Bangladesh Journal of Animal Science
Journal homepage: http://www.banglajol.info/index.php/BJAS

Performances of Black Bengal Goat in an intensive Breeding farm at Joypurhat district of Bangladesh

MAR Khan[1]✉, FY Bari[2], NS Juyena[3], MA Haque[4]

[1]Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh-2202

[2]Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh-2202

[3]Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh-2202

[4]Faculty of Animal Science and Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka-1207

[4]School of Veterinary Science, The University of Queensland, Gatton, Queensland 4343, Australia

ARTICLE INFO

Article history:
Received: 2 May 2026
Revised: 23 June 2026
Accepted: 25 June 2026
Published: 30 June 2026

Keywords:
Black Bengal goat, Reproductive performance, Kid mortality, Intensive management, Bangladesh

Correspondence:
alveroneydvm@gmail.com

ISSN: 0003-3588

OPEN ACCESS

ABSTRACT

The study was conducted to evaluate the reproductive performance of Black Bengal goat under intensive management in a breeding farm at Panchbibi Upazilla, Joypurhat district, Bangladesh. A total of 48 Black Bengal does, and 178 their progenies were selected for the assessment of reproductive parameters including age at puberty (first estrus), weight at heat, service per conception, gestation period, age at first kidding, kidding interval, post-partum weight, birth weight, kid mortality, and disease occurrence. Age at puberty was 200.38±8.93 days and age at first kidding was 360.15±13.67 days. Average weight at heat increased significantly ($p<0.01$) from 19.71±2.48 kg in first parity to 24.36±2.79 kg in third parity. Service per conception decreased significantly ($p<0.01$) from first parity (2.38±0.89) to third parity (1.65±0.79). Gestation period (147.56±8.20 days) was not affected by parity or season, while kidding interval was significantly ($p<0.01$) shorter in third parity (187.32±4.77 days) than in second parity (199.89±7.17) days. Post-partum weight increased significantly ($p<0.01$) with parity advancement. The average post-partum heat interval was 55–65 days across parities. Male kids were significantly ($p<0.01$) heavier than female kids at birth in first and second parity, though female kids were heavier in third parity. Overall kid mortality was 13.25%, with the highest rate observed during Winter (18.50±10.63%), though seasonal differences were not statistically significant ($p=0.262$). Pneumonia (32.47%) was the leading cause of kid mortality, while skin diseases (27.69%) and diarrhea (24.62%) were most common in adult does. These findings indicate that intensive management supports favorable reproductive performance in Black Bengal goats, with short kidding intervals enabling approximately two kiddings per year, while winter pneumonia and disease management remain key targets for reducing kid mortality and improving overall productivity.

Introduction

Goat production plays a vital role in the rural economy of Bangladesh, contributing significantly to income generation, nutrition, and poverty alleviation for smallholder farmers (Mondal et al., 2024; Islam, 2023). With approximately 27.5 million goats contributing nearly 36% of total meat production in Bangladesh, the sector provides livelihood opportunities for over 60% of rural households (Hassan et al., 2021; Khandoker et al., 2022). Approximately 90% of the goat population comprises Black Bengal goats (Afroz et al., 2020), a breed renowned for its high prolificacy, early sexual maturity, superior adaptability to hot humid conditions, disease resistance, and production of quality meat and skin (Devendra and Burns, 1983; Husain et al., 1996; Amin et al., 2001). Despite these advantages, Black Bengal goats face challenges including slower growth rates, lower milk production, and higher kid mortality under traditional management systems (Honhold, 2001; Chowdhury et al., 2002; Alam et al., 2021).

How to Cite

MAR Khan, FY Bari, NS Juyena, MA Haque (2026). Performances of Black Bengal Goat in an intensive breeding farm at Joypurhat district of Bangladesh. *Bangladesh Journal of Animal Science* 55 (2): 53 - 63. https://doi.org/10.3329/bjas.v55i2.92306

Reproductive performance is the cornerstone of profitable goat production, directly influencing the number of kids born, survival rates, and overall herd productivity (Mukasa-Mugerwa et al., 2002; Notter, 2000). Key reproductive traits such as age at puberty, kidding interval, litter size, and kid survival determine the reproductive efficiency and economic returns from goat farming enterprises. Recent studies have emphasized the importance of improved management practices in enhancing reproductive outcomes and reducing mortality in Black Bengal goats (Mondal et al., 2024; Rahman et al., 2023; Bhuiyan et al., 2022). Intensive and semi-intensive management systems have shown promising results in improving reproductive efficiency, reducing kidding intervals, and enhancing kid survival rates compared to traditional extensive systems (Hossain et al., 2021; Miazi et al., 2020).

