbreed goats have an extended kidding interval (263.77 ± 54.26 days), yet the gestation length and service per conception remain comparable among all three breeds. There was a significant difference (P<0.05) in some reproductive traits among the breeds, like age of puberty, kidding interval, age of first kidding, age of the first conception, and litter size (Table 4).

Table 4. Reproductive traits of Black Bengal, Jamunapari, and crossbreed goats.

Parameters	Black Bengal	Jamunapari	Crossbreed	Level of significance
	n = 103	n = 20	n = 103	
Age at puberty (days)	208.50±26.20	357.85±10.98	229.27±23.85	**
Service per conception	1.45±0.54	1.25±0.44	1.34±0.53	NS
Kidding interval (days)	191.13±98.49	217.90±14.08	263.77±54.26	**
Age of first kidding (days)	373.18±25.67	551.50±18.65	409.14±31.14	**
Gestation period (days)	150.04±7.96	149.90±2.59	150.71±4.31	NS
Age of first conception (days)	282.90±20.64	403.65±22.36	344.58±26.13	**

Note: n = Frequency, Values= Mean ± SE; SE = Standard error; Row wise different superscript letters denote significant level at *P <0.05, **P <0.01, NS = Non significant

3.4. Effect of parity on productive and reproductive trait and litter size of Black Bengal, Jamunapari, and crossbreed goats

Parity has a significant effect on different productive and reproductive traits. The average postpartum heat periods for Black Bengal, Jamunapari, and crossbreed goats were 44.83 ± 10.18, 68.50 ± 5.53, and 48.16 ± 19.54 days, respectively. Average lactation lengths were 69.09 ± 13.67, 77.25 ± 3.96, and 48.63 ± 4.20 days, and average litter weights were 5.38 ± 1.71, 6.56 ± 1.09, and 5.18 ± 2.46 kg for Black Bengal, Jamunapari, and crossbreed goats, respectively. Milk production averages were 0.49 ± 0.11, 0.36 ± 0.20, and 0.22 ± 0.23 liters, and litter sizes were 1.80 ± 0.07, 1.50 ± 0.11, and 1.15 ± 0.04 for Black Bengal, Jamunapari, and crossbreed goats, respectively (Table 5).

Table 5. Effect of parity on the productive and reproductive trait of Black Bengal, Jamunapari, and crossbreed goats.

Parameters	Parity	Black Bengal	Jamunapari	Crossbreed
Postpartum heat period (days)	1	44.83±10.18	68.50±5.53	48.16±19.54
	2	34.57±20.67	59.80±16.08	43.38±27.28
	3	22.96±26.66	13.35±32.63	18.54±27.58
Lactation length (days)	1	69.09±13.67	77.25±3.96	48.63±4.20
	2	41.59±22.61	58.25±6.84	38.42±22.53
	3	23.08±26.37	47.00±7.34	15.66±23.03
Milk production (Liter)	1	0.49±0.11	0.36±0.20	0.22±0.23
	2	1.10±0.21	0.98±0.30	0.15±0.37
	3	0.33±0.10	0.23±0.16	0.10±0.15

Table 5. Contd.

Parameters	Parity	Black Bengal	Jamunapari	Crossbreed
Average litter weight (kg)	1	5.38±1.71	6.56±1.09	5.18±2.46
	2	4.38±2.58	5.46±2.54	3.83±3.09
	3	2.56±2.89	0.46±1.44	1.91±3.03
Litter size (number)	1	1.80±0.07	1.50±0.11	1.15±0.04
	2	1.84±0.07	1.90±0.10	1.24±0.05
	3	1.90±0.10	1.33±0.33	1.35±0.15

Note: Values= mean ± SE; SE = standard error

3.5. Kid mortality of Black Bengal, Jamunapari, and crossbreed goats

Kid mortality rates varied across parities and types. For single-born kids, Black Bengal had rates of 13.11%, 9.84%, and 3.28% at 1st, 2nd, and 3rd parity, Jamunapari had rates of 33.33% and 16.67%, and crossbreeds had rates of 3.64% and 9.09%. Among twin kids, Black Bengal had rates of 18.035%, 16.39%, and 9.83%, Jamunapari had rates of 16.67% and 33.33%, and crossbreeds had rates of 27.27%, 25.45%, and 16.36%. For triplet kids, Black Bengal had rates of 14.75% and 8.20%, and crossbreeds had rates of 7.27%, 7.27%, and 3.64%. Among quadruplet kids, 6.56% died in the 1st parity of Black Bengal goats (Table 6).

