

EVALUATION OF PHYSIOLOGICAL, HAEMATOLOGICAL AND ETHOLOGICAL CHARACTERISTICS OF MITHUNS

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ABSTRACT

The study was carried on 20 Mithuns (3-5 years of age), irrespective of sex, 5 from each strain collected from the States of Arunachal Pradesh (AR), Mizoram (MZ), Manipur (MN) and Nagaland (NL) at NRC on Mithun, Medziphema, Nagaland. The values for physiological characteristics viz. body temperature, rumen movement, heart rate and respiration rate did not vary in four strains of mithun. The values of packed cell volume (PCV), haemoglobin (Hb), white blood cell (WBC), mean corpuscular volume (MCV) and mean cell haemoglobin concentration (MCHC) did not vary in the four strains. The value of red blood cell (RBC) was significantly ($P < 0.01$) higher in MZ and the lowest in MN strains while the values for MCH were significantly ($P < 0.01$) higher in MN and lowest in MZ strains. The values for average grazing time (GT), rate of grazing (GR), grazing intake (GI) and grazing cycle (GC) did not vary irrespective of strains of mithun. The average values for time spent in mastication in minutes (TMC) was significantly ($P < 0.05$) higher in MZ strain of mithun followed by MN, NL and the least in AR strain; however, the values did not vary between MN and NL strains. The average values for mastication rate as jaw movement/ minute (MR) was significantly ($P < 0.05$) higher in MZ strain of mithun followed by NL, MN and the least in AR strain; however, the values did not vary among MZ, NL and MN strains. The values for average eating speed of concentrate in second/kg (ECS) did not vary irrespective of strains of mithun. The average values for different drinking behaviour viz. time spent in drinking (TD), numbers of drinks (ND), drinking speed (DS) and numbers of sucking (NS) did not vary irrespective of strains of mithun. The average values for resting behaviour in terms of time spent in lying down (TLD), loafing (TLO), idling (TID), rumination (TR), number of rumination period (NRP), bites per bolus (BB), number of boluses (NB), boluses per rumination (BR) and rumination speed (RS) did not vary irrespective of strains of mithun.

From the study, it can be concluded that Mithuns have almost similar physiological and ethological characteristics irrespective of different four strains. However, such study may be repeated with large sized samples keeping the present investigation as a base-line work.

Key words: Haemoglobin, Loafing, Mastication, Rumen movement, Rumination and Boluses.

Mithuns (*Bos frontalis*) are important component of hill ecosystem and considered to be the animals of special significance by the people of North Eastern Hill Region (NEHR) of India. The animal is a symbol of peace and harmony among the tribal people. Mithuns are found in a wide range of altitudes varying from 300 m to 3000 m above mean sea level, comparatively in high rainfall and low sunshine

areas. The temperature in mithun populated areas ranges from 1.8°C to 34°C at different seasons and the animal adapts well to these variations of temperatures¹. It also adjusts well to hilly areas with different degree of slopes. The animal can climb well on sloppy, steep mountains and thrives well on fodders and grasses and utilizes the coarse fodders which are not generally consumed by other species of livestock. Due to various biotic and abiotic stresses, the animal has become very vulnerable and had resulted in inbreeding depression and low

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disease resistance¹. Further, under the intellectual property right, emphasis had to be laid to conserve the available breeds of mithun after documenting their genotypic and phenotypic characteristics. The present study was, therefore, postulated with aim to assess the physiological, haematological and ethological characteristics of four different strains of mithun available in North – East Region under uniform environmental set up in Nagaland.

MATERIALS AND METHODS

The present study was carried out on 20 Mithuns (3-5 years of age), irrespective of sex, 5 from each strain collected from the States of Arunachal Pradesh (AR), Mizoram (MZ), Manipur (MN) and Nagaland (NL) at National Research Center on Mithun, Jharnapani, Medziphema, Nagaland. The values for physiological characters *viz.* body temperature, respiration rate, heart beat rate and rumen movement were measured by following standard methods.

Physiological parameters

The physiological parameters included in the study were: body temperature, respiration rate, heart beat rate and rumen movement. These were measured by following standard methods and observations were recorded for a continuous period of twelve hours (from 5 am to 5 pm) at three hours intervals over six months. The measurements were repeated at monthly interval.

