International Journal of Livestock Research, Vol. 10 (12) Dec' 2020
http://www.ijlr.org
eISSN: 2277-1964
NAAS Rating 2020 – 5.36

Original Research

Effect of Giloy (*Tinospora cordifolia*) and Neem (*Azadirachta indica*) on Sero-biochemical Parameters of Marwari Lambs under Arid Zone

P. Kumari[1]*, T. Bothra[2], H. K. Narula[3], Vijay kumar[4], D. Jain[5] and A. S. Dewna[6]

[1]M.V.Sc. Scholar, Department of Livestock Production Management, CVAS, RAJUVAS, Bikaner, Rajasthan, INDIA
[2]Assistant professor, Department of Livestock Production Management, CVAS, RAJUVAS, Bikaner, Rajasthan, INDIA
[3]Principal Scientist and Head, ARC-CSWRI, Bikaner, Rajasthan, INDIA
[4]Professor and Head, Department of Livestock Production Management, CVAS, RAJUVAS, Bikaner, Rajasthan, INDIA
[5]Assistant Professor, Department of Animal Nutrition, CVAS, RAJUVAS, Bikaner, Rajasthan, INDIA
[6]Veterinary Officer, Animal Husbandry Department, Govt. of Rajasthan, Bikaner, Rajasthan, INDIA

*Corresponding Author: drpriyankachoudhary1191@gmail.com

How to cite this paper: Kumari, P., Bothra, T., Narula, H., Kumar, V., Jain, D., & Dewna, A. (2020). Effect of Giloy (Tinospora cordifolia) and Neem (Azadirachta indica) on Sero-Biochemical Parameters of Marwari Lambs under Arid Zone. *International Journal of Livestock Research*, 10(12), 99-104. doi: http://dx.doi.org/10.5455/ijlr.20200923033811

Received : Sep 23, 2020
Accepted : Nov 24, 2020
Published : Dec 31, 2020

Abstract

In an attempt to assess the effect of giloy (Tinospora cordifolia) and neem (Azadirachta indica) alone and in combination on sero-biochemical parameters of Marwari lambs, an experiment was conducted for a period of 3 months on 42 Marwari male lambs and divided into seven groups, six lambs in each group in a randomized block design. The lambs of T1 group were provided only basal diet (grazing + ad lib. fodder + 400 g concentrate per lamb per day) and were kept as control group and lambs of all other treatment groups were provided basal diet with herbal supplementation i.e. 0.5 per cent giloy stem powder in group T2, 1.0 per cent giloy stem powder in group T3, 0.5 per cent neem leaf powder in group T4, 1.0 per cent neem leaf powder in group T5, 0.25 per cent giloy stem powder along with 0.25 per cent neem leaf powder in group T6 and 0.5 per cent giloy stem powder along with 0.5 per cent neem leaf powder in group T7. At the end of experiment, non-significant effect was found on biochemical parameters viz. serum glucose, serum cholesterol and serum triglycerides whereas the numerical values were lower for group T6 and T7 than control and other groups though, they were within normal physiological range. At the end of experiment, it appears that incorporation of giloy stem powder along with neem leaves powder can be used as a part of strategy to be adopted to improve health status of lambs in arid zone of Rajasthan.

Keywords: Giloy, Neem, Serum Glucose, Serum Cholesterol, Serum Triglycerides, Sheep