Table 6. The kid mortality rate at different parities.

Parameters	Type of kids	Black Bengal			Jamunapari			Crossbreed		
		P1	P2	P3	P1	P2	P3	P1	P2	P3
		% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Kid mortality (%)	Single	13.11 (8)	9.84 (6)	3.28 (2)	33.33 (2)	16.67 (1)	0.00 (0)	3.64 (2)	9.09 (5)	0.00 (0)
	Twin	18.03 (11)	16.39 (10)	9.83 (6)	16.67 (1)	33.33 (2)	0.00 (0)	27.27 (15)	25.45 (14)	16.36 (9)
	Triplet	0.00 (0)	14.75 (9)	8.20 (5)	0.00 (0)	0.00 (0)	0.00 (0)	7.27 (4)	7.27 (4)	3.64 (2)
	Quadruplet	6.56 (6)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

Note: Values= percentage (frequency); n = frequency; % = percentage; p = parity

Kid mortality age categories (less than 1 day, 1 – 10 days, 11 – 20 days, and more than 20 days) were analyzed for Black Bengal, Jamunapari, and crossbreed goats. Notably, the highest number (6) of deaths within less than 1 day occurred among crossbreeds. Between 1 to 10 days, 19 kids died from Black Bengal, while 24 died from crossbreeds. In the 11 to 20 days category, 32 kids died from Black Bengal, compared to 22 from crossbreeds. Additionally, 9 Black Bengal goats died at an age exceeding 20 days (Table 7).

Table 7. Age of kid mortality of Black Bengal, Jamunapari, and crossbreed goats.

Age (days)	Black Bengal (n)	Jamunapari (n)	Crossbreed (n)
<1	1	0	6
1 – 10	19	1	24
11 – 20	32	1	22
> 20	9	4	3

3.6. Disease prevalence of Black Bengal, Jamunapari, and crossbreed goats

Among periparturient diseases, the highest percentage (35.0%) in Jamunapari goats was PPR, while Jamunapari and Black Bengal goats reported 10.00% pneumonia and 7.80% metritis, respectively. In postpartum diseases, Jamunapari goats had the highest percentage (20.0%) of pneumonia, whereas Black Bengal goats had 7.80% retained placenta (Table 8).

Table 8. Disease prevalence of Black Bengal, Jamunapari, and crossbreed goats.

Name of disease	Peripartum disease (%)			Postpartum disease (%)		
	Black Bengal	Jamunapari	Crossbreed	Black Bengal	Jamunapari	Crossbreed
Abortion	-	-	-	2.90	5.00	1.90
Bloat	1.00	-	-	-	-	-
Diarrhoea	1.00	5.00	-	-	-	-
Dystocia	-	-	-	1.90	5.00	1.00
Metritis	7.80	-	3.90	-	-	-
Pneumonia	1.00	10.00	-	-	20.00	-
Retain Placenta	-	-	-	7.80	5.00	4.90
PPR	-	35.00	-	-	-	-
Hypocalcemia	-	5.00	-	-	-	-
Mastitis	-	-	-	4.90	5.00	2.90

