Phenotypic Characteristics of Indigenous Goat of Bundelkhand

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ABSTRACT

This experiment was undertaken to know the phenotypic characteristics of indigenous goat. The study was conducted to investigate morphometric characters of goat in four different blocks Charkhari, Jaitpur, Panwari and Kabrai of Mahoba. Characteristics of body weight, body length, heart girth, wither height, fore leg length; hind leg length, head length, ear length, ear width, horn length etc were collected from mature goat. The results indicate that the average litter size, birth weight, weaning weight and body weight gain were comparatively higher in goat of Jaitpur than those of other three blocks. The average numbers of service/conception, post partum heat period (days), age at first heat (days), age at first kidding (days), kidding interval (days), gestation length were 1.45, 49.96, 347.11, 538.03, 358.92, 150.82 respectively in Jaitpur block flock which were comparatively better than the other three blocks. The average litter size, birth weight male, female (kg), weaning weight (kg), body weight gain (g), milk yield (kg) and lactation length in Jaitpur block flock were 1.65, 1.40, 1.16, 6.31, 52.09, 100.38 and 155.96 consequently. The average milk composition of fat, protein, lactose, SNF and mineral were 5.5, 3.9, 5.7, 10.9 and 0.7, respectively in all block. The overall performance of the goat of Jaitpur block flock were comparatively better than the others which may be due to the result of selective breeding, improve feeding, housing, health management etc.

Keywords: Bundelkhandi indigenous goat, Mahoba, phenotypic characters

The phenotype is a result of both genotype and the environment. The animal phenotypes of interest can be divided into three main categories: (1) physical description or measurements; (2) performance characteristics; and (3) adaptation to the environment. Physical characteristics include such characteristics as presence or absence of horns, coat color, body length; wither height, heart girth, tail length, tail type, fur type etc. Some of these like presence or absence of horns have simple inheritance and have been studied extensively. Others such as milk production, withers height, heart girth and body length are obviously quantitative in nature. Physical characteristics are arguably the most commonly used criteria for breed or strain definitions. For this reason, attempts have been made to investigate these traits to characterize the populations. One such example is the classification of goat populations based on multivariate analyses of physical characteristics. Performance characteristics are the traits most familiar to animal breeders. In mainstream, such traits as milk yield and quality, meat characteristics (measures of growth and carcass quality). They also include reproductive traits (age at first parturition, calving interval, prolificacy etc.). Indeed, in these systems there is no distinction between performance and adaptive traits. As a result, breeding strategies for low and medium input systems, which generally subsistence oriented, do not exist. Therefore, the objectives of the research program are to set determine the morphological characteristics, productive and reproductive performance of Bundelkhandi goat under semi-intensive and field management conditions.

MATERIALS AND METHODS

Field data on goat (221) under study were collected from Bundelkhand for conservation, characterization and the entire management strategies were designed to collect the maximum amount of data on the dam, sire and kids. In field condition, most of the houses of goat were made of kaccha bada, bamboo with wire fencing, bada made bamboo and Dhak leaf, tin sheds and the walls were with soil. Animals

Table 1: Morphological characteristic of Bundelkhandi bucks (1-3 years of age)

