Research Paper

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Effect of Dietary Energy Restriction on Blood Parameters of Non Descript Indian Buck at Thermonuetral Environmental Conditions

Veterinary science

KEYWORDS : Nutritional Stress, Blood parameters, Non descript Buck,Concentrate,feedRestriction

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ABSTRACT

The present trial was conducted to evaluate the effect of dietary energy level on the Blood parameters (Hemoglobin, Packed Cell Volume, and Glucose) in non descript Indian buck. The study comprised of eight native breeding bucks of uniform age and body weight which were considered as control animals forthe first 10 weeks and as treatment group for next 10 weeks in order to avoid the individual variations between animals. The control animals were provided with full feeding as per ICAR requirement and the treatment groupwere fed with fifty percentage concentrate restriction. Blood was collected once weekly from both control group and treatment group for estimation of blood parameters.Both PCV and Hb% reduced significantly (P<0.05) in treatment group than control .Serum glucose concentration reduced significantly (P<0.05) in treatment group in 2ndweek, then increased to a significant level (P< 0.05) with control and again reduced significantly from 5thweek onwards. From the study, it can be concluded that even in 50% concentrate restriction, animal can readjust blood parameters as an adaptive mechanism for maintenance of homeostasis.

INTRODUCTION

Small and marginal farmers in Indiamainly depend on goats for income generation and livelihood security.Goat production in India is facing many constraints like non-availability of high-yielding breeding stock, less than optimumnutrition and lack of scientific knowledge for economic livestock production. Hemoglobin, Packed Cell Volume, and Glucose are important blood parameters which are excellent indicators of physiological status of animal and the cardinal signals of metabolic adaptation. In the present era of climate change, goat production is negatively affected by energy deficiency due to scarcity of feed resources. .Goat rearing, an inevitable part of livestock production in India, mainly predominates in semi-arid tropical areas.Performance and genetic improvement in a herd is mainly contributed by male breeding animal (Maurya et al.,2010). To exploit male germ plasm in highly efficient manner, there should be optimum nutritional management. This requires a clear understanding of both the nutrient requirement for production and the mechanisms that partition nutrients between the various competing physiological systems (Sejian et al., 2010; Maurya et al., 2011). It is therefore important to pay attention to the factors which may influence male physiological efficiencies. But the effects of nutrition on animal physiology have been poorly studied in male animal compared to female animal. (Schwalbach et al., 2003). Hence the present study was planned to evaluate the effect of dietary energy restriction(nutritional stress) on the blood parameters ofnon descript Indian buck.

MATERIALS AND METHODS

EXPERIMENTAL DESIGN: This trial was designed for a duration of 20 weeks involving two groups, one control and one treatment group. Both the control and treatment groups consisted of same animals to avoid the individual variation between animals. The eight animals were treated as control group for the first 10 weeks of the study and then as the treatment group for next 10 weeks. Control animals were fed with adequate feeding as per ICAR feeding standard(ICAR, 1985). 50% concentrate is restrictedin treatment group compared with control.The mean temperature and relative humidity were kept constant at the thermoneutral condition inside psychometric chamber in order to reduce and nullify the seasonal effect on animal production.

HEMOGLOBIN ESTIMATION: using Drabkin's method of haemoglobinestimation. Principle: The method depends upon the fact that both hemoglobin and methemoglobin are changed quantitatively to cyanhemoglobin by dilute solutions of potassium cyanide. The color of the latter is a brilliant orange-red and is very suitable for colorimetric comparison. The slow conversion of hemoglobin into cyanhemoglobin is avoided by converting all the hemoglobin present into methemoglobin by the use of a little potassium ferricyanide, and then converting the methemoglobin into cyanhemoglobin.Procedure: Using a pipette, a sample of 20 µl of blood was added to 5ml of Drabkin's solution in a test tube and mixed thoroughly. Approximately 2ml of the resulting solution was placed into a cuvette and the absorbance values were read in a spectrophotometer at 540nm. The haemoglobin concentration of the blood sample can be calculated from a curve prepared from known standards.

PACKED CELL VOLUME: PCV was estimated according to the method using Wintrobe's tube. Principle: The blood cells are forced in to a packed column by the centrifugal force. Heavier red cells settle at the bottom with white cells and platelets forming a layer on RBC column. Procedure: Hematocrit tube was filleed with blood containing anticoagulant upto 100 mark with the aid of a Pasteur pipette. Duplicate samples were used. The tube was then centrifuged at 3000 rpm for 3 minutes. The height of the column of red cells was taken as packed cell volume. PCV was expressed as a percentage of total blood column taken. PCV value was obtained by reading the packed cells volume on the graduated hematocrit tubes.

SERUM GLUCOSE ESTIMATION

Glucose in serum was estimated using KIT method based on GOD-POD (Cogent,clinical chemistry division of SPAN Diagnostic Ltd). Glucose Oxidase oxidizes glucose intoGluconic acid and Hydrogen Peroxide. In presence of enzyme Peroxidase, hydrogenperoxidereleasedis coupled with Phenol and 4-aminoantipyrine to form colored Quinoneimine dye. Absorbance of colored dye is measured at 505 nm and is directly proportional to glucose concentration in the sample.