Hematological study

The blood samples were collected under aseptic condition from the jugular vein into heparinized tube. The haemoglobin (Hb), pack cell volume (PCV), red blood cell (RBC) and white blood cell (WBC) were determined as per protocol⁵. The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC) concentration were determined using appropriate formulae⁴.

Behavioral studies

The study was lasted for a period of 6 months (January to June). The animals were offered with concentrate mixture (15 % DCP, 72 % TDN) along

with a regular daily allowance of forest grazing. The behavioral parameters were recorded for a continuous period of twelve hours (from 5 am to 5 pm) over six months at fortnightly intervals. The behavioral parameters under study were grazing behaviour, feeding behaviour, drinking behaviour and resting behaviour with related activities of behaviour. These parameters were studied following conventional methods usually applied in case of cattle^{6,7} and expressed in terms of usual units.

Grazing behaviour

Out of the four groups of Mithun, the behavioural patterns of grazing were studied in three groups (AR, NL and MN) only. While studying the grazing behaviour, the followings were recorded and accordingly expressed:

1. GT = Grazing time (min)
2. GR = Rate of grazing (bites/min)
3. GI = Fresh herbage intake or Grazing intake (% body weight)
4. GC = Grazing cycle (numbers)

Feeding behaviour

For recording feeding behaviour, the four groups of Mithun namely AR, NL, MN and MZ were keenly observed and time taken for various behavioural activities was noted. The parameters studies are listed below:

1. TMC = Time spent in mastication (min)
2. MR = Mastication rate (jaw movement/ min)
3. ECS = Eating speed of concentrate (sec/kg)

Drinking behaviour

To generate the data on various behavioural activities of drinking, the four groups of Mithun were subjected to close observations for a period of 12 hours. The activities of this parameter those have been studied are given below:

1. TD = Time spent in drinking (min)
2. ND = Number of drinks in 12 hours
3. DS = Drinking speed (litres/sec)
4. NS = Number of sucking /min

Resting behaviour

The resting behaviour pattern had been quantified on AR, NL, MN and MZ Mithuns under nine different activities. The procedure followed was as per the conventional method in cattle. Time spent on resting actually included loafing, idling and rumination times. The nine different activities recorded were shown below:

1. TLD = Time spent in lying down (min)
2. TLO = Time spent in loafing (min)
3. TID = Time spent in idling (min)
4. TR = Time spent in rumination (min)
5. NRP = Number of rumination period
6. BB = Number of bites/ bolus
7. NB = Number of boluses
8. BR = Number of boluses/ rumination
9. RS = Rumination speed

Statistical analysis

All the parameters were measured and recorded the following standard procedure¹⁰.

RESULTS AND DISCUSSION

The average values for physiological characteristics had been presented in Table 1. The values of body temperature ranges between 100.36 - 102.26°F; rumen movement between 8.8 - 9.6 per five minutes; heart rate between 71.4 - 73.8 per minute and respiration rate between 25.2 - 30.6 per minute in four strains of mithun; however, these physiological characteristics did not vary significantly. The body temperature, rumen movement, heart rate and respiration rate are excellent indicators of health status and the values on these characteristics being within the normal limits among all the strains of mithun were well corroborated with the results of other workers for other domestic ruminants¹¹.

The average values for haematological parameters had been presented in Table 2. The values of PCV ranges between 29.0 to 40.6 per cent; Hb between 7.57 to 10.71 g/dl; WBC between

7.04 to 10.15 per μ l; MCV between 44.95 to 66.08 fl (femto litre) and MCHC between 22.98 to 28.71 per cent in the four strains of mithun. However, the values did not vary significantly in the four strains of mithun. The results in the present study were in close agreement with the observations of other workers⁹. The mean value of RBC was significantly ($P < 0.01$) higher (9.024 μ l) in MZ strain followed by AR (6.612), NL (3.76) and the least in MN (3.712 per μ l) strain of mithun; however, there was non significant variation between NL and MN strains of mithun. The results on RBC were well corroborated with the findings of other workers⁹ who had reported the RBC value of 4.70 million/ mm^3 ; however, variations in the value of RBC might be due to variations in the altitudes from where the strains of mithun procured for study. The mean value of MCH was significantly ($P < 0.01$) higher (22.50) in MN strain followed by NL (20.02), AR (16.48) and the least in MZ (10.31 pg) strain of mithun; however, there was no significant difference between MN and NL and between NL and AR strains of mithun.

