

**PHENOTYPIC CHARACTERISTICS AND  
REPRODUCTIVE TRAITS OF BERARI GOATS IN  
PARSEONI TAHSIL OF NAGPUR DISTRICT**

**THESIS**

**Submitted to  
Dr. Panjabrao Deshmukh Krishi Vidyapeeth,  
Akola  
in partial fulfilment of the requirements  
for the Degree of**

**MASTER OF SCIENCE  
IN  
AGRICULTURE  
ANIMAL HUSBANDRY AND DAIRY  
SCIENCE  
(ANIMAL HUSBANDRY)**

**By  
BODHADE MAYUR SANTOSH**

**SECTION OF ANIMAL HUSBANDRY AND DAIRY  
SCIENCE  
COLLEGE OF AGRICULTURE, NAGPUR**

**DR. PANJABRAO DESHMUKH KRISHI VIDYAPEETH,  
KRISHINAGAR PO, AKOLA (MS) 444104**

## DECLARATION OF STUDENT

I hereby declare that the experimental work and its interpretation of the thesis entitled “**PHENOTYPIC CHARACTERISTICS AND REPRODUCTIVE TRAITS OF BERARI GOATS IN PARSEONI TAHSIL OF NAGPUR DISTRICT**” or part thereof has neither been submitted for any other degree or diploma of any University, nor have the data been derived from any thesis / publication of any University or scientific organization. The source of materials used and all assistance received during the course of investigation have been duly acknowledged.

Place: Nagpur

**(Bodhade Mayur Santosh)**

Date: 17/06/2019

Enrolment No. LL/175

## CERTIFICATE

This is to certify that thesis entitled “**PHENOTYPIC CHARACTERISTICS AND REPRODUCTIVE TRAITS OF BERARI GOATS IN PARSEONI TAHSIL OF NAGPUR DISTRICT**” submitted in partial fulfilment of the requirement for the degree of “Master of Science in Agriculture (Animal Husbandry and Dairy Science)” of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola is a record of bonafide research work carried out by Bodhade Mayur Santosh under my guidance and supervision.

The subject of the thesis has been approved by the Student’s advisory Committee.

Place: Nagpur

Date: 17/06/2019

**Dr. A. B. Motghare**

Chairman

Advisory committee

### Countersigned

Associate dean

College of Agriculture Nagpur

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

THESIS APPROVED BY THE STUDENTS ADVISORY COMMITTEE  
INCLUDING EXTERNAL EXAMINER (AFTER VIVA-VOCE)

- |                    |                               |       |
|--------------------|-------------------------------|-------|
| 1. Chairman        | <b>(Dr. A. B. Motghare)</b>   | _____ |
| 2. Member          | <b>(Dr. V. G. Atkare)</b>     | _____ |
| 3. Member          | <b>(Dr. S. S. Bawaskar)</b>   | _____ |
| 4. Member          | <b>(Shri. P. D. Deshmukh)</b> | _____ |
| 5. External Member | <b>(Dr. N. S. Chore )</b>     | _____ |

## **ACKNOWLEDGEMENTS**

I express my respectable thanks to god or his showers of blessings on me in each and every step of my life.

I avail this unique opportunity to express the work under the inspiring guidance of honourable chairman of my advisory committee Dr. A. B. Motghare, Assistant Professor of Veterinary Science, College of Agriculture Nagpur, for his valuable Guidance, suggestion and cooperation during the course of my research work and for the preparation of the manuscript of the thesis.

My cordial, heartfelt thanks to the member of Advisory committee, Dr. V. G. Atkare, Associate professor of Animal Husbandry and Dairy science, and Dr. S. S. Bawaskar, Assistant Professor of Veterinary Science, and Shri. P. D. Deshmukh, Assistant Professor of Agriculture Economic and Statistic, College of Agriculture, Nagpur for their everlasting, vibrant and valuable guidance.

It is my great privilege to record my special, sincere and devoted thanks to Dr. A. S. Ingole, Professor of Animal Husbandry and Dairy science, College of Agriculture, Nagpur for their ever willing, untiring and timely suggestion during the period of PG programmed.

I wish to express my deep sense of gratitude to Dr. D. M. Panchbhai, Associate Dean, College of Agriculture, Nagpur for providing necessary facilities to carry out this investigation.

I really thankful to the Dr. R. M. Zinjarde, Associate Professor of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur and Dr. N. S. Chore, Assistant Professor of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur and Dr. B. R. Wankhade, Assistant Professor of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur for his valuable suggestion and keep interest taken during the investigation.

I express my heart full thanks to Dr. Kavita Kadu Senior Research Assistant (SRA), Shri. N. H. Sable Senior Research Assistant (SRA) Animal Husbandry and Dairy Science, College of Agriculture, Nagpur for their instant help, cooperation and valuable suggestion rendered throughout the investigation.

My special thanks to Shri. P. L. Adhe, Laboratory Attendant, Shri. Nilesh Choudhari, Shri K. S Hingrupe and, Shri. S. V. Ghongade Shri. Naresh Meshram Animal Husbandry and Dairy Science, College of Agriculture, Nagpur for helping during the present study.

I am also grateful to Dr. C. J. Gaikwad, Librarian, College of Agriculture, Nagpur for his valuable guidance and to provide all facilities related to my thesis work.

No words are enough to record my heartiest gratitude and deep sentiments towards my father Shri. Santosh R. Bodhade and mother Sau. Vijaya S. Bodhade, for their moral support, encouragement, spiritual inspiration and sharing the difficulties in building my education carrier from better to best.

A special thanks to my sweet and lovely friends sopan, vaibhav, shubham, Tushar, santosh sir, chetan sir, help me in carrying out my study with joy and happiness.

I take this opportunity to keep on records the remembrance of my batchment Subham, Sujit, Sopan, Jageshwar, Chhaya , Pooja and my lovely juniors who helped me to keep my composure and for being there when I needed them the most.

I am thankful to all the authors in past and present whose literature has been cited. Last but not least I am thankful to Shriniketan Computer and Graphics preparing this manuscript neatly and timely

Place: Nagpur

Date:

**(Bodhade Mayur Santosh)**

## CONTENTS

<b>Sr. No.</b>	<b>Particulars</b>	<b>Page</b>
	Declaration of students	i
	Certificate	ii
	Acknowledgement	iii
<b>A</b>	List of Table	vi
<b>B</b>	List of Figures	vii
<b>C</b>	List of Plates	viii
<b>D</b>	List of Abbreviations	ix
<b>E</b>	Thesis Abstract	x
<b>I</b>	Introduction	1
<b>II</b>	Review of Literature	6
<b>III</b>	Material and Methods	26
<b>IV</b>	Results and Discussion	38
<b>V</b>	Summary and Conclusions	72
<b>VI</b>	Literature Cited	75
	Vita	83
	Appendix	84

(A)

## List of Table

Table	Title	Page
1	Classification of Berari goat according to age group	30
2	Village selected for collection of data in Parseoni tahsil	32
3	Geographical area of Parseoni tahsil	34
4	Cropping pattern of Parseoni tahsil	34
5	Colour pattern of different physical characteristics of Berari goats along with $\chi^2$ value	41
6	Tail, Ear and Horn characteristics of Berari goats along With $\chi^2$ value	46
7	Mean and standard error of tail length of Berari goat	47
8	Mean and standard error of ear length of Berari goat	49
9	Mean and standard error of horn length of Berari goat	53
10	Mean and standard error of body length of Berari goat	55
11	Mean and standard error of chest girth of Berari goat	59
12	Mean and standard error of height at wither of Berari goat	61
13	Mean and standard error of body weight of Berari goat	65
14	Mean and standard error of reproductive traits of Berari goat	67
15	Overall mean and standard error for different Phenotypical character and reproductive trait of Berari goat recorded in Parseoni Tahsil	70

**(B)****List of Figures**

<b>Figure</b>	<b>Title</b>	<b>Page</b>
1	Map of Nagpur district	33
2	Map of Parseoni tahsil	33
3	Coat colour pattern of Berari goat	40
4	Eye colour pattern of Berari goat	40
5	Type of tail of Berari goat	42
6	Ear orientation of Berari goat	42
7	Horn orientation of Berari goat	45
8	Mean of tail length of Berari goat	50
9	Mean of ear length of Berari goat	50
10	Mean of horn length of Berari goat	56
11	Mean of body length of Berari goat	56
12	Mean of chest girth of Berari goat	62
13	Mean of height at wither of Berari goat	62
14	Mean of body weight of Berari goat	66

(C)

**List of Plates**

<b>Plate</b>	<b>Title</b>	<b>Page</b>
1	Photo showing female Berari goat	31
2	Photo showing different phenotypical characters of Berari goat	43
3	Photo showing measurement of tail length of Berari goat	51
4	Photo showing measurement of ear length of Berari goat	51
5	Photo showing measurement of horn length of Berari goat	57
6	Photo showing measurement of body length of Berari goat	57
7	Photo showing measurement of chest girth of Berari goat	63
8	Photo showing measurement of height at wither of Berari goat	63

**(D)****Abbreviations**

%	:	Per cent
°C	:	Degree Celsius
/	:	Per
Cm	:	Centimeter
d.f.	:	Degree of freedom
<i>et al.</i>	:	Et alia (and other)
Fig.	:	Figure
g.	:	Gram
Kg.	:	Kilogram
Lit	:	Litre
NBAGR	:	National Bureau of Animal Genetic and Resources
NS	:	Non-significant
SD	:	Standard deviation
SE (m) ±	:	Standard error of mean
sig.	:	Significant
Viz.,	:	Namely
$\chi^2$	:	Chi-square

**(E)**

**THESIS ABSTRACT**

- a) Title of the thesis : **“PHENOTYPIC CHARACTERISTICS AND REPRODUCTIVE TRAITS OF BERARI GOATS IN PARSEONI TAHSIL OF NAGPUR DISTRICT”**
- b) Full name of student : **BODHADE MAYUR SANTOSH**
- c) Name and address of Major Advisor : **Dr. A. B. Motghare**  
Assistant Professor,  
Veterinary Science,  
College of Agriculture, Nagpur
- d) Degree to be awarded : M.Sc. (Agri.) in Animal Husbandry and Dairy Science
- e) Year of award of degree : 2019
- f) Major subject : Animal Husbandry
- g) Total number of pages in the thesis : 86
- h) Number of words in the abstract : 242
- i) Signature of student :
- j) Signature, Name and address of forwarding authority :

**Dr. A. S. Ingole**

Professor

Department of Animal Husbandry  
and Dairy Science

College of Agriculture, Nagpur

## ABSTRACT

The present study entitled “Phenotypic Characteristics and Reproductive traits of Berari goats in Parseoni tahsil of Nagpur district” was undertaken in native tract of Parseoni tahsil of Nagpur district of Vidharbha region of Maharashtra state. The observations were recorded on 200 Berari goat for Physical characteristics and reproductive traits. The data were categorized according to age group 0-6, 6-9, 9-12, 12-18 and above 18.

It was found that Berari goats were medium in size and weight. The coat colour observed mostly brown. Black colour patches on body margin including forehead, neck and leg was noticed with significant variation in colour. Black margin on ventral side, dorsal side is confirmed characters of Berari goat. Mostly, brownish eye colour found in Berari goat.

The horn orientation in maximum goat were backward and pooled average was  $6.03 \pm 0.21$  cm. the ear orientation in 100 per cent goat found to be pendulous and ear length were  $13.55 \pm 0.26$  cm.

In adult Berari goat tail length, ear length, horn length, tail length, body length, chest girth, height at wither and body weight in kg. was  $12.66 \pm 0.33$  cm.  $13.55 \pm 0.26$  cm.  $6.03 \pm 0.21$  cm.  $54.74 \pm 1.16$  cm.  $63.45 \pm 0.83$  cm.  $63.99 \pm 0.94$  cm.  $18.31 \pm 0.56$  kg. respectively. Reproductive traits of Berari goat namely Age at first oestrus, oestrus cycle duration, age at first mating, number of services per conception, gestation period, age at first kidding and kidding interval were found to be  $9.18 \pm 0.15$  months,  $20.53 \pm 0.12$  days,  $15.91 \pm 0.09$  months,  $2.70 \pm 0.07$ ,  $148.14 \pm 0.19$  days,  $19.25 \pm 0.30$  months,  $249.56 \pm 0.79$  days, respectively.

## Chapter - I

### INTRODUCTION

#### 1.1 Background information

The livestock sector plays an important role in Indian economy. In India about 70 per cent population is engaged in agriculture occupation directly or indirectly. There is a symbiotic relationship in man and livestock ecosystem.

Contribution of goats is especially important in rural areas where goats are closely associated with the poorest of the poor and popularly known as redymade bank. As small animal it can be easily managed by family labour. Feeding, milking and caring of goats does not require much equipments, high incidence of multiple growth, short gestation period, space for housing compare to other animals is low. Thus economically, goat is cheap animal for rearing and suited to landless labour, marginal farmers and people below poverty line.

Goats are reared mainly by the poorest of the poor developing countries. In India to the small and marginal farmers including landless Agricultural labours mostly in non-green revolution area where irrigation facilities are poorly developed prominently rear goats.

Goat production can also be an important tool to eradicate the poverty of women in rural areas. The short gestation period in goats makes it possible to increase the productive life more rapidly than cattle. The small size and low individual price bring them within the capacity of low income groups. Rearing of large animals like cattle, buffaloes is becoming difficult day by day. Smaller animals like goats which have no specific demands, offer and benefiting economy in such situation in producing milk and meat.

Berari goat has recently been recognized at national level as 23<sup>rd</sup> goat breed of India. Berari is reared mainly for meat purpose in Vidarbha

region of Maharashtra. As a unique feature, animal have light to dark strips on lateral sides from horn base to nostrils of face.

Goats have high survival rate under the critical environmental condition and can simultaneously produce a variety of product for the family like meats, milk, manure, skin and fiber.

Goat is one of the most neglected domestic animal species. In villages they are maintained on grazing and browsing. In there traditional husbandry practices involving zero cost management, goats are freely allowed to pick up whatever they get in the fields and bunds. Many times this causes destructions of plantation and standing crops severely. However, goats are not provided with concentrated for making up deficiencies in their nutritional requirement

Goat has short generation interval, high prolificacy and is easily adaptable to a wide range of climatic conditions. This characteristic give it a greater relevance in the household economy of the poor, particularly in the marginal environments including arid, semi-arid and mountain regions.

## **1.2 Importance of study**

In India the contribution of livestock sector to gross domestic product is rising through the contribution of agriculture sector in general is witnessing a declining trend, in such a situation goats are going to be even more important source of livestock for many more people in coming year and thus deserve greater attention.

India ranks first in world goat population. India possesses 135.17 million heads of goat (FAO. 2012) which account for 15 percent of world population. Whereas, annually 38 percent of goat slaughtered. Goats are mainly maintained as meat animal in India and goat meat represent 0.5 million tones of total meat produced in the country, out of that almost 45 percent meat is consumed totally. Thought there are nearly 20 goat bread in india reared, out of which very few are considerable milk producing animal. Major portion of goat milk produced is consumed by the

goatkeepers and hence very small fraction of it is marked as liquid milk of its derivatives. However considering rate of growth in goat population, awareness in goatkeepers about improved goat rearing practices and application of new tools of biotechnology by the animal scientists, goat milk production would definitely set a boost in the near future. Goat provide cost benefit ratio of 1.11:7 with high investment return of 30 per cent.

Rate of increase in goat number is much higher than cattle, buffaloes and sheep. India is endowed with about 20 economically useful goat breeds, besides 80 per cent are nondescripts, on account of having low genetic potential and low weight gain.

The success and efficiency of goat farming largely depend upon reproductive performance of goat. Berari breed of goat are found in large number in parseoni tahsil and well adapted in their native tract but information on phenotypical characters and reproductive status for characterization and performance point of view is very scanty. Thus there is need to generate information for documentation, characterization, performance evaluation and preservation point of view is necessary. To characterize Berari breed of goat, study of phenotypic characteristic, body length, chest girth, height at wither and body weight are undertaken because selection for higher body measurements has been found to be beneficial for production and reproductive efficiencies of certain breeds of goats.

The major problem affecting goat production in Vidarbha region were observed to be poor productivity of Local goats due to low genetic potential and low weight gain. So by rearing genetically improved goat, enhancing milk and meat production which can increase the income and nutritional security of weaker section of population. However the present study has a limitation as one could not establish the strain of any breed only on phenotypical and reproductive traits. But such data needs confirmation by conducting supporting study on this breed. Few work was done in native tract and very scanty information is available.

The phenotypical characters like body length, chest girth, height at wither, body weight and reproductive traits like age at first oestrus, oestrus cycle duration, age at first mating, number of services per conception, gestation period, age at first kidding and kidding interval can serve as a guideline for planning future improvements of Berari goat and helpful to conserve this breed. The risk evolved of extinction can be minimized by this type of survey

### **1.3 Objectives**

1. To study the phenotypic characterization of Berari goat
2. To study the body weight and measurements
3. To study the reproductive traits

### **1.4 Hypothesis**

Berari goats were found in large number in rural areas of Parseoni tahsil of Nagpur districts in Maharashtra and Nimar in Madhya Pradesh needs attention for their conservation. Success of conducting any livestock enterprises lies with the efficient performance in the region to induce genetic potential and productivity.

The major problem affecting goat production in Vidarbha region was observed to be poor productivity of local goats due to low genetic potential and low weight gain. So by rearing genetically improved goat, milk and meat production can increase the income and nutritional security of weaker section of population. However the recent study has a limitation as one could not establish the strain of any breed only on phenotypical and reproductive traits. But such data need confirmation by conducting supporting study on this breed. Work was done in native tract and very scanty information is available.

The phenotypical characters like type of tail, orientation and length of ear, orientation and length of horn, body length, chest girth, height at wither, body weight and reproductive traits like age at first oestrus, oestrus cycle duration, age at first mating, number of services per conception, gestation period, age at first kidding and kidding interval can

serve as a guideline for planning future improvement of Berari goat and helpful to conserve this breed. The risk evolved of extinction can be minimized by this type of surveys.

### **1.5 Scope and limitation**

Berari goat found in Parseoni Tahsil of Nagpur district are now facing degeneration and getting diluted due to indiscriminate breeding and are under constant risk of extinction. The outcome of this survey would allow the goat owners to know about the phenotypical characters and reproductive traits which have direct and indirect bearing on the lifetime productivity performance of the phenotypical and reproductive traits varies with control of gene action and certain environmental factors such as humidity, temperature atmosphere on the productivity. The observation of the study which will also be helpful in describing the characterization and performance of Berari breed goat.

## **Chapter - II**

### **REVIEW OF LITERATURE**

Research is a continuous process for any scientific investigation, previous findings provide basis to the research. The review of literature is one of the important aspects in the research process. It helps the researcher to keep his work going in right and appropriate direction.

Goat production is mainly concentrated in the tropical and sub-tropical countries like India. However, due to its multiple utility, unquestionable superiority to thrive under all adverse conditions in which, other domesticated livestock find it difficult to survive the goats retained their place in the livestock industry.

