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Characterization, Production and Reproduction Performance of Southern Odisha Goats

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ABSTRACT

Background: The native goat populations in southern Odisha *viz*. Narayanpatna, Malkangiri and Ganjam were characterized phenotypically in the present study. Ganjam goats stood apart from other populations due to their large, pointed horns and stature. Odisha state has 30 districts and 10 different agro-climatic zones.

Methods: The present study area is under North Eastern ghat and Eastern ghat high land agro climatic zones. An extensive management system is used to raise all the goats with a flock size varying from 6 to 45. The body weight was recorded from birth to 12 months at an interval of 3 months.

Result: The average adult body weight from these 3 goat populations was 17.39±0.20, 16.31±0.17, 16.39±0.20 kg for Ganjam, Malkangiri and Narayanpatna goats, respectively revealing that Ganjam goats were heavier than the other two populations. The average age at sexual maturity and kidding interval was recorded as 318.24±5.24 and 312.06±1.28 days, 236.76±6.23 and 223.21±0.88 days, 218.34±4.28 and 218.22±0.76 days for Ganjam, Narayanpatna and Malkangiri goats, respectively revealing that Ganjam goats had significantly higher estimates than other two types. Males of all goat types were found to have higher body weight than the female counterparts beyond 3 months of age and found to be conspicuous at later age. This information on the physical characterization and production potentials may be helpful in developing further breed improvement strategies and breed registration.

Key words: Agro-climatic zones, Biometric traits, Heart girth, Paunch girth.

INTRODUCTION

Goat output in present system is comparatively poor due to a lack of inputs, infrastructure, uncertain marketing channels and multiple breeding objectives. There are 148.88 million goats in India overall, making up 27.80% of all livestock (20th Census of Livestock). In Odisha, there are around 64 lakh goats, with the only recognized breed having about 4 lakh heads (20th Livestock Census, 2019). The remaining goat populations are lesser known ones like the Malkangiri and Narayanpatna populations, or non-descript ones. In this region of India, the majority of the goat farmers are tribes and poor people. In India, the proportion of recognized indigenous breeds to the total population of goats has been estimated to be around 25%, with a small amount being crossbred. Numerous nondescript goat populations with the distinguishing traits of great fertility and high-quality meat have been sustaining the existence of the stakeholders for thousands of years through selection, evolution and development in the process of domestication to suit local agro-climatic circumstances. The most concerning factor was continuous breed replacement by farmers and random crossbreeding, both of which have a negative impact on the genetic assets of the present population of non-descript goats.

MATERIALS AND METHODS

In 2022, surveys were conducted in the districts of Malkangiri, Koraput and Ganjam in the state of Odisha (Fig 1). Because of the tropical environment of the area, April and May have unusually high temperatures. On the other hand, the Eastern Ghats have a chilly climate. The low temperature is often between 12 to 14°C, while the summer time temperature ranges from 35 to 40°C. In Koraput, Malkangiri and neighbouring areas, the winters are little harsh. Annual rain fall of the region is 150 cms. To reduce errors and eliminate the differences between recorders, all measurements were double-recorded using the measuring tape (Fig 2). While the other measurements were collected using a mapping stick, the circumference measurements were taken using a measuring tape. Body length, height at wither, heart girth and paunch girth were measured for both the sexes and recorded. Animals from various age groups were recorded for their body weights and grouped into birth (0-7 days), 3 (3-4 month), 6 (6-7 month), 9 (9-10 month), 12 (12-13 month)

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months and adults (more than 2 years). Reproduction traits were recorded from farmers directly through a structured scheduled questionnaire. The data thus collected was put to standard statistical analysis *viz*. Anova (Harvey, 1996).

RESULTS AND DISCUSSION

Malkangiri goats

In the Malkangiri district's two blocks (Mathili and Chitrakonda), eleven villages (Badapadar, Dantuguda, Katrimajhiguda, Panas Gaudi, Sairapalli *etc*.) were included in the survey. Four body metrics for animals in various age and sex groups were recorded. Malkangiri goats are raised only for their meat and are medium in size and weight. Most of the goats were light brown or dark brown in colour. Goats of the white and black colours were also seen. In the case of goats with brown colouring, the face had white stripes that ran from the base of the ear to the nose. They had a black top line (Fig 3). Male breeding animals had a black neck ring. Hooves and the muzzle were often black. The flocks were managed under semi-extensive system (Fig 4). Animals were raised on natural vegetation.

Morphometric traits

The average body length, height at withers, heart girth, paunch girth at different stages of growth (0, 3, 6, 9, 12 month and adults) were presented in Table 1. In adults, males are significantly higher than the female counterparts in the measurement of body length, height at withers, heart girth and paunch girth.

