Original Research Article

Influence of Seasonal Variation on Biochemical Parameters in Murrah Buffalo

ABSTRACT

The examination was carried out to study the effect of hot-humid and cold seasons on biochemical parameters in adult female Murrah buffalo (N=10). The blood samples were collected aseptically from jugular vein and serum was separated from each blood sample. All biochemical parameters i.e. serum metabolites including renal function tests were determined by automated blood biochemistry analyzer (Turbochem100). A highly significant ($P \leq 0.01$) effect of hot-humid and cold season was observed on the mean±SE values of Cholesterol, Uric acid and Urea whereas a non-significant ($P > 0.05$) effect was observed on Creatinine and Total Bilirubin concentration.

Comment [S1]: Need to elaborate. Abstract must be comprehensive include purpose, materials & methods, results, conclusions.

Keywords: Murrah buffalo, Biochemical, Creatinine, Uric acid, Urea,Cholesterol,Bilirubin

INTRODUCTION

Comment [S2]: Need major improvements

Buffalo plays an important role in the agricultural economy in numerous developing countries, providing draught power, meat and milk. Of all the domestic animals, the Asian buffaloes hold the greatest promise and potential for production. The Murrah Buffalo (Bubalus bubalis) is a domestic breed of Water buffalo, kept for dairy production. Murrah breed of buffaloes have a massive body, comparatively long neck and head, short and tightly curved horns, well developed udder, broad hips and drooping fore and hind quarters. The tail is long reaching up to the fetlocks. The body color is usually jet black with occasionally found white markings on tail, face and extremities.

Comment [S3]: Make it italic

Comment [S4]: Check grammar

Murrah breed has beaten the best dairy cows of the world in performance. Since, it has been a known fact that a portion of the metabolizable energy used for production is diverted to assure thermal balance under uncomfortable environmental conditions, particularly beyond an animal's thermo-neutral zone. Therefore, under environmental stress, productivity is reduced. Both heat and cold stress affect the productivity in cows as well as buffaloes, but very little information is available about physiological response of these animals to extreme seasonal conditions. The alteration of haemato-biochemical parameters is major marker for physiological and pathological states of the animal [1,2].Summer and winter stress causes rigorous changes in the blood biochemical and hormonal concentration and thereby reducing the production performance of the animals [3].

Comment [S5]: Add references

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Comment [S7]: Cow?

MATERIALS AND METHODS

Experimental animals and their feeding and management: Ten adult apparently healthy females of Murrah breed of buffalo (above three years of age, weighing about 300-350 Kg) were included in our study, reared at Livestock farm complex (LFC) Buffalo farm at Post Graduate Institute of Veterinary Education and Research, (P.G.I.V.E.R.), Jaipur (Rajasthan). It is a hot semi-arid zone of northern India, located at 26.9° N and 75.8° E, 1417 feet above the sea level. The experimental animals were maintained under uniform manage mental farm practices. They were housed in clean and well-ventilated sheds. Green fodder (Berseem/Lucerne and Oat as per availability due to season) was provided in the shed along with concentrate mixture @ 5 kg per animal per day.

Collection, processing and preservation of samples: Blood samples of adult female Murrah buffalo were collected during the hot-humid and cold season from the same animals (N=10). Blood sample from each animal was taken on any single day of the month/season, to estimate the biochemical parameters in Murrah buffalo under seasonal variation. Blood samples (5 ml each) were collected aseptically from jugular vein with least stress to animals, directly into the Non-EDTA vials in order to analyze different biochemical parameters. Non-EDTA vials were kept undisturbed for 15–30 minutes in slanting position at 45˚ angles at room temperature allowing the blood to clot and removed the clot by centrifuging at 2500–3000 RPM for 15 minute. The resulting supernatant (serum) was harvested and used for estimation of serum metabolites including renal function tests and minerals. The serum (Biochemical) samples were stored at -20°C temperature up to the performance of the assay.

Details of analytical procedures: The present investigation was carried out at Department of Veterinary Physiology and Biochemistry, Post Graduate Institute of Veterinary Education and Research (P.G.I.V.E.R.), Jaipur. Analytical procedure is presented in following sub-head:

Biochemical Studies: The blood biochemical parameters were estimated from serum which was stored in deep freezer (-20°C). The kidney function tests (urea, uric acid and creatinine) and metabolites (bilirubin and cholesterol) were estimated by using automated TurboChem 100 blood biochemistry analyzer by using Jeva Diagnostic Kits in the Department of Veterinary Physiology and Biochemistry, P.G.I.V.E.R., Jaipur.