Although the goats have proved important livestock species under the rural agriculture ecology beyond doubt, it remained the most neglected in the field of research and development. Hence, the literature on various aspects of goats is very scanty. In the present study, an attempt has been made to review the available literature in respect of phenotypic characteristics of various breeds of India.

The present study was undertaken to study Characterization and Reproductive performance of goat. The information collected is presented in this chapter on the following points

- 2.1 Colour
- 2.2 Body confirmation
- 2.3 Body weight and measurements
- 2.4 Reproductive performance

#### **2.1 Colour**

Singh and Mukharjee (1981) worked on variation in coat colour of Bengal goats. He concluded that possibly Black and Brown Bengal

are not two different strains but different colour goats of the same breed.

Mazumder and mazumdar (1983) studied on breed characterization of some Indian pashmina goats. He described all characters including physical character, general behaviour, milk production, oestrus cycle, parturition behaviour, feeding habits, survival data. He concluded that the average milk yield per animal per day was 369g. The average pashmina yield in adult males and female were  $189.50 \pm 22.22$  and  $118.62 \pm 4.79$ g. The average staple length was 5.9 cm.

Mittal and Ghosh (1985) worked on characteristics of Parbatsar breed of goat. He concluded that Parbatsar goat has light brown to dark chocolate body.

Bhat (1988b) observed colour pattern in 304 Jamunapari goats. Out of this 43% were completely white, 29.60% were white with brown patches on neck, ear and around the eyes, 21.05% white with a fawn patches and 6.25% were white with dark brown colour and fawn marking. 6.90% were white with black patches on neck, ear around the eye. The Majority of animal (86.8%) had black muzzle 74% brown muzzle and 3.2% white muzzle.

Jain *et al.* (2000) undertaken a survey of Kadi-Adu goats in south eastern coastal region of Tamil Nadu. They reported that colour of goat was predominantly white with splashes of black or red colour.

Thiruvankandan *et al.* (2000) studied Kanni-Adu goat breed in southern district of Tamilnadu. They reported that Kanni Adu goats were predominantly black in colour.

Shinde (2000) carried out survey on phenotypic characteristics of Osmanabadi goats maintained by farmers in Rahuri area of Ahmadnagar district and noticed that out of 631 Osmanabadi goats 62.26% were entirely black, 23.45% mainly black with white spotted

ear or some white patches on the body and only 7.29% goat were of varied colour.

Jangam (2001) studied the Berari goats in Akola, Nagpur and Wardha district of Vidarbha region and reported that colour of Berari goat was predominantly brown black (41.33%) but animals with black brown (25.44%) and completely black brown were also noted.

Mane (2004) observed that out of total 508 goats studied in Buldhana district. 68.70% had mixed colour i.e. brown white or brown black followed by brown (20.87%), white (6.50%) and black (3.93%) colour was observed very less in both sexes.

Deokar *et al.* (2006) studied the habitat and distributions of Osmanabadi goat by the survey in three district viz. Ahmednagar, Solapur and Osmanabad of Maharashtra. Data on morphological character were recorded on Osmanabadi goats of various age groups in both the sex from farmer's flocks. The study revealed that the Osmanabadi goats were of black in coat colour, having grey white skin, black muzzle, eyelids and hooves.

Singh and Barwal (2009) carried out work on Chaugarkha goat in their home tract. They recorded observations on coat colour of this breed. They found that coat colour varies from black, fawn and white.

Ravimurugan *et al.* (2009) conducted survey in the breeding tracts of Pallai Adu (local) goats revealed in block of Tirunelveli districts in Tamil Nadu. They reported that goats were predominantly yellowish brown in colour.

Verma *et al.* (2009) conducted survey on Malabari goats inhabit the Calicut, Kannur, Waynad and Malappuram districts of Kerala. They found that coat colour of these goats varies from complete white, admixtures of white and brown, black and brown to complete black.

Verma *et al.* (2010) studied phenotypic characterization of Sangamneri goat breed. The study conducted in the village of Nasik,

Ahmednagar and Pune district of Maharashtra. The colour of goat was complete white but admixture of black brown was also available. Eye lids were pinkish white. Muzzle is black but pinkish white in pure white animals. Hoof and horns are grey.

Katekhaye (2011) studied phenotypic characterization of Berari goat in Hingna tahsil of Nagpur district. She recorded the phenotypic characters like colour, body length, horn length, chest girth, height, body weight and lactation performance. The coat colour of most of the Berari goats were dark brown (75%) followed by light brown (12.5%) and brown (12.5%) with significant variation.

Hassen *et al.* (2012) conducted a survey to study the morphological characteristics of indigenous goats in representative zones and districts of Amhara Region of Ethiopia as a first step towards characterization and designing of breeding programs. The results show the presence of clear morphological variations between and within these indigenous goat ecotypes. The most frequent coat color was white with spots (20.7%), followed by brown with patch (17.5 %) and brown (15.4%). In general, black coats with or without spots or patches were less frequent than brown or white ones. There was different coat color types in Ethiopian goat populations in which black with spot (26.7%), brown with patch, brown and black with spots (25%) and brown were found more frequently in Gumuz, Abergelle and Central Abergelle goats, respectively, than other goat ecotype.

Verma *et al.* (2012) studied konkan kanyal goats in konkan region of Maharashtra. Animals were predominantly black with white marking in a specific pattern however, brown coat with the similar pattern of white or light brown marking were also available.

Kuralkar *et al.* (2013) studied berari goats in Vidarbha region of Maharashtra. They found Dark tan coat colour (60.1%) more prominent than light tan (39.9%) in Berari goats.

Oseni and Ajayi (2014) observed that WAD goats display wide variations in qualitative traits including coat colour pigmentation, wattles, beard and super-numerary teats among females. Coat colour pigmentations include predominantly black, brown white, pied and mixed colours. Noted that WAD goats had a preponderance of basic black coat colour (53.3%) while basic brown and white goats were 39.9 and 6.8% respectively.

Verma *et al.* (2015) reported that Ganjam goats were found in varied coat colour i.e. black, brown, blackish brown, brownish black sometimes with white patches. Hooves, muzzle, eyelashes and horns were grayish black.

Raskar *et al.* (2015) reported that, the distribution of goats in surveyed area revealed that 62.16 per cent (483) goats were from first breed sub-type i.e. entirely black and horned followed by 17.12 per cent (133) goats with black colour and polled goats i.e. breed sub-type 3 (Hondi). The proportion of breed sub-type 2 i.e. goats with black colour and horned goats with white spotted ear (Morkhani) was 10.68 per cent (83). The proportion of breed sub-type 4 i.e. entirely black, polled goats with spotted ears was 3.09 per cent (24) and proportion of remaining goats having different colour combination i.e. breed sub-type 5 was 6.95 per cent (54).

Mishra *et al.* (2015) Conducted study on phenotypic characterization of Kalahandi goats. Kalahandi goats were mostly brown/tan and white with a strip on either side of face extending from base of horns to muzzle.

Nandani Kumari *et al.* (2015) undertaken the present study on Black Bengal goats of Jharkhand (Jharkhand Black) maintained in Instructional Farm Small Ruminants, Ranchi Veterinary College, Birsa agricultural University, Ranchi. The goat was predominantly black in colour but sometime it may be brown or grey (30%) and white (10%).

Rawat and Gupta (2016) undertaken experiment to know the phenotypic characteristics of indigenous goat. The coat colors of goat in all regions were same while 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 were 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.

Kumar *et al.* (2017) studied Jaunpuri breed of goat in eastern part of U.P. state of India. It was observed from the present findings that the most common colour of Jaunpuri breed of goat was black with white spots (patch), followed by black and brown colour varieties.

## **2.2 Body confirmation**

Mukharjee *et al.* (1979) worked on some phenotypic parameters in Grey and Brown Bengal goats. Body weight, body length, height at withers, chest girth, length of neck, length of ear, tail length, all above measurements recorded. The difference observed for body weight and chest girth at adult stage did not exist when animal becomes

Jain *et al.* (2000) described kodi Adu breed of goat of south eastern coastal region of TN. The average body length was  $19.0 \pm 0.16$  cm in males and  $12.6 \pm 0.48$  cm in females. The ears of this breed were observed to be medium in size. Curved forward slightly drooping having average ear length of  $15.27 \pm 0.10$  cm. Tail length was reported to be average in size and thin with average of  $17.19 \pm 0.22$  cm in length.

Ambhore (2000) observed the average body measurement of Berari goats for 6 and 9 months of age. The average for ear length tail length and horn length were  $14.5 \pm 0.22$  and  $14.06 \pm 0.17$ ,  $11.00 \pm 0.27$  and  $13.22 \pm 0.24$  and  $5.55 \pm 0.18$  and  $8.00 \pm 0.22$  cm. respectively for six and nine months of age.

Shinde (2000) studied 631 Osmanabadi goats and reported that out of total goats. 89.38% goats had convex forehead while. 7.61 per cent and 3.01 goats had concave and straight forehead respectively, 99.55 percent females and 98.46 per cent males did not have wattle while 98.45% males and 99.81 per cent females did not have beard. In case of horn, 88.43% goats had horns and 11.57 per cent were polled. Maximum goats had straight horns (74.01%) with only 25.99 per cent goats bearing curved horns, 98.50 per cent goats had pendulous ears out of which 98.48 per cent were males and 98.68 per cent were females. while 1.54 per cent males and 1.37 per cent females had horizontal ears.

Thiruvankadan *et al.* (2000) studied physical appearance of kanni-Adu goats of Tamil Nadu and reported that the breed had broad forehead, and ears were medium long. Both males and females possessed horns without any topical pattern. About 55 per cent males and 15 per cent females had beard wattles were absent in both the sexes.

Jangam (2001) studied the Berari goats in Akola, Nagpur and Wardha district of Vidarbha region and reported that horns of Berari goat were medium in size directed downward, backward. Almost all goats ears were pendulous not a single case, erect was noticed. Average horn length was  $9.01 \pm 0.09$  cm, ear -  $12.28 \pm 0.06$  cm, and tail -  $15.37 \pm 0.10$  cm. He concluded that wattle and beard was not a common feature of Berari goat.

Lokhande (2005) collected data of 150 goat keepers selected from 10 villages of Akola district. He observed phenotypic characteristics, majority of goats (82.67%) possessed long, tabular and pendulous ear.

Deokar *et al.* (2006) studied the habitat and distributions of Osmnabadi goat were studied by the survey in three district viz. Ahmednagar, Solapur and Osmanabad of Maharashtra. Data on morphological character was recorded on Osmanabadi goats of

various age groups in both the sex from farmer's flocks. Goats possessing grey straight and backward oriented horns (13.01 cm length), pendulous ears ( $4.83 \pm 0.08$  cm length), convex head type, absence of wattles and beard, curved slender and medium tail. The width, depth and length of udder, length diameter and distance between two teats observed in Osmanabadi goats were  $9.89 \pm 0.15$ ,  $8.13 \pm 0.32$ ,  $15.11 \pm 48$ ,  $7.74 \pm 0.35$ ,  $11.16 \pm 0.66$ , and  $5.66 \pm 0.36$  cm, respectively.

Verma *et al.* (2009) conducted survey on Malabari goats inhabit the Calicut, Kannur, Waynad and Malappuram districts of Kerala. The horns are slightly twisted, directed upward and backward sometimes curved downward touching the skin. The nose is straight. The ears are directed outwards and downwards reaching up to the nose. The tips of the ear in some animals were curved and in some animals almost folded. The reason of folding of ear tip is not clear. The tail is small and thin. Udder is small and round with medium size teats.

Verma *et al.* (2010) revealed that, the Sangamneri goat is a dual-purpose breed existing the villages of Nasik, Ahmednagar and Pune districts of Maharashtra. Sangamneri goats are small- to-medium sized animals. Head is proportionate to the body. Face is triangular and convex type. Horns are thin and small orienting upward and backward. Ears are long and drooping.

Verma *et al.* (2012) studied konkan kanyal goats in konkan region of Maharashtra. Head is bilateral white strips from nostrils to ears, forehead is flat and broad, ear is black with white margins, flat, long drooping, horn is grey, pointed backward, cylindrical.

Hassen *et al.* (2012) conducted a survey to study the morphological characteristics of indigenous goats in representative zones and districts of Amhara. A pre-tested questionnaire was used for recording morphological features, body weights and linear body measurements. Variations between and within goat ecotypes were also observed in head profile, horn orientation, ear form and head shape.

Most of the goat ecotypes in Amhara Region of Ethiopia have slightly concave head profile, horizontal ear form, spiral horn shape and upward horn orientation.

Kuralkar *et al.* (2013) studied berari goats in Vidarbha region of Maharashtra. Majority of Berari goats had convex forehead (99.8%). The percentage of absence of wattle in Berari goats was 98.2 and absence of beard was 98.9. This clearly indicated that both wattle and beard characteristics were not the common feature of Berari goats.

Verma *et al.* (2015) Visited to Koraput, Narayanpatnam, Nabrangpur, Raigarh and Malkangiri districts of Odisha state. They found Ganjam goat was a medium sized hardy animal having wide chest, long legs, well built neck and shoulders, long hair on thigh and vertebrae region. The males were very strong and have comparatively longer horns. Head was convex and proportionate to body. Beard and wattles are seen both in male and female goats.

Nandani Kumari *et al.* (2015) was undertaken study on Black Bengal goats of Jharkhand (Jharkhand Black) maintained in Instructional Farm Small Ruminants, Ranchi Veterinary College, Birsa agricultural University, Ranchi. The body was dwarf in size, straight back beard in both sexes. The body length, height and heart girth 54, 50 and 59 cm in bucks and 55, 49 and 59 cm in does respectively with well set and nicely developed udder. Ear was short and nearly upright.

Mishra *et al.* (2015) Conducted study on phenotypic characterization of Kalahandi goats. Ears are flat, leafy and drooping horns long flat upward and backward legs thin and cylindrical.

Kumar *et al.* (2017) studied Jaunpari breed of goat in eastern part of U.P. state of India. The overall percentage of, curved, straight and twisted horn was 22.56, 64.60 and 12.84 %, respectively. The findings revealed that, the proportion of pendulous ear was highest revealing that the most common ear orientation was of pendulous type, the proportion of convex head profile was highest, and indicating that

the most common head profile was of convex type, the non wattle and beard type of goat were found in maximum proportion in Jaunpuri goats.

### 2.3 Body weight and measurement

Mishra and Arora (1980) carried out breed characterization of Sirohi goat on the basis of physical characteristics. The average for first 90 days of lactation was  $48.22 \pm 1.48$  kg. Average for body weight was at birth, weaning 3 month, 9 month, 12 months and full grown adult were  $2.71 \pm 0.064$ ,  $9.33 \pm 0.36$ ,  $15.35 \pm 0.52$ ,  $17.84 \pm 0.52$ ,  $22.93 \pm 0.86$  and  $44.12 \pm 0.76$  kg respectively

Acharya (1982) summarized the body measurements of various important indigenous breeds as under.

Sr. No.	Breed	Sex	Chest girth	Body length	Height at wither
1	Sirohi	M	$80.30 \pm 1.0$	$80.00 \pm 1.02$	$85.60 \pm 1.4$
		F	$62.40 \pm 0.2$	$61.30 \pm 0.20$	$68.40 \pm 0.21$
2	Marwari	M	$71.66 \pm 1.41$	$70.97 \pm 1.65$	$74.74 \pm 1.61$
		F	$68.60 \pm 0.26$	$63.91 \pm 0.44$	$69.29 \pm 0.22$
3	Beetle	M	$86.60 \pm 0.20$	$87.97 \pm 1.45$	$91.60 \pm 1.97$
		F	$73.3 \pm 0.79$	$70.42 \pm 0.50$	$77.13 \pm 0.46$
4	Jhakarana	M	$86.0 \pm 1.91$	$84.10 \pm 2.45$	$90.40 \pm 1.61$
		F	$79.13 \pm 0.31$	$70.74 \pm 0.36$	$79.12 \pm 0.29$
5	Barberi	M	$75.53 \pm 1.25$	$70.45 \pm 1.43$	$70.67 \pm 0.73$
		F	$63.31 \pm 0.30$	$58.68 \pm 1.56$	$56.18 \pm 0.34$
6	Jamunapari	M	$79.52 \pm 1.2$	$77.37 \pm 1.33$	$78.15 \pm 1.24$
		F	$76.11 \pm 0.56$	$75.15 \pm 0.46$	$75.20 \pm 0.36$
7	Osmanabadi	M	$72.06 \pm 2.04$	$69.5 \pm 1.93$	$77.87 \pm 1.23$
		F	$72.05 \pm 0.40$	$71.07 \pm 1.36$	$74.70 \pm 0.34$

Mittlal (1988) describe breed characteristics of Marwari goat. The mean body weight at birth, 3 months, 6 months, 9 months, 12 months

and full grown adults were  $2.35\pm0.15$ ,  $10.50\pm0.82$ ,  $12.73\pm0.42$ ,  $17.20\pm1.05$ ,  $20.51\pm1.60$ , and  $39.31\pm1.72$ kg in males. In addition to milk and meat this goat also produce long hairs.

Bhoite and Wani (1994) carried out biometrical studies on Sangamneri goats. The body weight in Sangamneri males and female were  $59.08\pm2.18$  and  $35.72\pm1.04$  kg. The Body length weight at withers and chest girth were  $76.4\pm2.11$ ,  $0.20\pm2.22$ ,  $85.5\pm1.81$ ,  $65.29\pm0.66$ ,  $9.62\pm0.64$  and  $74.01\pm0.75$  cm in the males and female respectively. The males were significantly heavier ( $P,0.01$ ) than the female.

Mishra and Koratkar (1994) worked on phenotypic characteristics of Sangamneri goats. He concluded that Sangamneri goat is an important meat breed of Deccan Plateau. The average body weight of males and female were  $59.072.19$ g and  $35.74+1.05$  kg resp.

Varade *et. al.* (1997) described body measurement of Local goats. He observed that body weight is significantly co-related with heart girth and body length. Thus the predicdtion of body weight in kg from heart girth with the help of regression equation.  $Y=49.91$ , is found to be practical utility in field condition.

Ambhore (2000) observed that average body measurement of Berari goats for 6 and 9 months of age. The averages for ear length were  $14.5 \pm 0.22$  and  $14.06 \pm 0.17$ ,  $11.00 \pm 0.27$  and  $13.22 \pm 0.24$  and  $5.55 \pm 0.18$  and  $8.00 \pm 0.22$  cm. respectively for six and nine months of age.

Barua *et al.* (2002) studied growth and performance of Beetal, Assam local and Beetal X Assam Local goats. The study was undertaken at Assam Agriculture University, Burnihat, India. The body weight and body measurement (length, height at wither and heart girth) were recorded at birth and 1, 3, 6, and 10 months of age. Body weight and height at withers varied ( $P<0.05$ ) between months of age, the variation was highly significantly ( $P<0.01$ ) in case of all the parameters.

Motghare *et al.* (2004) studied on some economic traits of Osmanabadi goats in Vidarbha region. The average body length, height at withers, heart girth, paunch girth and body dimension score were found to be  $48.11 \pm 2.21$ ,  $70.21 \pm 2.56$ ,  $67.25 \pm 1.67$ ,  $76.41 \pm 10.99$  and  $263.15 \pm 8.65$  cm. respectively. The average birth weight of Osmanabadi kids found to be  $1.825 \pm 0.03$  kg. The mean body weight was  $5.84 \pm 0.66$  and  $7.30 \pm 0.66$  kg. for below 2 months and above 2 months of age respectively.