Parameters	Blocks				Probability
	Jaitpur (25)	Kabrai (20)	Panwari (8)	Charkhari (7)	
Body Weight (kg)	26.43[a]±2.99	22.14[b]±1.74	24.10[b]±1.50	25.34[a]±2.75	P<0.001
Body Length (cm)	93.65[a]±1.46	87.92[b]±1.72	90.20[b]±1.43	92.84[b]±1.60	P<0.01
Chest Girth (cm)	74.63[a]±2.81	70.87[b]±2.37	71.90[b]±2.48	73.40[a]±2.68	P<0.01
Wither Height (cm)	66.23[ab]±2.53	60.71[b]±1.80	62.80[b]±2.06	64.40[a]±2.63	P<0.01
Leg Length (cm)	39.88±1.16	38.61±0.91	37.90±1.74	39.13±1.07	NS
Head Length (cm)	21.86[a]±2.16	20.25[b]±1.57	19.73[b]±1.75	21.20[a]±1.84	P<0.01
Ear Length (cm)	20.60[b]±1.37	18.28[b]±1.60	17.70[c]±1.81	19.10[a]±0.28	P<0.001
Ear Width (cm)	7.36[a]±0.37	6.89[a]±0.36	6.25[b]±0.19	7.15[a]±0.45	P<0.01
Horn Length (cm)	10.26[ab]±1.30	9.24[c]±0.96	9.93[bc]±1.10	10.15[a]±0.73	P<0.001
Hip Length (cm)	71.13[a]±2.18	67.86[b]±1.89	66.75[c]±2.25	70.41[a]±1.50	P<0.01

[a, b, c] Means within rows with different superscripts differ significantly,

[*]Figure in parentheses indicates the total number of observations

Table 2: Morphological characteristics of Bundelkhandi Does (1-3 years of age)

Parameters	Regions				Probability
	Jaitpur (41)	Kabrai (38)	Panwari (42)	Charkhari (40)	
Body Weight (kg)	24.27[a]±2.59	20.84[b]±2.44	22.51[b]±1.62	23.64[a]±1.97	P<0.001
Body Length (cm)	91.35[a]±2.76	85.48[b]±1.72	88.72[b]±2.61	90.49[b]±2.86	P<0.01
chest Girth (cm)	72.43[a]±2.61	68.23[b]±1.87	69.84[b]±2.20	71.50[a]±2.51	P<0.001
Wither Height (cm)	66.23[ab]±2.53	60.71[b]±1.80	62.80[b]±2.06	64.40[a]±2.63	P<0.001
Leg Length(cm)	39.88±1.16	38.61±0.91	37.90±1.74	39.13±1.07	NS
Head Length (cm)	21.86a±2.16	20.25b±1.57	19.73[b]±1.75	21.20[a]±1.84	P<0.001
Ear Length (cm)	20.60[b]±1.37	18.28[b]±1.60	17.70[c]±1.81	19.10[a]±0.28	P<0.001
Ear Width (cm)	7.36[a]±0.37	6.89[a]±0.36	6.25[b]±0.19	7.15[a]±0.45	P<0.001
Hip length(cm)	71.13[a]±2.18	67.86[b]±1.89	66.75[c]±2.25	70.41[a]±1.50	P<0.001
Horn Length (cm)	10.26[ab]±1.30	9.24[c]±0.96	9.93[bc]±1.10	10.15[a]±0.73	P<0.001

[a b c d] Means within rows with different superscripts differ significantly, [*] Figure in Parentheses indicates the total number of observation

Table 3: Productive and Reproductive Performance of Bundelkhandi goat

Parameters	Regions				Probability
	Jaitpur	Kabrai	Panwari	Charkhari	
No. of service/conception	1.37±0.08	1.48±0.15	1.53±0.13	1.45±0.02	NS
Gestation length (days)	148.8±2.89	153.1±1.5	151.2±2.83	150.2±1.80	NS
Litter size	1.79±0.08	1.68±0.26	1.61±0.39	1.54±0.21	NS
Post kidding doe weight (kg)	26.52^b±1.3	22.46^c±2.4	24.73^c±2.9	28.17^a±1.03	P<0.001
Post partum heat period (days)	48.24^a±2.0	49.71^b±1.6	50.10^b±1.9	51.82^b±2.1	P<0.01
Weaning weight (kg)	6.80^a±0.23	6.12^b±0.86	5.90^b±0.61	6.44^{ab}±0.12	P<0.05
Body weight gain (g/day)	58.31^a±3.6	49.74^b±1.8	46.52^b±2.6	53.81^{ab}±2.2	P<0.05
Age at first heat (days)	324.65^a±4.9	353.27^b±8.6	342.70^b±5.8	367.83^b±9.4	P<0.001
Age at first kidding (days)	528.90^a±6.7	541.75^b±4.2	536.28^b±3.9	545.21^b±5.6	P<0.001
kidding interval (days)	342.80^a±5.0	364.61^b±4.1	376.91^b±5.4	351.39^b±5.2	P<0.01
Birth weight(kg) Male	1.46±0.08	1.35±0.05	1.29±0.02	1.52±0.06	NS
Female	1.18^{ab}±0.02	1.12^b±0.08	1.25^a±0.03	1.09^b±0.05	P<0.01
Milk yield (150) days	102.43±4.6	93.74±2.2	95.29±3.8	110.06±2.1	NS
Lactation length(day)	161.47±6.3	142.49±5.8	151.37±7.3	168.52±4.6	NS
Sex Ratio % Male	53.8	52.6	53.1	54.2	NS
Female	46.2	47.4	46.9	45.8	NS