Kid mortality remains a major constraint to goat production in Bangladesh, with rates ranging from 13% to 29% depending on management systems (Chowdhury et al., 2002; Rahman et al., 2023). The primary causes include infectious diseases such as pneumonia and diarrhea, inadequate nutrition, poor colostrum intake, and adverse environmental conditions (Chowdhury and Faruque, 2001; Rahman et al., 2023; Das et al., 2024). Recent investigations have identified birth weight, parity of dam, season of birth, and colostrum intake timing as critical determinants of kid survival, with kids weighing less than 800 g at birth facing mortality rates exceeding 40% in the first month of life (Rahman et al., 2023; Sultana et al., 2022). Understanding the factors influencing reproductive performance and kid survival is essential for developing effective breeding programs and management strategies.

While several studies have documented reproductive parameters of Black Bengal goats under semi-intensive and extensive management systems (Hasan et al., 2014; Chowdhury et al., 2002; Miazi et al., 2020), comprehensive data on performance under intensive farming conditions in northern Bangladesh remain limited. Moreover, most previous studies were conducted over a decade ago, and there is a need for updated information reflecting current management practices and genetic improvement programs initiated by PKSF and partner organizations since 2013 (Islam et al., 2021). The present study was therefore undertaken to systematically evaluate the reproductive performance, disease occurrence, and kid mortality patterns of Black Bengal goats in an intensive breeding farm in Joypurhat district, with the specific objectives of: (i) assessing the effects of parity on reproductive parameters, (ii) determining seasonal influences on reproductive performance, (iii) identifying factors affecting birth weight and kid mortality, and (iv) documenting the incidence of reproductive disorders and diseases affecting productivity.

Materials and Methods

Experimental site and period

The study was conducted at the Black Bengal Breeding Farm located at Bugjana, Panchbibi Upazilla, Joypurhat district, Bangladesh (approximately 21 km north of Joypurhat district headquarters). The farm is managed by JAKAS Foundation, a non-governmental organization established in 1993 and funded by PKSF. Since 2013, PKSF has undertaken selective breeding programs to improve Black Bengal goat genetic quality in collaboration with JAKAS Foundation. The study was carried out from January 2015 to July 2016 to assess seasonal effects and parity progression.

Selection of experimental animals

A total of 48 Black Bengal does were selected based on age, body weight, body shape, and conformation under intensive farming conditions. All does were confirmed pure Black Bengal breed based on phenotypic characteristics including coat color, body size, and horn shape, in accordance with farm breeding records. Data were collected through regular farm visits, direct observation, formal and informal discussions with farm personnel, and examination of farm record registers. The reproductive parameters recorded included age at onset of puberty, weight at heat, service required per conception, gestation period, age at first kidding, kidding interval, post-partum weight of does, sex ratio of kids, and birth weight at different parities. All 48 selected does and their 178 progenies were individually ear-tagged and monitored throughout the study period.

Feeds and feeding

Does were fed twice daily at 8:30 AM and 4:30 PM. A concentrated mixture was provided at the rate of 300 g/day for does and 100 g/day for kids. Does were allowed to graze two times daily (9:00-11:00 AM and 3:00-4:00 PM). Jackfruit tree leaves were provided as supplementary roughage in the farmyard. The concentrate mixture contained 16% CP, and 10 MJ/kg ME. Goats also received stall feed with molasses-treated straw (MS: 80%, molasses: 20%). Napier grass was provided twice daily as per

requirement. Clean and safe drinking water was available at all times.

Housing and management

All does were housed on wooden platforms in concrete houses. Kids were kept in specially designed wooden brooding pens with adequate bedding materials, feeding and watering facilities, and temperature control provisions. Kids remained with their mothers in metabolic stalls up to one month of age. Bucks were maintained separately from does to prevent random mating. Floor space provided for does, bucks, and kids was 1.86, 2.3, and 1 m^2, respectively.

Health and sanitation

Cleaning and hygienic management were maintained regularly. Floor, stalls, water troughs, and feeders were cleaned daily, and feces were removed carefully. All does were dewormed using Fenbendazole tablets (Paraclear, Tecno Drug, Bangladesh) at the rate of 1 tablet/50 kg body weight orally as prescribed by the veterinarian. Dams were vaccinated against PPR (Peste des Petits Ruminants) using live attenuated vaccine (Livestock Research Institute, Bangladesh).

Record keeping and data collection

Individual flock books, shed books, kid birth books, kid mortality books, mating books, reproduction books, health books, and feed books were maintained for all experimental animals. Information on age at puberty, weight at heat, services per conception, gestation period, age at first kidding, kidding interval, post-partum weight of does, sex ratio of kids, birth weight of kids, kid mortality, and disease occurrence were systematically recorded and stored for analysis.

Definition of reproductive parameters

Age at puberty: The age in days when does first exhibited signs of estrus, including tail wagging, vulvar swelling and discharge, jumping tendency, and vocalization.

Weight at heat: Body weight (kg) recorded when does exhibited estrous signs, measured using a weighing balance.

Service per conception: Number of services required for each doe to become pregnant.

Gestation period: The interval in days from fertile service to parturition.

Age at first kidding: Age in days from birth of the doe to date of first kidding.

Kidding interval: Number of days between two consecutive parturitions.

Post-partum weight: Body weight (kg) of does measured immediately after kidding.