Introduction

Biochemical parameters are important indices of the physiological state of animals (Khan and Zafar, 2005). The ability to interpret the state of blood profiles in normal and diseased conditions is a primary objective of biochemical studies. This has been proved by research that definite alterations occur in the blood throughout life (Khan *et al*., 1987). The serum biochemical indices make clinical predictions of the health status of a particular animal. The blood picture varies with certain conditions such as stress, infections and toxicity (Khan and Zafar, 2005). Heat exposure also influences the concentrations of blood metabolites and modifies endocrine secretions (Bell *et al*., 1987; Bell *et al*., 1989; Achmadi *et al*., 1993; Itoh *et al*., 2001). Constituents of blood provide valuable media for clinical investigations and nutritional evaluations of an animal (Aderemi, 2004). Small ruminants are reared for production to meet up the demand for animal protein in human. Heat exposure is a major constraint which reduces the productivity of ruminants through reduced feed intake and impaired physiological functions. To fulfill the demand and to decrease the mortality of lamb by boosting immune system use of naturally occurring compounds like herbs, herbal preparations and other botanicals are preferred over chemical compounds to satisfy consumer concerns over safety and toxicity is becoming a novel goal in livestock production. Various modern medicines are used at large scale for production as well as treatment and prevention of diseases of animals, which can ultimately reach us through food chain (Pattanayak *et al.,* 2013). The use of herbs or other botanicals as medicine is widespread throughout the world. It is estimated that more than 35,000 plant species are being used around the world for medicinal purposes (Dandotiya *et al*., 2013). The plant-based remedies are having a critical role as the potential source of therapeutic aids in health systems all over the world for both humans and animals (Chakraborty and Pal, 2012). Giloy (*Tinospora cordifolia*), also known as *guduchi,* is one of the most versatile rejuvenating herbs having the top spot in "*Ayurvedic Materia Medica*" and also known as "*Rasayana*" (Bhattacharyya and Bhattacharya, 2013). *T. cordifolia* showed the hypolipidemic effect in alloxan diabetic rats (Stanley *et al.,* 1999). Hypoglycaemic and hypolipidemic effect of giloy was found to reduce serum and tissue cholesterol, phospholipids and free fatty acids (Stanley *et al.,* 2000). It is claimed that the plant climbing up the neem tree is said to be the best as synergy between these two bitter plants enhances giloy`s efficacy. More than one hundred and thirty-five compounds have been isolated from different neem trees (Unigue *et al*., 2016). Traditionally, it was used by the Indians for treatment of a number of health problems such as parasitic infections and reduction of plasma cholesterol levels. Research has shown that neem boost the immune system by stimulating the production of T-cells when faced with infections (Upadhyay, 1990).

To our knowledge, there is a lack of information pertaining to dietary inclusion of giloy (*Tinospora cordifolia*) alone and in combination with neem (*Azadirachta indica*) to the growing lambs; therefore, the objective of the present study was to evaluate the effect of giloy and neem on serum biochemical parameters of growing lambs under hot summer conditions.

Materials and Methods

The present study was conducted on Marwari lambs maintained at Arid Region campus of Central Sheep and Wool Research Institute (ICAR-ARC-CSWRI), Bikaner. The average rainfall is low (250 mm) and erratic. The temperature varies between subzero (-2°C) during winter and high (49°C) during summer. The experiment was conducted from May to July, 2019. Meteorological data viz. temperature and relative humidity were collected from Agriculture Research Station, Bikaner from May 2019 to July 2019 at weekly intervals. THI values were calculated from recorded meteorological variables as described below by formula given by Marai *et al.* (2007)-

$$THI = db^{o}C - [(0.31-0.31RH)\ (db^{o}C-14.4)]$$

THI = Temperature humidity index
db = Dry-bulb temperature (^{o}C)
RH = Relative humidity as fraction of a unit (%)

Forty-two growing male Marwari lambs (3-4 months old) were divided into seven groups T_1, T_2, T_3, T_4, T_5, T_6 and T_7 having six lambs in each group on body weight basis. The lambs of T_1 group were provided only basal diet (grazing for a period of 8 hours + *ad lib*. fodder + 400 g concentrate per lamb per day) and were kept as control group. The lambs of T_2 group were provided basal diet supplemented with 0.5 per cent giloy stem powder. The lambs of T_3 group were provided basal diet supplemented with 1.0 per cent giloy stem powder. The lambs of T_4

