



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(8): 570-576
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Received: 04-06-2021
Accepted: 06-07-2021

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Effect of generations and different agroclimatic zones an important reproductive trait in black Bengal goats

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Abstract

Goat farming is a traditional occupation and an integral part of rural India's symbiotic system of agriculture and livestock production. For Jharkhand, it is a legacy breed due to superior quality meat and skin. Black Bengal goat farming plays an important role in improving the present investigations were carried out on Black Bengal goats maintained at AICRP BAU. Three agro-climatic zones, namely central and Northeastern plateau (IV), Ranchi and Deoghar, were selected. Similarly, from the Western plateau (V), East-Singbhum, and from South Eastern plateau (VI), Lohardhaga were respectively selected for the study. A cluster of four villages each from the four Districts above were taken, namely Chamguru, Palajori, Barabanki, and Tiko. Twenty farmers were each taken from each of the clusters, making a total of eighty farmers. The study was conducted on 80 farmers, 1600 Doe, 2459 kidding and their 4256 kids (male 2223 kids and female 2027 kids) during a period of six years maintained under All India Coordinated Research Project (AICRP) from 2014 to 2020 on Goat Improvement were observed. The average age at first estrus (days) for different agro-climatic zones and villages were observed to be 237.28 ± 1.28 , 238.9 ± 1.25 , 240.2 ± 1.2 , and 240.18 ± 1.1 days for the villages Chamguru, Palajori, Tiko, and Barabanki, respectively. Pooled overall age at first estrus was observed to be 239.14 ± 0.06 for all the districts taken together. Age at first estrus (days) was observed to be highest for the village Tiko (240.2 ± 1.2) followed by Barabanki (240.18 ± 1.1), Palajori (238.9 ± 1.25), Chamguru (237.28 ± 1.28), and the effect of the village was significant ($P < 0.05$).

Keywords: black Bengal goat, litter size, weight gain, birth weight, kidding interval

1. Introduction

Goat rearing is an essential part of the lives of poor farmers in Jharkhand and of the rural economy. Goats are often referred to as the poor man's cow and contribute to the farmers' livelihoods, especially for the women in the household. Despite its rising prices, goats are also an essential part of society and culture, especially for the tribal farmers. It being a slice of meat without any social or religious taboo is the preferred meat during marriages and festivals despite its ever-rising prices. At the global level, India stands second in goat population and accounts for 26% of global meat production. The small ruminant population of India, about 222.6 million heads of which about 148.88 million in goat (census 2019) in Jharkhand goat population 9.12 million (livestock census 2019) [13] GDP is minimal (0.61) as compared with other sectors. The Goat population in the country in 2019 is 148.88 million showing an increase of 10.1%. Total milk production in India is 187.75 million tones and 4% of the total milk production (livestock census 2019) [13] and goat meat production 13.53% in Jharkhand goat meat production is 21.68 million tones. Meat production in India increased by 2.88% annually from (livestock census 2019) [13], but demand continues to exceed supply in the country as well as in Jharkhand. The development of the goat sector, therefore, holds excellent opportunity for farmers and to contribute in a more significant manner to their household income. Reproductive performance is one of the main determinants of productivity as well as profitability. Proper selection, breeding, and management to improvise important reproductive and productive traits are essential for profit in Black Bengal goat production. Interaction of genes and environment plays a crucial role besides the genotype and environment effect in deciding the phenotype of any animal. Parity wise Reproductive efficiency as such can be measured and expressed as the kidding rate, kidding interval, litter size at birth, and litter weight at birth. Black Bengal goat is a popular, resilient, and prolific breed of goat highly preferred among the goat rearers. Thus the objective of the present study was:-To evaluate the reproductive and production performance and production potential of Black Bengal goats.