Lokhande (2005) collected data of 150 goat keepers selected from 10 villages of Akola district. The mean body length in male and female  $53 \pm 0.03$  and  $69.04 \pm 0.76$  respectively.

Pathodiya *et al.* (2007) reported that in Sirohi goats the effect of year of kidding, sire and lactation were highly significant on body weight from birth to 12 month of age while effect of season on birth was significant upto 9 months.

Patil *et al.* (2008) reported on factor affecting on wither height at different weight in Osmanabadi goats under semi intensive system. Year of birth weight group had significant influence on wither height at birth 1, 3, 6 and 12 month of age. Birth weight group above 2 kg. had higher at all stage ages. Season of birth showed non significant difference in wither height at all the ages except 3 month age.

Sharma (2008) studied on variation in absolute growth rates in Sirohi under field condition. Results revealed that in kids of 0-3 month age, maximum growth rate occurred. Hence, they should be given full care during this period. Management conditions should be improved to gain profit from goat rearing.

Singh and Dixit (2009) reported the adult body weight in Mehsana goat  $37.21 \pm 1.80$  and  $30.40 \pm 0.37$  in male and female respectively.

Solanki *et al.* (2009) studied growth characteristics of local goats under different management systems. The study was conducted at

veterinary college, how for 3 months. Growing male kids of 6 to 7 months age were selected for experiment. The body height, body length, heart girth and paunch girth of kids were recorded as per standard procedure.

Verma *et al.* (2009) conducted survey on Malabari goats inhabit the Calicut, Kannur, Waynad and Malappuram districts of Kerala. The body weights at 3, 6, 9 and 12 months of age were 5.73, 9.20, 13.27 and 20.54 kg, respectively, and that of adult goats were 30.68 and 41.20 in female and male respectively.

Ravimurugan *et al.* (2009) conducted survey in the breeding tracts of Pallai Adu (Local) goats revealed in block of Tiruneiveli districts in Tamil Nadu. They studied morphology, body weight and reproduction performance was recorded in both sexes. The average flock size was  $21.2 \pm 3.8$ . The overall mean height at withers, body length and chest girth in adult goats were  $69.07 \pm 0.05$ ,  $52.82 \pm 0.04$  and  $69.79 \pm 0.02$  cm respectively.

Burte (2010) reported the body dimensions of konkan kanyal goat at farmers flock.

Age (month)	Number of observation	Height (cm)	Body length (cm)	Chest girth (cm)
At birth	709	26.77±1.45	25.45±1.53	24.62±1.43
2 to 4	700	48.93±2.10	47.21±2.00	46.18±1.95
4 to 6	726	50.46±3.00	48.77±2.83	47.53±3.03
7 to 9	753	52.12±4.03	50.45±4.00	49.17±3.83
10 to 12	826	58.40±3.36	56.84±3.15	55.63±3.18
15 to 18	816	65.19±2.59	63.09±2.56	63.14±2.59
Above 2 yr	806	73.01±1.75	71.74±2.05	72.92±2.08

Singh *et al.* (2010) observed that, the data on 265 Mehsana kids born during 2006 to 2008 recorded for growth and production performance on 221 does maintained at sheep and goat research station of SD agricultural university was analysed. The overall average birth weight was  $2.68 \pm 0.03$  kg.

Verma *et al.* (2010) revealed that, the Sangamneri goat is a dual-purpose breed existing the villages of Nasik, Ahmednagar and Pune districts of Maharashtra. Sangamneri goats are small- to-medium sized animals. The male kids at an early age showed comparatively less body weight than the female kids of the same age group. However, the adult males were heavier than their female counterparts.

Verma *et al.* (2012) studied konkan kanyal goats in konkan region of Maharashtra. The body weights of adult male and females were 35.26 kg and 29.80 kg under field conditions. The birth weights recorded under farm conditions indicated the average weights of male and female kids as 2.275 kg. and 2.055 kg. which increased up to 24.29 kg and 20.44 kg, respectively, at 12 months age.

Sundaram *et al.* (2012) collected data from 27 male Tellicherry goats and 10 female Tellicherry goats maintained at the livestock unit of Tamilnadu Agricultural University (Coimbatore. India). The goats were maintained as per the routine feeding and management practices of the farm. The average birth weight recorded was  $2.62 \pm 5.04$  Kg. for male and  $2.34 \pm 0.72$  Kg. for female kids. The average body weight at 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, and 36 months for male and female goats and average daily gain in body weight was calculated respectively.

Singh *et al.* (2013) carried out study in two districts, viz. Hamirpur and Mahoba in the Bundelkhand region of Uttar Pradesh. The average body weight of goats (females) at 6 and 12 months of age was 10.6 kg. and 18.1 kg. in Hamirpur district and 10.4 kg. and 18.5 kg. in Mahoba district.

Patel and Pandey (2013) studied growth, production and reproduction performance of Mehsana goat. The study was conducted at Sheep Goat Research Station, Sardar Krushinagar Dhantiwada Agri. University, Sardanagar, India. The overall means of body weight at birth, weaning (3 month), 6 month, 9 months and 12 months were observed to be  $2.81 \pm 0.02$ ,  $9.92 \pm 0.11$ ,  $13.24 \pm 0.16$ ,  $15.70 \pm 0.21$  and  $19.23 \pm 0.24$  kg, respectively.

Kuralkar *et al.* (2013) studied berari goats in Vidarbha region of Maharashtra. The least squares mean for body weight, heart girth, body length, height at wither, paunch girth, horn length, ear length and tail length for 1–2 years of age were  $25.7 \pm 0.5$  kg,  $69.5 \pm 0.6$  cm,  $57.0 \pm 0.8$  cm,  $69.6 \pm 0.7$  cm,  $71.0 \pm 0.9$  cm,  $9.3 \pm 0.4$  cm,  $15.3 \pm 0.4$  cm and  $12.3 \pm 0.3$  cm. In Berari goats.

Kharkar *et al.* (2013) investigated growth, production and reproduction performance of Berari goats under field conditions. The overall body weights at birth, 3, 6, 9 and 12 months of age were  $2.41 \pm 0.03$ ,  $8.92 \pm 0.13$ ,  $15.02 \pm 0.23$ , and  $18.14 \pm 0.52$  and  $21.32 \pm 0.36$  kg, respectively. In all the age groups, higher body weights were recorded in males than females. The overall mean for birth weight was  $2.41 \pm 0.03$  kg, while, the birth weights of male and female were  $2.46 \pm 0.04$  and  $2.36 \pm 0.03$  kg, respectively.

Mule *et al.* (2014) carried out survey of Osmanabadi goats of different age groups in Hingoli and Nanded districts of Marathwada region in Maharashtra state. The aim of study was to see relationship of bodyweight with linear body measurement in different five age groups (0 to 3, 4 to 6, 7 to 12, 13 to 36 and above 36 months). The correlation of body weight at up to 0 to 3 months, 4 to 6 months, 7 to 12 months, 13 to 36 months and above 36 months (adults) age with different body measurements viz. height at withers, chest girth, and body length were estimated.

Oseni and Ajayi (2014) reported that Mean kid birth weight of  $1.28 \pm 0.01$  Kg was significantly affected by type of birth (singletons,

twins, triplets or quadruplets) and by sex of kid. Body weight from birth to 9th week of kids derived from different litter types revealed that kids in singletons were heaviest at all ages from birth to 9th week of age, while kids from quadruplets weighed the least.

Tyagi *et al.* (2015) carried out experiment on Surti, a dual purpose (milk & meat) and medium sized goat breed native to Surat district in Gujarat state of India. Data on body weight records of 1121 Surti and 1311 Non-Surti (Local) goat kids at birth, 3m, 6m, 9m, and 12m of age, born during 2009 -13, and maintained in six clusters of 20 villages under All India Coordinated Research Project (AICRP) on Goat improvement programmed were used in the study. The phenotypic correlations between 3m and 12m (0.065), 6m and 12m (0.274), and 9m and 12m (0.476) body weights were significant ( $P \leq 0.01$ ).

Verma *et al.* (2015) visited to Koraput, Narayanpatnam, Nabrangpur, Raigarh and Malkangiri districts of Odisha state. The body measurements of adult ( 12 months) males for different traits were  $66.72 \pm 0.52$  for heart girth,  $67.23 \pm 0.43$  for height at withers,  $59.67 \pm 0.51$  for body length,  $62.46 \pm 0.51$  cm. for paunch girth. The measurements for the same traits in females were  $64.87 \pm 0.38$ ,  $65.62 \pm 0.37$ ,  $58.32 \pm 0.36$ ,  $61.37 \pm 0.42$  respectively. The body weights in male and female goats are  $18.63 \pm$  and  $16.75 \pm$  kg. respectively.

Mishra *et al.* (2015) Conducted study on phenotypic characterization of Kalahandi goats. Body weights were taken of adult (>18 months) animals of both sexes. The body weights of adult male and females were 33.42 and 30.88 kg. The average biometric estimates for height at withers, body length, chest girth, paunch girth, face length, horn length, ear length and tail length were 70.32, 69.05, 71.53, 73.84, 17.89, 15.05, 15.74 and 15.32 respectively for adult males and 65.51, 66.28, 70.36, 74.87, 15.29, 12.74, 15.01 and 13.97 respectively for females.

Panda and Ghorpade (2016) studied relationship of body weight with linear body measurement in Osmanabadi kids. A total of 50 female

Osmanabadi goats were randomly selected from the farm after weaning and the observations were made for the age groups of 4 to 6 months and 7 to 12 months. Body weight and linear measurement (mean  $\pm$  S.E.) of Osmanabadi goats (N=50).

<b>Age groups (months)</b>	<b>Body weight (kg)</b>	<b>Body length (cm)</b>	<b>Height at withers (cm)</b>	<b>Heart girth (cm)</b>
4-6	12.37 $\pm$ 0.13	48.64 $\pm$ 0.20	53.02 $\pm$ 0.14	47.29 $\pm$ 0.17
7-12	15.81 $\pm$ 0.11	52.13 $\pm$ 0.35	56.37 $\pm$ 0.26	49.77 $\pm$ 0.18

Kumar *et al.* (2017) studied Jaunpari breed of goat in eastern part of U.P. state of India. The overall average body weights of male goats of the age groups 0 to 3, 3 to 6, 6 to 9, 9 to 12 and above 12 months were observed as 5.50  $\pm$  0.327, 12.07  $\pm$  0.598, 19.62  $\pm$  0.738, 21.92  $\pm$  0.571 and 30.44  $\pm$  0.978 kg respectively. The overall average body length of male goats of the age groups 0 to 3, 3 to 6, 6 to 9, 9 to 12, and above 12 months were observed as 38.63 $\pm$ 1.762, 48.55  $\pm$  2.090, 58.77  $\pm$  0.652, 67.23  $\pm$  0.777 and 67.56  $\pm$  0.747 cm. The overall average height of male goats of the age groups 0 to 3, 3 to 6, 6 to 9, 9 to 12 and above 12 months were observed as 41.63  $\pm$  1.945, 53.36  $\pm$  2.094, 66.23  $\pm$  1.051, 72.69  $\pm$  0.664 and 72.31  $\pm$  0.893 cm, respectively. The corresponding values for females were 44.24  $\pm$  0.825, 50.38  $\pm$  0.836, 62.81  $\pm$  0.466, and 69.14  $\pm$  0.387 and 69.00  $\pm$  0.691 cm. The mean value of horn size of male goats of the age groups 0 to 3, 3 to 6, 6 to 9, 9 to 12 and above 12 months were observed as 1.94  $\pm$  0.346, 2.73  $\pm$  0.449, 5.54  $\pm$  0.584, 5.85  $\pm$  0.696 and 7.56  $\pm$  0.381 cm respectively. The respective averages for females were 1.77  $\pm$  0.171, 2.60  $\pm$  0.173, 4.94  $\pm$  0.322, 6.53  $\pm$  0.424 and 6.79  $\pm$  0.421 cm.

## 2.4 Reproductive performance

Patro and Mishra (1987) studied performance of Ganjam breed of Orissa and reported that age at first kidding was  $395.25 \pm 17.29$  days, age at first conception was  $215.19 \pm 8.59$  days while kidding interval was  $362.17 \pm 31.73$  days.

Saha and Dhingra (1987) studied on sex ratio, oestrus interval weight at first kidding and first gestation period in Local goats in Malwa region. The average oestrus interval of local goats was  $51.72 \pm 3.90$  days, weight at first kidding was  $18.59 \pm 0.80$  kg and gestation period was  $147.75 \pm 1.18$  days.

Ram Reddy *et al.* (1991) studied breeding strategy in rural areas of Andhra Pradesh and reported that twinning and triplet birth were 30 to 35 per cent and 5 to 10 per cent, respectively.

Jain *et al.* (2000) described Kadi-Adu goat of Tamil Nadu and reported that in this breed kidding took place round the year. Kidding interval was ranging from 8 to 10 months. Age at first kidding ranged from 15 to 18 months, the preparturient does generally gave birth to single. However, twinning was common in the pluriparous does triples were also seen in a few does.

Thiruvankandan *et al.* (2000) studied reproduction performance of Kanni-Adu of Tamil Nadu and reported that average age at first mating in males was  $9.90 \pm 0.20$  months and in females average age at first mating and age at first kidding was  $9.38 \pm 0.11$  and  $14.63 \pm 0.14$  months, respectively. The overall incidence of kid's born as single, twin, triplet, quadruplet was 32.80, 15.92 and 4.78%, respectively.

Ulmek (2003) reported that average age at maturity (months) age at first kidding (months), kidding interval (months), daily milk yield (kg) were 7.15, 12.17, 7.26 and 0.65, respectively in Osmanabadi goat breed while corresponding values for Sangamneri breeds were 9.14, 14.53, 7.26 and 0.50, respectively. Also he reported that percentage of single, twin and triplet kidding was 58.42, 40.33, 1.25, respectively in

Osmanabadi breed and 48.05, 50.66 and 1.29 in Sangamneri breed, respectively.

Mane (2004) studied on local goat and reported that average daily milk yield was  $0.45 \pm 0.01$  kg/animal. Moreover, the average milk yield of local goats was lower than that of Osmanabadi and Sangamneri goats breeds. These trends indicated that Local goats proved better for meat purpose.

Alam *et. al.* (2005) studied on performance evaluation of Beetal goat in its native tract.

The reproductive performance of beetal goats are given as below

Sr. No.	Traits	Pooled average. mean $\pm$ SE
1	Age at weaning (days)	2.83
2	Age at first mating (days)	426.63 $\pm$ 7.97
3	Weight at first mating (kg)	26.52 $\pm$ 0.28
4	Age at first kidding (days)	579.63 $\pm$ 10.29
5	Inter kidding period (days)	332.81 $\pm$ 6.80
6	Gestation period (days)	150.93 $\pm$ 0.21

Bhushan and Rai (2008) studied genetic evaluation and improvement of Jhakarana Breed of goats. Gestation period and kidding interval were  $151.33 \pm 1.48$  and  $322.00 \pm 25.61$  days, respectively.

Verma *et al.* (2009) studied characterization, management, performance and genetic variability. They reported that Malabari goat showed early maturity and conceives at an age of 8 to 10 months. The male start breeding at an age of 9 to 12 months. The breed had a good prolificacy i.e. 50% twinning, 25% triplets and 5% quadruplets. The milk yield varies from 0.5 to 1.5 litre/day.

Burte (2010) reported the reproductive performance of Konkan Kanyal goat breed as below

1	Age at maturity in females (day)	329.25±31.48
2	Age at first kidding (days)	507.67±41.30
3	Weight at first kidding (kg)	24.50±1.07
4	Kidding interval (days)	239.85±57.21
5	Gestation period (days)	147.52±2.81
6	Mortality (%)	5.06

Sabapara and Despande (2010) evaluated reproductive and productive performance of Surti goat in its native tract. The mean age at puberty, age first kidding, kidding interval, service period, gestation length, first post part of estrous, estrous cycle length and estrus duration were recorded as  $9.04 \pm 0.49$  months,  $14.28 \pm 0.38$  months,  $7.80 \pm 0.20$  months,  $2.90 \pm 0.20$  months,  $147.20 \pm 0.41$  days,  $32.5 \pm 0.3$  days,  $20.4 \pm 0.3$  days and  $29.6 \pm 0.2$  h, respectively. Twinning was 50.89% while only 8.28 % goat kidded.

Singh *et al.* (2010) observed that, the data on 265 Mehsana kids born during 2006 to 2008 recorded for growth and production performance on 221 does maintained at sheep and goat research station of SD agricultural university was analysed. The overall means  $\pm$  SE for total lactation milk yield, lactation length, service period, dry period, kidding interval, weight at first kidding, age at first kidding and gestation period were  $76.35 \pm 1.67$  kg,  $219.05 \pm 4.86$  days,  $204.19 \pm 3.58$  days,  $110.73 \pm 8.29$  days,  $360.04 \pm 5.63$  days,  $28.42 \pm 0.39$  kg,  $701.16 \pm 16.92$  days and  $147.25 \pm 0.42$  days, respectively.

Verma *et al.* (2010) studied phenotypic characterization of Sangamneri goat breed. The study was conducted in the village of Nasik, Ahmednagar and Pune district of Maharashtra. The data

recorded on farm animals indicated the average daily milk yield of 0.860 litres, lactation yield is 77.40 litres in about 160 days of lactation. Some goats produced 3.0 litres of milk per day under farm as well as field conditions.

Dhara *et al.* (2012) conducted study to investigate the milk production performance of Black Bengal goats in different parities reared in a semi-intensive system. The 112 female Black Bengal goats were selected on the basis of their phenotypic characteristics and ancestral history from goat Farm, Mohanpur, Nadia, and West Bengal, India. The overall milk production of 112 goats in the 9th week was within the range of 0.240 to 1.73 kg. On an average, the initial yield, peak yield, average peak yield, days to attain peak yield, total milk yield and daily milk yield was 0.250 kg, 0.380 kg, 0.310 kg, 11.35 days, 7.21 kg and 0.210 kg, respectively. The milk production increased in the fourth week of lactation and then decreased afterwards. Milk production of those goats which gave birth to more than three kids was highest, followed by those that gave birth to two and one kids. Milk production performance of Black Bengal goat in the third parity was better than that of the first and second parities.

Verma *et al.* (2012) studied konkan kanyal goats in konkan region of Maharashtra. Kanyal goat is not a very good milch animal but yields 0.5 to 1.0 liter milk / day. The farm records revealed that average milk production per lactation to be 69.035 litre in a lactation period of  $96.199 \pm 17.49$  days and an average milk production  $0.609 \pm 0.095$  litre/day.

Kuralkar *et al.* (2013) they studied berari goats in Vidarbha region of Maharashtra. The Berari goat is low yielding medium size meat breed thriving well in tropical wet and dry climate. The breed had lower age at first oestrous, age at first kidding and higher litter size, which can be exploited for improving the breeding efficiency of local nondescript goat population. The average daily milk yield of goat recorded as 533.28 gm./day with a total lactation yield of 78 in 130 days of lactation, while age at first conception was 10 to 11 months.