group were provided basal diet supplemented with 0.5 per cent neem leaf powder. The lambs of T_5 group were provided basal diet supplemented with 1.0 per cent neem leaf powder. The lambs of T_6 group were provided basal diet supplemented with 0.25 per cent giloy stem powder and 0.25 per cent neem leaf powder. The lambs of T_7 group were provided basal diet supplemented with 0.5 per cent giloy stem powder and 0.5 per cent neem leaf powder. Blood samples from experimental lambs were collected in the morning hours before the feeding and watering of lambs. Samples were collected at monthly interval by puncturing jugular vein following aseptic measures. For separation of serum, blood was collected in second tube, without anticoagulant, and kept in slanting position. These tubes were incubated for 1 h at 37°C. Blood clots were broken and tubes were centrifuged at 2500 rpm for 30 minutes. The serum was pipetted out in small pyrex tubes and kept for analysis of serum glucose, serum cholesterol and serum triglyceride. Analysis of serum glucose, serum triglyceride and serum cholesterol were determined by the Thermoscientific Evolution 220 UV-Visible spectrophotometer. Serum glucose and serum cholesterol were determined by using kit supplied by Diasys diagnostics India Pvt. Ltd. as per the manufacturer's subscribed procedure. The data obtained in the study was analyzed in one-way ANOVA using SPSS 20.00 statistical analysis software.

Results and Discussion

The values of average temperature (°C), average relative humidity (%) and average THI at weekly intervals have been presented in Table 1.

Table 1: Temperature (°C), Relative humidity (%) and THI

Weeks	Temperature (°C)	Relative Humidity (%)	THI
1	33.6	59	31.15
2	30.6	44.1	27.78
3	33.8	54.6	31.04
4	39.5	83.9	38.2
5	38.2	82.4	36.93
6	37.1	61.5	34.4
7	34.1	79.4	32.85
8	34.3	77.1	32.87
9	36.4	87.9	35.58
10	34.6	54.5	31.79
11	33.7	56.5	31.1
12	32	64.9	30.1
Average	**34.8**	**67.1**	**32.74**

Marai *et al.* (2007) established THI threshold of 25.6 for sheep. In present study, the calculated THI values revealed that the experimental lambs were in extreme severe heat stress, during the course of experiment. The mean values of serum glucose of lambs under different treatment groups at monthly intervals of experiment have been presented in Table 2.

Table 2: Serum glucose (mg/dl) of lambs at monthly intervals in different treatment groups

Treatment Groups	Period (Monthly)				
	0	I	II	III	Average
T_1	57.89	58.64	58.84	59.42	58.7
T_2	57.79	57.64	57.25	57	57.42
T_3	57.89	57.45	57.05	56.97	57.34
T_4	57.59	57.52	57.49	58	57.65
T_5	57.62	57.54	57.32	57.55	57.51
T_6	57.85	57.5	57.04	56.75	57.29
T_7	57.74	57.49	57.1	56.35	57.17
SEM	1.03	1.03	1	0.97	0.99

The mean values of serum glucose (mg/dl) of lambs recorded to be varied from 57.89 (zero day) to 59.42 (3rd month)

in T_1, 57.00 (3rd month) to 57.79 (zero day) in T_2, 56.97 (3rd month) to 57.89 (zero day) in T_3, 57.49 (2nd month) to 58.00 (3rd month) in T_4, 57.32 (2nd month) to 57.62 (zero day) in T_5, 56.75 (3rd month) to 57.85 (zero day) in T_6 and 56.35 (3rd month) to 57.74 (zero day) in T_7 group. Statistical analysis of variance revealed no significant effect on the average serum glucose of lambs during whole period of experiment. The mean values of serum cholesterol of lambs under different treatment groups at monthly intervals of experiment have been presented in Table 2. The mean values of serum cholesterol (mg/dl) of lambs recorded to be varied from 118.30 (2nd month) to 119.07 (3rd month) in T_1, 117.75 (3rd month) to 118.89 (zero day) in T_2, 117.40 (3rd month) to 118.44 (zero day) in T_3, 118.17 (3rd month) to 118.82 (zero day) in T_4, 118.14 (1st month) to 119.05 (3rd month) in T_5, 117.15 (3rd month) to 118.22 (zero day) in T_6 and 116.95 (3rd month) to 118.34 (zero day) in T_7 group. Statistical analysis of variance revealed no significant effect on the average serum cholesterol of lambs during whole period of experiment. The mean values of serum triglyceride of lambs under different treatment groups at monthly intervals of experiment have been presented in Table 3.