2. Material and Methods

The study was conducted on 80 farmers, 1600 does, 2499 kidding, and their 4256 kids (male 2223 kids and female 2027 kids) during period six (6) years maintained under All India Coordinated Research Project on Goat Improvement [AICRP], Black Bengal field unit, BAU. The present investigations were carried out on Black Bengal goat maintained at AICRP BAU. Three agro-climatic zones, namely central and Northeastern plateau (IV), Ranchi and Deoghar were selected. Similarly, from the Western plateau (V), East-Singbhum, and from South Eastern plateau (VI), Lohardhaga was respectively selected for the study. A cluster of four villages each from the four Districts above were taken, namely Chamguru, Palajori, Barabanki, and Tiko. Twenty farmers were each taken from each of the clusters making a total of eighty farmers. The study was conducted on 80 farmers, 1600 Doe, 2499 kidding and their 4256 kids (male 2223 kids and female 2027 kids) during a period of six years maintained under All India Coordinated Research Project

(AICRP) on Goat Improvement, Black Bengal field unit, BAU from 2014 to 2020. Farmers having a minimum number of twenty goats were selected randomly. Reproductive and productive traits were studied in the experimental animals. For molecular characterization, ten goats were selected from each cluster; the data was recorded and collected from animals of three agro-climatic zones of four BAU cluster villages of Jharkhand. Cropped Area 851.05 thousand hectares Irrigated Area to Cropped Area 11.40%, Altitude, 275-670 m, average rainfall: 1270mm, temperature 4.8-44.2°C. Important Crops: Rice, Wheat, Maize, Ragi, Potato, Mustard-Rapeseeds Gram and Pulses. Statistical analysis of the data collected was done using WINSTAT trial version. One way ANOVA was the Parametric test of hypothesis testing applied to see if the effect of the district was significant or not and to see the year-wise variation on different economic traits. The results have been tabulated in Table 1.

Table 1: Agro climatic zone and cluster village wise selected farmers and animals Population

Agro –climatic zone	Name of cluster Districts and village	Total Number of farmers	Total Number of goats	Total Number of kids		Number of total kids
				Male	Female	
Central and north eastern plateau	Ranchi Chamguru	20	400	569	501	1070
	Deoghar Palajori	20	400	475	555	1030
Western plateau	Lohardaga Tiko	20	400	499	489	986
Southern plateau	East-singhbhum Barabanki	20	400	683	487	1170
	Total	80	1600	2223	2027	4256

3. Results and Discussion

The reproductive performances of black Bengal goats *viz.* age at first estrus, age at first service, age at first kidding, kidding interval, and litter size at birth, litter weight at birth were obtained. Various reproductive traits, namely, age at first estrus, age at first service, age at first kidding, kidding interval, litter size, the number of kid produced for a total of eighty farmers, and 1600 does have been reported for four villages under study.

3.1. Effect of Agro-climatic zone on reproductive performance of black Bengal goat.

Average reproduction performance of Black Bengal goats belonging to the three different agro-climatic zones and four villages, namely Central and North Eastern Plateau (Chamguru and Palajori), Western Plateau (Tiko), and Southern Plateau (Barabanki) were observed. The average Age at first estrus(days)for different agro-climatic zones and villages were observed to be 237.28±1.28,238.9±1.25, 240.2±1.2,and 240.18±1.1days for the villages Chamguru, Palajori, Tiko, and Barabanki, respectively Pooled overall age at first estrus were observed to be239.14±0.06for all the districts taken together. Age at first estrus (days) was observed to be highest for the village Tiko (240.2±1.2) followed by Barabanki (240.18±1.1), Palajori (238.9±1.25), and Chamguru (237.28±1.28), and the effect of the village was significant ($P<0.05$). Table 2 Ali *et al.*, (2016)^[2] reported by Average reproductive performance of Black Bengal goats under farming conditions and management.

Average Age at first service (days) during different (three) agro-climatic zones and the four villages were observed to be 257.23±1.2· 257.95±1.2· 240.2±1.2 and 257.71±1.1 days for Chamguru, Palajori, Tiko and Barabanki, respectively. Overall Age at first service (days) was observed to be

257.74±0.61 for all the villages taken together. A significant difference ($P<0.05$) for age at first service (days) was observed among villages Tiko (240.2±1.2) followed by Palajori (257.95±1.2), Barabanki (257.71±1.1), and Chamguru (257.23±1.2). Table 2 The age at first service in Bengal goat vary from 200 to 240 days. Das *et al.*, 2008^[12] and Dhara *et al.*, 2008)^[14] and a higher range (296 to 332 days) This study recorded the age of effective service for Bengal goat as 261.35 days with a range of 113 to 483 days.