abc Means within rows with different superscripts differ significantly * Figure in parentheses indicates the total number of observations

Table 4: Milk yield of Bundelkhandi goats

Months	Milk yield (ml/day)	Significance
1st month	640.5±47.6	NS
2nd month	686.2±20.7	NS
3rd month	590.4±58.2	NS
4th month	414.9±34.6	NS
5th month	325.6±45.7	NS
Average	543.5±41.3	NS

were allowed to graze for 8-10 hours per day and reared by tethering as well as traditional system (extensive) without any feed supplementation. Some farmers the animals were reared by semi-intensive system and housed in slatted floor permanent house. Concentrate feed was offered twice daily at the rate of 50-100g per head per day. The data were recorded on morphologica1 characteristics and reproductive performance of goat conducted in four blocks namely Charkhari, Jaitpur, Panwari and Kabrai regularly. The morphometric characteristics of both sexes were measured using the weighing balance and a standard measuring tape. Parameters studied for physical and reproductive traits were; coat color, body weight (BW), body length (BL), heart girth (HG), wither height (WH),

Table 5: Milk composition of Bundelkhandi goat throughout lactation

Parameter (%)	Month of lactation					
	1	2	3	4	5	Overall
Fat	3.7±0.8	5.3±0.9	5.6±0.4	6.1±0.8	6.8±1.3	5.5 ± 0.8
Protein	3.6±0.5	4.1±0.1	4.0±0.2	3.9±0.3	4.3±0.2	3.9 ± 0.2
Lactose	5.2±0.6	5.5±0.4	5.8± 0.1	6.1±0.2	6.3±0.5	5.7 ±0.3
SNF	9.7±.6	10.4±.7	11.6±.4	11.1± .9	11.7±.9	10.9±0.7
Mineral	0.7±0.2	0.8±0.1	0.8±0.1	0.7± 0.4	0.7±0.2	0.7±0.2

Significantly (P<0.01), SNF = solids not fat.

fore leg length (FLL), hind leg length (HLL), horn length (HNL), ear length (EL), age at first heat (AFH), age at first kidding (AFK), kidding interval (KI), post partum heat period (PPHP), gestation length (GL), number of service/ conception (NSC), litter size (LS), post kidding doe weight (PKDW), kid birth weight (KBW), weaning weight (WW), body weight gain (BWG) and milk production. The statistical analysis of the data was performed using ANOVA procedure of SPSS (Statistical Packages for Social Sciences, Version 11.5). The difference among the treatment means were examined by using Duncan's Multiple Range Test (1955).
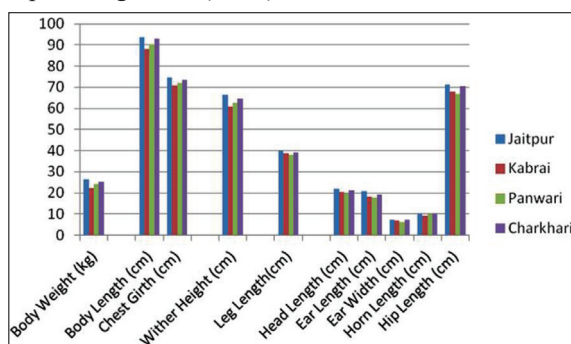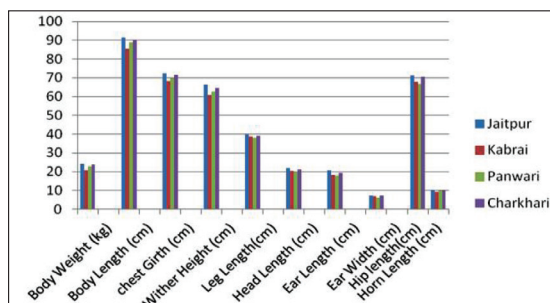