Statistical Analysis

The statistical significance of differences in means was assessed using SPSS software. Independent T test was used for

assessing the effect of nutritional stress on allometric parameters.

RESULTS AND DISCUSSION

Fig. 1 Mean ± SE of PCV of control and treatment

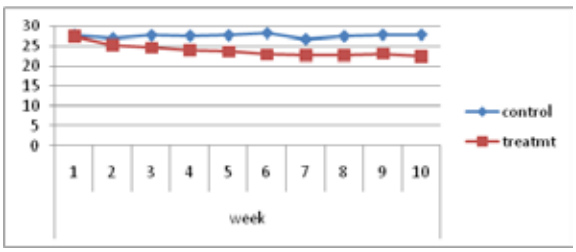


Fig. 2. Mean ± SE of Hb% of control and treatment

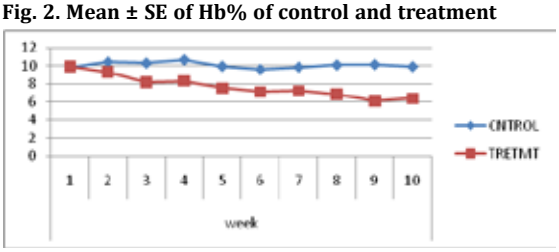
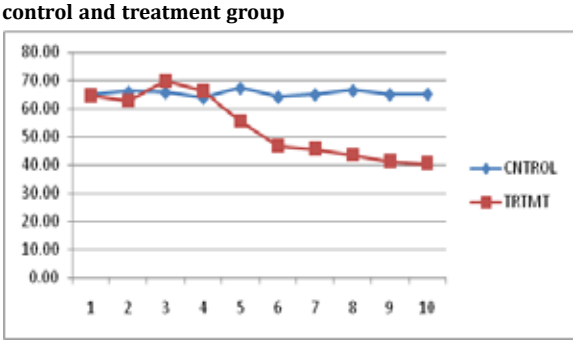


Fig. 3. Mean serum glucose concentration (in mg/dl) of control and treatment group



Mean Packed cell volume (PCV) and haemoglobin % of control and treatment groups are given in fig. 1 and 2 respectively. Both PCV and Hb% reduced significantly (P<0.05) in treatment group than control. Blood glucose concentration of control and treatment groups are given in and fig. 3. Serum glucose concentration reduced significantly (P<0.05) in treatment groupin 2ndweek, then increased to a significant level (P< 0.05) with control and again reduced significantly from 5thweek onwards.

DISCUSSION

Reduction in the hematocrit value and hemoglobin percentage may be attributed to reduced erythropoiesis (Pati and Thapliyal, 1984). Another key factor may be the reduction in substrate for metabolism (mainly glucose) and physiological adaptation by reduced metabolic rate. This affects the pentose phosphate pathway (HMP shunt) resulting in limited production of NADPH which is needed for maintaining glutathione in RBC in its reduced form and thereby preventing oxidative damage of RBC. In nutritional restriction, as the activity or turnover of HMP shunt is low, reduced NADPH (oxidised glutathione) inflicts an oxidative damage to RBC, leading to lysis of RBC membrane, thereby resulting in reduction in PCV and Hb%.

Feed restriction is generally associated with lower plasma insulin concentrations inruminants (Lobley, 1992). It has been observed in our study that in the feed restricted groupblood glucose level was higher on 3rd week (17th day), a phenomenon termed as overcompensation, which might be due to higher concentrations of circulating glucocorticoids,reduction in concentration of insulin, reduction in metabolism and ability of animal to mobilize,distribute and oxidize endogenous lipids (Holecek et al., 2001). Increased concentration ofcirculating glucocorticoids on initial phase of feed restriction switch on a number of physiologicalmechanisms viz., it stimulate gluconeogenesis, enhance action of glucogon and epinephrine onglucose availability, inhibits the effects of insulin and stimulate hepatic glycogenolysis by activating key enzymes like glycogen phosphorylase (Munck et al., 1984). In addition to this, glucocorticoids inhibit the translocation of cytosolic GLUT 4 to cell membrane. This decreases the uptake and utilization of glucose by muscle and adipose tissue. As a result of this cumulative effect, a transient increase in blood glucose level was observed in feed restricted group on the beginning of third week (Mc Donald and Pineda, 2003).

CONCLUSION

Both PCV and Hb% reduced significantly (P<0.05) in treatment group than control.Serum glucose concentration reduced significantly (P<0.05) in treatment group in 2ndweek, then increased to a significant level (P< 0.05) with control and again reduced significantly from 5thweek onwards. From the study, it can be concluded that even in 50% concentrate restriction, animal can readjust blood parameters as an adaptive mechanism for maintenance of homeostasis.

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