Body weight

The marketable male and female animal weighed 16.77±0.22 and 15.97±0.23 kg respectively (Table 2). The overall body weights (kg) of Malkangiri at different stages (0,3, 6,12 month) of growth were 1.39±0.06, 6.16±0.09, 11.11±0.10, 16.31±0.17, respectively, which did not differs significantly with Narayanpatna goat. Overall adult body weight from these 3 goat populations were 17.39±0.20, 16.31±0.17, 16.39±0.20 kg for Ganjam, Malkangiri and Narayanpatna goats, respectively revealing that Ganjam was heavier than the other two populations. Verma *et al*. (2015) reported higher body weight at 3 and 6 months of age but lower at 12 months of age with regards to present study of male Malkangiri goat. In case of female, the present study shows lower value than previous studies at the age of 3, 6 and 12 months of age.

Reproduction traits

Natural service is carried out in Malkangiri type does. Females reached sexual maturity at an age of 218.34±4.28 days which was similar with Narayanpatna goat but significantly different from Ganjam (Table 3). The breeding bucks had a black marking as a neck ring.

Narayanpatna goats

Goats from three villages from respective native tracts of Koraput were taken in the present study and biometric traits



Fig 1: Map of Odisha.



Fig 2: Recording of body measurements.



Fig 3: Malkangiri doe.



Fig 4: Goat shed.

Table 1: Morphometric traits of Malkangiri goats.

Age	Sex	Height at withers (cm)	Body length (cm)	Heart girth (cm)	Paunch girth (cm)
0 M (15)	M	29.47±0.43	26.75±0.54	26.75±0.65	28.43±0.87
0 M (15)	F	27.45±0.45	25.00±0.65	24.22±0.64	26.22±0.76
Overall (30)		28.46±0.32	25.88±0.43	25.48±0.48	27.33±0.45
3 M (15)	M	45.60±0.80	44.40±0.80	43.80±0.96	46.20±0.90
3 M (15)	F	44.38±0.86	43.13±0.78	42.88±0.80	44.50±0.80
Overall (30)		44.99±0.56	43.77±0.58	43.3 4±0.60	45.35±0.70
6 M (15)	M	48.20±0.46	50.20±0.92	48.60±0.60	49.50±0.79
6 M (15)	F	47.30±0.70	48.20±0.78	47.30±0.67	48.40±0.76
Overall (30)		47.75±0.30	49.20±0.70	47.95±0.40	48.95±0.68
9 M (15)	M	53.00±0.92	52.73±0.85	54.82±0.86	55.09±1.34
9 M (15)	F	52.29±0.47	51.29±0.81	53.86±0.88	57.57±1.21
Overall (30)		52.65±0.40	52.01±0.60	54.34±0.70	56.33±0.98
12 M (15)	M	58.65±0.54	56.67±0.56	59.78±0.65	61.79±0.65
12 M (15)	F	56.22±0.67	54.97±0.54	57.22±0.45	60.10±0.76
Overall (30)		57.44±0.50	55.82±0.45	58.50±0.40	60.95±0.45
A (5)	M	60.75^{a}±0.72	63.63^{a}±0.73	66.50^{a}±0.72	71.25^{a}±0.73
A (74)	F	57.33^{b}±0.36	59.09^{b}±0.42	62.96^{b}±0.57	66.80^{b}±0.65
Overall (79)		57.55±0.54	59.38±0.48	63.18±0.62	67.08±0.71

Figures in parentheses indicate number of observations in the table.

*Means with different superscripts along the column (For a trait) indicate significantly (P<0.05) different values.

Table 2: Least squares means with standard error for body weights (kg) of Ganjam, Malkangiri and Narayanpatna goats at different stages of growth.

Age	Sex	Ganjam goats	Malkangiri goats	Narayanpatna goats
0 M	Overall	2.11^{x}±0.05 (48)	1.39^{y}±0.06 (45)	1.54^{y}±0.06 (48)
	M	2.14±0.07 (27)	1.41±0.09 (20)	1.54±0.08 (25)
	F	2.06±0.08 (21)	1.38±0.08 (25)	1.55±0.09 (23)
3 M	Overall	6.72^{x}±0.11 (61)	6.16^{y}±0.09 (63)	6.32^{y}±0.11 (61)
	M	7.22^{a}±0.13 (33)	6.46^{a}±0.13 (25)	6.76^{a}±0.14 (31)
	F	6.15^{b}±0.12 (28)	5.97^{b}±0.12 (38)	5.87^{b}±0.13 (30)
6 M	Overall	11.25±0.12 (71)	11.11±0.10 (75)	11.25±0.12 (71)
	M	11.78^{a}±0.14 (38)	11.43^{a}±0.15 (32)	11.70^{a}±0.15 (36)
	F	10.64^{b}±0.13 (33)	10.88^{b}±0.13 (43)	10.79^{b}±0.14 (35)
12 M	Overall	17.39^{x}±0.20 (54)	16.31^{y}±0.17 (67)	16.39^{y}±0.20 (54)
	M	18.17^{a}±0.20 (33)	16.77±0.22 (28)	16.90±0.27 (26)
	F	16.17^{b}±0.24 (21)	15.97±0.23 (39)	15.92±0.28 (28)

*Figures in parentheses indicate number of observations.