Tyagi *et al.* (2013) studied lactation performance of Surti goats under field conditions. The investigation was carried out to analyse the data on milk production of Surti goats and various associated fixed factors. Data on milk yield were taken randomly using proportionate sampling method from 51, 75 and 105 goats that completed their lactation during 2009, 2010 and 2011 respectively from six clusters. Fortnightly one time test day milk yield was recorded on each goat. They observed following result

<b>Variables</b>	<b>Lactation Length (days)</b>	<b>90 days milk yield (litres)</b>	<b>150 days milk yield (litres)</b>	<b>Total milk yield (litres)</b>
Over all mean	168.11±1.84 (231)	110.70±1.10 (231)	166.08±1.64 (193)	176.39±2.27 (199)
Milk yield (litres/day)	-	1.23±0.01 (231)	1.11±0.01 (193)	1.03±0.01 (193)
Year				
2009	165.58±3.26 (51)	105.61±1.94 (51)	167.76±2.70 (44)	176.96±3.75 (44)
2010	165.22±2.73 (75)	106.44±1.62 (75)	161.68±2.51 (58)	169.53±3.47 (58)
2011	173.52±2.27 (105)	120.05±1.35 (105)	168.79±1.96 (91)	182.69±2.72 (91)

Patel and Pandey (2013) studied growth, production and reproduction performance of Mehsana goat. The overall means for production performance traits, viz., total lactation milk yield, peak yield, days to attain peak yield, lactation length, dry period, weight at first mating, age at first service, service period, weight at first kidding, gestation period, age at first kidding, weight at kidding and kidding interval were estimated to be 70.23 ± 1.37 kg, 0.580 ± 0.01 kg, 156.23 ± 3.72 days, 224.00 ± 4.19 days, 112.31 ± 6.64 days, 26.00 ± 0.50 kg, 560.43 ± 20.83 days, 209.66 ± 2.90 days, 28.19 ± 0.45 kg, 148.97 ± 0.28 days, 716.52 ± 19.01 days, 31.58 ± 0.29 kg and 364.40 ± 4.32 days, respectively.

Bhuarya *et al.* (2014) studied characterization of local goats Chhattisgarh plains. The mean value for the productive performance

traits i.e. daily milk yield, total lactation milk yield and lactation length were recorded as  $307.25 \pm 13.46$  ml,  $32.29 \pm 2.65$  litre, and  $105.15 \pm 2.48$  days, respectively.

Upadhyay *et al.* (2014) studied on udder morphology and its relationship with production parameters in local goats of Rohilkhand region of India. An attempt was made to study udder morphology and establish its relationship with milk production in 25 local goats of Rohilkhand region. Udder morphological traits recorded were udder length, udder row width, udder column width. Udder depth, udder circumference, teat length, teat diameter, teat circumference, teat height from ground, distance between teats and udder volume. Total milk produced during 90 days was measured and average daily milk yield was calculated. The udder volume in preparturient and multiparous goats was  $516.54 \pm 74.52$  and  $940.76 \pm 46.47$  ml, respectively which differ significantly ( $P < 0.05$ ). Average daily milk yield was positive and significantly ( $P < 0.01$ ) correlated with all udder morphological traits except for teat height from ground (THG) as correlation was found negative. All udder phenotypical traits had positive and significant ( $P < 0.05$ ) correlation with doe's body weight at different intervals.

Kharkar *et al.* (2013) studied an investigation conducted for the study of growth, production and reproduction performance of Berari goats under field conditions. The average total lactation milk yield was  $77.72 \pm 1.85$  kg. The mean lactation length and dry period were  $132.84 \pm 0.76$  and  $110.34 \pm 2.09$  days, respectively. Fat and solid not fat (SNF) contents of Berari goat milk were  $5.72 \pm 0.38$  and  $11.15 \pm 0.30\%$ , respectively. The mean age at first oestrus age at first mating, age at first kidding, kidding interval, service period and gestation length in Berari goats were  $292.10 \pm 1.66$ ,  $313.25 \pm 1.42$ ,  $460.74 \pm 1.56$ ,  $240.86 \pm 1.94$ ,  $91.65 \pm 2.08$  and  $147.26 \pm 0.17$  days, respectively. Kidding pattern showed that Berari goat had 59% twinning rate. It was concluded that Berari breed has low milk yield, however milk had higher fat and SNF%. Berari goat had lower age at first oestrus, age at

first mating and age at first kidding and higher litter size also, which indicated that Berari goats has early maturity with high prolificacy.

Oseni and Ajayi (2014) studied on fertility, prolificacy, annual doe productivity and kid survival rate of WAD goats.

Raskar *et al.* (2015) conducted study to analyse the Phenotypic Characters of Osmanabadi goat in Scarcity zone of Marathawada region of Maharashtra State under field condition. A total of 777 goats, 253 were the males and 524 were the females herds from 40 villages spread in 4 blocks in two districts (Latur and Osmanabad) were utilized for this study. Sex and sub-type effects revealed that sex difference is an inherent pattern which can be considered from commercial point of view till the age of 11-12 months for production of Chevron.

Verma *et al* (2015) studied characterization, performance and genetic diversity among goats of Odisha. They recorded average milk production in a lactation of 120 days was 45.94 litres. Age at first kidding in Ganjam goat is 583 days.

Nandani Kumari *et al.* (2015) undertaken present study on Black Bengal goats of Jharkhand (Jharkhand Black) maintained in Instructional Farm Small Ruminants, Ranchi Veterinary College, Birsa agricultural University, Ranchi. Average litter size was 2.1 average, age at first kidding was 9-10 months. Its fine skin has high demand for good quality and shoe making.

## Chapter - III

### MATERIAL AND METHODS

The present study entitled Phenotypic characteristics and reproductive traits of Berari goats in Parseoni tahsil of Nagpur District was conducted on the information provided by the goat owners of Parseoni tahsil in Nagpur district during the year 2018 – 2019. The material and methods used for research was as under.

#### 3.1 Material required

##### 3.1.1 Collection of data

The data were collected by direct observation on 200 Berari goats belonging to different age groups for Phenotypical characters and female Berari goats for reproductive traits from 5 selected villages of Parseoni tahsil. The data were categorized for study of morphometric traits as follows

**Table 1: Classification of Berari goats according to age groups.**

Sr. No.	Age group	Sex of goat	
		Male	Female
1	0 to 6 month	12	18
2	6 to 9 month	07	23
3	9 to 12 month	11	29
4	12 to 18 month	08	42
5	Above 18 month	06	44
	Total	44	156



**Plate 1. Photo showing of female Berari goat**

### 3.2 Methods adopted

#### 3.2.1 Information about place of work

The data used for present investigation were collected from Parseoni tahsil of Nagpur district of Maharashtra state. 5 villages (Chargaon, Kondasawari, Palasavali, Navegaon khairi and Bitoli) in Parseoni tahsil was selected by random sampling method. The information on Phenotypical characters and reproductive traits was obtained from the goat keepers through personal interaction with the help of questionnaire form following villages in Parseoni tahsil.

**Table 2: Village selected for collection of data in Parseoni tahsil**

District	Tahsil	Villages for survey
Nagpur	Parseoni	1. Chargaon 2. Kondasawari 3. Palasavali 4. Navegaon Khairi 5. Bitoli

#### 3.2.2 Geography of tahsil

The Parseoni tahsil form the western and central portion of the district, laying between 15.6° C to 22.1° C north longitude and 72.80° to 80.9° east longitude. The total geographical area of entire Parseoni tahsil is 3.08 lakh sq.km. the maximum and minimum temperature is 40.1° and 10° throughout the year, respectively. The average rainfall of tahsil is 1570 mm. Parseoni tahsil is surrounded by Saoner tahsil from north side, Ramtek tahsil from east side Kamptee tahsil from south – east side. Nagpur urban form south – west side. The features of Nagpur tahsil have been given in map

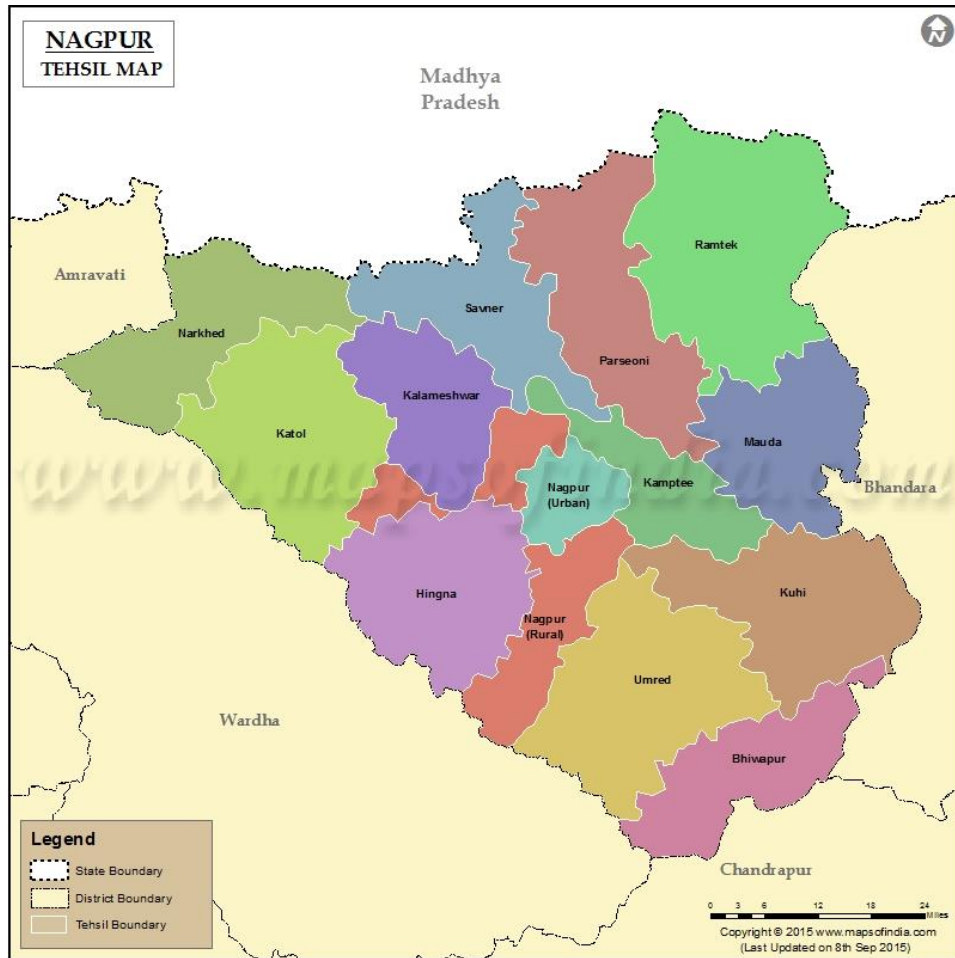


Fig.1. Map of Nagpur district.



Fig. 2. Map of Parseoni tahsil

### 3.2.3 Geographical area

**Table 3: Geographical area of Parseoni tahsil.**

Sr. No	Particular	Area (ha)
1	Total geographical area	54909.32
2	Forest land	4030.65
3	Barren and cultivated	587.25
5	Non-agriculture land	321
6	Cultivated land	30010.69
7	Fallow land	758.62

(Source: District social and economic survey 2008)

**3.2.4. Table 4: Cropping pattern of Parseoni tahsil.**

Sr. No	Particular	Area (ha)
1	Gram	157
2	Jowar	365
3	Cotton	1685
5	Soybean	945
6	Wheat	245
7	Vegetable and fruit	156
8	Tur	70

(Source: District social and economic survey (2008)

### 3.2.5 Livestock population

Total livestock population in Parseoni tahsil is 86706, comprising cattle class 62543, buffaloes class 3805, sheep and goat class 18358 and poultry birds are 2000. Majority of cattle buffaloes and goat are non-descript type. The main purpose of livestock is to meet the farm power, milk. Meat and manure.

### 3.2.6 Phenotypical characters and reproductive traits.

The phenotypic characters like type of tail, orientation and length of ear, orientation and length of horn, body length, chest girth, height at

wither in cm were studied by adopting procedure as described below and for reproductive traits, the information were collected through personal interaction with the help of questionnaire and record maintained by goat keepers

### **3.2.6.1 Phenotypical characters and body measurements**

Phenotypic measurements were taken as colour pattern, type and length of tail , orientation and length of ear, orientation and length of horn, body length, chest girth and height at wither with the help of standard measuring tape in centimeters (cm) of all available Berari goats belonging to different age groups. Body weight in kilograms (kg) were taken by standard spring balance.

1. Colour pattern:- Colour of body, eye and patches on different body parts were observed in qualitative term by direct observation
2. Type and length of tail (cm):- Type of tail observed bunchy or thin. It was measured from base to the tip of the tail
3. Orientation and length of ear (cm):- The orientation includes the horizontal, pendulous or erect ears. It was measured from base of ear to the tip of ear.
4. Orientation and length of horn (cm):- The presence or absence of horn was observed. Orientation of horns were observed in term of upward, backward or downward. It was measured from base of the horn to tip of horn
5. Body length (cm):- It was recorded form points of shoulder to points of pine bone of the same side.
6. Chest girth (cm):- It was recorded by measuring the circumference of chest at wither point
7. Height at wither (cm):- It was estimated by allowing the animal to stand on level platform and height was recorded from level platform to the wither point
8. Body weight (kg):- It was recorded by using spring balance.

### **3.2.6.2 Reproductive traits**

The information were collected by personal interaction with the help of Questionnaire provided by National Bureau of Animal Genetics Resources, Karnal

1. Age at first oestrus (months) – it is the age at which the female animal is come on heat at first time. Females become sexually mature and are ready for breeding.
2. Oestrus cycle duration (days) - it is period in which animal comes in heat which is a period of 21 days in goat. (period sexual receptivity).
3. Age at first mating (months) - it is the age at which animal bred after attaining puberty.
4. Number of services per conception- it means the number of services required to affect for pregnancy.
5. Gestation period (days) – it is the period form day of conception to day of kidding.
6. Age of first kidding (month) – the age of goat at its first parturition was considered as age at first kidding. It was calculated from the date of birth to the date of first kidding of each individual goat studied.
7. Kidding interval (days) - it means interval between date of kidding till the date of subsequent kidding. It was calculated for each lactation of individual goat in days separately.

### **3.3 Statistical method**

- a) The data collected in respect of all above parameters were tabulated and subjected to statistical evaluation. Mean, standard error, standard deviation and coefficient of variation for all the characters were calculated as per standard statistical procedure prescribed by Snedecor and Cochran (1994).

Chi-square test ( $\chi^2$ ): Testing of homogeneity for various physical characteristics was tested by r x c contingency as per Amble (1975).

The Chi-square value for each observation was calculated as per following formula.

$$\chi^2 = \sum \frac{(\text{Observed value} - \text{Expected value})^2}{\text{Expected value}}$$

### **3.4 Place/Duration/Season of experiment**

The present study on phenotypical characters and reproductive traits of Berari goat in Parseoni tahsil. Was carried out from December 2018 to March 2019 as per manual.

## **Chapter - IV**

### **RESULTS AND DISCUSSION**

An attempt has made to study the phenotypical character and reproductive traits of Berari goat in Parseoni tahsil. "The results of this investigation are presented and discussed in this chapter in the light of research work conducted earlier under following heads.

#### **4.1 Phenotypical characters and body measurements**

- 4.1.1 Colour pattern
- 4.1.2 Type and length of tail
- 4.1.3 Orientation and length of ear
- 4.1.4 Orientation and length of horn
- 4.1.5 Body length
- 4.1.6 Chest girth
- 4.1.7 Height at wither
- 4.1.8 Body weight

#### **4.2 Reproductive traits**

- 4.2.1 Age at first oestrus
- 4.2.2 Oestrus cycle duration
- 4.2.3 Age at first mating
- 4.2.4 Number of services per conception
- 4.2.5 Gestation period
- 4.2.6 Age at first kidding
- 4.2.7 Kidding interval

## **4.1 Observation of Phenotypic characters**

Phenotypic character pertaining to Colour pattern, Type and length of tail, Orientation and length of ear, Orientation and length of horn, body length, chest girth, height at wither and body weight, was collected by direct observation and measurements of goats from the goat keepers.

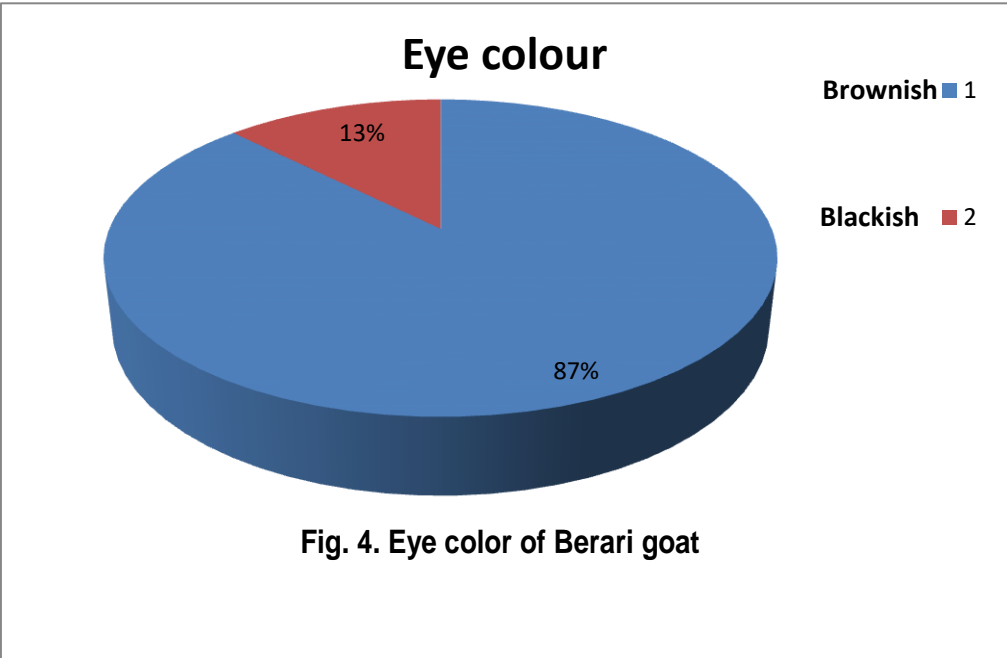
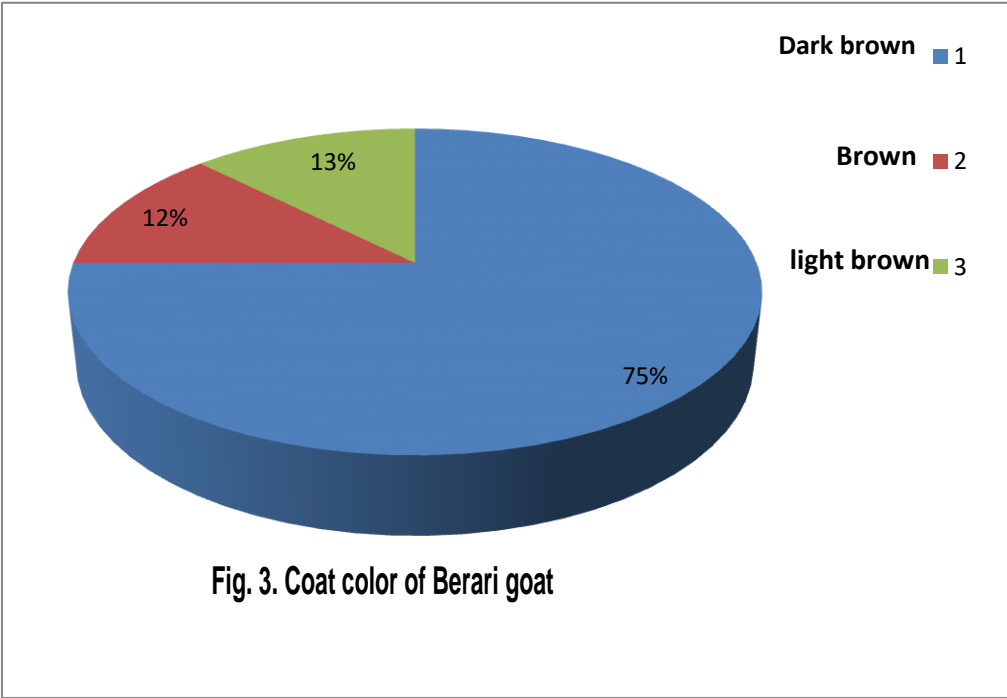
### **4.1.1 Colour pattern**

The colour variation was observed and recorded for body coat, eyes in per cent and presented in Table 5.