Average Age at first Kidding (days) for different (three) agro-climatic zones and (four) villages were observed to be 423.49±1.2· 421.31±1.2, 420.16±1.2, and 415.41±1.1 days for the village Chamguru, Palajori, Tiko, and Barabanki, respectively. Overall Age at first kidding (days) was observed to be 420.00±0.00for all the villages taken together. A significant difference ($P<0.05$) for age at first Kidding (days) were observed among village Chamguru (423.49±1.2) followed by Palajori (421.31±1.2), Tiko (420.16±1.2) and Barabanki (415.41±1.1) days respectively. Table 2 Faruque *et al.* (2010)^[16] calculated the average age at first kidding to be 283.83±31.16 day's and370.26±25.48 days for intensive and semi intensive system. Halim *et al.* (2011)^[21] reported the age at first kidding for Black Bengal goat to be 361.83±11.29 days. Bhowmik *et al.* (2014)^[8] has reported the age at first kidding for Jamunapari, Black Bengal, and crossbred goats to be 534±24.58, 368.12±16.96 and 471.25±21.25days, respectively. Hasan *et al.* (2015)^[20] reported the age at first kidding to be 448.26±25.48 days under semi-intensive conditions, whereas under extensive conditions, it was recorded to be 450.07±22.43 days.

Average Kidding interval (days) during different (three) agro-climatic and (four) villages were observed to be 241.4±1.2, 240.68±1.2, 240.28±1.2, and 241.21±1.1days during village Chamguru, Palajori, Tiko, and Barabanki, respectively.

Overall, Kidding interval days were observed to be 240.9±0.61 respectively. Significant different highest (P<0.05) Kidding interval days were observed to be among village Chamguru (241.4±1.2) followed by Barabanki (241.21±1.1), Palajori (240.68±1.2), and Tiko (240.28±1.2) days respectively. However, significant differences (P<0.05) were observed among village Table 3. The kidding interval of animal is breed-specific but it varies due to management condition in which they prevail. Most of the previous workers reported the kidding interval for Black Bengal goat Faruque *et al.* (2010) [16] found that the average kidding interval was 181.23±4.55 days for Black Bengal goats. Mamabolo *et al.* (2010) [28] reported the average kidding interval of goats in South Africa at village level to be 145-148 days. Bhowmik *et al.* (2014) [8] has reported the first kidding interval for Jamunapari, Black Bengal, and crossbred goats to be 224±14.42, 181.76±15.81 and 199.17±21.71 days respectively. Hasan *et al.* (2015) [20] found that the kidding interval was 178.23±50 days under semi-intensive conditions and 190.20±20 under an extensive system.

Average Litter size at birth (nos.) for the different (three) agro-climatic and (four) villages were observed to be 2.24±0.00, 2.30±0.00, 2.32±0.00 and 2.16±0.00 days for the villages Chamguru, Palajori, Tiko, and Barabanki, respectively. Overall, Litter size at birth (nos.) was found out to be 2.25±0.00 for all the villages taken together. A significant difference (P<0.05) was found on litter size at birth (nos.) among the villages Tiko (2.32±0.00), Palajori (2.30±0.00), Chamguru (2.24±0.00), and Barabanki (2.16±0.00). Table 2 Hasan *et al.* (2015) [20] found that the average birth weight of kids was 1.28±0.11kg and 1.25±0.10 kg under semi-intensive and an extensive system of management, respectively and Paul *et al.* (2014) reported the average birth weight of Black Bengal kids in NBF, Modhupur

and Dimla were 1.09±0.027 kg, 1.09±0.025 and 1.10±0.027 kg respectively, Bhowmik *et al.* (2014) [8] has reported that the average birth weight of Jamunapari, Black Bengal and cross bred goats were 1.53±0.22kg, 0.89±0.09 and 1.26±0.20 kg respectively.

