Management practices, perceived constraints and estimation of biochemical parameters in indigenous goats of Gwalior city of Central India

ABSTRACT

Aim: A study was conducted in order to analyze goat rearing practices prevailing in the Gwalior City of Central India and to identify the constraints in goat farming.

Study Design: Data of ninety six indigenous goats of 2 to 5 age group from thirty respondents from the district was collected.

Place and Duration of Study: The study was carried out in Gwalior City of Central India during July 2023.

Methodology: The data pertaining to goat rearing practices being followed and constraints being faced were collected with the help of pre-structured interview schedule after ensuring its reliability and validity. To evaluate the nutritional status of the animals the blood sample of twenty four randomly selected female goats of 2 to 5 years of age was taken from Jugular vein for the normal biochemical profile.

Results: It was observed that total protein and serum calcium level was significantly lower than normal value, while. Alkaline phosphates, SGOT and SGPT and blood urea levels are higher than the normal values.

Conclusion: it is concluded that goats reared on extensive system of rearing have poor reproductive performance (higher age at first kidding and kidding interval and low twinning rate) due to lack of scientific management and feeding practices by goat farmers of Gwalior City of Central India.

Keywords: goats, feeding, management, blood biochemistry, reproductive performance , constraints.

INTRODUCTION

With the increase in demand of goat products, the population of goats increased from 135.17 in 2012 to 148.88 million goat in 2019, showed a 10% growth rate over previous livestock census. Madhya Pradesh has fifth rank in goat population in India, population of goats increased from 8.3 million in 2012 to 11.6 millions in 2019, showed tremendous growth of 38% [1] . "Goat is a multipurpose animal and mostly reared by landless, poor, marginal and nomadic farmers under the most traditional managemental systems using low or no cost inputs" [2]. "Goats (*Capra hircus*) plays a significant role in the rural economy of India and acts as an insurance against crop failure to meet the immediate demand of finance, in addition it also provides an alternative source of livelihood to the farmers throughout the year. Goats in India are also known as poor man's cow because goat rearing is a great economic support to a large section of population in rural areas. India is a rich repository of goat genetic resources in the form of 28 well defined breeds" [3].

"At farmer level to obtain the maximum production, animals should be scientifically managed for feeding and breeding. Productive and reproductive traits are the most important traits in all animal production systems and reproductive efficiency is the most important factor affecting production rate and profit in livestock sector" [4]. "Thus, efforts should be made to improve these traits for efficient goat production, which are further influenced by genetic, environmental, and managemental factors. Any deficiency of nutrients affecting the production and reproduction of the animal are well appeared blood biochemical profile. Due to the limited

information about the local goat breeds about their blood chemistry, it is essential to conduct such a research especially because local people prefer them more than the commercial breeds. Thus, biochemical profiles are important preliminary step to be determined because they provide valuable information about the breed, sex and health status of the animal" [5]. Thus, keeping these views in mind the research was to observe the managemental practices followed at field level by farmers of Gwalior city of central India and investigation of blood chemistry of indigenous goats as a preliminary study, to assess the nutritional status of the animals.

MATERIAL AND METHODS

A study was conducted in order to analyze goat rearing practices prevailing in the Gwalior City of Central India and to identify the constraints in goat farming through collection of data of ninety six indigenous goats of 2 to 5 age group from thirty respondents from the district was collected. The data pertaining to goat rearing practices being followed and constraints being faced were collected with the help of pre-structured interview schedule after ensuring its reliability and validity.

Blood samples were collected randomly from 24 from goat from selected goat farmers. The animals were restrained and blood samples were collected directly from jugular vein of the Goats under aseptic condition by using 15 gauge in vials uncoated and coated with EDTA vials for blood biochemistry by blood analyser for estimation of blood biochemical constituents. Blood biochemical constituent's viz. blood Glucose, albumin, globulin, total protein, blood urea, SGPT, SGOT, alkaline phosphatase and calcium.