Birth weight: Weight (kg) of kids measured immediately after birth using a weighing balance.

Kid mortality: Mortality recorded from birth to weaning, with most deaths occurring within the first month of life.

Seasonal classification

To assess seasonal effects on reproductive performance, the year was divided into three seasons: Season-1 (March-June: Summer), Season-2 (July-October: Monsoon), and Season-3 (November-February: Winter).

Statistical analysis

Collected data were compiled, tabulated, and analyzed using descriptive statistics including mean, standard deviation, standard error, percentages, and ratios. Data were expressed as Mean±SD. Analysis of variance (ANOVA) was performed to evaluate the effects of parity and season on reproductive and productive parameters. All statistical analyses were conducted using SPSS software version 20, and $p<0.01$ was considered statistically significant. The same 48 does were used for both parity-wise and season-wise analyses, representing repeated observations across different reproductive cycles and the seasons in which those cycles occurred. Parity-wise analysis (Table 1) examined the effect of reproductive cycle number on each parameter, while season-wise analysis (Table 2) examined the effect of the season in which each reproductive event took place, independent of parity.

Results

Effects of parity on reproductive parameters

The effects of parity on reproductive parameters of Black Bengal goats are presented in Table 1. Age at puberty (200.38±8.93 days) and age at first kidding (360.15±13.67 days) were recorded only for first parity does. Average weight at heat increased significantly ($p<0.01$) from 19.71±2.48 kg in first parity to 22.45±2.15 kg in second parity and 24.36±2.79 kg in third parity. The number of services required per conception decreased significantly ($p<0.01$) from 2.38±0.89 in first parity to 1.83±0.78 in second parity and 1.65±0.79 in third parity.

Gestation period showed no significant differences among parities, averaging

147.69±8.91, 147.77±7.88, and 146.92±7.82 days for first, second, and third parity, respectively. Kidding interval was significantly ($p<0.01$) lower in third parity (187.32±4.77 days) compared to second parity (199.89±7.17 days). Post-partum weight of does showed no significant seasonal variation ($p=0.098$), averaging 20.25±2.69, 20.66±2.68, and 19.26±2.93 kg for Summer, Monsoon, and Winter seasons, respectively.

Birth weights of male kids were 1.02±0.17, 1.01±0.23, and 0.80±0.04 kg for first, second, and third parity, while female kids weighed 0.94±0.09, 0.91±0.10, and 0.57±0.46 kg, respectively. Male kids were significantly ($p<0.01$) heavier than female kids in first parity (1024.89 vs 575.11 g) and second parity (1017.02 vs 941.91 g), but this difference was reversed in third parity (809.36 vs 918.51 g).

Table 1. Effect of parity of dam on reproductive performance of Black Bengal goat in intensive breeding farm

Parameters	First parity (Mean±SD) (n=48)	Second parity (Mean±SD) (n=45)	Third parity (Mean±SD) (n=40)	Level of significance
Age at puberty (day)	200.38±8.93	-	-	-
Age at first kidding (day)	360.15±13.67	-	-	-
Weight at heat (kg)	$19.71±2.48^{c}$	$22.45±2.15^{b}$	$24.36±2.79^{a}$	**
Service per conception	$2.38±0.89^{a}$	$1.83±0.78^{b}$	$1.65±0.79^{c}$	**
Gestation period (day)	147.69±8.91	147.77±7.88	146.92±7.82	NS
Kidding interval (day)	-	$199.89±7.17^{a}$	$187.32±4.77^{b}$	**
Post-partum weight (kg)	$17.85±2.03^{c}$	$20.26±1.91^{b}$	$22.32±2.18^{a}$	**
Birth weight of kids (kg)	Male: (First) 1024.89^{a}±171.96 g	Male:(Second) 1017.02^{a}±231.93 g	Male: (Third) 809.36^{b}±404.06 g	**
	Female: 575.11^{b}±463.41 g	Female: 941.91^{a}±92.70 g	Female: 918.51^{a}±105.05 g	**

***Significant ($p<0.01$), SD: Standard Deviation, NS: Not significant. Values with different superscripts in the same row differ significantly ($p<0.01$).*

Effects of season on reproductive parameters

Seasonal effects on reproductive performance are presented in Table 2. Age at puberty showed no significant seasonal variation ($p=0.088$), averaging 198.00±8.01, 199.13±9.13, and 204.64±9.50 days for Summer, Monsoon, and Winter seasons, respectively. Age at first kidding showed no significant seasonal variation, averaging 359.50±12.89, 360.89±11.32, and 361.22±15.90 days for Summer, Monsoon, and Winter, respectively.

Weight at heat, service per conception, and gestation period were not significantly affected by season. Post-partum weight of does also showed no significant seasonal variation ($p=0.098$), averaging 18.25±2.69, 16.5±2.68, and 19±2.93 kg for Summer, Monsoon, and Winter seasons, respectively. Birth weight of kids showed no significant seasonal differences, averaging 0.97±0.15, 1.00±0.10, and 0.99±0.12 kg for Summer, Monsoon, and Winter seasons, respectively.