Average Litter weight at birth (Kg) for different (three) agro-climatic zones and the (four) villages were observed to be 3.28±1.2, 3.27±1.2, 3.26±1.2 and 3.27±1.2 days for the villages Chamguru, Palajori, Tiko, and Barabanki, respectively. Overall, Litter weight at birth (Kg) was found out to be 3.27±0.61 for all the cluster villages pooled together. Significant (P<0.05) effect on litter weight at birth (Kg) was found between the four villages, namely Chamguru (3.28±1.2), Palajori (3.27±1.21), Barabanki (3.27±1.2), and Tiko (3.26±1.2). (Table 2 and fig 1) They also recorded that the gains of triplets kids were the lowest but steady for 0-3 and 3-6 months, whereas gains of single and twin kids sharply declined from 6-9 months. The significant effect of the village on 6-month body weight indicates that the genetic pool and management practices of village 2 are poor. However, the 6-month body wt. of Black Bengal kids recorded in this study as 7.96 ± 0.38 kg was within the range of 6.82 kg to 10.59 kg as observed by earlier workers at different times and different places Hasan *et al.* (2015) [20] found that average litter weight of kids was 4.28±0.11kg and 5.25±0.10kg under semi-intensive and an extensive system of management respectively. Paul *et al.* (2014) [35] reported the average birth weight of Black Bengal kids in NBF, Modhupur, and Dimla were 3.09 ± 0.027 kg, 5.09± 0.025 and 5.10± 0.027kg, respectively. Bhowmik *et al.* (2014) [8] has reported that the average litter weight at birth of Jamunapari, Black Bengal, and crossbred goats were 1.53±0.22kg, 0.89±0.09, and 1.26±0.20 kg, respectively.

Table 2: Effect of Agro-climatic zone on reproductive performance of Black Bengal goat

Parameter/village	Central and North Eastern Plateau		Western Plateau	Southern Plateau	Overall
	Chamguru	Palajori	Tiko SE	Barabanki	
Age at first estrus(day)	237.28±1.28 ^a (400)	238.9±1.25 ^b (400)	240.2±1.2 ^c (400)	240.18±1.1 ^c (400)	239.14±0.61 (1600)
Age at first service (day)	257.23±1.2 ^a (400)	257.95±1.2 ^a (400)	258.08±1.2 ^b (400)	257.71±1.1 ^a (400)	257.74±0.61 (1600)
Age at first Kidding(day)	423.49±1.2 ^c (400)	421.31±1.2 ^{ab} (400)	420.16±1.2 ^b (400)	415.41±1.1 ^a (400)	420.00±0.00 (1600)
Kidding interval(day)	241.4±1.2 ^b (400)	240.68±1.2 ^a (400)	240.28±1.2 ^a (400)	241.21±1.1 ^b (400)	240.9±0.61 (1600)
Litter size at birth (No)	2.24±0.00 ^b (559)	2.30±0.00 ^c (564)	2.32±0.00 ^c (685)	2.16±0.00 ^a (651)	2.25±0.00 (2459)
Litter weight at birth (Kg)	3.28±1.2 ^c (559)	3.27±1.21.2 ^b (564)	3.26±1.2 ^a (685)	3.27±1.2 ^b (651)	3.27±0.61 (2459)

Fig: parentheses indicate the number of dams
 * P < 0.05, ** P < 0.01, NS = Non-Significant

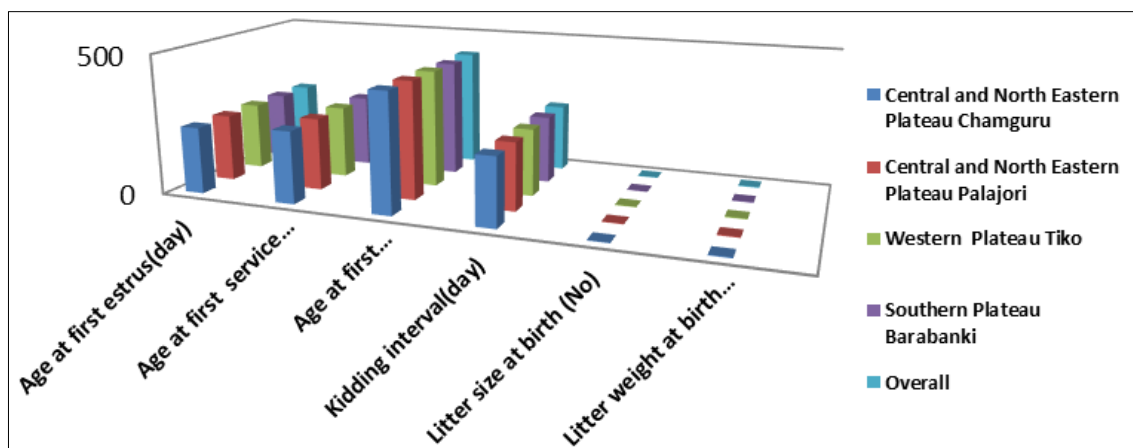


Fig 1: Effect of Agro-climatic zone wise reproductive performance of Black Bengal goat.