Each selected respondent was interviewed personally according to the prepared questionnaire for the collection of desired information about management, feeding and breeding information followed by the goat farmers of the area was collected and analyzed. The data of ninety six adult female goats (same age group of 2 to 5 years) about method of feeding, concentrate feeding, mineral mixture supplementation, deworming, age at first kidding (days), kidding Interval (days), twinning rate was collected from goat farmers.

RESULT AND DISCUSSION

Management practices and perceived constraints

The information regarding health care practices and nutritional status of the goats (n= 96) opted by the goat farmers of Gwalior city of Central India are depicted in table 1. On the basis of data obtained it was reported that all the goats are reared on extensive system of rearing in which goats are allowed to graze in forest for average 6 to 8 hours a day only and no concentrate is fed to the animal, thus, all goats are solely depends on grazing to fulfill their nutritional demands. It might be due to intensive system of rearing requires initial high cost involvement and lack of knowledge about scientific goat rearing. On the other hand, maximum farmers (90%) of Burdwan district of West Bengal rearing goats in semi intensive system of rearing [6]. While data obtained in present study showed that farmers of the selected area does not fed concentrate to the goats i.e, 0% animal receiving concentrate and 6.25% goats received the mineral mixture, rest 93.75% goats did not receiving any mineral mixture.

As the goats are reared exclusively on extensive system of rearing, chances of parasitic infection are higher but only 18.75% animals were received the drug for control of endoparasites while remaining 81.25% animals were not received any drug for endoparasite control. Similarly, out of 39 goats examined, 23 found positive for helminth infestation in Jaipur District of Rajasthan [7]. "Gastrointestinal parasitism is one of the major threats to small ruminant industry causing production losses and even mortality in severe cases" [8]. "Parasitic infestation is responsible to affect the growth, body weight, yield and reproductive performance of animal leading to economic loss of the farmer" [9]. "In sub-clinical cases also parasites continuously sucks host blood resulting in anemia, hypoproteinemia and lower blood glucose" [10].

In present study, all goats (100%) are not receiving any supplement ration or special feeding as per demand in pregnancy to meet the demand of growing foetus. All of the goat farmers kept pregnant and non pregnant animals together it might be due to either lack of knowledge about the isolation of pregnant does from others in the herd or may be due to less availability of space.

The findings presented in Table 1 revealed that, majority of goats showed history of foot and mouth disease (FMD), mastitis, metritis, prolapsed, dystocia, retained fetal membranes and disease incidence are 77.0%, 42.7 %, 31.25 %, 25.0 %, 21.8 % and 14.5 %, respectively, were reported.

Table 1: Health and nutritional status parameters of Indigenous Goat (*Capra hircus*)

S.No.	**Parameters**		**Mean**
1	Type of rearing	Intensive	0
		Semi intensive	0
		Extensive	96 (100%)
2	Concentrate feeding	Yes	0
		No	96 (100%)
3	Special feeding of pregnant goat	Yes	0

		No	96 (100%)
4	Segregation of pregnant doe from others	Yes	12 (12.5%)
		No	84 (87.5%)
5	Feeding of mineral mixture	Yes	6 (6.25%)
		No	90 (93.75%)
6	Drugs used to control endoparasites	Yes	18 (18.75%)
		No	78 (81.25%)
7	The disease incidence in buffaloes	FMD	74 (77%)
		Mastitis	41 (42.7%)
		Metritis	30 (31.25%)
		Prolapse	24 (25.0%)
		Dystocia	21 (21.8%)
		ROP	14 (14.5%)
6	Age at first kidding (days)		654 ± 94.4
7	Kidding Interval (days)		391± 31.5
8	Twinning rate		1.1±0.1

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107 On the basis of data obtained it was reported that overall means for age at first kidding,
108 kidding Interval and twinning rate are 654 ± 94.4 days, 391.2 ± 31.5 days, 1.1± 0.1, respectively.
109 This variation might be attributed to different plan of nutrition as well as reproductive health.

