Haematological Profile and Growth Performance of Goats under Transportation Stress

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Abstract

Stress in caprine lowers overall growth, performance and induces various haematological alterations. A study was conducted in 24 Osmanabadi goats divided randomly into four groups; negative control (I), positive control (II), treated groups III & IV. Group III was given Restobal liquid@20 ml/animal bid & group IV, Stresomix premix@5gm/day/animal with gur for 10 days. Group II, III, IV were subjected to transportation stress on day 10th. Pre-load and post-load transported goats were weighed to assess the weight loss during the journey and blood samples were collected for haematological evaluation. Administration of both the antistressor, immunomodulator and performance enhancer formulations to goats prior to their transportation was found safe and efficacious as evident by significantly lesser shrinkage of body weight and normalization of physiological and haematological parameters.

Keywords: transportation, stress, goat, polyherbal, weight shrinkage.

Introduction

Stress is a common factor responsible for various physiological and haematological alterations in the body that indirectly insults the immune system through production of reactive oxygen species (ROS) leading to decreased endurance and increased susceptibility to various infections. Stress induced immuno-supression reduces overall productivity, fertility leading to economic losses to the farmers *(Ndazo et al, 2007)*. In animals, stress may be due to overcrowding, production/lactation, weaning, transportation, environmental changes etc. Among these, transportation andenvironmental stress is more common in goats *(Kannan et al, 2000).* Apart from a long distance travelling for grazing, goats are frequently transported to the markets for their sale/purchase which causes enormous stress to them leading to low production. Transportation stress in animals has been scientifically established to produce shrinkage in body weight *(Kannan et al, 2002).* During transportation the physiological alterations primarily includes electrolyte imbalance, increased respiration rate and heart rate, dehydration, energy deficit and related catabolism *(Das et al., 2000).* The main objective to treat the animals before or after the journey is to defeat the various physiological changes during transportation and potentiate the immune system to resist the infections.

Therefore, in the present study, an attempt was made to evaluate efficacy of herbal immunomodulator, antistressor and performance enhancer formulations namely, Restobal and Stresomix premix (*supplied by Ayurvet Ltd., Baddi, India*) in alleviating environmental and transportation stress in goats.

Materials and Methods

A study was conducted in 24 Osmanabadi goats (approx. 3 years of age) with average body weight of 21.79 kg. Goats were marked with identification numbers and divided randomly into 4 groups (I-IV). Group I served as untreated negative control and goats were kept in complete comfort zone and environmental ambience, confined in a room where cooling has done with fans and with water soaked gunny bags so as to maintain normal room temperature. Group II (positive control) and treated groups (III, IV) were kept in environment with mean ambient temperature (38±1.87°C) indicative of environmental stress.

The environmental temperature in the goat shed was recorded daily in the morning, at noon and during evening hours by using environmental thermometer. Group II (positive control) animals were not given any treatment. Group III was treated with Restobal Liquid @ 20 ml/animal bid for 10 days and kept in normal environment. The animals in Group IV were

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Table-1. Mean body weight (Kg) in goats before & after transportation in different groups.

Groups/ Days	0 days	BT	AT	5th day AT
Negative Control (Gr. I)	21.50 ± 3.22	21.85 ± 3.27	21.85 ± 3.27	21.97 ± 3.27
Positive Control (Gr. II)	21.83 ± 2.95	21.88 ± 2.94	20.62 ± 2.83**	20.70 ± 2.85
Treatment I (Gr. III)	21.83 ± 2.06	22.45 ± 2.03	21.95 ± 2.06	22.22 ± 2.10
Treatment II (Gr. IV)	22.00 ± 1.87	22.47 ± 1.86	21.78 ± 1.90	21.98 ± 1.90

** Significant at 1 % level, BT: Before transport, AT: After transport

administered Stresomix premix@5gm/day/animal with gur for 10 days and kept in normal environment. The goats of group II, III & IV were subjected to transportation stress by transporting them for 12 hrs over a distance of about 350 km, on day 10th of experiment. During the journey all the animals were kept off-feed and deprived of water. Before (Pre-load) and after (post-load), the transported goats were weighed to assess the weight loss during the journey and were also weighed after 5 days post-transportation (day 15th). Physiological parameters were also recorded during pre & post-load periods in all the control & treatment groups. The goats were bled from jugular vein thrice during the complete experiemental period on day 5th, 10th (immediately or within one hour of transportation) and on day 15th of experiment (5 days after transportation), for collection of blood samples and estimation of haematological parameters viz. haemoglobin (Hb), packed cell volume (PCV), total erythrocytic count (TEC), total leukocytic count (TLC), differential leukocytic count (DLC). Negative control group was considered as baseline of the respective parameters in the study. The results were statistically analysed as per the method given by Snedecor & Chochran, (1994).