Statistical Analysis- The results were presented as mean±SE. The data was analyzed statistically as perSnedecor and Cochran using t-test: Paired to Samples for Means and results were interpreted [4].

RESULTS AND DISCUSSIONS

Renal function test and Serum metabolites: The mean±SE values of serum creatinine, uric acid and urea during hot humid and cold season are presented in table 1.

Comment [S8]: Check grammar

Comment [S9]: Correct the sentence

Comment [S10]: Hot season and cold season? Please mention season name properly, month, duration of study.

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Comment [S12]: Please stop repeating word Murrah

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Serum Creatinine

The mean±SE values of serum creatinine (mg/dl) in hot-humid and cold season were interpreted as 1.73±0.12 and 1.91±0.11, respectively. The mean±SE value of serum creatinine was non-significantly (P>0.05) higher in cold season as compared to hot-humid.

Comment [S15]: Don't repeat the table values.

Similar findings to the present study were suggested AL-Saeed et al.[5]who noticed significantly (P<0.01) higher values during the winter season as compared to summer season in local cattle. Ghosh et al.[6]also reported the same results in goat.

Comment [S16]: Goat?

Present results were contrary to the findings of Dar et al.[7]who reported that serum creatinine levels were significantly higher during summer season in Badri cattle. Mazzullo et al.[8] revealed that the levels of creatinine were increased in summer season along with increased renal activity and increased protein catabolism as compared to cold season in cow. Pandey et al.[9] in Marwari goat, Rathwaet al.[10] in Indigenous sheep and Bargaaet al.[11]in Moroccan camel observed the similar results.

Increased serum creatinine values in cold season could be due to increased metabolic activity in liver and muscles due to heat stress. Stimulated creatinine metabolism in liver could result in higher creatinine formation.

Comment [S17]: References?

SerumUric acid

Themean±SEvaluesofserumuric acid(mg/dl)inhot-humidand coldseason were measured as 0.78±0.16 and 18.02±0.68, respectively. The mean±SEvalue of serum uric acid was highly significantly (P≤0.01) higher in cold season ascomparedto hot-humidseason.

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The result of the present study regarding higher serum Uric acid during winter season cannot be compared with the result of the other scientist because no literature is available with this regard.

Present results were contrary to the findings of Giri et al.[12]who reported higher uric acid during summer season than winter season in dairy cows. Rathwaet al.[10] in Indigenous sheep also reported the same.

Heat stress may cause peripheral vasodilation to lose body heat and reduce the blood flow to the internal organs that result in reduced blood flow to the kidney. In addition to that, dehydration may also cause reduced blood flow to kidney as hot environment cause dehydration in animals. So, the reduced blood flow to kidney may lead less urine formation and thereby less excretion of uric acid. Higher serum uric acid levels may also be associated with inefficient rumen ammonia incorporation in to microbial protein or hepatic deamination of amino acids, mobilized from skeletal muscle.

Comment [S19]: References?

Serum Urea

The mean±SE values of serum urea (mg/dl) in hot-humid and cold season were recorded as 13.40±3.27 and 49.28±7.31, respectively. The mean±SE value of serum urea was

Comment [S20]: Don't repeat the table values.

significantly (P≤0.01) increased in cold season as compared to hot- humid season.

Similar findings to the present study were observed by Abdou et al.[13] who reported significantly (P<0.05) higher values during winter season compared to summer season in postpartum period in newly parturition female buffaloes. Giri et al.[12] observed the higher BUN values during winter season as compared to summer season in dairy cows. Shrikhande etal.[14] in cattle also observed the same results.

Present results were contrary to the findings of Dar et al.[7] who reported that the blood urea levels were significantly (P<0.05) higher during summer season as compared to cold season in Badri cattle. Chandrashekhar et al.[15], Rasooli et al.[16] and Mazzullo et al.[8] in cattle, Urwatet al.[17] in goats.Bargaaetal.[11] incamelandRathwaetal.[10] inIndigenoussheepreported similarresults.

This may be attributed to the decrease in ruminal ammonia-nitrogen which iscompensated by the more absorption of urea nitrogen by rumen causing the decreaseofbloodurea andtheincrease ofurinary nitrogen excretion. Transportof ureaoccurs by simple diffusion, but is highly variable. A significant increase of ureainflux is caused by the fermentation products $CO_2$and short-chain fatty acids. Highmetabolicandimmuneparametersarenotedduringwinterwhichsuggestsanadaptive significance in buffalo against ecological stress and pathogenic invasion.Higher serum urea noticed the increased activity of hepatocytes as a result of stressdue to extreme seasons which could influencethe ureacycle.

Comment [S21]: References?