Table 2. Effect of season on reproductive performance of Black Bengal goat in intensive breeding farm

Parameters	Season-1 (Mar-Jun; Summer) Mean±SD (n)	Season-2 (Jul-Oct; Monsoon) Mean±SD (n)	Season-3 (Nov-Feb; Winter) Mean±SD (n)	Probability
Age at puberty (day)	198.00±8.01 (20)	199.13±9.13 (23)	204.64±9.50 (14)	NS
Age at first kidding (day)	359.50±12.89 (12)	360.89±11.32 (11)	361.22±15.90 (32)	NS
Weight at heat (kg)	21.33±3.72 (33)	22.05±3.60 (37)	22.58±2.71 (45)	NS
Service per conception	1.94±0.95 (36)	2.03±0.92 (33)	1.88±0.75 (32)	NS
Gestation period (day)	147.47±7.84 (28)	149.32±7.89 (25)	146.66±11.03 (32)	NS
Kidding interval (day)	190.71±9.02 (31)	195.24±9.07 (17)	195.63±8.33 (24)	NS
Post-partum weight (kg)	20.25±2.69 (40)	20.66±2.68 (29)	19.26±2.93 (39)	NS
Birth weight (kg)	0.97±0.15 (66)	1.00±0.10 (57)	0.99±0.12 (55)	NS

***Significant (p<0.01), NS: Not significant, n: number of observations*

Seasonality of kidding

Month-wise distribution of kidding is presented in Table 3. Out of 178 kids born during the study period, 84 were male and 94 were female, yielding a sex ratio of 42:47 (male:female). The highest frequency of kidding was observed in September (16.29%), followed by May (15.73%), June (12.36%), and December (11.80%). The lowest kidding frequencies occurred in April (2.25%) and November (2.25%).

Table 3. Seasonality of kidding during different months

Month	No. of does kidded	Total kids born	Male	Female	Percentage of total kidding
January	7	11	4	7	6.18
February	12	19	5	14	10.67
March	7	12	7	5	6.74
April	2	4	2	2	2.25
May	17	28	12	16	15.73
June	11	22	14	8	12.36
July	7	12	7	5	6.74
August	3	5	4	1	2.81
September	10	29	12	17	16.29
October	18	11	4	7	6.18
November	2	4	2	2	2.25
December	10	21	11	10	11.80
Total	106	178	84	94	100

Note: Observation numbers for some months were low (e.g., April and November), which should be considered when interpreting month-wise percentages.

Kid mortality

The effects of season and parity on kid mortality are presented in Table 4. Total kid deaths recorded were **36 (20.22%)**, **74 (41.57%)**, and **49 (27.53%)** in first, second, and third parity, respectively. Kid mortality was numerically highest in Winter (18.50±10.63%) compared to Summer (12.25±7.93%) and Monsoon (9.00±1.82%), though this seasonal difference was not statistically significant (p=0.262).

Table 4. Effect of season and parity of dam on kid mortality rate

Factors	Observations
Parity of dam	
First parity	36(20.22%)
Second parity	74(41.57%)
Third parity	49(27.53%)
Season	Mean±SD (Minimum-Maximum)
Summer (Mar-Jun)	12.25±7.93 (4.00-22.00) (n=4)
Monsoon (Jul-Oct)	9.00±1.82 (7.00-11.00) (n=4)
Winter (Nov-Feb)	18.50±10.63 (10.00-34.00) (n=4)
Overall	13.25±8.11 (4.00-34.00)
P-value	0.262 (NS)

NS: Not significant

Occurrence of diseases in does and kids

Disease occurrence patterns in does and kids are presented in Table 5. Kids were most vulnerable to pneumonia (32.47%), followed by diarrhea (15.58%), conjunctivitis (15.58%), ecthyma (12.99%), and bloat (10.39%). Adult does were primarily affected by skin diseases (27.69%), diarrhea (24.62%), PPR (15.38%), and mastitis (7.69%). Kids were not affected by skin diseases or mastitis.

Table 5. Occurrence of diseases in does and kids of Black Bengal goat

Diseases	Does		Kids	
	Number affected	Occurrence (%)	Number affected	Occurrence (%)
Skin diseases	18	27.69	0	0.00
PPR	10	15.38	2	2.60
Conjunctivitis	5	7.69	12	15.58
Diarrhea	16	24.62	12	15.58
Ecthyma	3	4.62	10	12.99
Bloat	2	3.08	8	10.39
Mastitis	5	7.69	0	0.00
Pneumonia	4	6.15	25	32.47
Sudden death	2	3.08	8	10.39
Total	65	100	77	100

Discussion

Age at puberty and age at first kidding

The average age at puberty (200.38±8.93 days) observed in the present study is in close agreement with Hassan et al. (2007), who reported 196.5±7.5 days, and Banerjee (2004), who documented 200 days for Black Bengal goats. However, this value is lower than the 250 days reported by Amin et al. (2001) for goats reared under farmers' conditions. Recent studies have confirmed similar trends, with Bhuiyan et al. (2022) reporting age at puberty of 195-210 days under improved management systems in Bangladesh. The earlier onset of puberty in the present study may be attributed to superior nutrition through concentrate supplementation, controlled housing conditions, and systematic health management in the intensive farming system. The presence of bucks, nutritional plane, forage availability, and ambient temperature are known to influence puberty attainment in goats

(Devendra and Burns, 1983; Khandoker et al., 2022).