110 Similarly, majority of respondents (64.67%) received 2 kids per birth, maximum number
111 of goat farmers (64.67%) pointed out that kidding interval was 8-10 months, whereas 23.33 per
112 cent raisers noticed kidding interval above 10 months in black bengal goat rearing in Burdwan
113 district of West Bengal,. In addition 57.33% farmers in the district area vaccinated their goats
114 against major diseases like Goat pox, PPR and FMD [6].

115 On the basis of data obtained in present study, it is found that indigenous goats showed
116 higher age at first kidding, kidding interval and low twinning rate. It might be due to absence of
117 concentrate and mineral mixture in feeding of goats along with no timely deworming of the
118 animal. Similarly, production performance of Jakharan goats in its home tract in District Alwar

of Rajasthan and reported average age at first kidding, kidding interval and twinning rate were 561.24 ± 9.83 days, 287.78 ± 9.89 days, and 1.54 ± 0.16 days in semi-intensive, and 632.3 ± 7.83 days, 332.86 ± 9.34 days and 1.32 ± 0.16 in extensive system of management respectively [11].

Patel and Pandey (2013) [12] also found age at first kidding (days), kidding Interval (days) 364.40± 4.32 and 716.52 ± 19.01 respectively in Mehsana goats. Similarly, the overall least squares means of age at first conception, age at first kidding, kidding interval, service period, gestation period and dry period were 513.20±20.94, 657.20±20.48, 292.03±4.14, 142.17±4.18, 149.95±0.07 and 144.00±4.09 days, respectively in Sirohi goats of Udaipur city of India [13]. Arun *et al*. (2006) [14], however, reported age at first kidding of 698.41 ± 1.49 days in Kutchi goats. The average at first kidding obtained in the present finding was in agreement to the findings of Acharya (1992) [15].

On the basis of information obtained from present study it was revealed that, most important constraints in the goat rearing practices-

1. Lack of pure breed buck (due to higher cost of castrated buck in market),
2. High incidence of diseases(due to lack of proper vaccination),
3. Improper feeding and management practices involves lack of mineral mixture feeding and timely deworming and vaccination),
4. Problem of lack of capital to start goat farm and
5. Lack of knowledge about scientific goat rearing.
6. Improper feeding management involves lack of mineral mixture and concentrate supplementation as per the requirement of different physiological stages along with timely deworming. Similar observations were also reported by Singh *et al*. (2008)

[16], Guljar and Pathodiya (2008) [17] in Rajasthan and by Meganathan *et al*. (2010) [18] in Tamil Nadu.

Estimation of blood biochemical parameters of the indigenous goats

The blood biochemical values of indigenous goats reared under extensive system of rearing are presented in table 2. The overall mean of values showed the lower values of serum calcium and total protein levels, while, higher overall mean values of blood urea nitrogen (BUN), alkaline phosphatase, SGOT, SGPT levels were found.

Table 2: Values of blood parameters of Indigenous Goat (*Capra hircus*)

S. No.	Parameters	Mean value	Normal value*
1	Glucose (mg/dl)	51.0± 9.0	50-75
3	Serum Ca (mg/dl)	8.1± 0.97	8.9–11.7
4	Total protein (g/dl)	5.0±0.62	6.4–7.0
5	Albumin (g/dl)	3.0± 0.26	2.7–3.9
6	Globulin (g/dl)	2.0± 0.68	2.7–4.1
7	A:G ratio	1.8± 0.77	-
8	T Bilirubin (mg/dl)	0.9± 0.09	-
9	Bilirubin direct (mg/dl)	0.3±0.08	-
10	Bilirubin indirect (mg/dl)	0.6±0.14	-
11	Alkaline phosphatase (IU/L)	121.9±7.81	93–387
12	SGOT (U/L)	67.3±12.00	167–513
13	SGPT (U/L)	82.6±12.81	6–19
14	Blood urea (mg/dl)	31.1± 4.78	10–20

* Whitbread, T. J. (2017) Clinical Biochemistry MSD Veterinary manual [19].