The average values for grazing behaviour had been presented in Table 3. The values of average grazing time (GT) ranged between 251.00 to 346.67 minutes; rate of grazing (GR) ranged between 56.66 to 69.91 bites per minute; grazing intake (GI) ranged between 3.73 to 4.74 per cent of body weight and the number of grazing cycle (GC) were ranging between 3.67 to 4.67 irrespective of strains of mithun. The results obtained in the present study were well corroborated with the findings of few workers² for cattle and buffaloes.

The average values for feeding behaviour had been presented in Table 4. The values of average time spent in mastication (TMC) ranged between 54.50 to 63.00 minutes; mastication rate/ jaw movement (MR) ranged between 75.15 to 95.20 per minute and eating speed of concentrate (ESC) ranged between 583.00 to 651.50 second per kg of concentrate in the four strains of mithun. The values on feeding behaviour did not differ significantly. The results obtained in the present study were in close agreement with the observations of other worker³ reported for cattle and buffaloes.

The average values for drinking behaviour had been presented in Table 5. The average time spent in drinking (TD) ranged between 5.25 to 6.25 minutes; the number of drinking (ND) ranged between 2.00 to 2.50 per twelve hours; drinking speed (DS) ranged between 4.25 to 6.57 sec/litre and numbers of sucking (NS) ranged between 38.15 to 42.86 per minute in the four strains of mithun. The values on drinking behaviour did not differ significantly. The results obtained in the present study were well corroborated with the findings of other workers⁸.

The average values for resting behaviour had been presented in Table 6. The average time spent in lying down (TLD) ranged between 37.0 to 44.8 minutes; time spent in loafing (TLO) ranged between 164.0 to 182.0 minutes; time spent in idling (TID)

ranged between 133.0 to 142.8 minutes; time spent in rumination (TR) ranged between 109.0 to 115.3 minutes; number of rumination period (NRP) ranged between 3.25 to 4.25; the number of bites per bolus (BB) ranged between 27.6 to 36.2; the number of boluses (NB) ranged between 204.5 to 229.5; the number of boluses per rumination ranged between 44.1 to 68.5 and rumination speed (RS) ranged between 31.3 to 39.3 bolus per second in the four strains of mithun. The values on resting behaviour did not differ significantly.

From the study, it can be concluded that Mithuns have almost similar physiological, haematological and ethological traits irrespective of four different strains of mithun.

Table 1. Physiological parameters in four strains of mithun

Strains	BT (°F)	RM / 5 min	HR / min	RR / min
AR	100.36 ± 0.818	9.4 ± 0.748	71.4 ± 0.600	27.8 ± 1.800
MZ	102.26 ± 0.876	8.8 ± 0.663	73.8 ± 0.969	30.6 ± 2.379
MN	100.50 ± 0.866	9.6 ± 0.509	73.6 ± 1.122	25.2 ± 1.200
NL	100.50 ± 0.707	9.2 ± 0.800	73.4 ± 0.812	27.2 ± 1.392

Note: AR: Arunachali; NL: Nagaland; MN: Manipuri and MZ: Mizoram. BT: body temperature; RM: respiration rate; HR: heart beat rate and RR: rumen movement.

Table 2. Haematological parameters in four strains of mithun

Strains	PCV (%)	Hb (g/dl)	WBC (µl)	RBC (µl)	MCV (fl)	MCH (pg)	MCHC (%)
AR	37.8 ± 2.67	10.71 ± 0.39	10.15 ± 1.24	6.612 b ± 0.65	57.94 ± 3.40	16.48 b ± 0.99	28.71 ± 1.55
MZ	40.6 ± 4.08	9.13 ± 0.69	7.04 ± 0.38	9.024 c ± 0.82	44.95 ± 2.06	10.31 a ± 0.93	22.98 ± 1.86
MN	29.0 ± 3.56	8.09 ± 0.78	9.07 ± 1.43	3.712 a ± 0.44	59.78 ± 13.40	22.50 c ± 2.50	28.41 ± 1.87
NL	31.0 ± 3.66	7.57 ± 1.12	9.42 ± 1.62	3.760 a ± 0.53	66.08 ± 14.83	20.02 b c ± 0.51	24.23 ± 2.53

^{a, b, c} Means bearing different superscripts in a column differ significantly (P <0.01).