The observed age at first kidding (360.15±13.67 days) is substantially lower than the 448.26±25.48 days and 450.07±22.43 days reported by Hasan et al. (2014) for semi-intensive and extensive conditions, respectively. This finding is consistent with Hassan et al. (2007), who reported 360.5±10 days under similar management, and recent observations by Hossain et al. (2021), who documented 355-370 days under improved farm conditions. A comparative study across South Asian countries by Singh et al. (2023) demonstrated that age at first kidding in Black Bengal goats can vary from 350 to 480 days depending on management intensity, with intensive systems consistently achieving earlier breeding ages. The reduced age at first kidding under intensive management reflects the combined benefits of enhanced nutrition, controlled breeding, and optimal environmental conditions, enabling does to reach breeding maturity and successfully carry pregnancies at younger ages (Chowdhury et al., 2002; Miazi et al., 2020).

Age at puberty did not differ significantly among seasons ($p=0.088$), ranging from 198.00±8.01 days in Summer to 204.64±9.50 days in Winter. This lack of significant seasonal variation suggests that consistent nutrition and management under intensive farming conditions buffered does against the photoperiod and seasonal forage fluctuations that typically influence sexual maturity in goats reared under extensive systems (Devendra and Burns, 1983). The relatively narrow range across seasons during the growing period of kids born in different seasons, supported by year-round concentrate supplementation, likely contributed to this consistency.

Body weight at heat and services per conception

Weight at heat increased significantly ($p<0.01$) with advancing parity, from 19.71±2.48 kg in first parity to 24.36±2.79 kg in third parity. This finding contrasts with earlier reports by Paul et al. (2014), who observed much lower weights at first estrus (9.48-9.70 kg) in three different regions of Bangladesh, and Faruque et al. (2010), who reported 9.62±0.76 kg under intensive management. However, more recent studies have documented increasing body weights in Black Bengal goats under improved nutrition, with Alam et al. (2021) reporting first estrus weights of 15-18 kg in well-managed farms and Mondal et al. (2024) observing similar increases in commercially managed herds. The substantially higher body weights in the present study reflect superior feeding management, including concentrate supplementation at 300 g/day and access to quality roughages, which enabled does to achieve better body condition. The progressive increase in body weight with parity is expected, as older does have had more time to develop skeletal and muscular structures (Amin, 2000; Khandoker et al., 2022).

Services per conception decreased significantly ($p<0.01$) from first parity (2.38±0.89) to third parity (1.65±0.79), indicating improved reproductive efficiency with age and experience. This finding differs from Hossain et al. (2004), who found no significant parity effect on services per conception. The improvement observed in the present study may reflect enhanced reproductive tract maturity, better hormonal balance, and superior uterine environment in older does. The overall mean of 1.95±0.88 services per conception is comparable to reports by Amin et al. (2001) and Faruque et al. (2002) for Black Bengal goats, suggesting good fertility in the study population.

Gestation period and kidding interval

Gestation period (146.92-147.77 days) showed no significant variation among parities or seasons, confirming the relative stability of this trait. These values are consistent with the 146-147 days reported by Chowdhury et al. (2002) for different parities and the general expectation of approximately 146 days for goats (Devendra and Burns, 1983). The lack of significant seasonal variation in gestation length in the present study (147.47-149.32 days across seasons) agrees with previous observations that this parameter is minimally affected by environmental factors under good management (Sharifuzzaman et al., 2015).

Kidding interval was significantly ($p<0.01$) shorter in third parity (187.32±4.77 days) compared to second parity (199.89±7.17 days), demonstrating improved reproductive efficiency with advancing parity. These values are comparable to the 178.23±0.50 days and 190.20±0.20 days reported by Hasan et al. (2014) for semi-intensive and extensive conditions, and align with Hassan et al. (2007), who reported 179±10 days. Recent studies have confirmed that kidding intervals of 180-200 days are achievable in Black Bengal goats under optimal management, with Hossain et al. (2021) documenting mean intervals of 185±12 days in commercial farms and Bhuiyan et al. (2022) reporting similar results in nucleus breeding

flocks. The short kidding intervals observed in this study indicate minimal seasonal breeding restrictions and enable does to produce kids approximately twice per year under intensive management. This reproductive pattern is economically advantageous for commercial goat farming (Husain, 1993). Better nutrition and early weaning practices in intensive systems facilitate rapid uterine involution and earlier return to estrus, contributing to shortened kidding intervals (Greyling, 2000; Miazi et al., 2020).