Table 1: Effect of Hot-humid and cold season on Mean±SE values of Serum Creatinine, Uric Acid and Urea in Murrah buffalo (N=10)

Parameter	Season	Mean±SE	Observation
Creatinine(mg/dl)	Hot-humid	1.73±0.12	NS
	Cold	1.91±0.11	
UricAcid(mg/dl)	Hot-humid	0.78±0.16	**
	Cold	18.02±0.68	

Urea(mg/dl)	Hot-humid	13.40±3.27	**
	Cold	49.28±7.31	

N = No. ofAnimals

NS = Non-significant(P>0.05)

** = HighlySignificant (P≤0.01)

* = Significant(P≤0.05)

Themean±SEvaluesofthemetabolitesi.e.serumcholesterolandtotalbilirubinaccordingtotheeffectof hot-humidandcoldseasoninMurrahbuffalohavebeen presented in table 2.

SerumCholesterol

The mean±SE values of serum cholesterol (mg/dl) in hot-humid and coldseasonwereobservedas102.90±6.07and171.53±12.09,respectively.Themean±SEvalue of serum cholesterol was significantly (P≤0.01) increased in cold as comparedtohot-humidseason.

Comment [S22]: Don't repeat the table values.

Similar findings to the present study were observed by Rasooli et al.[16] in cattle, Pandey et al.[9] in Marwari goats, Urwatet al.[17] in Changthangi,Pashmina goats and Rathwaet al.[10] in Indigenous sheep. Dar et al.[7] observed that cholesterol levels were significantly (P<0.05) higher during winterseason as compared to summerseason in Badricattle.

Hozyenet al.[18] found that the serum cholesterol level was significantly(P<0.05)lowerduringsummerandautumnseasonswhencomparedtowinterand spring seasons. The effect of heat stress couldbe related tothe low fertility inbuffalo in the summer season. This variation may be attributed to lower liver activityduring summer period. Decreased blood cholesterol in heat stressed animals wasattributed to decreased thyroid activityresultinginlowermetabolicrate.

Presentresultswerecontrary tothefindingsofBargaaetal.[11] inMoroccancamel.Thehigherlevelsofcirculatingcholesterolduringhot-humidmight support the enhanced cortisol synthesis that occurs during heat stress as thecholesterol actsas aprecursorfor thesynthesisof steroid hormonesinthebody.Thisincrease in circulating cholesterol could also support hepatic gluconeogenesis during adaptivemechanisms.

SerumTotalbilirubin

The mean±SE values of Serum total bilirubin (mg/dl) in hot-humid and coldseason were showed as 0.08±0.06 and 0.11±0.06, respectively. The mean±SE valueof Serumtotal bilirubin was non-significantly (P>0.05) higher incold as comparedtohot-humidseason.

Comment [S23]: Don't repeat the table values.

Similar findingstothepresentstudy wereobservedby AL-Saeedetal.[5] who reported that the

levels of serum bilirubin were significantly (P<0.05)lower in summer season as compared to winter season in local cattle. Mazzullo et al.[8] reported that the total bilirubin levels were lower in summer as compared towinterseason incow.

Present results were contrary to the findings of Dar et al.[7] in Badricattle. Total bilirubin is often increased due to periods of anorexia under heat stressconditions.

Determination of serum total bilirubin is valuable for the diagnosis of fattyliver in animals. Serum bilirubin occurs in the normal catabolic pathway breakinghemeasafateofRBCwhichistheexcretedinbileandurineinhigherconcentrationinblood were indicative of diseases. This variation might be due to different species,environmentaland physiological conditions of the animal.

Table2: EffectofHot-humidand ColdseasononMean±SEvaluesofCholesterolandTotalBilirubin inMurrahbuffalo(N=10).

Parameter	Season	Mean±SE	Observation
Cholesterol(mg/dl)	Hot-humid	102.90±6.07	**
	Cold	171.53±12.09	
TotalBilirubin(mg/dl)	Hot-humid	0.08±0.06	NS
	Cold	0.11±0.06	

N = No. ofAnimals

NS = Non-significant(P>0.05)

** = HighlySignificant (P≤0.01)

* = Significant(P≤0.05)

CONCLUSION:

The buffalo does not adapted to seasonal weather fluctuations in the environment it was found in research. A highly significant effect of hot-humid and cold season was observed on values of Cholesterol, Uric acid and Urea whereas a non-significant effect of season was observed on the Creatinine and Total Bilirubin concentration. It is concluded that seasonal variation also alters various renal functions as Creatinine, Urea and Uric acid are the markers of renal functions.

Comment [S24]: Proper conclusions need to be extracted from the study.

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Comment [S25]: Format as per journal's guidelines

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