Results and Discussion

The mean maximum and minimum ambient temperature in which group II, III & IV animals were kept was recorded to be 38±1.87°C and 26±0.96°C, respectively. However, goats of group I were kept in comfortable environment having mean maximum temperature of 34± 1.23°C & a minimum of 24±2.32°C. The goats (Negative control group I), confined to environmental ambience showed the improvement in their appetite, body weight gain and general appearance as compared to the goats under normal environmental conditions (II, III, IV). The average weight gain of 1.86 % was found in group I goats over their pre-experiment weight. While in the goats transported for 12 hrs over a distance of about 350 Km revealed significant decrease in the live body weight than their preload weight. After transportation an average 5.77, 2.39 and 4.80 per cent shrinkage of the body weight was observed in group II, III and IV, respectively than their pre-transport body weight (Table. 1). The findings in present experiement coincide with that reported by *Knowles and Warriss, (2007)* that transportation involving extended periods without food and water results into an initial loss of live weight (approx. 7% in ruminants and 4% in pigs) during the first 18-24 hrs of transportation. In the present study positive control group administered no treatment exhibited significantly ($P < 0.01$) higher shrinkage in body weight than the polyherbal formulation supplemented treatment groups. However, among the treatments, restobal administered group showed significantly ($P< 0.01$) lower shrinkage than the Stresomix premix administered group.

Evaluation of physiological parameters revealed a significant ($P < 0.01$) increase in the heart rate & respiration rate in group II in comparision to treated groups before and after transportation (Table,2). Significant difference ($P < 0.01$) in body temperature in the positive control group was evident while in treated groups (III and IV) moderate non-significant change in body temperature was recorded during post

Table-2. Mean clinical observations in goats before and after transportation in different groups.

Parameters	Heart Rate (per min.)			Pulse Rate (per min.)			Temp (°F)		
Groups / Days	BT	AT	5th day	BT	AT	5th day	BT	AT	5th day
Negative Control (Gr. I)	87.30 ± 1.52	89.00 ± 2.91	84.70 ± 5.69	29.30 ± 2.17	30.00 ± 1.46	31.30 ± 3.00	101.65 ± 0.11	101.27 ± 0.21	101.50 ± 0.15
Positive Control (Gr. II)	86.30 ± 2.03	105.0 ± 03.00**	90.30 ± 1.67	29.70 ± 2.50	43.70 ± 3.03**	34.70 ± 2.67	102.22 ± 0.26	104.23 ± 0.35**	102.43 ± 0.19
Treatment I (Gr. III)	85.70 ± 2.85	96.00 ± 2.39**	98.70 ± 6.06	29.70 ± 1.84	31.70 ± 1.89	28.30 ± 1.67	102.47 ± 0.29	103.78 ± 0.29*	102.87 ± 0.07
Treatment II (Gr. IV)	86.30 ± 3.32	98.00 ± 1.89**	93.70 ± 1.82	30.30 ± 2.85	32.00 ± 2.42	32.30 ± 2.94	102.82 ± 0.46	103.92 ± 0.29*	102.50 ± 0.11

Table-3. Mean haematological values (Hb, PCV and TEC) in goats before & after transportation in different groups.

Parameters	Haemoglobin (g/dl)			PCV (%)			TEC (million/µl)		
Groups / Days	BT	AT	5th day	BT	AT	5th day	BT	AT	5th day
Negative Control (Gr. I)	10.43 ± 0.47	10.53 ± 0.49	10.77 ± 0.44	32.58 ± 1.13	32.40 ± 0.62	32.05 ± 0.83	9.80 ± 0.72	10.08 ± 0.92	9.83 ± 0.47
Positive Control (Gr. II)	10.43 ± 0.36	10.57 ± 0.45	10.47 ± 0.41	32.48 ± 1.11	37.20 ± 1.72**	34.27 ± 1.46	10.62 ± 0.64	11.85 ± 1.03	10.78 ± 0.61
Treatment I (Gr. III)	10.47 ± 0.25	10.93 ± 0.42	10.90 ± 0.30	32.23 ± 0.74	35.90 ± 1.07**	33.50 ± 0.78	11.26 ± 0.49	11.67 ± 0.61	11.00 ± 0.28
Treatment II (Gr. IV)	10.33 ± 0.31	10.83 ± 0.43*	10.57 ± 0.38	31.30 ± 1.12	35.90 ± 1.90**	32.80 ± 0.96	10.74 ± 0.93	11.14 ± 0.92	10.90 ± 0.83

Table-4.Mean haematological values (TLC, Lymphocytes and Neutrophils) in goats before & after transportation in different groups.