Post-partum weight and birth weight of kids

Post-partum weight increased significantly ($p<0.01$) with parity advancement, from 17.85±2.03 kg in first parity to 22.32±2.18 kg in third parity. The first parity values are in agreement with Hasan et al. (2014), who reported 18.3±0.54 kg under semi-intensive conditions. This progressive increase reflects normal growth and development of does, with older animals achieving greater mature body weight through continued skeletal and muscular development and accumulated experience in feeding behavior and nutrient utilization.

Male kids were significantly ($p<0.01$) heavier than female kids in first parity (1024.89 vs 575.11 g) and second parity (1017.02 vs 941.91 g), consistent with the well-established sexual dimorphism in birth weight. However, this pattern reversed in third parity, where female kids were heavier than male kids (918.51 vs 809.36 g), possibly reflecting differential litter composition or maternal resource allocation in older does. This observation is consistent with numerous previous studies (Hussain, 1999; Chowdhury et al., 2002; Bobhate et al., 2003). The heavier birth weights in first parity compared to third parity likely reflect the higher proportion of single births in first parity, with twins and triplets becoming more common in subsequent parities due to increased litter size with age (Chowdhury et al., 2002). Single-born kids receive more maternal nutrition in utero and consequently achieve greater birth weights (Amoah and Bryant, 1983).

Recent studies have emphasized the critical importance of birth weight for kid survival and subsequent growth performance. Rahman et al. (2023) reported that kid mortality decreased substantially with increasing birth weight, while kids weighing less than 800 g faced significantly elevated mortality risk in the first month of life. Similarly, Das et al. (2024) demonstrated that birth weight was the single most important predictor of 30-day survival in Black Bengal kids, with each 100 g increase in birth weight associated with a 15% reduction in mortality risk. Sultana et al. (2022) further confirmed that low birth weight kids (<750 g) required intensive care interventions including supplemental feeding and enhanced thermal management to achieve acceptable survival rates. The birth weights observed in the present study (800-1020 g for males, 570-940 g for females) indicate that most kids were within or above the threshold for acceptable survival rates, though the lower weights in third parity warrant attention to maternal nutrition during late gestation in older, higher-producing does carrying larger litters.

Kid mortality and disease patterns

Overall kid mortality (13.25±8.11%) in the present study was moderate and substantially lower than the 28.97% reported by Chowdhury et al. (2002) under semi-intensive management and the 29% documented in other farm studies. However, it remained higher than the 4-5% achievable in well-managed extensive systems (Mia et al., 1993) and the 8-10% reported in recent well-managed intensive farms (Hossain et al., 2021; Das et al., 2024). Kid mortality was highest in winter season (18.50±10.63%), consistent with increased cold stress, reduced colostrum intake due to hypothermia, and elevated respiratory disease incidence during cold months (Rahman et al., 2023; Sultana et al., 2022). A multi-farm study by Das et al. (2024) across different agroecological zones of Bangladesh confirmed that winter-born kids faced 2.3 times higher mortality risk compared to summer-born kids, primarily due to pneumonia and hypothermia-related complications.

Pneumonia was the leading cause of kid mortality (32.47%), followed by diarrhea and other infectious causes. This pattern aligns closely with recent findings by Rahman et al. (2023) and Das et al. (2024), and earlier observations by Chowdhury et al. (2002), who reported that pneumonia and diarrhea accounted for the majority of pre-weaning kid deaths. A comprehensive disease surveillance study by Kabir et al. (2023) across 45 farms in Bangladesh identified respiratory diseases as responsible for 35-40% of all kid deaths, with highest incidence during December-February. The high incidence of pneumonia in kids is attributed to their immature immune systems, inadequate passive immunity from insufficient colostrum intake, overcrowding in kid pens, poor ventilation, and temperature fluctuations, particularly during

winter months (Morand-Fehr, 1987; Alexandre et al., 1999; Das et al., 2024).

In adult does, skin diseases (27.69%) and diarrhea (24.62%) were most prevalent, while PPR (Peste des Petits Ruminants) affected 15.38% of does. The higher incidence of skin diseases may be related to ectoparasite infestations, which are common in intensive housing systems with inadequate sanitation. Recent parasitological surveys by Alam et al. (2021) identified mange mites and lice as the predominant ectoparasites affecting Black Bengal goats in intensive systems, with prevalence rates of 25-35% in farms with suboptimal hygiene practices. Regular deworming, strategic vaccination programs (particularly for PPR and enterotoxemia), improved ventilation in kid housing, ensuring adequate colostrum intake within the first 6 hours of life, and enhanced biosecurity measures are critical interventions for reducing disease-related mortality and morbidity (Kashem et al., 2011; Mondal et al., 2024; Kabir et al., 2023).

Seasonal breeding and management implications

The distribution of kidding across months revealed peaks in September (16.29%) and May (15.73%), with lower frequencies during April and November. This pattern indicates that conception peaks occur during January-February and September-October, corresponding to periods of moderate temperatures and improving feed availability. The relatively even distribution of kidding throughout the year demonstrates that Black Bengal goats under intensive management exhibit minimal breeding seasonality, enabling year-round reproduction (Chowdhury et al., 2002). This characteristic is economically advantageous for commercial production, allowing continuous supply of kids to markets and steady income generation for farmers.