3.2 Effect of Black Bengal (goats) Dam performance up to 6th Parity

The data for important genetic traits like age of kidding, kidding interval, litter size, and litter weight was collected and tabulated, and it was observed that the Black Bengal goats had the genetic capability to produce first kid as early as 1.13 years and by 4.39 years it completed 6th kidding. The kidding interval ranged from 171.85 to 222.30 in parity one to 216 days in the 6th parity, and the variation in the kidding interval was significant ($P < 0.05$) w.r.t the number of parity. The average litter size in Black Bengal goats in different parity ranged from 2.21 to 2.31, and litter weight ranged from 3.26 to 3.39. The effect of parity was significant ($p < 0.05$) on both the traits, namely litter size at birth and litter weight at birth. (Table-3 reported that the productive life period is almost half compared to the average life period, although they studied in cattle. As per Alam (2003) [5] the average fertile life period of Black Bengal doe in Bangladesh was 7–8 years and 7–10 years, respectively. Faruque *et al.* (2010) [16], Hasan *et al.* (2015) [20], and Paul *et al.* (2014) [35] reported a significant effect of parity on the birth weight of kids. Average litter size (1.76±0.08) of Black Bengal goats is almost the same as the results of Amin *et al.* (2014) [7], who reported 1.9±0.56, 1.86,

1.61±0.02 litter size, respectively. Variation in litter size may be due to the interaction of genetics and environment, status and age of the dam, parity. Abraham *et al.* (2019) [1] reported that the effect of genetic and non-genetic factors on the reproductive performance of Sirohi and its crosses with the Beetal (half-bred) in the semi-arid conditions of Rajasthan were studied. The crossbred has significantly less kidding interval than Sirohi does. There was no effect of season on the reproductive traits studied. Misra and Sinha (2001) [29] reported the average kidding interval in Black Bengal as 8.80±0.03 months. Hassan *et al.* (2007) [18] reported the average interval in Black Bengal and crossbred goats as 179±20 and 270±22 days, respectively, and the differences are statistically significant ($P < 0.01$). Hasan *et al.* (2015) [20] found the non-significant effect of parity on kidding interval. Akhtar *et al.* (2006) [4] reported that the mean body weight of Black Bengal at 3 months age were 4.99±0.15, 4.64±0.33, 4.07±0.42 and 4.38±0.13, 4.39±0.27, 3.99±0.47 kg respectively for three generations of selected and control groups. Jimenez *et al.* (2009) in Serrana Transmontano kids, in Nigeria Sahelian goats, have reported significant effect of parity of dam on body weight of kids.

Table 3: Effect of Black Bengal (goats) Dam performance up to 6th Parity

Parity/parameter	Age at kidding (Years)	Kidding interval (day)	Litter size (No)	Litter weight(Kg)
1 st parity	1.13±0.02 (400)		2.21±0.14 ^{ab} (181)	3.29±0.17 ^d (181)
2 nd parity	1.85±0.06 (309)	216.30±0.00 ^d (309)	2.31±0.14 ^b (134)	3.26±0.18 ^{ab} (134)
3 rd parity	2.50±0.00 (263)	195.25±0.60 ^c (263)	2.16±0.00 ^a (122)	3.27±0.19 ^c (122)
4 th parity	3.11±0.04 (185)	183.91±0.6 ^b (185)	2.26±0.16 ^{ab} (80)	3.24±0.00 ^a (80)
5 th parity	3.85±0.03 (107)	222.30±0.60 ^c (107)	2.31±0.16 ^{ab} (47)	3.24±0.21 ^a (47)
6 th parity	4.39±0.06 (69)	171.83±0.74 ^a (69)	2.17±0.18 ^{ab} (32)	3.27±0.23 ^c (32)
Overall			2.23±0.12 (591)	3.26±0.16 (591)

Fig: in parentheses indicate number of dams/litter
 * $P < 0.05$, ** $P < 0.01$, NS = Non-Significant