*Different superscripts along the column (for a trait) indicate significantly (P<0.05) different values.

Table 3: Production and reproduction traits in three goat populations.

Traits	Populations		
	Ganjam (68)	Narayanpatna (84)	Malkangiri (77)
Age at sexual maturity (Days)	318.24^{a}±5.24	236.76^{b}±6.23	218.34^{b}±4.28
Age at first kidding (Days)	488.36^{a}±5.78	406.25^{b}±5.87	378.43^{b}±5.17
Kidding interval (Days)	312.06^{a}±1.28	223.21^{b}±0.88	218.22^{b}±0.76
Multiple birth types (%) after 2nd kidding	Nil	58	63

Figures in parentheses indicate number of observations. *Means with different superscripts along the row (For a trait) indicate significantly (P<0.05) different values.

were recorded (Fig 5). Through conversations with the goat keepers, data on reproduction performance traits were gathered. The goat keepers in the region raised these goats through browsing on natural vegetation since generations.

Morphometric traits

The biometric traits of Narayanpatna goats at different stages of growth are recorded and presented in Table 4. The biometric traits of males were found to be significantly higher than the contemporary females at adult stage, but no significant difference was recorded for the biometric traits between the males and females during the stages of growth in the present study. In Narayanpatna goat, the present study showed higher values in height and body length parameter but with regards to heart girth and paunch girth it showed lower value at the adult age (Verma *et al*., 2015).



Fig 5: Narayanpatna goat.

Body weight

The average body weights of adult (marketable) male and female animals were 16.90±0.27 and 15.92±0.28 kg, respectively, which were significantly lesser than Ganjam.

Reproduction traits

Female animals reached sexual maturity at a younger age of 236.76±6.23 days which was significantly lower than Ganjam and varied non significantly with Malkangiri goats. The age at sexual maturity, first kidding, kidding interval, multiple birth percentage after 2nd kidding for all three goat populations were presented in Table 3.

Ganjam goat

The Ganjam goat is a sturdy, medium-sized animal with strong legs, well-developed shoulders and long hair on its thighs and vertebrae. It also has a huge chest. The horns on the males are noticeably longer and they are very powerful. Both male and female goats had wattles and beards (Fig 6). Goats used for ganja had a variety of coat colours, including black, brown, blackish brown and brownish black, occasionally with white spots, with medium-sized and drooping ears. The distinctive trait of the breed was the size of the horns. In females the horns tended to be relatively thiner and straight, whereas in males' the horns were thicker, twisted and curled. Goats of the Ganjam breed are also known as "Gola Chheli" or "Lanka Chelli" as the Gola people were raising them for meat purposes since many years, hence the name. Further, Ganjam goats are raised for both milk and meat. The premium priced ghee prepared from

Table 4: Morphometric traits of Narayanpatna goats.

Age	Sex	Height at withers (cm)	Body length (cm)	Heart girth (cm)	Paunch girth (cm)
0 M (15)	M	27.76±0.45	26.70±0.45	25.47±0.47	29.22±0.49
0 M (15)	F	27.09±0.67	26.20±0.57	24.50±0.48	27.88±0.50
Overall (30)		27.43±0.38	26.45±0.34	24.99±0.40	28.55±0.24
3 M (15)	M	54.22±0.38	52.22±0.45	51.99±0.49	54.32±022
3 M (15)	F	53.24±0.37	50.22±0.47	51.22±0.65	51.22±0.11
Overall (30)		53.73±0.30	51.22±0.32	51.61±0.40	52.77±0.09
6 M (15)	M	58.44±0.43	54.12±0.54	58.66±0.54	60.22±0.43
6 M (15)	F	57.32±0.42	55.12±0.43	57.22±0.58	59.22±0.42
Overall (30)		57.88±0.22	54.62±0.30	57.94±0.30	59.72±0.20
9 M (15)	M	65.20±1.20	62.22±1.11	63.22±1.23	62.11±1.45
9 M (15)	F	63.22±1.11	60.22±1.11	60.22±1.22	60.22±1.25
Overall (30)		64.21±0.98	61.22±0.97	61.72±0.95	61.17±0.98
12 M (15)	M	70.45^{a}±0.44	66.45±0.86	68.34±0.33	70.32±0.32
12 M (15)	F	68.22^{b}±0.43	65.32±0.56	68.44±0.22	68.48±0.22
Overall (30)		69.34±0.30	65.89±0.43	68.39±0.10	69.40±0.12
A (5)	M	74.45^{a}±0.54	70.22^{a}±0.22	70.98^{a}±0.78	73.22^{a}±0.54
A (74)	F	68.99^{b}±0.53	67.22^{b}±0.33	70.20^{b}±0.76	71.22^{b}±0.43
Overall (79)		69.34±0.45	67.41±0.10	70.25±0.50	71.35±0.35

Figures in parentheses indicate number of observations in the Table.