Table 3: Serum cholesterol (mg/dl) of lambs at monthly intervals in different treatment groups

Treatment Groups	Period (Monthly)				
	0	I	II	III	Average
T_1	118.52	118.54	118.3	119.07	118.61
T_2	118.89	118.74	118.15	117.75	118.38
T_3	118.44	118.25	117.8	117.4	117.98
T_4	118.82	118.64	118.52	118.17	118.54
T_5	118.15	118.14	118.6	119.05	118.49
T_6	118.22	118.17	117.54	117.15	117.77
T_7	118.34	117.9	117.52	116.95	117.68
SEM	1.74	1.69	1.64	1.64	1.67

The mean values of serum cholesterol (mg/dl) of lambs recorded to be varied from 21.00 (zero day) to 22.99 (3rd month) in T_1, 21.14 (2nd month) to 21.85 (1st month) in T_2, 21.20 (3rd month and zero day) to 21.62 (1st month) in T_3, 21.34 (zero day) to 21.99 (1st month) in T_4, 21.15 (zero day) to 21.87 (1st month) in T_5, 20.52 (3rd month) to 21.77 (zero day) in T_6 and 19.77 (3rd month) to 21.79 (zero day) in T_7 group. Statistical analysis of variance revealed no significant effect on the average serum cholesterol of lambs recorded during entire period of experiment. Looking into the results of biochemical parameters, variability in biochemical parameters was recorded during different months of research trial though, they were within normal physiological range. Plasma glucose concentrations did not differ significantly though the numerical values were lower for group T_6 and T_7 than control and other groups. It may be due to *Tinospora cordifolia* have insulin-like action and can significantly reduce the blood glucose in normal rabbits and in alloxan-induced diabetic rabbits (Wadood *et al.,* 1991). Total cholesterol and triglycerides were numerically lower for group T_6 and T_7 than control and other groups.

Table 4: Serum triglycerides (mg/dl) of lambs at monthly intervals in different treatment groups

Treatment Groups	Period (Monthly)				
	0	I	II	III	Average
T_1	21	21.64	22.32	22.99	21.99
T_2	21.25	21.85	21.14	21.37	21.4
T_3	21.2	21.62	21.29	21.2	21.33
T_4	21.34	21.99	21.44	21.87	21.66
T_5	21.15	21.87	21.52	21.8	21.59
T_6	21.77	21.67	21.14	20.52	21.28
T_7	21.79	21.47	20.64	19.77	20.92
SEM	1.26	1.15	1.14	1.04	1.13

Results of present findings are in agreement with Sumon *et al*. (2014) who reported numerically lower value of plasma glucose, total cholesterol and triglycerides in sheep supplemented with plantain diet. On the other hand, Al-Wazeer (2017) reported serum glucose was not affected by increasing level of fenugreek seeds in Awassi lambs.

Sharma (2017) reported lower level of total cholesterol in blood of lactating cow supplemented with fenugreek seeds alone and in combination with giloy but triglyceride remain unchanged. Hypolipidemic effect of giloy supplementation has been reported by many workers (Stanley *et al.*, 1999 and Stanley *et al*., 2003).

Conclusion

Supplementation of giloy (*Tinospora cordifolia*) and neem (*Azadirachta indica*) may be a positive indicator of immune response and effective to control heat stress condition in lambs by influencing glucose metabolism. At the end, based on the sero-biochemical parameters *viz*. serum glucose, serum cholesterol and serum triglycerides of lambs, it appears that incorporation of giloy stem powder along with neem leaves positively influence the sero-biochemical parameters of lambs although the effect was non-significant.

Acknowledgement

We gratefully acknowledge the help offered by Dean, College of Veterinary and Animal Science, Bikaner and Head, ARC-CSWRI, Bikaner for providing infrastructure and necessary facilities to conduct the research.

Conflict of Interests

There is no conflict of interest.

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