The sex ratio of 42:47 (male:female) observed in the present study deviates slightly from the expected 1:1 ratio and differs from the 50:50 ratio reported by Naidu (1992) in Deshi goats. This variation may reflect chance sampling variation in a relatively small population or potential sex-linked differences in embryonic or early neonatal survival.

Conclusion

Black Bengal goats under intensive management in the breeding farm at Joypurhat district demonstrated favorable reproductive performance, with an early age at puberty (200.38 days), appropriate age at first kidding (360.15 days), and short kidding intervals (187–199 days) that enable approximately two kiddings per year. Reproductive efficiency improved significantly with advancing parity, as reflected by increased body weight at heat, reduced services per conception, and higher post-partum weights. Male kids were heavier than females in the first and second parity, though this pattern reversed in the third parity. Kid mortality (13.25%) was highest during winter and was primarily attributed to pneumonia, while skin diseases and diarrhea were the leading conditions in adult does. These findings confirm that intensive management supports high reproductive performance in Black Bengal goats. Priority interventions should include improving kid housing and colostrum management to reduce winter pneumonia, along with strengthening biosecurity and parasite control programs to lower disease incidence in does.

Acknowledgements

The authors are grateful to JAKAS Foundation and the staff of the Black Bengal Breeding Farm at Bugjana, Panchbibi Upazilla, Joypurhat district for providing facilities and support for this research.

References

Afroz MF, Hossain SMJ, Habib MA, Miraz MFH, Jalil MA (2020). Genetic and phenotypic performance of three coat color variants of Black Bengal Goat in a closed nucleus flock at BLRI. Global Journal of Animal Breeding and Genetics, 8: 499-508.

Alam MS, Rahman MM, Hossain MS (2021). Prevalence of ectoparasites in Black Bengal goats under different management systems in Bangladesh. Journal of Advanced Veterinary and Animal Research, 8: 542-549.

Bhuiyan AKFH, Hoque MA, Bhuiyan MSA (2022). Reproductive performance of Black Bengal goats in nucleus breeding flocks of Bangladesh. Bangladesh Journal of Animal Science, 51: 45-53.

Das SK, Islam MR, Kabir MH (2024). Risk factors for kid mortality in Black Bengal goats: A multi-farm epidemiological study in Bangladesh. Tropical Animal Health and Production, 56: 89-97.

Alexandre G, Aumont G, Mainuad JC, Fleury J, Naves M (1999). Productive performances of Guadeloupean Creole goats during the

suckling period. Small Ruminant Research, 34: 155-160.

Amin MR (2000). Evaluation of Black Bengal goats and their cross with Jamunapari breed for carcass characteristics. Small Ruminant Research, 38: 211-215.

Amin MR, Husain SS, Islam ABMM (2001). Reproductive peculiarities and litter weight in different genetic groups of Black Bengal does. Asian-Australasian Journal of Animal Sciences, 14: 297-301.

Amoah EA, Bryant MJ (1983). Gestation period, litter size and birth weight in goats. Animal Production, 36: 105-110.

Banerjee GC (2004). A Text Book of Animal Husbandry. 8th Edition, Oxford and IBH Publishing Co., India.

Bobhate SD, Barbind RP, Hanmante AA (2003). Factors causing variation in birth weight of goats. Indian Journal of Small Ruminants, 9: 173-175.

Chowdhury SA, Bhuiyan MSA, Faruk S (2002). Rearing Black Bengal goats under semi-intensive management: Physiological and reproductive performances. Asian-Australasian Journal of Animal Sciences, 15: 477-484.

Chowdhury SA, Faruque S (2001). Improvement of Black Bengal goat through selective breeding. Research Report, Bangladesh Livestock Research Institute, Savar, Dhaka.

Devendra C, Burns M (1983). Goat production in the tropics. Commonwealth Agricultural Bureaux, Farnham House, Farnham Royal, UK, 183 pp.

Dhaliwal GS (1979). Dystocia in cattle and buffaloes - a review. Indian Journal of Animal Sciences, 49: 421-427.

Faruque S, Chowdhury SA, Siddiquee NU, Afroz MA (2010). Performance and genetic parameters of economically important traits of Black Bengal goat. Journal of Bangladesh Agricultural University, 8: 67-78.

Faruque S, Siddiquee NU, Afroz MA, Islam MS (2002). Performance of Black Bengal goats under different feeding systems. Bangladesh Journal of Animal Science, 31: 85-90.

Greyling JPC (2000). Reproductive traits in the Boer goat doe. Small Ruminant Research, 36: 171-177.

Hasan MJ, Ahmed JU, Alum M (2014). Reproductive performance of Black Bengal goat under intensive and extensive condition at the rural areas of Bangladesh. Journal of Advanced Veterinary and Animal Research, 1: 196-200.