#### **a) Coat colour**

A reference of Table 5. and depicted in Fig. 3. indicated that, out of 200 Berari goats, 150 goats (75%) had dark brown colour. The chi-square test applied and chi-square value found to be 156.33, which is statistically significant.

These findings are in agreement with past workers, Mishra and Arora (1980) in beetal goat, Singh and Mukharjee (1981) Bengal goat, Muzumdar and Muzumdar (1993) Chengu goat, local goats of Sikkim, Mittal and Ghosh (1985) in Kashmeri goat, Similarly, Bhat (1988) in Jamunapari goat. Mittal (1988) in Marvati goat. Ram Reddy et al. (1991) Local goats of Andra- Pradesh, Osmanabadi goat, Shinde (2000), Local goat, Trivendrakandam et al. (2001) Kanni- Addu goat. Jangam (2001) Berari goat and Mane (2004) in Local goat.



## b) Eye colour

It was observed from Table 5. and depicted in Fig. 4, that the colour of eye found to be brownish (87.5%) followed by Blackish (12.5%) and found statistically significant indicated colour variation to this character. Thus it is indicated that brownish colour eyes could be consider as essential character in Berari goat.

**Table 5: Colour pattern of different physical characteristics of Berari goat along with  $\chi^2$  value. (N=200).**

Sr. No.	Characters	No. of observation	Percentage (%)	Chi-square ( $\chi^2$ )	d.f.	Significance
1	Coat colour					
	Dark brown	150	75.00	156.33	2	*
	Brown	25	12.5			
	Light brown	25	12.5			
2	Eye colour					
	Brownish	175	87.5	112.52	1	*
	Blackish	25	12.5			

\*Significant at 5% level of significance

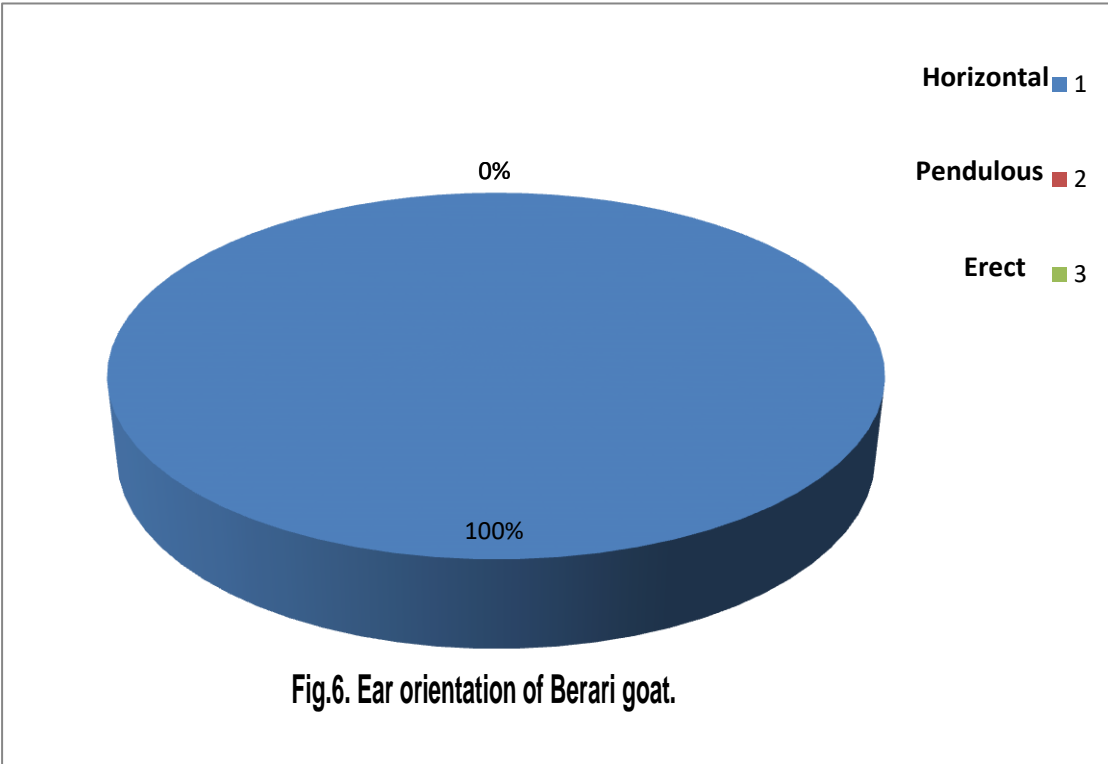
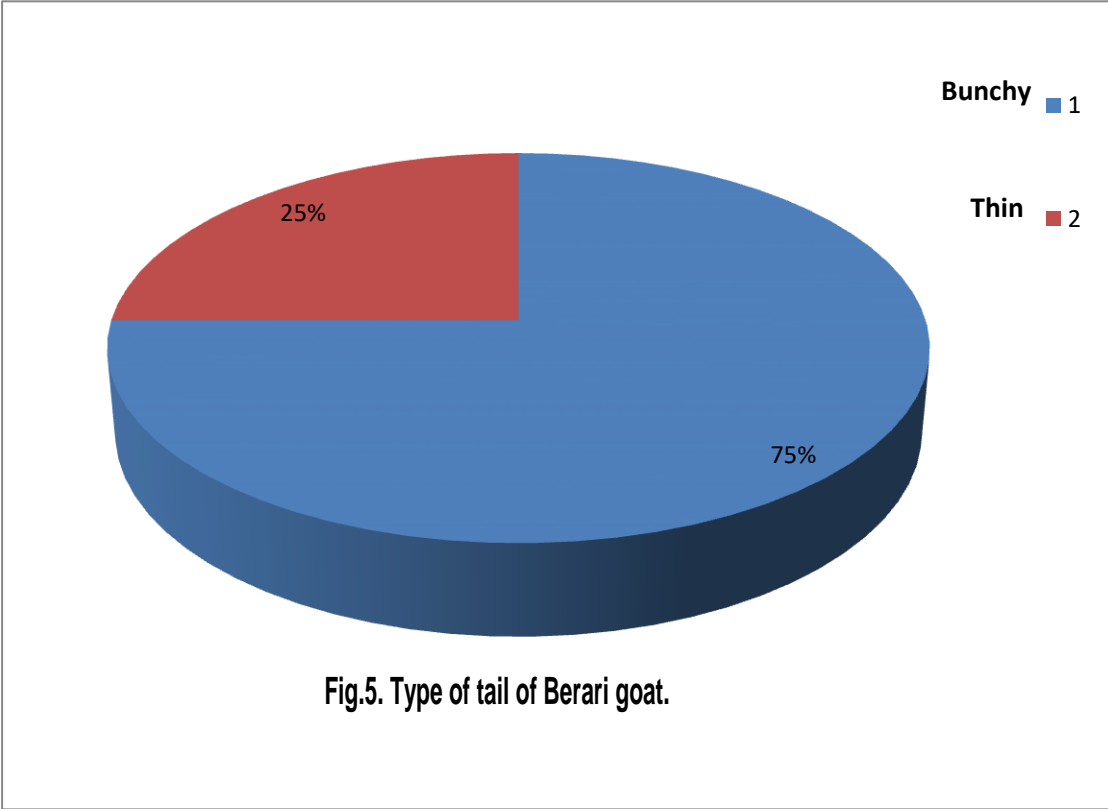
NS – Non significance

### 4.1.2 Type of tail, orientation of ear and horn

The observation pertaining to type of tail and orientation ear and horn were recorded and their per cent values were calculated along with Chi-square values and presented in Table 6.

#### a) Type of tail

It was observed from table 6. and depicted in Fig. 5 that the type of tail was found to be bunchy in 75% goats while remaining were thin (25%) the chi-square test applied and values calculated which was found to be 66.66 which is statistically significant indicating variation in type of tail. Lokhande (2005) reported local goats possessed curved tail.





**Plate 2. Photo showing different phenotypical characters of Berari goat**

### **b) Orientation of ear**

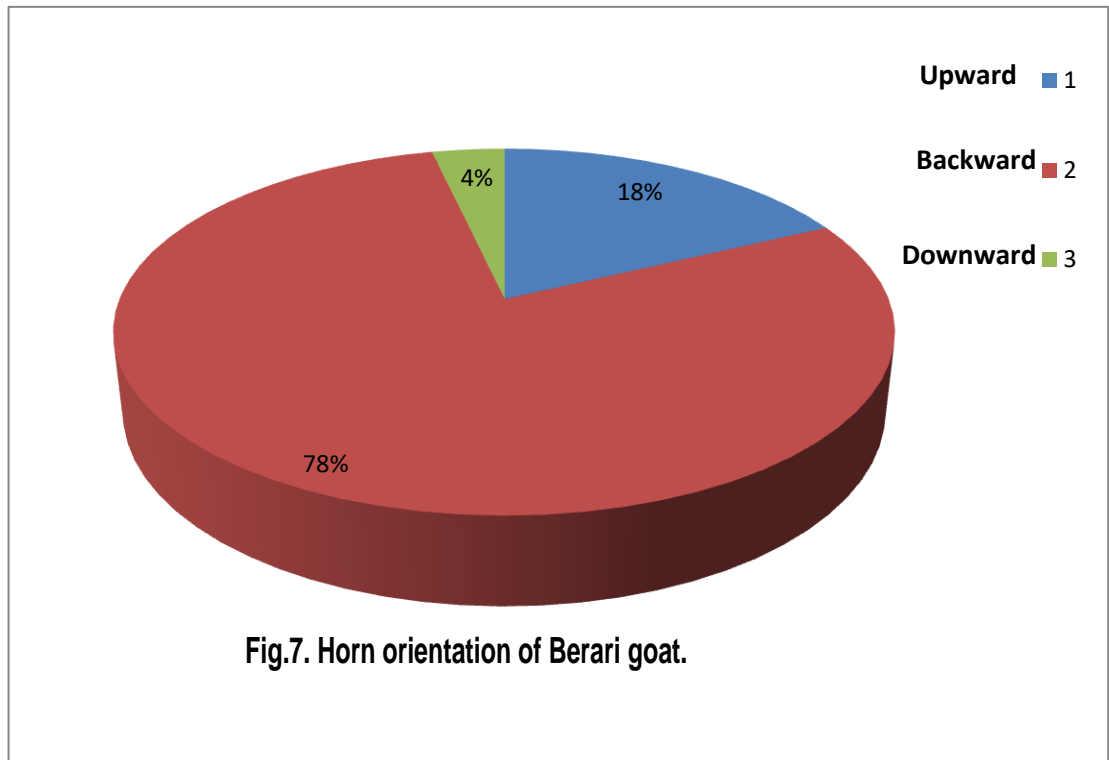
From Table 6. and depicted Fig.6 all the goats (100%) had pendulous ears. Not a single case of Horizontal or erects was noticed. The Chi-square value found to be 399.98 indicate significant result.

The present trend of result were more or less similar with observation taken by Lokhande (2005) in local goat. He stated that 91.92 ears in males and 78.69 percent goats had pendulous ears while 21.51 percent goats had horizontal ears. Similar result were reported by Bhat (1988) in Jamunapari goats, Shinde (2000) in Osmanabadi goats and Jangam (2001) in Berari goat.

### **c) Orientation of horns**

It was found from the Table 6. and depicted in Fig. 7 that the orientation of horns were backward side in 85% Berari goat whereas only 12.5% and 2.5% goats were with upward and downward horns respectively. The chi-square found to be significant (243.22) indicates variation of horn orientation in all age groups. Thus horn orientations of maximum goat were backward.

These findings are more or less in agreement with Shinde (2000) reported that 74.01% Osmanabadi goats were with straight horns. Trivendrakadan et al. (2000) reported that in Kanni- adu goat horns were without any typical pattern.



**Table 6: Horn, Ear and Tail characteristics of Berari goats along with  $\chi^2$  value. (N=200).**

Sr. No	Character	No. of observation	Percentage (%)	Chi-Square	d. f.	Significance
<b>1</b>	<b>Tail</b>					
	Bunchy	150	75	66.66	1	*
	Thin	50	25			
<b>2</b>	<b>Ear</b>					
	Horizontal			399.98	2	*
	Pendulous	200	100			
	Erects					
<b>3</b>	<b>Horn</b>					
	Upward	25	12.5	243.22	2	*
	Backward	170	85			
	Downward	5	2.5			

\*Significance at 5% level of significance    NS- Non significant

#### 4.1.4 Tail length

It was evident from Table 7. and depicted in Fig.8 that the tail length of Berari goat was less as compare to other goat breed. At the age of 0-6 month tail length was  $10.51 \pm 0.27$  cm. in male and  $10.21 \pm 0.15$  cm. in female. With increase in age, tail length was slightly increased. In adult animal, above 18 months age group length of tail was found to be  $17.41 \pm 0.56$  cm. in male and  $12.50 \pm 0.23$  cm. in female. The pooled average of tail length from all age group was  $12.66 \pm 0.33$ cm.

The present findings are closely agreement with Jangam (2001) who observed tail length was  $15.37 \pm 0.10$  cm in Berari goat. Lokhande (2005) stated that tail length was  $17.84 \pm 0.13$  cm in male and  $14.5 \pm 20.6$  cm in female in local goat. Similar finding were also reported by Bhat (1988) in Jamunapari goat and Jain *et al.* (2000) in Kanni-adu goat, Shinde (2000) in Osmanabadi goat, Mane (2004) in local goat.

**Table 7: Mean and Standard error values of tail length of Berari goats (cm).**

Sr. No.	Group	Age Group (month)	Sex	Number Of Animal	Tail Length (cm)		Average $\pm$ SE	S.D.
					Max	Min		
1	A	0-6	M	12	12	9	10.51 $\pm$ 0.27	0.950438
			F	18	11	9	10.21 $\pm$ 0.15	0.662339
2	B	6-9	M	07	14	10	12.28 $\pm$ 0.49	1.308216
			F	23	12	9	10.75 $\pm$ 0.23	1.107342
3	C	9-12	M	11	15	10	13.10 $\pm$ 0.46	1.53131
			F	29	12	10	11.08 $\pm$ 0.11	0.615902
4	D	12-18	M	08	17	12	15.52 $\pm$ 0.56	1.603345
			F	42	15	11	13.30 $\pm$ 0.21	1.362483
5	E	Above-18	M	06	19	15	17.41 $\pm$ 0.56	1.384798
			F	44	17	12	12.50 $\pm$ 0.23	1.54219
		Total		200			12.66 $\pm$ 0.33	

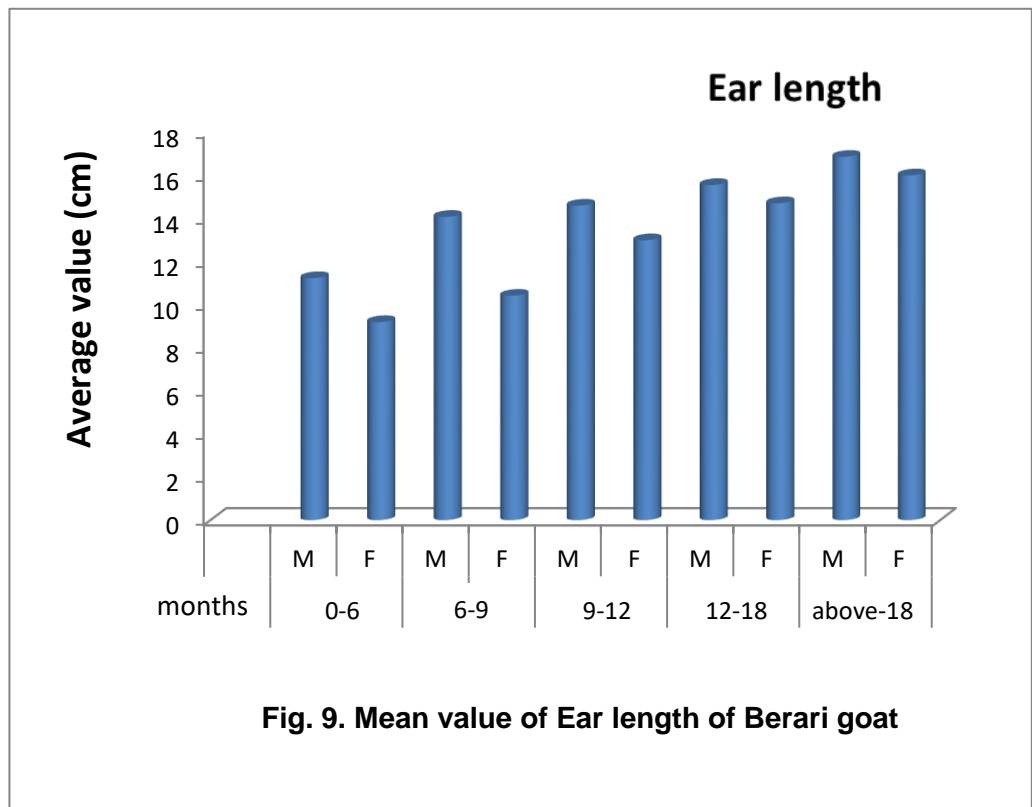
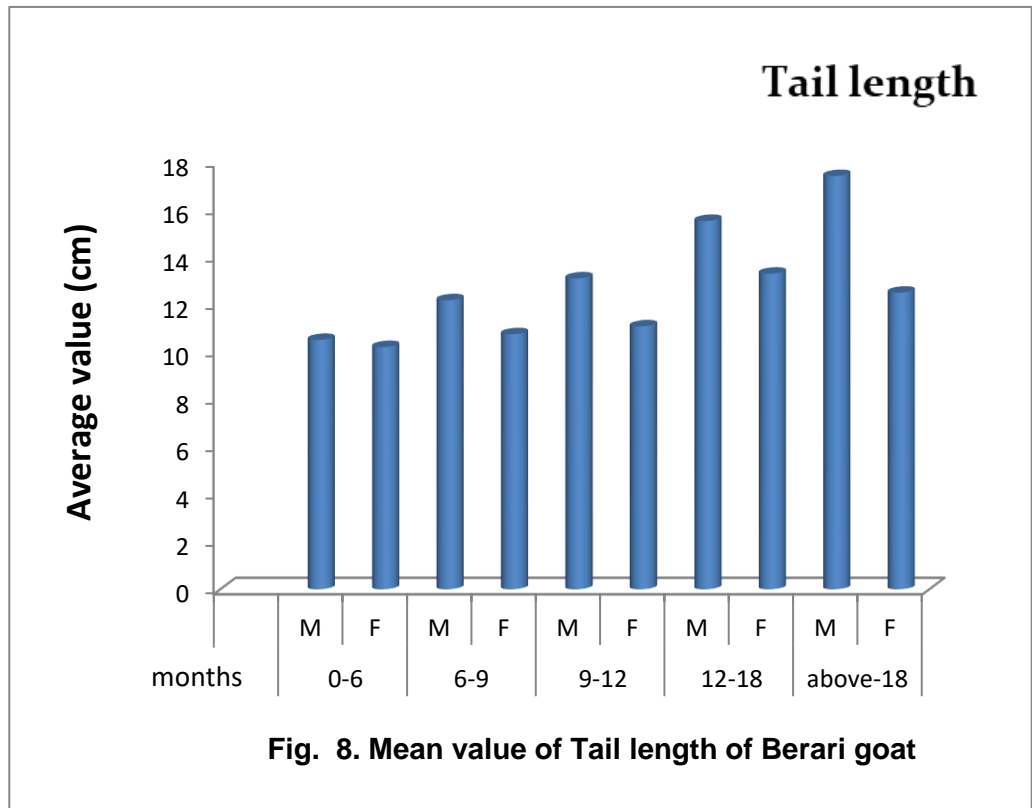
#### 4.1.5 Ear length

The average length of ears are presented in Table 8. and depicted in Fig. 9 In age between 0-6 months it was  $11.22\pm 0.37$  cm. in male and  $9.18\pm 0.33$  cm. in female. The length of ear is increases as increasing age. The average length of ear at above 18 months age group was  $16.86\pm 0.32$  cm. in male and  $16.00\pm 0.09$  cm. in female. The pooled average of ear length was  $13.55\pm 0.26$  cm.