Parameters	TLC (th./µl)			Lymphocytes (%)			Neutrophils (%)		
Groups / Days	BT	AT	5th day	BT	AT	5th day	BT	AT	5th day
Negative Control (Gr. I)	6.17 ± 0.64	6.20 ± 0.44	6.19 ± 0.61	58.00 ± 2.53	56.83 ± 1.19	56.33 ± 2.15	37.67 ± 2.32	40.00 ± 1.30	39.67 ± 2.11
Positive Control (Gr. II)	6.52 ± 0.54	8.56 ± 0.61**	7.14 ± 0.67	58.67 ± 1.76	39.67 ± 1.99**	58.67 ± 2.56	36.17 ± 1.70	57.70 ±1.82**	37.50 ± 2.40
Treatment I (Gr. III)	7.32 ± 0.74	8.65 ± 0.78**	7.48 ± 0.70	56.00 ± 2.63	53.50 ± 1.71	56.50 ± 2.51	40.00 ± 2.45	41.66 ± 1.74	41.00 ± 3.09
Treatment II (Gr. IV)	7.28 ± 0.80	7.94 ± 0.87**	7.21 ± 0.78	57.50 ± 2.23	54.66 ± 2.08	57.50 ± 1.82	38.17 ± 2.31	41.33 ± 1.63	38.33 ± 1.38

and pre transportation periods, respectively (Table,2). Among haematological parameters, the haematocrit values were significantly ($P < 0.01$) increased from a mean in the positive control group II and treatment group III & IV (Table, 3,4). An increase in PCV is suggestive of dehydration but may also be due the release of erythrocytes into the circulation as a result of sympatho-adrenal stimuli causing contraction of spleen (Knowles et al., 1995). The total leukocyte count was found to be increased in all the transported groups. The differential leukocyte count revealed significant ($P < 0.01$) increase in neutrophil per cent (table 5) in the goats after transportation as compared to their pre-transport and negative control values and eosinopenia was observed in positive control group as compared to negative control group (Table 5). The findings are in concomitance with those of Kannan et al. (2000), who reported an increased percentage of neutrophils and decreased lymphocytes due to transportation stress and the N:L ratios were higher at all time periods after transportation than prior to the beginning of transportation of goats. These responses in general may be cortisol driven. There were no significant ($P > 0.05$) changes in total erythrocytic count between pre & post-load periods, in all the groups. However, no significant ($P > 0.05$) increase in PCV, TLC values in treated groups was evident (Table 3,4) indicating less dehydration/electrolyte imbalance and normal immune functions. This may be attributed to the major constituent herbs of polyherbal formulations Restobal Liquid & Stresomix premix namely *Withania somnifera, Ocimum sanctum, Phyllanthus emblica, Asparagus racemosus, Glycerrhiza glabra* & many more which are scientifically well proven to possess potent Adaptogenic, antistressor, immunopotentiating & performance enhancing properties.

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Table-5. Mean haematological values (Eosinophil, Basophil and Monocyte) in goats before and after transportation in different groups.

Parameters	Eosinophils (%)			Basophils (%)			Monocytes (%)		
Groups / Days	BT	AT	5th day	BT	AT	5th day	BT	AT	5th day
Negative Control (Gr. I)	2.30 ± 0.33	1.67 ± 0.21	2.33 ± 0.42	0.67 ± 0.21	0.67 ± 0.21	0.67 ± 0.21	1.33 ± 0.33	1.00 ± 0.26	1.00 ± 0.26
Positive Control (Gr. II)	3.30 ± 0.56	1.67 ± 0.33**	2.33 ± 0.21	0.67 ± 0.21	0.33 ± 0.21	0.67 ± 0.21	1.17 ± 0.31	0.67 ± 0.21	0.83 ± 0.31
Treatment I (Gr. III)	2.66 ± 0.33	3.00 ± 0.26	2.33 ± 0.61	0.66 ± 0.21	0.50 ± 0.22	0.33 ± 0.21	0.66 ± 0.33	1.00 ± 0.26	1.33 ± 0.21
Treatment II (Gr. IV)	2.67 ± 0.33	2.33 ± 0.49	2.83 ± 0.31	0.67 ± 0.21	0.33 ± 0.21	0.67 ± 0.21	1.00 ± 0.26	1.33 ± 0.21	0.67 ± 0.33

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