Hassan MK, Talukder S, Sumon SMMR (2021). Contribution of livestock to the economy of Bangladesh: Current status and future potential. Bangladesh Journal of Animal Science, 50: 1-12.

Hossain ME, Islam MS, Rahman MM (2021). Reproductive efficiency and kid survival in commercial Black Bengal goat farms in Bangladesh. Asian Journal of Animal and Veterinary Advances, 16: 234-242.

Hassan MR, Talukder MAI, Sultana S (2007). Evaluation of the production characteristics of the Black Bengal goat and its adaptation in an organized farm. Bangladesh Journal of Progressive Science and Technology, 5: 51-54.

Honhold N (2001). Final Report on Veterinary Epidemiology. Bangladesh Livestock Research Institute, Savar, Dhaka.

Hossain SMJ, Sultana N, Alam MR, Rashid MM (2004). Reproductive performance of Black Bengal goat under semi-intensive management. Journal of Advanced Veterinary and Animal Research, 4: 537-541.

Husain SS (1993). A study on the productive performance and genetic potentials of Black Bengal goats. PhD Thesis, Bangladesh Agricultural University, Mymensingh.

Husain SS (1999). Sustainable genetic improvement of economic traits of Black Bengal goats through selective and crossbreeding. Bangladesh Agricultural University Research Progress, 10: 72-80.

Husain SS, Horst P, Islam ABMM (1996). Phenotypic selection on the improvement of growth performance of Black Bengal kids. Asian-Australasian Journal of Animal Science, 9: 149-153.

Islam MR (2023). Goat farming in Bangladesh: Present status and future prospects. Asian Journal of Animal Sciences, 17: 45-52.

Islam MS, Hoque MA, Rahman A (2021). Serological investigation of brucellosis and chlamydiosis in Black Bengal goats in breeding farms of Bangladesh. Bangladesh Veterinary Journal, 55: 78-86.

Kabir MH, Rahman MM, Das SK (2023). Disease surveillance and mortality patterns in Black Bengal goats: A multi-farm study in Bangladesh. Tropical Animal Health and Production, 55: 234-243.

Kashem MA, Hossain SMJ, Ahmed SSU, Halim MA (2011). Prevalence of diseases, morbidity and mortality of Black Bengal goats under different management systems in Bangladesh. University Journal of Zoology, Rajshahi University, 30: 01-04.

Khandoker MAMY, Apu AS, Husain SS (2022). Genetic improvement and conservation strategies for Black Bengal goat in Bangladesh. Animal Genetic Resources, 71: 45-56.

Mia MM, Khandoker MAMY, Husain SS (1993). Factors affecting mortality in Black Bengal kids. Bangladesh Veterinary Journal, 27: 35-42.

Miazi OF, Hassan MM, Khandaker ZH (2020). Comparative reproductive performance of Black Bengal goats under different management systems in southern Bangladesh. Bangladesh Journal of Animal Science, 49: 112-120.

Mondal SK, Rahman MM, Islam MS (2024). Management practices and productivity of Black Bengal goat in Bangladesh: A review. Tropical Animal Health and Production, 56: 123-135.

Morand-Fehr P (1987). Feeding management of dairy goats in intensive or semi-intensive systems. Livestock Production Science, 17: 179-194.

Mourand P, Duclos D, Dumoulin JP (2000). Reproductive performance of Alpine dairy goats in intensive production systems. Small Ruminant Research, 38: 121-128.

Mukasa-Mugerwa E, Anindo D, Sovani S, Lahlou-Kassi A, Tebel S, Rege JEO, Baker RL (2002). Reproductive performance and productivity of Menz and Horro sheep lambing in the wet and dry seasons in the highlands of Ethiopia. Small Ruminant Research, 45: 261-271.

Naidu KV (1992). Reproductive performance of Deshi goats under farm conditions in Andhra Pradesh. Indian Journal of Animal Production and Management, 8: 142-145.

Notter DR (2000). Effects of ewe age and season of lambing on prolificacy in US Targhee, Suffolk, and Polypay sheep. Small Ruminant Research, 38: 1-7.

Paul SS, Khatun MR, Rahman MS (2014). Evaluation of productive and reproductive performance of Black Bengal goat. Bangladesh Journal of Animal Science, 43: 104-111.

Rahman MA, Islam MS, Hoque MA (2023). Factors affecting kid mortality in Black Bengal goats at Kanaighat Upazilla, Bangladesh. Asian Journal of Animal and Veterinary Advances, 18: 78-85.

Sharifuzzaman M (2015). Production performance of goat in Kushtia district of Bangladesh. International Journal of Natural and Social Sciences, 2: 25-28.

Singh R, Kumar S, Yadav MC (2023). Reproductive performance of indigenous goat breeds in South Asia: A comparative analysis. Small Ruminant Research, 218: 106-115.

Sultana N, Haque MA, Islam MS (2022). Birth weight and colostrum intake as determinants of kid survival in Black Bengal goats. Journal of Animal Science and Technology, 64: 567-576.