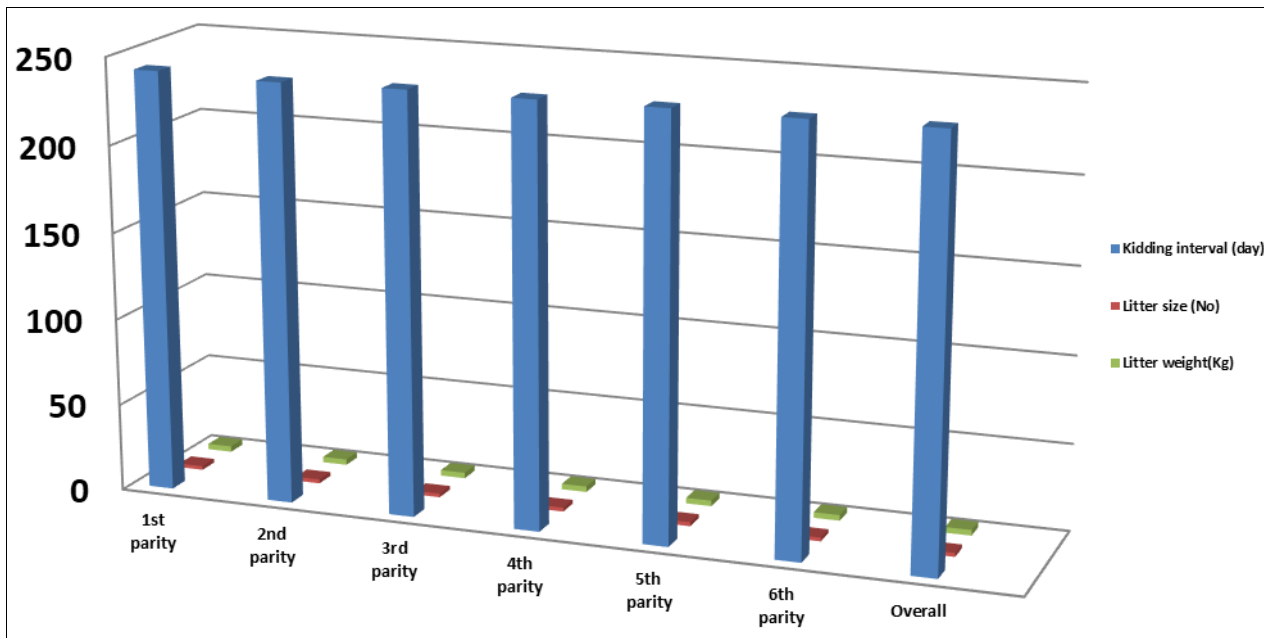


Fig 2: Effect of Black Bengal (goats) Dam performance up to 6th Parity

3.3. Effect of different Generation wise reproductive parameters of Black Bengal Goat

A study was conducted to see the effect of generation on different reproductive parameters. Data collected for various economic traits like Age at first estrus (day), Age at first

service (day), Age at first Kidding (day), Kidding interval (day), Litter size (No), and Litter weight (Kg) for six generations in the experimental Black Bengal goats. Age at first estrus (day), was to be found to the significantly lowest in first-generation followed by 4th generation. The maximum

value was found in the fifth generation. The average age at first estrus (day) was 239.14 ± 0.61 days. Similarly, age at first service (day) was found to the lowest in first generation and the highest Age at first service (days) was reported in 2nd generation with a mean value 257.47 ± 0.00 days and 258.12 ± 0.55 days, respectively. The average mean value of age at first service (days) was 257.74 ± 0.64 , respectively. Age at first kidding (days) was observed to the 424.67 ± 2.5 , 420.03 ± 2.53 , 415.33 ± 0.00 , 421.83 ± 2.5 , 415.34 ± 2.5 , and 421.78 ± 2.5 days respectively for the 1st, 2nd, 3rd, 4th, 5th and 6th generation respectively. The age at first service in Bengal goat varies from 200 to 240 days [42; Das *et al.*, (2008) [12] and Dhara *et al.*, (2008) [14], and a higher range (296 to 332 days) has also been reported by this study recorded the age of effective service for Bengal goat as 261.35 days with a range of 113 to 483 days.

The average value was found out to the 420.00 ± 0.61 days. The kidding interval was reported to be 424.67 ± 2.5 , 420.03 ± 2.53 , 415.33 ± 0.00 , 421.83 ± 2.5 , 415.34 ± 2.5 and 421.78 ± 2.5 for the 1st, 2nd, 3rd, 4th, 5th and 6th generation respectively. The kidding interval of animals is breeding specific but it is varied chiefly due to management condition in which they prevail. Most of the previous workers reported the kidding interval for Black Bengal goat 176 – 240 days Misra and Sinha, (2001) [29] Das *et al.*, (2008) [12] and Dhara *et al.*, (2008) [14]. This result confirms the kidding interval of Black Bengal goat as 230–240 days even in farmer's conditions. Abraham *et al.* (2019) [1] found the kidding interval of does under semi-intensive system (233.8 ± 13.12 days) than those of the does manage under an extensive system (242.8 ± 32.66 days).