*Means with different superscripts along the column (for a trait) indicate significantly (P<0.05) different values.

Table 5: Morphometric traits of Ganjam goats.

Age	Sex	Height at withers (cm)	Body length (cm)	Heart girth (cm)	Paunch girth (cm)
0 M (15)	M	28.52±0.47	26.47±0.48	27.80±0.36	27.83±0.37
0 M (15)	F	27.95±0.46	26.48±0.49	26.80±0.37	26.83±0.38
Overall (30)		28.24±0.34	26.48±0.40	27.30±0.31	27.33±0.33
3 M (15)	M	49.84±0.54	47.19±0.58	48.88±0.76	51.15±0.58
3 M (15)	F	48.14±0.68	46.14±0.41	47.29±0.61	50.43±0.68
Overall (30)		48.99±0.45	46.67±0.32	48.09±0.50	50.79±0.50
6 M (15)	M	53.60±1.41	50.00±1.10	53.80±1.32	53.80±1.13
6 M (15)	F	51.60±1.21	50.60±1.19	51.60±1.25	53.00±1.17
Overall (30)		52.60±1.17	50.30±1.01	52.7±1.02	53.40±1.10
9 M (15)	M	55.20±1.07	54.00±0.63	56.00±1.38	61.80±1.08
9 M (15)	F	54.00±1.17	53.20±0.91	54.60±1.04	60.20±1.20
Overall (30)		54.60±1.02	53.60±0.54	55.30±0.97	61.00±0.98
12 M (15)	M	59.36±0.45	59.22±0.63	60.22±0.65	59.28±0.63
12 M (15)	F	57.21±0.47	57.78±0.65	58.78±0.63	56.76±0.62
Overall (30)		58.29±0.32	58.50±0.57	59.50±0.58	58.02±0.56
A (5)	M	74.40^{a}±0.77	69.60^{a}±0.71	70.60^{a}±0.79	71.40^{a}±0.90
A (74)	F	68.47^{b}±0.56	65.63^{b}±0.57	70.86^{b}±0.60	73.14^{b}±0.73
Overall (79)		68.85±0.46	65.88±0.43	70.84±0.58	73.03±0.70

Figures in parentheses indicate number of observations. *Means with different superscripts along the column (For a trait) indicate significantly (P<0.05) different values.



Fig 6: Ganjam goat.

milk of Ganjam goats popularly used for the treatment of asthma (Dash *et al*., 2006).

Morphometric traits

The morphological traits of the Ganjam goat, particularly its large horns, set it apart from other species of Odisha goats. The biometric traits of Ganjam goats were presented in Table 5. Rao *et al.* (2009) reported higher values of body length, height at withers, heart girth, paunch girth at 12 months of age in Ganjam goats than those recorded in the present study.

Body weight

The overall body weights (kg) of Ganjam at different stages (0, 3, 6,12 month) of growth were 2.11±0.05, 6.72±0.11, 11.25±0.12, 17.39±0.20 respectively, which were significantly heavier than Narayanpatna and Malkangiri types (Table 2).

Reproduction traits

The average age at sexual maturity and kidding interval were recorded as 318.24±5.24 and 312.06±1.28 days, 236.76±6.23 and 223.21±0.88 days, 218.34±4.28 and 218.22±0.76 days for Ganjam, Narayanpatna and Malkangiri goats (Table 3), respectively revealing that Ganjam goats had a significantly higher estimates than other two types. According to Rao *et al.* (2009), the age at sexual maturity for Ganjam goats was higher than the observations of the present study. In age at first kidding, Dash and Sethi (2017) reported more days than the present study in Ganjam goat. Further the findings in Narayanpatna and Malkangiri goats corroborates with that of Singh Bariah *et al.* (2008) and the age at sexual maturity of Ganjam goat is more than the present study.

CONCLUSION

The goat types studied under the present study were medium sized with Ganjam being significantly heavier as compared to Narayanpatna and Malkangiri goat types, which was confirmed by the body dimensions. Males exhibited significantly higher biometric estimates than the females at all the ages. It is important that indigenous breeds of goats need to be conserved, developed and propagated. Efforts were being made to conduct wider studies to facilitate registration of such indigenous types as specific breeds in future.

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Conflict of interest

There is no conflict of interest.

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