Blood biochemical profile can be used to evaluate the health, nutritional and physiological status of the goats. The glucose level is found within the normal range (51.0± 9.0 mg/dl). Blood glucose is one of the key nutrients affecting production and reproduction in farm

154 animals and a minimum level of 40-60 mg/dl is required to maintain the physiological processes
155 of the body [20]. Low blood glucose may cause infertility. The blood glucose can be used as
156 indices of nutritional status during pregnancy in goats [21].

157 Proteins are the building blocks of all cells and body tissues. They act as transport
158 substances of hormones, vitamins, minerals, lipids and other materials. Thus, protein act as
159 working horses of the cell [22]. Baumgartner and Pernthaner (1994) [23] observed no effect of
160 physiological stage on total protein. The total protein (g/L), albumin (g/L), urea (mg/dl), ALT
161 (U/L), AST (U/L) in black bengal goats are 69.9 ± 1.03, 43.01 ± 0.75, 23.90 ± 0.89, 26.15 ±
162 1.72, 59.8 ± 2, respectively, while, values for Jamnapari goats are 78.53 ± 2.05, 47.36 ± 1.35,
163 35.85 ± 1.47, 17.33 ± 0.69, 47.16 ± 1.05, respectively [24].

164 Urea is made in the liver and passed out from the body in the urine. A blood urea
165 nitrogen test is done to assess the function of kidneys. If kidneys are not able to remove urea
166 from the blood normally, then BUN level rises. Alanine Aminotransferase (ALT or SGPT), is an
167 enzyme found in many tissues, but the highest levels are found in liver and kidney tissues. Serum
168 ALT has been recognized as a marker of hepatocellular injuiry since the 1950s [25]. Aspartate
169 aminotransferase (AST or SGOT) is an enzyme involved in amino acid metabolism. Increased
170 serum AST activity is observed with both reversible and irreversible injury to hepatocytes and
171 can be seen following hepatocellular injury and cholestasis, similar to serum ALT activity in
172 dogs, swine, cats and goats.

173 The diagnostic sensitivity of serum AST activity in animals has been reported as 72% for
174 hepatic necrosis and 100% for hepatic lipidosis [26]. In West African dwarf goat mean value of

AST reported as 20.9 ± 1.2 U/L [27], while AST in wild goats reported as 235.3 ± 212.4 U/L [28].

Alkaline phosphatase enzyme is involved in energy transfer reactions its utility in growth has been established. The plasma alkaline phosphatase activity in healthy goats was found to be 432.78 ± 20.00 IU/L [29]. Bhooshan *et al* (2010) [30] found alkaline phosphatase in Barbari and Jamunapari goats irrespective of age and season of birth were 44.62±1.30 and 35.49±1.53 KA units respectively. In local Israeli goats [31] and in Black Bengal goats [32], alkaline phosphatase decreased with increase in age.

In present study the mean value of serum calcium (mg/dl) was found to be 8.1± 0.97, which is towards the lower side of normal range. Calcium is necessary for milk production, muscle contraction, nerve conduction and blood clotting. Milk is relatively high in calcium, and lactating goats need adequate levels of calcium for milk production. Serum calcium has a critical role in the metabolism of the body including the cells of reproductive system. An excess of calcium can cause abnormal bone growth [33]. Similarly, in smallholder cattle production feed shortages in the dry season, diseases and parasites were major challenges that affected the production and reproduction performance of smallholder cattle production [34].

The feed and feeding strategies in goat rearing have significant impact on the quality and nutritional value of the meat. Therefore, it is important for producers to carefully manage feeding practices to ensure that their goats produce high quality meat [35].

Conclusion

It is concluded that goats are reared on extensive system in Gwalior city of Central India, lack of scientific feeding and management practices causing lower total protein and calcium

level and higher levels of blood urea and SGPT levels in blood and poor reproductive performance (higher age at first kidding and kidding interval and low twinning rate), thus, causing economic losses to the farmers.

Author contribution

All the authors confirm the concept, design, data collection and analysis and interpretation, and writing are our own. We confirm there are no other contributors.

Declaration of competing interest

We have read and understood the policy on declaration of interests and have no relevant interests to declare.

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