The average litter size at birth (kg) of the six-generation taken together was 2.25 ± 0.06 in 6th generation and 2.21 ± 0.12 , 2.32 ± 0.12 , 2.16 ± 0.00 , 2.25 ± 0.12 , 2.31 ± 0.12 , and 2.16 ± 0.12 in the 1st, 2nd, 3rd, 4th, 5th and 6th generation respectively. They also recorded that the gains of triplets kids were the lowest but steady for 0 – 3 and 3 – 6 months whereas gains of single and twin kids sharply declined from 6 – 9 months. The significant effect of the village on 6-month body weight indicates that the genetic pool and/or management of village 2 are poor. However, the 6-month body wt. of Black Bengal

kids recorded in this study as 7.96 ± 0.38 kg was within the range of 6.82 kg to 10.59 kg as observed by earlier workers at different times and different place average litter size (1.76 ± 0.08) of Black Bengal goats which is almost same with the results of Amin *et al.* (2014) [7] and Paul *et al.* (2014) [35] who reported 1.9 ± 0.56 , 1.86, 1.61 ± 0.02 litter size, respectively. Variation in litter size may be due to the interaction of genetics and environment, status and age of the dam, parity.

The average litter weight at birth (kg) of the six generations taken together was 3.27 ± 0.61 kg for the and the litter weight (kg) was observed to be 3.29 ± 0.14 , 3.27 ± 0.14 , 3.27 ± 1.4 , 3.25 ± 0.00 , 3.26 ± 0.14 and 3.27 ± 0.14 in the 1st, 2nd, 3rd, 4th, 5th and 6th generation respectively. They also recorded that the gains of triplets kids were the lowest but steady for 0 – 3 and 3 – 6 months whereas gains of single and twin kids sharply declined from 6 – 9 months. The significant effect of the village on 6-month body wt. Indicates that the genetic pool and/or management of village 2 are poor. However, the 6-month body wt. of Black Bengal kids recorded in this study as 7.96 ± 0.38 kg was within the range of 6.82 kg to 10.59 kg as observed by earlier workers at different times and different place average litter weight of Black Bengal goats which is almost same with the results of Amin *et al.* (2000) [7] who reported 1.9 ± 0.56 , 1.86, 1.61 ± 0.02 litter size, and litter weight respectively. Variation in litter size may be due to the interaction of genetics and environment, status and age of the dam, parity. Mishra and Sinha. (2001) [29] reported that the effect of genetic and non-genetic factors on the reproductive performance of Sirohi and its crosses with the Beetal (half-bred) in the semi-arid conditions of Rajasthan were studied. The crossbred has significantly less kidding interval than Sirohi does. There was no effect of season on the reproductive traits studied. Abraham *et al.* (2019) [1] reported the average kidding interval in Black Bengal as 8.80 ± 0.03 months. [18] reported the average interval in Black Bengal and crossbred goats as 179 ± 20 and 270 ± 22 days, respectively, and the differences are statistically significant ($P < 0.01$). Hasan *et al.* (2015) [20] found the non-significant effect of parity on kidding interval

Table 4: Effect of different Generation wise reproductive parameters of Black Bengal Goat