4. Discussion

The study area has Black Bangles, cross-breeds, and Jamunapari goats. Doe age varies, with 21-30 months age doe having the highest number (42.50%). Most farmers rear semi-intensive (86.73%) and rest-intensive (13.27%). Green grass and concentrate were supplied to 27.20% doe, with over 2 kg in 27.20% does and 1 kg in 3.70% does. Most farmers supplied milk (60.48%) and rice bran (39.52%), with 94.20% of does producing sufficient milk. The present study compared the puberty age of Black Bengal and Jamunapari goats, with Hassan *et al*. (2007, 2010) and Miah *et al*. (2016) recording slight variation in results. The Black Bengal goats had a puberty age of 208.50 ± 26.20 days, while the Jamunapari goats had an age of 357.85 ± 10.98. The variation in results may be due to genetic causes, while the rearing system did not affect the age of puberty. Crossbreeds had a puberty age of 229.27 ± 23.85 days, slightly lower than Hassan *et al*. (2007). The study also found that BBGs were reported early in maturing goats than CBGs (225 days). Variations in the breeds' duration were statistically significant (P<0.05). The present study found that the service per conception in Black Bengal was 1.45 ± 0.54, similar to Miah *et al*. (2016) observation. In Jamunapari, the service per conception was 1.25 ± 0.44, slightly larger than Hassan *et al*. (2007) and Miah *et al*. (2016), 1.3 ± 0.6 and 1.34 ± 0.085, respectively. In the case of crossbreeds, the service per conception was 1.34 ± 0.53 in the present study. The difference may be due to inadequate heat detection and mating methods. The average kidding interval in Black Bengal was 191.13 ± 98.49 days in the present study, where Hassan *et al*. (2010) and Miah *et al*. (2016) found 181.23 ± 4.55 days and 186.15 ± 1.25 days, respectively, which are slightly longer than the present study. For Jamunapari, the kidding interval was 217.90 ± 14.08 days, as shown by the present study, where Miah *et al*. (2016) recorded 199.22 ± 2.40 days, slightly longer than the present study. Improper record-keeping by the farmers could be the reason for the issue. In the case of crossbreeds, the average kidding interval was 263.77 ± 54.26 days in the present study, whereas Hassan *et al*. (2007) found 270 ± 22 days, slightly longer than the present study. The reason for this may be the difference in the number of times a doe has given birth. The kidding interval increases in later parities than the first one (Miah *et al*., 2016).

The average age of first kidding in Black Bengal was 373.18 ± 25.67 days in the present study, whereas Hassan *et al*. (2007) had 360.5 ± 10 days, slightly shorter than the present study. However, Hassan *et al*. (2010) found Jamunapari and crossbreeds average age of first kidding of 548.6 ± 68.1 days, almost similar to the current study, and 409.14 ± 31.14 days for crossbreeds. The average gestation period in Black Bengal was 150.04 ± 7.96 days in the present study, whereas Miah *et al*. (2016) recorded 147.90 ± 0.25 days, slightly shorter than the present study. For Jamunapari, it was 149.90 ± 2.59 days in the present study, whereas Hassan *et al*. (2010) and Miah *et al*. (2016) found 152.8 ± 17.5 and 146.24 days, which are slightly longer and shorter than the present study, respectively. In the case of crossbreed goats, the average gestation period was 150.71 ± 4.31 days. This variation in gestation period is due to an increase in later parities compared to the first one (Miah *et al*., 2016). The average age of the first conception in Black Bengal was 282.90 ± 20.64 days in the present study, which supports the earlier findings of Hasan *et al*. (2014). In the present study, Jamunapari and crossbreeds were 403.65 ± 22.36 and 344.58 ± 26.13 days, respectively. The Black Bengal goats have a considerably lower age at conception and first kidding, which agrees with Amit *et al*. (2011). The present study's findings were supported by Miah *et al*. (2016). It was larger and smaller in Jamunapari and crossbreeds than in Black Bengal. It is observed that Jamunapari has a more extended gestation period than Black Bengal, as supported by Miah *et al*. (2016). The lactation length is relatively longer in Black Bengal goats than in Jamunapari and crossbreeds, which agrees with Hassan *et al*. (2007). The study found that the milk production of Black Bengal was 0.49 ±

0.11, 1.10 ± 0.21, and 0.33 ± 0.10 liters during their first, second, and third parities, respectively. However, other studies have shown that milk production generally increases with age and is highest during the third parity. The difference in findings could be due to the number of observations made during specific parities and other management factors. The present study shows that the average litter weight decreases with higher parity and exhibits significant variation among the breeds. The birth weight may be affected by the gender of the kid (Hassan *et al*., 2010; Paul *et al*., 2014), birth type (single, twin, etc.) (Hasan *et al*., 2014), and season (Moni and Samad, 2019).