The finding more or less similar, also reported by Lokhande (2005) in Local goat. He stated that ear length was  $19.92\pm 0.02$  cm. Similar observation were recorded by Singh (2010) who observed that ear length was  $15.50\pm 0.10$  in female and  $14.13\pm 0.10$  in male of Chaugarkha goat also Mukharjee (1979) in grey Bengal goat.

**Table 8: Mean and Standard error values of ear length of Berari goats (cm)**

Sr. No.	Group	Age Group (month)	Sex	Number Of Animal	Ear Length (cm)		Average $\pm$ SE	S.D.
					Max	Min		
1	A	0-6	M	12	13	9	11.22 $\pm$ 0.37	1.290613
			F	18	11	7	9.18 $\pm$ 0.33	1.441767
2	B	6-9	M	07	15	12	14.07 $\pm$ 0.42	1.113125
			F	23	12	9	10.40 $\pm$ 0.17	0.847946
3	C	9-12	M	11	16	13	14.59 $\pm$ 0.31	1.037742
			F	29	14	12	12.98 $\pm$ 0.13	0.722629
4	D	12-18	M	08	17	14	15.55 $\pm$ 0.40	1.150155
			F	42	15	13	14.07 $\pm$ 0.88	0.572466
5	E	Above- 18	M	06	18	16	16.86 $\pm$ 0.32	0.794145
			F	44	17	15	16.00 $\pm$ 0.09	0.629721
		Total		200			13.55 $\pm$ 0.26	





**Plate 3. Photo showing measurement of tail length of Berari goat.**



**Plate 4. Photo showing measurement of ear length of Berari goat**

#### 4.1.6 Horn length

The average length of horn presented in Table 9. and depicted in Fig. 10. was  $2.65\pm 0.10$  cm. in male and  $3.46\pm 0.07$  cm. in female under age group 0-6 months. While in adult age group above 18 months age groups, it was  $12.4\pm 0.16$  cm. in male and  $10.7\pm 0.21$  cm. in female. The horn length progressively increases with advancement of age. The pooled average of horn length from all age group was  $6.03\pm 0.21$  cm.

More or less similar observations with respect to sex differences in Horn length were also reported in by Lokhande (2005) in Local goat. He stated that horn length of Male was  $13.78\pm 0.12$  in male and  $12.6\pm 0.09$  cm in female. Similar observations were recorded by Mane (2005) in local goat. Muzumder and Muzumdar (1983) in Chegu goat. Mittal and Ghosh. (1985) in Parbatsar goat, Sangamneri goat Mishra and Koratkar (1994), Jangam (2001) in Berari goat.

**Table 9: Mean and Standard error values of horn length of Berari goats (cm).**

Sr. No.	Group	Age Group (month)	Sex	Number Of Animal	Horn Length (cm)		Average $\pm$ SE	S.D.
					Max	Min		
1	A	0-6	M	12	3	0	2.65 $\pm$ 0.10	0.34772
			F	18	3	0	3.46 $\pm$ 0.07	0.30125
2	B	6-9	M	07	5	3	4.01 $\pm$ 0.23	0.620292
			F	23	4	2	3.00 $\pm$ 0.11	0.54606
3	C	9-12	M	11	8	4	6.09 $\pm$ 0.35	1.164864
			F	29	6	3	4.45 $\pm$ 0.17	0.964595
4	D	12-18	M	08	10	6	8.16 $\pm$ 0.46	1.327659
			F	42	9	4	5.40 $\pm$ 0.21	1.418977
5	E	Above- 18	M	06	13	9	12.4 $\pm$ 0.16	0.397073
			F	44	11	6	10.7 $\pm$ 0.21	1.394
		Total		200			6.03 $\pm$ 0.21	

#### 4.1.1 Body length

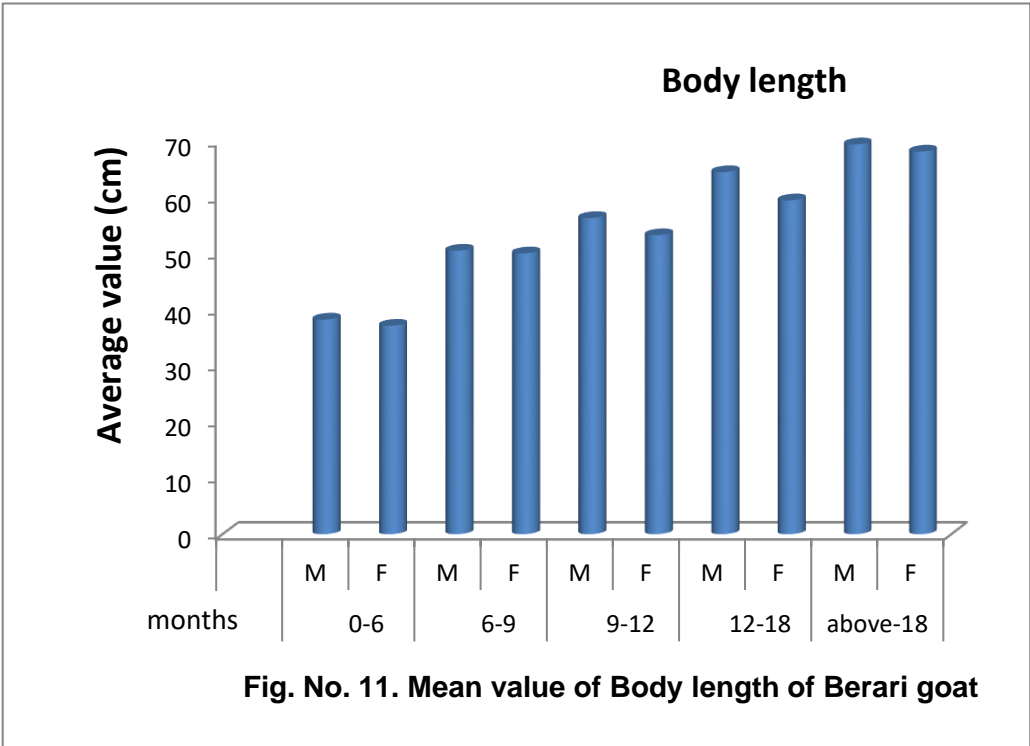
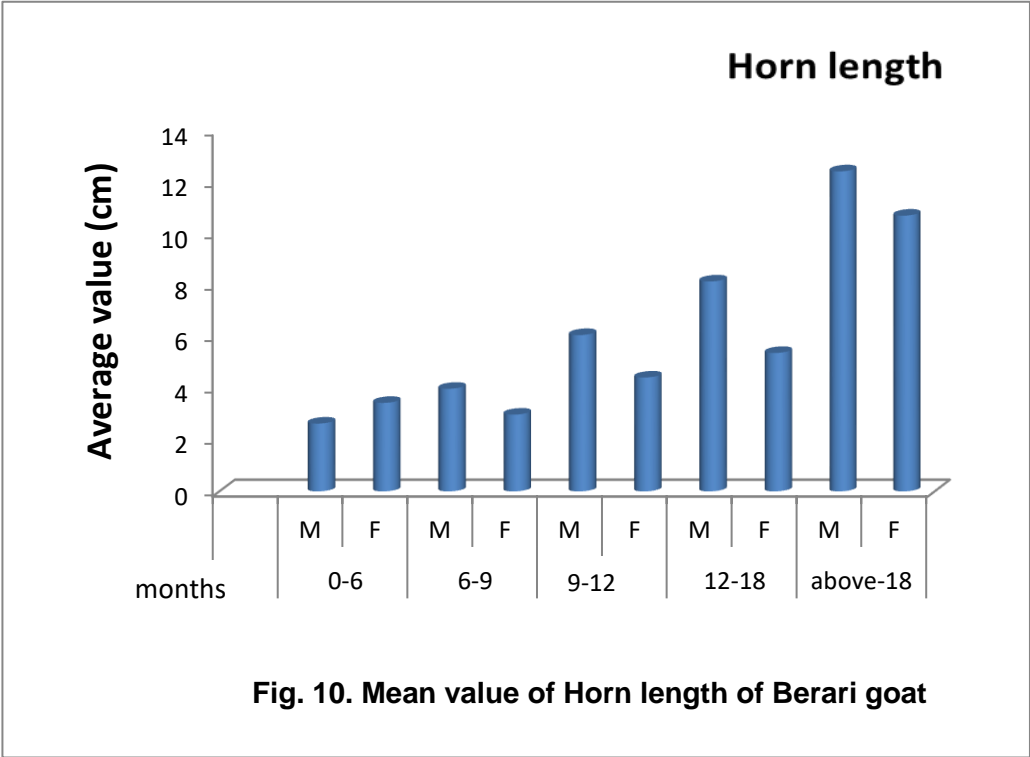
The age groupwise mean body length along with SE are presented in Table 10 and depicted in Fig. 11 showed that there was variation in body length of female Berari goat confined to different age group.

From the Table 10. it was revealed that in the age group between 0-6 months, the average body length observed to be  $38.29 \pm 1.66$  cm. in male and  $37.20 \pm 1.38$  cm. in female Berari goat. As the age advances, the body length progressively increased. In the age group of above 18 months, the body length observed to be  $69.46 \pm 1.30$  cm. in male and  $68.40 \pm 0.47$  cm. in female the average of body length of all age group was found to be  $54.74 \pm 1.16$  cm.

The average body length found in present study was in close agreement those reported by Acharya (1982) in Sirohi goat and Manwari goat. Similarly Burte (2010) reported body length. 72.73 cm. in Konkan Kanyal goat. Bhoite and Wani (1994) indicated that Sangamneri goat had However Ravimurugan et al. (2009) observed comparatively less body length in Pallai Adu goats which was 50.33 cm.

**Table 10: Mean and Standard error values of body length of Berari goats (cm).**

Sr.no	Group	Age group (month)	Sex	Number Of Animal	Body Length (cm)		Average $\pm$ S.E	S.D.
					Max	Min		
1	A	0-6	M	12	46	32	38.29 $\pm$ 1.66	1.661619
			F	18	45	30	37.20 $\pm$ 1.38	1.381744
2	B	6-9	M	07	57	45	50.55 $\pm$ 1.64	1.646476
			F	23	54	43	50.07 $\pm$ 0.71	0.712776
3	C	9-12	M	11	63	48	55.36 $\pm$ 1.71	1.711314
			F	29	62	45	52.31 $\pm$ 1.02	1.027037
4	D	12-18	M	08	69	58	62.52 $\pm$ 1.22	3.47676
			F	42	66	55	59.62 $\pm$ 0.50	0.502268
5	E	Above- 18	M	06	74	65	69.46 $\pm$ 1.30	1.309877
			F	44	72	63	68.40 $\pm$ 0.47	0.479562
		Total		200			54.74 $\pm$ 1.16	





**Plate 5. Photo showing measurement of horn length of Berari goat**



**Plate 6. Photo showing measurement of body length of Berari goat**

#### 4.1.2 Chest girth

The age group wise mean chest girth along with SE are presented in Table 11. and depicted in Fig. 12. With reference to table it revealed that the average chest girth in age group 0-6 months was  $53.14 \pm 0.97$  cm. in male and  $52.89 \pm 0.55$  cm. in female Berari goat. Average chest girth was progressively increased with the age. In the age group of above 18 months chest girth was  $73.05 \pm 1.24$  cm. in male and  $68.00 \pm 0.42$  cm in female. The average of chest girth of all age groups was found to be  $63.45 \pm 0.83$  cm.

The average chest girth recorded in the present finding was in close agreement with Acharya (1982) in Beetal, Surti, Sangamneri and Marwari goats. Similarly Bhoite and Wani (1994) observed chest girth 74.12 cm in female Samgamneri goats however, Varade *et al.* (1997) observed lightly higher chest  $77.37 \pm 1.53$  cm in female. Motghare (2004) observed less chest girth in Osmanabadi goat.

**Table 11: mean and Standard error values of chest girth of Berari goats. (cm)**

Sr. No.	group	Age Group (month)	Sex	Number Of Animal	Chest girth (cm)		Average S.E	S.D
					Max	Min		
1	A	0-6	M	12	58	47	53.14±0.97	3.620956
			F	18	56	49	52.89±0.55	2.379135
2	B	6-9	M	07	66	55	62.17±1.38	2.865638
			F	23	63	53	58.80±0.72	3.465709
3	C	9-12	M	11	71	57	65.12±1.25	4.183419
			F	29	69	61	65.21±0.49	2.530494
4	D	12-18	M	08	74	66	71.67±0.93	2.632625
			F	42	73	65	65.00±0.32	2.197592
5	E	Above 18	M	06	77	69	73.05±1.24	2.025729
			F	44	77	68	68.00±0.42	2.850361
		Total		200			63.45±0.83	

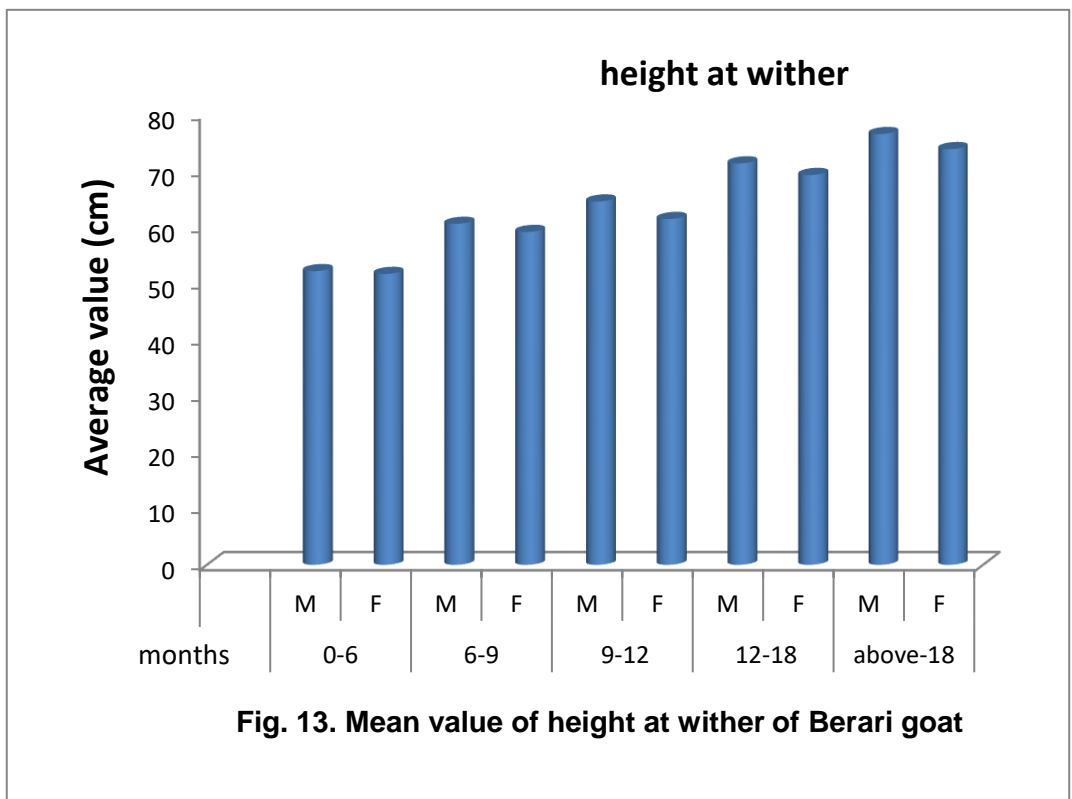
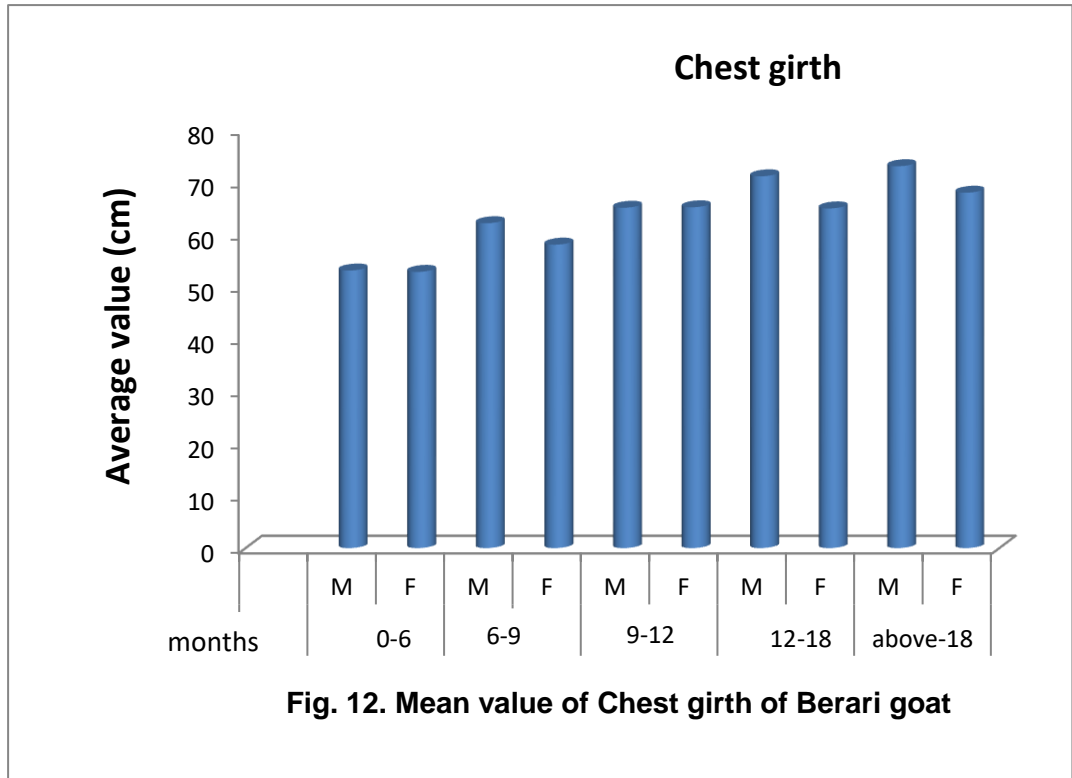
#### 4.1.1 Height at wither

The age group wise mean height at wither along with SE are presented in Table 12. and depicted in Fig. 13 it was observed that the average height at wither of all age group was  $63.99 \pm 0.94$  cm. In age group of 0-6 months, it was observed to be  $52.12 \pm 1.39$  cm. In male and  $51.62 \pm 0.70$  cm. In female. While in group of age above 18 month, height at wither was observed to be  $76.48 \pm 1.36$  cm. In male and  $73.80 \pm 0.37$  cm. in female.