Note: AR: Arunachali; NL: Nagaland; MN: Manipuri and MZ: Mizoram. PCV: pack cell volume; Hb: haemoglobin; WBC: white blood cell; RBC: red blood cell; MCV: mean corpuscular volume; MCH: mean corpuscular haemoglobin and MCHC: mean cell haemoglobin concentration

Table 3. Grazing behaviour in three strains of mithun

Parameters	Strains of mithun		
	AR	NL	MN
GT	346.67 ± 14.62	297.27 ± 92.44	251.00 ± 45.79
GR	68.50 ± 2.15	69.91 ± 2.32	56.66 ± 6.28
GI	4.74 ± 0.59	3.86 ± 3.60	3.73 ± 1.00
GC	4.33 ± 0.33	± 0.33	3.67 ± 0.33

Note: AR: Arunachali; NL: Nagaland and MN: Manipuri. GT: grazing time (min); GR: rate of grazing (bites/min); GI: grazing intake (% body weight) and GC: grazing cycle (numbers)

Table 4. Feeding behaviour in mithun

Parameters	Strains of mithun			
	AR	NL	MN	MZ
TMC	54.50 ^a ± 0.64	62.50 ^b ± 6.14	58.00 ^b ± 3.90	63.00 ^c ± 3.02
MR	75.15 ^a ± 3.32	94.70 ^b ± 2.16	94.45 ^b ± 1.56	95.20 ^b ± 1.98
ESC	599.50 ± 17.96	583.00 ± 156.00	603.00 ± 194.06	651.50 ± 74.10

^{a, b, c} Means bearing different superscripts in a row differ significantly (P < 0.05).

Note: AR: Arunachali; NL: Nagaland and MN: Manipuri and MZ: Mizoram. TMC: time spent in mastication (min); MR: mastication rate (jaw movement/ min) and ECS: eating speed of concentrate (sec/kg).

Table 5. Drinking behaviour in four strains of mithun

Parameter	Strains of mithun			
	AR	NL	MN	MZ
TD	6.25 ± 0.63	5.75 ± 0.25	5.25 ± 0.25	5.25 ± 0.25
ND	2.00 ± 0.00	2.50 ± 0.28	2.00 ± 0.00	2.25 ± 0.25
DS	5.00 ± 0.41	4.25 ± 0.25	5.00 ± 0.41	6.57 ± 1.31
NS	42.86 ± 3.91	41.02 ± 3.15	38.15 ± 0.56	39.94 ± 2.11

Note: AR: Arunachali; NL: Nagaland; MN: Manipuri and MZ: Mizoram. TD: time spent in drinking (min); ND: number of drinks in 12 hours; DS; drinking speed (litres/sec) and NS: number of sucking /min

Table 6. Resting behaviour in four strains of mithun

Parameters	Strains of mithun			
	AR	NL	MN	MZ
TLD	41.8 ± 12.9	43.5 ± 10.5	37.0 ± 5.5	44.8 ± 8.9
TLO	172.0 ± 10.9	164.0 ± 45.3	167.5 ± 31.9	182.0 ± 17.2
TID	142.8 ± 21.5	138.00 ± 11.0	142.3 ± 17.7	133.0 ± 33.0
TR	109.0 ± 15.3	109.5 ± 1.9	110.5 ± 19.8	115.3 ± 26.2
NRP	3.25 ± 0.5	3.75 ± 0.3	4.25 ± 0.5	4.25 ± 0.5
BB	27.6 ± 1.5	35.4 ± 3.3	35.3 ± 1.9	36.2 ± 2.1
NB	210.0 ± 42.1	204.5 ± 9.7	219.8 ± 34.1	229.5 ± 30.7
BR	68.5 ± 17.4	47.3 ± 4.7	44.1 ± 6.7	51.6 ± 6.1
RS	31.3 ± 1.6	39.2 ± 2.6	38.3 ± 2.4	39.3 ± 3.7

Note: AR: Arunachali; NL: Nagaland; MN: Manipuri and MZ: Mizoram. TLD: time spent in lying down (min); TLO: time spent in loafing (min); TID: time spent in idling (min); TR: time spent in rumination (min); NRP: number of rumination period; BB: number of bites/ bolus; NB: number of boluses; BR: number of boluses/ rumination and RS: rumination speed

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