The study found that the average litter size in Black Bengal goats was 1.80 ± 0.07, 1.84 ± 0.07, and 1.90 ± 0.10 at first, second, and third parity. This finding of the study is aligned with those of Faruque and Khandoker (2007), Hassan *et al*. (2007), and Miah *et al*. (2016). Hassan *et al*. (2015) also found that the rearing system significantly impacted litter size. In Jamunapari goats, litter sizes were 1.50 ± 0.11, 1.90 ± 0.10, and 1.33 ± 0.33 at first, second, and third parity in the present study. In contrast, Hassan *et al*. (2010) and Miah *et al*. (2016) reported an average litter size of 1.70 ± 0.60 and 1.59±0.11, respectively. Crossbreeds' average litter sizes were 1.15 ± 0.04, 1.24 ± 0.05, and 1.35 ± 0.15 at first, second, and third parity, which aligns with previous research of Hassan *et al*. (2007). Kid mortality in Black Bengal and crossbreeds was high in the second parity, while in Jamunapari, it was higher in the first and second parities. The study found that kid mortality was higher in semi-intensive conditions, which may be due to poisoning, higher disease incidence, and predators (Hasan *et al*., 2014). The kid mortality in Black Bengal was significantly higher (50.00%) than in Jamunapari (4.92%), indicating a higher mortality rate compared to Husain (1999) on Black Bengal goat kids. Mortality rates were high for newborns (under 20 days) due to low immunity and birth weight, consistent with Hasan *et al*. (2014). Faruque and Khandoker (2007) found that factors such as dam weight, milk yield, season, birth, litter size, parity, nutrition, and diseases contribute to this issue. The study of Chauhan *et al*. (2019) on BBGs revealed that birth weight significantly influences kid mortality, with goats with higher birth weights experiencing descending mortality. Among the gyneco-obstetrical cases, abortion and dystocia were more prevalent in Jamunapari than others, whereas retained placenta was more prevalent in Black Bengal goats. However, Lucky *et al*. (2016) and Sayeed *et al*. (2020) reported earlier that abortion is most prevalent among gyneco-obstetrical cases, which may be due to the advancement of parity. Hasan *et al*. (2014) found that increased parity decreased the incidence of abortions, while the abortion rate was higher under extensive rather than semi-intensive conditions, possibly due to intra-species fighting. Earlier research found that higher damage levels increase fertility rates and decrease abortion rates (Hasan *et al*., 2015). Mastitis is the most prevalent digestive, metabolic, and nutritional disease in all three breeds, while PPR is the most prevalent in bacterial and viral diseases. These findings support previous research by Lucky *et al*. (2016) on the prevalence of gyneco-obstetrical cases in goats.

5. Conclusions

Goats are domesticated worldwide for their cheap management and good meat and milk production. Their productivity and reproductive performance vary based on sex, birth type, parity, and season. Jamunapari goats are suitable for meat and milk production due to their higher age at first estrus and longer kidding intervals. Black Bengal goats perform better in semi-intensive systems, making them suitable for Bangladesh's socioeconomic and climatic conditions.

Acknowledgements

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Data availability

The data used to support the findings of this study are included in the article.

Conflict of interest

None to declare.

Authors' contribution

Conceptualization: Sangita Mondal and Amitush Dutta; methodology: Sangita Mondal, Asib Ahmed, Jarin Tasnim, Promitush Dutta and Mizanur Rahman Sarker; formal analysis: Sangita Mondal, Amitush Dutta and Asib Ahmed; writing-original draft preparation: Sangita Mondal, Amitush Dutta, Asib Ahmed, Jarin Tasnim, Promitush Dutta and Mizanur Rahman Sarker; writing-review and editing: Jarin Tasnim, Promitush Dutta and Mizanur Rahman Sarker. All authors have read and approved the final manuscript.

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