Fig. 3: Productive and Reproductive Performance of Bundelkhandi goat

Fig. 4: Productive and Reproductive Performance of Bundelkhandi goat

Fig. 1. Morphological characteristic of Bundelkhandi bucks (1-3 years of age)
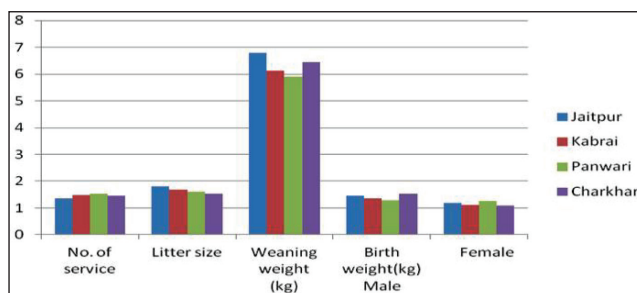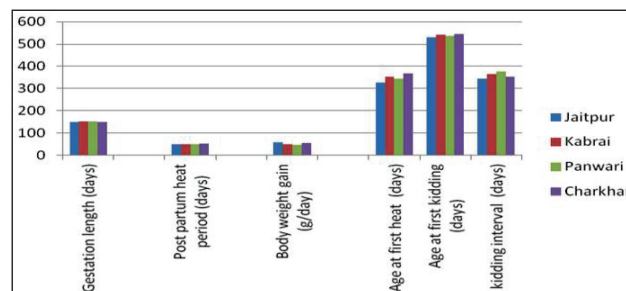

Fig. 5: Milk yield of Bundelkhandi goats

Fig. 2: Morphological characteristics of Bundelkhandi Does (1-3 years of age)
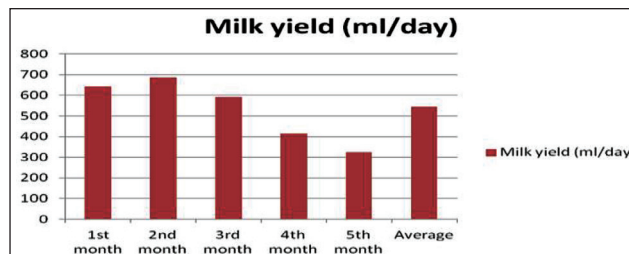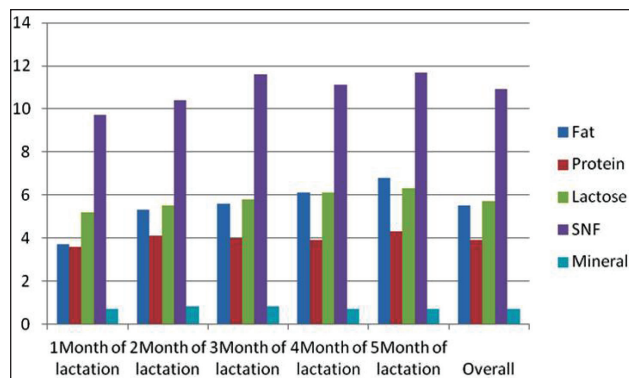
Fig. 6: Milk composition of Bundelkhandi goat throughout lactation