The average height at wither found in the present study was in close agreement with Acharya (1982) who reported height at wither  $74.79 \pm 0.30$  cm in Osmanabadi goat,  $75.20 \pm 0.38$  cm in Jamunapari goats and 76.15 cm in Kannai Adu goats. Similarly Burte (2010) observed height at wither i.e. 74.24 cm in Konkan Kanyal goat Lokhande (2005) reported height at wither  $71.23 \pm 0.90$  cm in local goat.

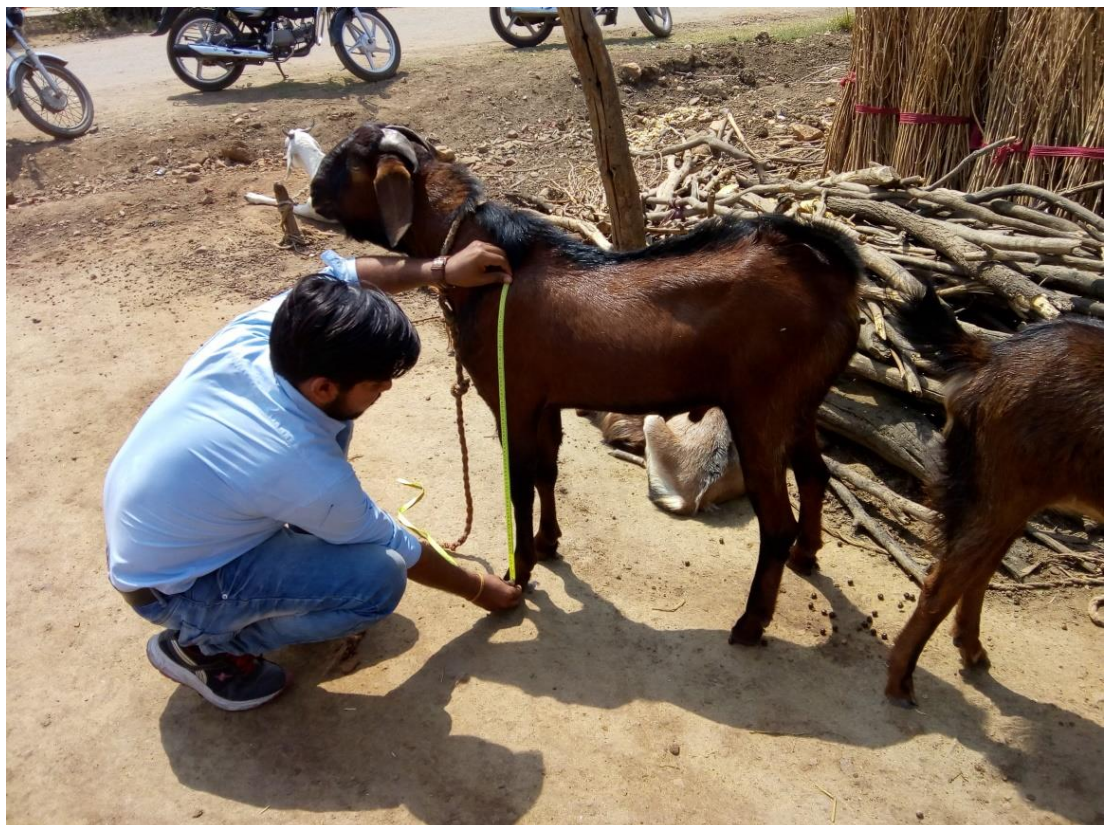
**Table 12: Mean and Standard error values of height at wither of Berari goats. (cm)**

Sr. No.	Group	Age Group (month)	Sex	Number Of Animal	Height at Wither (cm)		Average $\pm$ S.E	S.D
					Max	Min		
1	A	0-6	M	12	59	42	52.12 $\pm$ 1.39	4.81534
			F	18	56	45	51.62 $\pm$ 0.70	3.009701
2	B	6-9	M	07	65	51	60.52 $\pm$ 1.91	5.077307
			F	23	63	54	59.09 $\pm$ 0.51	2.486859
3	C	9-12	M	11	69	57	64.49 $\pm$ 1.10	3.651152
			F	29	68	55	61.38 $\pm$ 0.65	3.542368
4	D	12-18	M	08	75	65	71.26 $\pm$ 1.08	3.059849
			F	42	71	63	69.20 $\pm$ 0.37	2.458614
5	E	Above-18	M	06	79	70	76.48 $\pm$ 1.36	3.353456
			F	44	75	66	73.80 $\pm$ 0.37	2.474094
		Total		200			63.99 $\pm$ 0.94	





**Plate 7. Photo showing measurement of chest girth of Berari goat**



**Plate 8. Photo showing measurement of height at wither of Berari goat.**

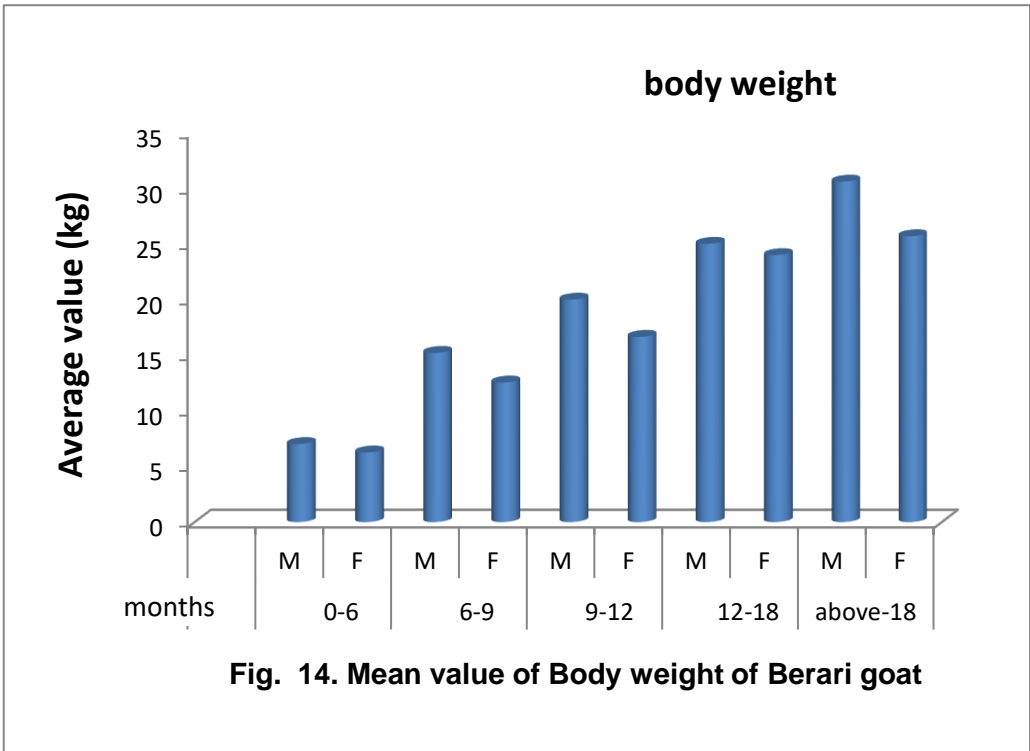
#### 4.1.1 Body weight

It is essential to get an idea about the weight of animals to decide its heaviness or lightness. Data presented in Table 13. and depicted in Fig. 14. indicated that in the age group 0-6 months, the average body weight of animals was found to be  $7.02 \pm 0.52$  kg. In male and  $6.26 \pm 0.31$  kg. In female, it was increased up to  $30.61 \pm 1.01$  kg. and  $25.70 \pm 0.31$  kg. In the age group of above 18 months in male and female respectively. The pooled average of body weight from all age groups was found to be  $18.31 \pm 0.66$  kg.

The average body weight found in the present study is comparable with those reported by Lokhande (2005) and Mane. (2004) In local goat. Singh and Dixit (2009) in Mehsana goat reported that adult body weight was  $37.21 \pm 1.80$  and  $30.40 \pm 0.37$  in male and female respectively. However, Mukharjee (1979) observed comparatively less body weight in Grey Bengal goat while, Mishra and Koratkar (1994) observed comparatively more body weight in Sangamneri goat. Thus the medium body weight suggested the lighter built in all the age group of Berari goats.

**Table 13: Mean and Standard error values of body weight of Berari goats (kg).**

Sr. No.	Group	Age Group (month)	Sex	Number Of Animal	Body Weight (kg)		Average $\pm$ S.E.	S. D.
					Max	Min		
1	A	0-6	M	12	10	4	7.02 $\pm$ 0.52	1.81114
			F	18	8	3	6.26 $\pm$ 0.31	1.33416
2	B	6-9	M	07	19	9	15.22 $\pm$ 1.37	3.628918
			F	23	16	7	12.56 $\pm$ 0.60	2.879347
3	C	9-12	M	11	23	17	20.00 $\pm$ 0.55	1.839021
			F	29	21	12	16.66 $\pm$ 0.47	2.549944
4	D	12-18	M	08	30	22	25.02 $\pm$ 1.06	3.013185
			F	42	27	18	24.00 $\pm$ 0.42	2.722092
5	E	Above-18	M	06	34	27	30.61 $\pm$ 1.01	2.48227
			F	44	30	21	25.70 $\pm$ 0.31	2.107953
		Total		200			18.31 $\pm$ 0.66	



## 4.2 Reproductive traits

The reproductive traits are desirable for multiplication which having tremendous importance for economic aspect of animal production. The reproduction record of age at first oestrus, Age at first kidding, Oestrus cycle, duration, age at first mating, Number of services per conception, gestation period, and kidding interval were collected by personal interaction and with the help of questionnaire. The data of 138 Berari goats were analysed and mean values along with standard error, standard deviation and coefficient of variation is presented in Table 14.

**Table 14: Mean and standard error values of reproductive traits of Berari goats.**

<b>Sr. No.</b>	<b>Reproductive Traits</b>	<b>No of Observations</b>	<b>Average</b>	<b>S.E</b>	<b>S.D</b>	<b>C.V %</b>
<b>1</b>	Age at first oestrus (months)	138	9.18	0.15	1.85	20.21
<b>2</b>	Oestrus cycle duration (days)	138	20.53	0.12	1.45	7.07
<b>3</b>	Age at first mating (months)	138	15.91	0.09	1.15	7.23
<b>4</b>	Number of services per conception	138	2.70	0.07	0.2	28.9
<b>6</b>	Gestation period (days)	138	148.14	0.19	2.24	1.51
<b>7</b>	Age at first kidding (months)	138	19.25	0.30	3.62	18.82
<b>8</b>	Kidding interval (days)	138	249.56	0.79	9.12	3.72

#### **4.2.1 Age at first oestrus (months)**

The overall mean of age at first oestrus in Berari goats is presented in Table 14. along with values of mean, standard error, standard deviations and coefficient of variance. The data form the table revealed that average age at first oestrus for Berari goats was found to be  $9.18 \pm 0.15$  month with standard deviation of 1.85 and coefficient of variation of 20.21 per cent.

The age at first oestrus found in the present study is in close agreement with Burte (2010) in Konkan Kanyal goat.

#### **4.2.2 Oestrus cycle duration (days)**

The average oestrus cycle duration in days along with standard error, standard deviation and coefficient of variation is presented in Table 14 for 138 observation of Berari goats in Parsioni tahsil.

The overall average oestrus cycle duration was observed to be  $20.53 \pm 0.12$  days in Berari goat with a standard deviation of 1.45 and coefficient of variation of 7.07 per cent. The average oestrus cycle duration was higher in present study than reported by Saha and Dhingra (1987) in local goats.

#### **4.2.3 Age at first mating (months)**

The overall average age at first mating in months along with standard error, standard deviation and coefficient of variation is presented in Table 14. From the table, it reveled that the average age at first mating was found to be  $15.91 \pm 0.09$  months in Berari goat. The standard deviation was 1.15 with coefficient of variation 7.23 per cent.

The age at first mating found in the present study is in close agreement with Thiruvankandan et. al. (2000) in Kannai adu goats who observed age at first mating  $9.38 \pm 0.11$  month. However Patro and Mishra (1987) observed comparatively less age at first mating which

was  $215.19 \pm 8.59$  days. Alam *et al.* (2005) observed more age at first mating in Beetal goat the present study.

#### **4.2.4 Number of services per conception**

The average number of services per conception along with standard error, standard deviation and coefficient of variation is presented in Table 14.

The results of Table, 14 indicated that the average number of services per conception was found to be  $2.70 \pm 0.07$  in Berari goat with a standard deviation of 0.2 and coefficient of variation of 28.9 per cent.

#### **4.2.5 Gestation period (days)**

The average gestation period along with standard error, standard deviation and coefficient of variation is presented in Table 14. The observation presented in table indicated that the average gestation period was found to be  $148.14 \pm 0.19$  days in Berari goat with a standard deviation of 2.24 and coefficient of variation of 1.51 per cent.

The result of present study is in close agreement with Burte (2010) who observed average gestation period  $147.52 \pm 2.81$  days in Konkan Kanyal goat. Similarly Saha and Dhingra (1987) reported average gestation period  $147.45 \pm 1.18$  days in local goat in Malva region. Similar result were also reported by Bhusan and Rai (2008) in Jakrana goat and Alam *et al.* (2005) in Beetle goat.

#### **4.2.7 Age at first kidding (month)**

The overall age at first kidding along with standard error, standard deviation and coefficient of variation is presented in Table 14.

The data from Table 14 revealed that the average age at first kidding was found to be  $19.25 \pm 0.30$  months with a standard deviation of 3.62 and coefficient of variation of 18.82 per cent.

The present findings are in close agreement with Saha and Dhingra (1987) in local goats. Similarly Burte (2010) observed age at first kidding 17 months in Konkan Kanyal goat. However Ulmek (2003) observed less age at first kidding 14.53 months in Sangamneri goats.

#### 4.2.8 Kidding interval (days)

The overall kidding interval along with standard error, standard deviation and coefficient of variation is presented in Table 14.

The data presented in Table 14. indicated that the average kidding interval was found to be  $249.56 \pm 0.79$  days with standard deviation of 9.12 and coefficient of variation of 3.72 per cent.

The present findings are in close agreement with Burte (2010) who reported average kidding interval  $239 \pm 57.2$  days in Konkan Kanyal goat. While Ulmek (2003) observed less kidding interval in Osmanabadi and Sangamneri goat.

**Table 15: Overall Mean and Standard error for different Phenotypical characters and reproductive traits of adult Berari goat (above 18 months) recorded in Parseoni tahsil.**

Sr. No.	Parameter	Chi-square/ Mean $\pm$ S.E.
	<b>Phenotypical character</b>	
1	Coat colour	156.33
2	Eye colour	112.52
3	Tail length (cm)	12.66 $\pm$ 0.33
4	Ear length (cm)	13.55 $\pm$ 0.26
5	Horn length (cm)	6.03 $\pm$ 0.21
6	Body length (cm)	54.74 $\pm$ 1.16
7	Chest girth (cm)	63.45 $\pm$ 0.83
8	Height at wither (cm)	63.99 $\pm$ 0.94
9	Body weight (kg)	18.31 $\pm$ 0.66
	<b>Reproductive traits</b>	
1	Age at first oestrus (month)	9.18 $\pm$ 0.15
2	Oestrus cycle duration (days)	20.53 $\pm$ 0.12
3	Age at first mating (month)	15.91 $\pm$ 0.09
4	No. of services per conception (No.)	2.70 $\pm$ 0.07
6	Gestation period (days)	148.14 $\pm$ 0.19
7	Age at first kidding (month)	19.25 $\pm$ 0.30
8	Kidding interval (days)	249.56 $\pm$ 0.79

The overall mean values with standard error estimated for phenotypical character for Berari goats in Parseoni tahsil were 12.66±0.33 cm. 13.55±0.26 cm. 6.03±0.21 cm 54.74±1.16 cm. 63.45±0.83 cm. 63.99±0.94 cm. 18.31±0.56 kg. for tail length (cm). ear length (cm). horn length (cm). body length (cm), chest girth (cm), Height at wither (cm) and Body weight (kg) respectively. While for reproductive traits were 9.18±0.15 months, 20.53±0.12 days, 15.91±0.09 months, 2.70±0.07, 148.14±0.19 days, 19.25±0.30 months, 249.56±0.79 days, for Age at first oestrus (months), Oestrus cycle duration (days), Age at first mating (month), Number of services per conception, Gestation period (days), Age at first kidding (months) and kidding interval (days) respectively in Berari goat.

## Chapter - V

### SUMMARY AND CONCLUSIONS

Breed of Berari goats are found in large number in rural area of Nagpur district of Maharashtra as well as Nimar in Madhya Pradesh which needs attention for their conservation. The major problem affecting goat production in Vidarbha region is poor productivity of Local goats due to low genetic potential and low weight gain

Berari breed of goat is well adapted in their native tract but information on phenotypical characters and reproductive status for characterization and performance point of view is very scanty. Hence, attempt was made to characterize Berari goat with respect to morphometric and reproductive characters. The present investigation entitled "Phenotypical characters and reproductive traits of Berari goats in Parseoni tahsil was conducted on 200 Berari goats belonging to different age groups of 0-6, 6-12, 12-18, and above 18 months for phenotypical characters and 138 Berari goats for reproductive traits in 5 selected villages of Parseoni tahsil.