Parameter/ generation	1 st G Mean±SE	2 nd G Mean±SE	3 rd G Mean±SE	4 th G Mean±SE	5 th G Mean±SE	6 th G Mean±SE	Overall Mean±SE
Age at first estrus (day)	237.22 ± 0.00^a (58)	240.17 ± 1.4^b (38)	240.17 ± 1.4^b (36)	238.85 ± 1.4^b (32)	240.24 ± 1.4^b (25)	238.86 ± 1.4^b (12)	239.14 ± 0.61 (201)
Age at first service (day)	257.47 ± 0.00^a (58)	258.12 ± 0.55^b (38)	257.66 ± 0.55^{ab} (36)	258.03 ± 0.55^{ab} (32)	258.09 ± 0.55^b (25)	258.03 ± 3.5^b (12)	257.74 ± 0.61 (201)
Age at first Kidding (day)	424.67 ± 2.5^c (58)	420.03 ± 2.53^b (38)	415.33 ± 0.00^a (36)	421.83 ± 2.5^b (32)	415.34 ± 2.5^a (25)	421.78 ± 2.5^b (12)	420.00 ± 0.61 (201)
Kidding interval (day)	241.79 ± 0.5^c (58)	240.26 ± 0.00^a (38)	241.26 ± 0.51^b (36)	241.01 ± 0.51^b (32)	241.25 ± 0.51^b (25)	241.01 ± 0.51^b (12)	240.9 ± 0.61 (201)
Litter size (No)	2.21 ± 0.12^{ab} (122)	2.32 ± 0.12^b (80)	2.16 ± 0.00^a (68)	2.25 ± 0.12^{ab} (61)	2.31 ± 0.12^b (45)	2.16 ± 0.12^a (18)	2.25 ± 0.61 (394)
Litter weight (Kg)	3.29 ± 0.14^a (122)	3.27 ± 0.14^a (80)	3.27 ± 1.4^a (68)	3.25 ± 0.00^a (61)	3.26 ± 0.14^a (45)	3.27 ± 0.14^a (18)	3.27 ± 0.61 (394)

Fig: In parentheses indicate the number of dams/litter

* $P < 0.05$, ** $P < 0.01$, NS = Non-Significant

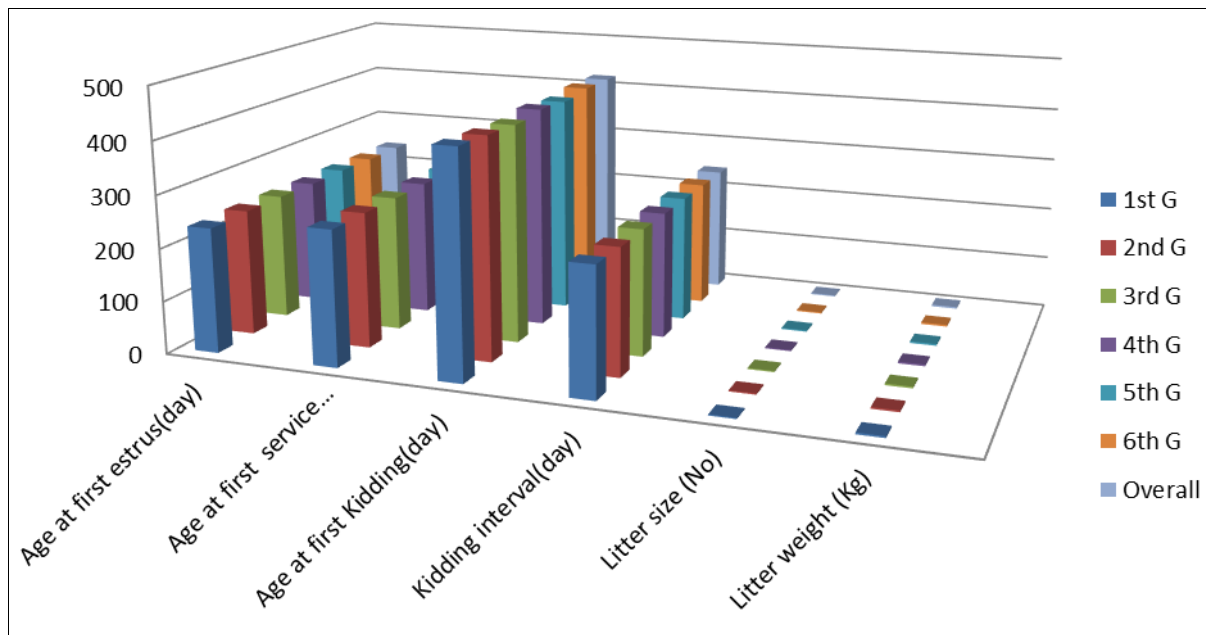


Fig 3: Effect of different Generation wise reproductive parameter of black Bengal Goat

4. Conclusions

Black Bengal goats exhibit good performance records with respect to all reproductive and economic traits in the current research, so more farmers in the Jharkhand region of India should be encouraged to keep this breed of goat for their economic upliftment.

The effect of generation on litter weight was found to be non-significant. However, no definite increase or decrease in the value of any of the six economic traits studied was found with increasing in parity from 1st to 6th generation.

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