RESULTS AND DISCUSSION

The coat colors of goat in all region are same were either most of the animals are white in colour. The intensity of colour varies from white to yellowish tan and black patches and white mixed. The survey revealed that 72 percent of the animals are in white, 15% in yellowish tan and 13% in light brown or black spots are found on the body. Some of them have black and brown markings on the forehead, inner parts of thigh and lower abdomen. The morphological characteristics of buck are shown in Table 1. The blocks had significant (P<0.01) effect on BW, BL, HG, WH, HL, EL, EW, and HNL. The bucks of Jaitpur block were found to be better than that of Charkhari, Panwari and Kabrai blocks in respect to BW, BL and HG. The blocks had non-significant effect on FLL and HLL. The morphological characteristics of ewes are given in Table 2. The blocks had significant (P<0.01) effect on BW, BL, HG, WH, HL, EL and EW. The BW, HG and WH of ewes were significantly (P<0.01) higher in Jaitpur than Charkhari, Panwari and Kabrai blocks. Hassan *et al.* (2010) found the body weight of Jamunapari kid was 1.6 kg at birth which was similar to present study. In the present study the average daily body weight gain from birth to weaning was 52.09 gm/day which was similar with Husain *et al.* (1997) and khan and Singh, (1989). They observed average daily body weight gain was 35-45 gm/day.

No-body measurement was significantly different in male and female, which agrees with the results of Rout *et al.* (1999), but the authors reported Bundelkhandi bucks lower body length (87.92±1.72) cm than the present findings.

Horns projected backwards. Ear length 88 cm was similar to results reported by Rout *et al.* (2002).

Male Jamunapari attained about 48.8 kg body weight by 12 months under good husbandry. Patnaik and Nayak, (1988) found that weight at birth and after three month was 2.3 ± 0.1 and 9.4 ± 0.6 kg, respectively, which was higher than the present findings. In contrast Nath and Chawla, (1978), Patnaik *et al.* (1988) reported significant influences of gender on birth weight. This may be due to differences in feeding, housing, health and management factors. Singh *et al.* (2013) and (Hassan *et al.* (2010) found age at first kidding to be 17-18 months, kidding interval to be 11-12 months, litter size to be 1.7 of jamunapari goat was almost similar with the performance of Bundelkhandi goat. The reproductive performances of native goat are shown in Table 3. The blocks had significant (P<0.01) effect on PKDW, female kid birth weight, PPHP, WW, BWG, AFH, AFK and KI. The sex ratio was 53.4 males: 46.6 females. The female kid birth weight, WW, BWG and PKDW were significantly better (P<0.01) in goat of Jaitpur than those of Charkhari, Panwari and Kabrai blocks. The average milk productions (g/animal/year) were comparatively higher in Jaitpur block than the others.

The average PPHP, AFH, AFK and KI were significantly (P<0.01) shorter in goat of Jaitpur followed by Charkhari, Panwari and Kabrai blocks. Kids were heavier at birth, grew faster than lighter weight kids who also supports the results of Khan and Naznin, (2013). The average gestation length ranges from 148 to 153 days which also supports the previous results of Hassan *et al.* (2010) where they found the gestation length 152.8 days for Jamunapari goat in Bangladesh.

The milk production of native goat is shown in Table 4. Milk yield of Bundelkhandi does in the first to fifth months are shown in Table 4, where highest yield of milk was in the second month and lowest in fifth month of lactation. Kala and Prakash, (1990) found peak yield in the third two-week period in Jamunapari goats. Rout *et al.* (1999) reported that Jamunapari can produce 4.9 liters of milk daily with average lactation yields 1.5 liters/day. Similar result found in jamunapari goat Hassan *et al.* (2010). Milk yields increased up to the end of two months and then started to decline with an average lactation length of 150 days.