#### 5.1 Phenotypical characters

The phenotypic characters of 200 Berari goats viz. Type of tail length, Orientation and length of ear, orientation and length of horn, body length, chest girth, height at wither were actually measured using measuring tape and body weight was recorded by using spring balance for different age groups in selected village of Parseoni.

The coat colour of majority Berari goat exhibited dark brown (75%) followed by light brown (12.5%) and Brown (12.5%) with significant variation. Eye colour found to be mostly brownish (87.5%) and blackish (12.5%) with significant variation. A black colour patch was found on all body margins and it was confirmed character to identify Berari goat The average tail length, ear length, horn length, body length, chest girth, height at wither. and body weight. was

12.66±0.33 cm. 13.55±0.26 cm. 6.03±0.21 cm. 54.74±0.94 cm.  
63.45±0.83 cm. 63.99±0.94 cm. 18.31±0.66 kg. respectively,

## 5.2 Reproductive traits

Data of 138 Berari goats for reproductive traits collected by personal interaction and with the help of questionnaire from goat owner.

The mean age at first oestrus, oestrus cycle duration, age at first mating, number of services per conception, gestation period, age at first kidding and kidding interval were found to be 9.18±0.15 months, 20.53±0.12 days, 15.91±0.09 months, 2.70±0.07, 148.14±0.19 days, 19.25±0.30 months, 249.56±0.79 days, respectively.

## Conclusions

- 1) Berari breed of goat mainly confined to rural area of Parseoni tahsil of Nagpur district of medium in size and weight with prominent black patches on body margin.
- 2) Body coat colour of majority goat is dark brown and the colour of eye mostly found brown colour.
- 3) The horn is medium in length with backward orientation. The ear comparatively long in length with pendulous orientation. Tail is medium in length with bunchy appearance.
- 4) The body length, height and chest girth are similar in all adult goats.
- 5) This breed can be improved by using selective breeding, feeding and management practice under field condition.

Hence, the phenotypical character are fairly satisfactory and can be useful for selection and characterization of Berari breed of goat. The reproductive performance suggested that Berari breed possesses good genetic potential for high meat production along with early sexual

maturity and can be reared economically by adopting selective breeding

### **Implications**

The major problem affecting goat production in Vidarbha region were observed to be poor production of local goats due to low genetic potential and low weight gain. 80 per cent population of goat is non descript, on account of intermixing and indiscriminate breeding. So by rearing genetically improved goat chances of increasing milk and meat production, which can increase in income, nutritional security of weaker section of population. The present study of phenotypical characters and reproductive status of Berari goat, will be useful for characterization evaluation and documentation of Berari goat in Parseoni Tahsil and also selection on the basis of body measurements.

## Chapter VI

### LITERATURE CITED

- Acharya, R. M. 1982. Sheep and goat breed of India. FAO Animal production and Health papers 30, Food and Agriculture Organization of the united nations, Rome
- Alam, S, P. K. Singh and B. U. Khan. 2005 Performance evaluation of Beetle goat in its native tract. *Indian Vet. J.* 85:640-642.
- Ambhore. G. S, 2000. Studied on carcass quality characteristics of Berari goats of Nagpur region. MAFSU. Nagpur, Maharashtra.
- Amble, V. N. 1975. Statistical methods in Animal Sciences, Indian Society of Agriculture Statistics, New Delhi Publishing: 91-92.
- Anonymous. 2013. Present status of the world goat populations and their productivity. Vol. 45 (2).
- Anonymous. 2013. Tahsil Social and economic survey.
- Barua, P. M., K. C. Nath, and A. Saleque, 2002. Growth and reproductive performance of Beetal, Assam Local and Beetal X Assam Local goats. *Indian J. of Small Ruminants Vol. 8 (2):* 135-137.
- Bhat, P. P. 1988b. External trait in Jamunapari goats. *Indian J. ani. Sci.* 58 (4): 456-462.
- Bhoite, U. Y. and Wani, V. S. 1994 Biometrical studies on Sangamneri goats. *Indian Vet. J.* 71: 289-290.
- Bhuarya S., K. Mukherjee, M. Singh and K. Parveen, 2014. Characterization of local goats Chhattisgarh plains. *Indian J. Anim. Sci.* 84 (10): 1080-1084.

- Bhusan, S. and B. Rai 2008 Genetic evaluation and improvement of Jhakrana breed of goats. National symposium on indigenous animal genetic resources. NBAGR, Karnal.. PP 180.
- Burte, R. G. 2010a. Body dimensions of Konkan Kanyal goat breed Recommendation proposal. B.S.K.K.V. Dapoli. Dist- Ratnagiri. PP 10-11
- Burte, R. G. 2010b Reproductive performance of Konkan Kanyal goat breed Recommendation proposal. B.S.K.K.V. Dapoli Dist- Ratnagiri. PP 21-22
- Chandra, S. 2002. Anticipating a spurt in international trade. *The Hindu Survey of Indian Agriculture*, 2002: 151-157.
- Deokar, D. K., V. S. Lawar and B. R. Ulmek, 2006. Morphological Characteristics of Osmanabadi Goats. *Indian J. of Small Ruminants*, 12(1):13-15.
- Deshmukh A. R., 2011. Phenotypic characteristics of goats maintained in Washim tahsil. M.Sc. (Agri.) thesis (Unpub.), submitted to Dr. P.D.K.V. Akola (M.S.).
- Dhara. K. C., N. Ray, S. Taraphder and S. Guha. 2012. Milk production performance of Black Bengal goats in West Bengal. *International J. Livestock Production* 3 (2): 17-20.
- Hassen, H., M. Baum, B. Rischkowsky and M. Tibbo, 2012. Phenotypic characterization of Ethiopian indigenous goat populations. *African J. of Biotech*, 11(73): 13838-13846.
- Jain, A., G. Sahana, N. Kandasamy, and A. E. Nivarkar, 2000. Kadi-Adu - A new goat breed of Tamil Nadu. *Indian J. Anim. Sci.* 70 (60): 649-651.

- Jangam, R. 2001. A study on Phenotypic Characteristics of Berari goat under field condition. M. V. Sc. thesis (Unpub.) submitted to MAFSU, Nagpur.
- Katekhaye, K. F. 2011. Phenotypic Characterization of Berari Goat in Hingna tahsil M.sc. (Agri.), thesis (Unpub.) submitted to Dr. P.D.K.V. Akola (M.S.).
- Kharkar, K., S.V. Kuralkar and P. Kuralkar, 2014. Growth, Production and Reproduction Performance of Berari Goats in their Native Tract. *The Indian J. of Small Ruminants*, 20(1): 12-15.
- Kumar, V. K. Singh, A. K. Yadav, A. K. Jha and J. Singh, 2017. Morphometric and carcass characteristics of Jaunpuri breed of goats. *Asian J. Dairy & Food Res*, 36(2) : 122-126.
- Kuralkar, S. V., N. K. Verma, K. Kharkar, and P. kuralkar, 2013. Characterization, management, performance and population status of Berari goat. *Indian J. Anim. Sci.* 83 (12): 1292-1298.
- Lokhande, T. A., 2005. Phenotypic Characteristics of local goats maintained in Akola tahsil M.Sc. (Agri.) thesis (Unpub.) Submitted to Dr. P.D.K.V. Akola (M.S.).
- Mahmud, M. A., P. Shaba and U. Y. Zubairu, 2014. Live Body Weight Estimation in Small Ruminants A Review. *Global J. of Anim. Sci. Res.* 2 (2): 102-108.
- Mane. H. B., 2004. Phenotypic characteristics of goats maintained in Khamgaon tahsil of Buldhana district. M.Sc. (Agri) thesis (unpub) submitted to Dr. P.D.K.V.. Akola (M.S.).
- Mazumdar, N.K. and Mazumder. A. 1983. Breed Characteristics of some Indian pashmina goats. *Indian J. Anim. Sci.* 53(7):779-782
- Mishra, P., A. S. Ali, A. K. Aggarwal, S. P. Dixit, S. K. Dash, P. S. Dangi, N. Tyagi and N. K. Verma, 2015. Phenotypic

characterization and micro satellite markers based genetic evaluation of Kalahandi goats. *Indian J. of Anim. Sci.*, 85(3): 266–270.

Mishra, R. K. and C. I. Arora. 1980. Breed characterization of sirohi goat. *Indian J. Anim. Sci.* 55(8):673-678.

Mishra, R. K. and D. P. Koratkar. 1994. Phenotypic characteristics of Sangamneri goats. *Indian Vet. J.* 71: 678-683

Mittal, J. P. and P. K. Ghosh, 1985. Characteristics of Parbatsar goat from Rajasthan desert. *Indian J. Anim. Sci.* 55 (8): 673-678.

Mittal, J. P., 1988. Breed characterization of Marwari goat of arid western Rajasthan. *Indian J. Anim. Sci.* 58 (8):357-361

Mukharjee, D. K., C. S. P. Singh and H. R. Mishra 1979. A note on some phenotypic parameters in Grey and Brown Bengal goats. *Indian J. Ani. Sci.* 49 (8): 671-673.

Motghare, A. B., S. Z. Ali and S. V. Kuralkar 2004. Growth rate characteristics and body measurement of Osmanabadi goat, *Indian j. of Animal production and Management* VOI.20 (1-4) 44-46.

Mule, M. R., R. P. Barbind and R. L. Korake, 2014. Relationship of Body Weight with Linear Body measurement in Osmanabadi Goats. *Indian J. Anim. Res.*,48(2): 155-158.

Nandani Kumari, Banani Mandal, Thanesh Oraon and Saroj Kumar Thakur, 2015. Breed Characterization for Identification and Conservation of Black Bengal Goats of Jharkhand. *Indian J. of Sci. and Tech.*, 8(28): 1-6.

Oseni S. O. and B. A. Ajayi, 2014. Phenotypic Characterization and Strategies for Genetic Improvement of WAD Goats under Backyard Systems. *Open J. of Anim. Sci.*,(4) 253-262.

- Panda. R. and P.P. Ghorpade, 2016. Relationship Between Body weight with Linear Body Measurement In Post Weaning Stall Fed Osmanabadi Kids Under Katcha Housing System. *Indian J. Anim. Hlth.*, 55(2) : 157-160.
- Patel, A. C. and D. P. Pandey, 2013. Growth, Production and reproduction performance of Mehsana goat. *J. of livestock Sci.* (ISSN online 2277-6214) 4: 17- 21.
- Pathodiya. O.P.. M. L Gurjar, B. S Khadda, 2007. Growth performance evaluation of Sirohi goats at farmers flocks. *Indian J. of Dairy Sci.* 60 (1): 51-52.
- Patil, S. J., S. D. Mandakmale and D. K. Kamble, 2008. Factor affecting on withers height at different ages in Osmanabadi goats under semi intensive system. *The Asian. J. Anim. Sci.* 3(2): 103 – 105.
- Patro, P. C. and M. C. Mishra. 1987. Performance of Ganjam breed of goats under field condition in Orissa. *Indian J. Anim. Prod. And Mgmt.* 3:40-45.
- Raskar, B. R., D.S. Chauhanand, B. N. Thorat, 2015. Studies on Phenotypic Characters of Osmanabadi Goat in Scarcity Zone of Maharashtra State. *International J. of Tropical Agri Serials Publications*, 33(4): 0254-8755.
- Ravimurugan. T., P. Devendran. D. Cauveri, and S. Balachandran, 2009. Performance Of Indigenous Goat (Pallai Adu) Under Field Condition. *Tamilnadu J. Vet. S. Anim. Sci.* 5 (5): 203-207.
- Rawat, S. K. and R. Gupta, 2016. Phenotypic Characteristics of Indigenous Goat of Bundelkhand. *J. of Anim. Res.*, 6(1): 145-150.

- Ram Reddy, R. G, A. R. S Mudaliar and N Muniraj. 1991. Breeding strategy in goats in rural areas of Andhra Pradesh, *Livestock Advisor*. 16 (12):39-43.
- Sabapara, G. P., S.B. Deshpande, G. Singh and B.K. Joshi, 2010. Reproduction and Production Performance of Surti Goats in its Native Tract. *Indian J. of Small Ruminants*, 16(2): 195-198.
- Saha, D. N. and M. M. Dhingra. 1987. Studies on Sex Ratio, Oestrus interval, weight at first kidding and first gestation period in Local goats of Malwa region. *Indian Vet. J.* 70: 580 -581.
- Sastry, N.S.R. and C. K. Thomas. 1976. *Livestock Production and Management*, Kalyani Publisher, Ludhiana-1414008.
- Sharma, M. C., 2008. Variation in absolute growth rates in Sirohi goats under field condition. *Indian J. Anim. Sci.* 78 (2): 222-224.
- Shinde, P. M., 2000. Phenotypic characteristics of Osmanabadi goats maintained by farmers in Rahuri area. M. Sc. (Agri) thesis (unpub.) submitted to M.P.K.V. Rahuri (M.S.).
- Singh, C. S. P. and D. K. Mukherjee. 1981. Note on body measurements and weight of Black Bengal goats. 51(2): 234-236.
- Singh, C. V. and R. S. Barwal, 2009. Characterization of Changurakha goat in their home tract. *Indian J. Small Ruminants*. 15 (2): 274-276.
- Singh, K. P. and S. P. Dixit 2009. A note on growth and reproduction traits of Mehsana goat under farmers flock. *The Indian J. Small Ruminant*. 15(2):Pront ISSN :0973-9718.
- Singh, K. P., H. H. Panchasara, S. Kumar, A. C. Patel, G.B. Solanki and P. K. Patel, 2010. Growth, Mortality and Production

Performance of Mehsana goat. *Livestock Biodiversity J.* 2(1): 385 -506.

Singh, M.K., A.K. Dixit, A.K. Roy and S.K. Sing 2013. Goat Rearing: A Pathway for Sustainable Livelihood Security in Bundelkhand Region. *Agri. Economics Res. Review* (26) (Conference Number): 79-88.

Snedecor, G. W. and W. G. Cochran 1994. *Statistical methods*, 6 th Ed. New Delhi. Oxford and IBH Pub co, New Delhi.

Solanki, C. P., S. Nanavati, N. K. Nayak, and H. B. S. Bhadoria, 2009. Growth Characteristics of Local goats under Differential Management Systems. *Inadian J. Anim. Sci.* 79(7): 737-739.

Sundaram, M., T. Muthuramalingam, J. S. I. Rajkumar, B. Nishanth, and T. Sivakumar, 2012. Growth Performance of Tellichery Goats In An Organized Farm. *International J. Dairy Sci. Res.* 1(3): 9-11.

Thiruvankandan, A. K., S. Paneerselvam and N. Kandasamy, 2000. Distribution Characteristics and production performance of Kanni- Adu goats of Tamil Nadu. *Indian J. Anim. Sci.* 70(7): 723-727.

Tyagi, K. K., M.D. Patel, L.M. Sorathiya, D.P. Kshirsagar, M.V. Patel and R. B. Thakor, 2015. Growth Traits and their Interrelationship in Surti Goats. *Anim. Sci. Reporter*, 9(3): 105-113.

Upadhyay, D., B. H. M. Patel, S. Kerketta, S. Kaswan, S. Sahu, B. Bhushan and T. Butt 2014. Study on udder morphology and its relationship with production parameters in local goats of Rohilkhand region of *indian J. Anim. Res.* 48 (6): 615-619.

Ulmek, B. R. 2003. Recent trends in goat production. State level workshop on recent advances in goat rearing. Raruri, M. S 1-5.

- Varade, P. K., S. Z. Ali, and P. S. Malkhede, 1997. Body measurements of Local goats under field conditions. *Indian Vet. J.* 74: 448-449.
- Verma, N. K., P. Mishra, R. A. K. Aggarwal, S. P. Dixit, P. S. Dangi and S. K. Dash, 2015. Characterization performance and genetic diversity among goats of Odisha. *Indian J. Ani. Sci.* 85 (2): 165-171.
- Verma, N. K., R. A. K. Aggarwal, S. P. Dixit, V. S. Kawatkar, P. S. Dangi, Navneet Kaur, Priyanka Mishra and B. K. Joshi, 2012. Konkan Kanyal-Characters and performance of a newly discovered goat germplasm of Maharashtra. *Indian J. of Ani. Sci.* 82 (9): 1079–1081.
- Verma, N. K., S. P. Dixit, R. A. K. Aggarwal, P. S. Dangi and B. K. Joshi, 2010. Phenotypic and Genetic Characterization of Sangamneri goat breed. *Indian J. of Anim. Sci.*, 80 (11): 1109 – 14.
- Verma, N. K., S. P. Dixit, P. S. Dangi, R. A. K. Aggarwal, S. Kumar and B. K. Joshi. 2009. Malabari goat: Characterization, Management, Performance and genetic variability. *Indian J. Anim. Sci.* 79 (8): 813-818

## VITA

1. **Name of students** : Bodhade Mayur Santosh
2. **Date of Birth** : 15<sup>th</sup> mar. 1995
3. **Name of college** : College of Agriculture, Nagpur
4. **Residential address along with phone number** At. Wani Rambhapur Post. Nipana  
Tq. Akola Dist. Akola  
Mob. No. 8379931287
5. **Academic qualifications** :

Sr. No.	Name of Degrees awarded	Year in which obtained	Division / Class	Name of Board / Awarding University	Subjects
1	B.Sc. (Agri.)	2017	Second	Dr .P.D.K.V.Akola	Agriculture
2	Diploma	2012	Second	Dr .P.D.K.V.Akola	Agriculture
3	S.S.C.	2010	Second	Amravati	General

6. **Field of Interest** : **Agriculture**                      Animal Husbandry

**Place** : Nagpur

**Date** : 17 /06 / 2019

**Signature of students**

## APPENDIX

### QUESTIONNAIRE

Title :- **Phenotypic characteristics and Reproductive traits of Berari goat in Parseoni tehsil of Nagpur District.**

Name of student : Bodhade Mayur Santosh  
Department : Animal Husbandry and Dairy Science

#### **A) General information**

1. Name of goat keeper –

2. Name of village -

Taluka-

District

3. Age of farmer-

4. Education -

5. Family size-

a) Male-

b) Female -

6. Occupation

a) Main-

b) Subsidiary-

7. Land holding (ha)

a) Rainfed-

b) Irrigated-c)total

8. Age group of goat:-

## B) Phenotypic characters

Sr. No.	Phenotypic characters	Age group wise
1	Colour patter	
	a) Coat colour	
	b) Eye colour	
2	Tail	
	a) Length (cm)	
	b) Type (cm) (Bunchy/Thin)	
3	Ear	
	a) Length (cm)	
	b) Orientation (horizontal/pendulous/erect)	
4	Horn	
	a) Length (cm)	
	b) Orientation (upward/backward/downward)	
5	Body length (cm)	
6	Chest girth (cm)	
7	Height at wither (cm)	
8	Body weight (kg)	

**B) Reproductive traits;**

1. Age at first oestrus (months) :
2. Oestrus cycle duration (days) :
3. Age at first mating (months) :
4. No. of services/conception (nos.) :
5. Gestation period (days) :
6. Age at first kidding (months) :
7. Kidding interval (days) :