Highest fat, lactose and SNF were in the later stage of lactation where protein and minerals had similar trend throughout the lactation Table 5. Similarly, Boros, (1986), Simos *et al.* (1990) reported that lactose and protein were fairly constant over the lactation and higher fat values at the beginning and the end of lactation but lower in the middle. Kala and Prakash, (1990) reported that fat and protein increased and lactose and average daily milk yield decreased with advancing lactation in Jamunapari goats. Qureshi *et al.* (1981) found that the protein, lactose and SNF of Jamunapari goat was 3.8, 3.9 and 8.6%, respectively, which was lower than the present findings. Similar result found in Jamunapari goat Hassan *et al.* (2010). (Singh and Singh 1980) determined average protein of 2.9% in early lactation, 3.2% in mid lactation and 3.8% in late lactation, which is also lower than that of the present findings. The overall performance of Jaitpur goat were better among the other three blocks which might be due to the better management, feeding, health and selective breeding.

CONCLUSION

It may be concluded that goat of Jaitpur block were better performer followed by Charkhari, Panwari and Kabrai blocks.

REFERENCES

Boros, V. 1986. Influence of the lactation period on variations in the levels of certain Components of bulked goats' milk *International Dairy Federation Bulletin,* **202:** 81-83.

Duncan, D.B. 1955. "Multiple range and multiple F tests". Biometrics **11**: 1–42.

Hassan, M.R., Talukder, M.A.I. and Sultana. 2010. Evaluation of the production characteristic of the jamunapari goat and its adaptability to farm condition in Bangladesh. *J. Bangladesh vet*., **27**:26-35.

Husain, S.S., Harst, P. and Islam, A.B.M.M. 1997. Growth performance of black Bengal goat in different regions of Bangladesh *Asian-Aust. J. Anim. Sci.,* **10**: 491-494.

Kala, S.N., Prakash, B. 1990. Genetic and phenotypic parameters of milk yield and milk Composition in two Indian goats breeds. *Small Rumin Res.,* **3:** 475– 484.

Khan, A.A. and Singh, D.K. 1989. Annual progress report. All India coordinated research project on goat for meat production, Bihar agriculture university, Ranchi, Bihar, India, 130-137.

Khan, M.K.I. and Naznin, M. 2013. Study the live weight and live weight gain of black Bengal and jamunapari goat breeds by fitting the linear regression under semi intensive conditions. *Pak. J. Biol. Sci.,* **16**(19): 998-1003.

Nath, I. Chawla, D.S. 1978. A study on birth weight of Beetal, Alpine and Beetal x exotic crossbred kids. *Indian Vet. J.,* **55:** 306-309.

Patnaik, R.K., Nayak, S. 1988. Growth rate and survivability patterns in Black Bengal, Ganjam and Jamunapari breeds of goats under farm conditions in Orissa. *Indian J Anim Sci.,* **58:** 1442-1445.

Qureshi, H.A., Deshpande, K.S., Bonde, H.S. 1981. Studies on chemical composition of goat milk. *Indian Vet. J.,* **58:** 212-214.

Rout, P.K., Mandal, A., Roy, R., Singh, L.B. 1999. Improvement and conservation of Jamunapari goats in their home tract, *Ministry of Agriculture Report*, New Delhi India.

Rout, P.K., Mandal, A., Singh, L.B., Roy, R. 2002. Studies on behavioral patterns in Jamunapari goat, *Small Rumin Res*. **43:** 185-188.

Singh, M. 2013. Goat Rearing: A Pathway for Sustainable Livelihood Security in Bundelkhand Region. *Agri. Econom. Res. Rev.,* **26**: 79-88.

Singh, V.B., Singh, S.N. 1980. Total protein, whey protein and casein content of milk of four Indian goat breeds during lactation. *Goat Sheep Res.,* **1:** 118-124.