

Impact of lightning strike on economics of sheep and goat rearing in Tamil Nadu under field condition

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Abstract

Lightning is a high energy luminous electrical discharge mostly accompanied by thunder during rainy seasons. During rainy days, more than 70% of peoples or livestock are affected by lightning strike due to standing under the tree. The current paper reported the effect and economic losses of lightning strike in Tamil Nadu, India. The reported flock had 155 sheep and 32 goats. About 23 sheep and 5 goats died in the lightning strike. Other effects of lightning strike was total eye blindness, unilateral eye blindness, fore legs in-coordination, hind legs in-coordination, edematous swelling on lateral abdominal region and anorexia. Highest mortality (34.78%) was observed in pregnant ewe. The total eye blindness and unilateral eye blindness in sheep were about 1.29% and 1.94%, respectively which were not recoverable. The hind legs were affected more common in comparison to fore legs in lightning strike in sheep and goat. The fore legs in-coordination, edematous swelling in lateral abdominal region and anorectic animals were mostly recovered within three days of post lightning period. The total economic losses were about Rs. 1,26,000/- (17.92%) in sheep and Rs. 34,500/- (18.75%) in goat flock. The total economic losses due to lightning was Rs. 1,60,500/- (18.09%) in sheep and goat flock. It concluded that the lightning strike caused severe mortality particularly to the pregnant animal, physical deformities which in terms affect the economics of sheep and goat production in field condition.

Key words: Economic loss, Goat, Lightning strike, Sheep, Tamil Nadu

Lightning is a high energy luminous electrical discharge mostly accompanied by thunder during rainy days which is very common during rainy season and latter part of summer. The power of lightning is estimated to be between 10,000 and 2,00,000 Ampere of current with estimated voltage ranging from 20 million to 1 billion Volts (Norman *et al.*, 2001). Livestock are more vulnerable to be affected by lightning as they are usually placed outdoor even under thunderstorm conditions. Animals such as elephant, cattle, horses, sheep, goat, donkeys, etc. are more common to receive lightening injuries since these animals have large separation between their front and hind feet. This leads to build up of dangerous potential difference between front and hind feet,

in the event of nearby lightning (Gomes, 2012). More than 70% peoples or livestock were affected by lightning mostly due to standing under the tree during rainy/ monsoon seasons (Mid-Monsoon lightening report, 2019).

There are several case studies were published on lightning effects in domestic and wild animals which mainly focused on medical aspects of lightning injuries, technically viable solutions to minimize the lightning hazards with some precautionary measures (Boeve *et al.*, 2004; Evans *et al.*, 2012; Gomes, 2012; Shankar and Braddon, 2015). Only few papers were reported the effect and economic impact of lightning under field condition in animals. Traceable literatures are available on the post lightning effects in animals. The main object of

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this paper was an attempt to investigate the post lightning effect and economic impact of lightning in affected sheep and goat flock under farmers' field in Tamil Nadu, India.

The flock of Mr. Rajesh, Vaiyavur village, Kancheepuram district, Tamil Nadu was registered with the Indian Council of Agricultural Research funded "Network Project on Sheep Improvement-Madras Red Field Unit". He had 155 (3 rams, 45 pregnant ewes, 30 non-pregnant ewes, 25 yearlings and 52 lambs) and 32 (1 buck, 5 pregnant does, 13 non-pregnant does, 5 yearlings and 8 kids) number of Madras Red sheep and non-descriptive goats in his flock. Heavy rain was started around 1.45 PM on 09.10.2020 and his entire flock tried to escape from communal grazing land. Unfortunately a group of animal was accommodated under the palm tree with surrounding bushes. However, other animals and shepherd were standing some distance from that palm tree, where a flash of lightning happened around 3.15 PM. The investigation

was carried out at 7.30 pm on the lightning day and the effect of post lightning was carried out through personnel interview with the owner and on examination of the affected flock. Post lightning effects like age wise mortality, total eye blindness, unilateral or one side eye blindness, edematous swelling on lateral abdominal region and anorexia were recorded for next three days. Animals with total eye blindness, unilateral eye blindness, hind legs in-coordinated sheep and goat were sold as they failed to recover after three days post lightning. Through those data, the post lightning complications, total economic loss and total economic loss percentage of lightning strike in sheep and goat flocks were calculated. Number of animals and percentage of animals affected by lightning strike in sheep and goat flock were presented in Table 1. It was observed that 14.84% (23) and 15.63% (5) mortality were recorded among the sheep and goat flock during the sudden lightning (Fig. 1). The pregnant ewe's mortality percentage (34.78%) was

Table 1. Total number of animals and percentage of animals affected by lightning strike in sheep and goat flock

Sl. No.	Particulars	Total number of animals affected by lightning strike		Percentage of animals affected by lightning strike	
		Sheep	Goat	Sheep	Goat
1.	Total number of animals in the flock	155	32	100	100
2.	Death due to lightning strike	23	5	14.84	15.63
	i. Pregnant ewes/does	08	00	34.78	0.00
	ii. Dry ewes/does (non-pregnant)	04	03	17.39	60.00
	iii. Yearlings	05	02	21.74	40.00
	iv. Lambs/kids	06	00	26.09	0.00
Post lightning effects					
3.	Total eye blindness	02	00	1.29	0.00
4.	Unilateral eye blindness	03	00	1.94	0.00
5.	Fore legs in-coordination	03	01	1.94	3.13
6..	Hind legs in-coordination	07	03	4.52	9.38
7.	Edematous swelling on lateral abdominal region	03	00	1.94	0.00
8.	Anorexia in day 1	79	17	50.97	53.13
9.	Anorexia in days 2	41	05	26.45	15.63
10.	Anorexia in days 3	15	01	9.68	3.13

higher as compare to dry/non-pregnant ewes (17.39%) in the total lightning death. The yearlings and lamb mortality percentage were 21.74 and 26.09, respectively in total sheep death. The non-pregnant does and yearlings' goat mortality percentage were 60 and 40, respectively. Observations indicate that mortality in pregnant animals were high since these animals had less chance to escape from natural calamities such as lightning strike followed by lamb, yearlings and dry ewes.

The chance of total eye blindness (Fig. 2) and unilateral eye blindness was about 1.29% and 1.94%, respectively in sheep. This blindness was permanent and not able to recover. The fore legs in-coordination and hind legs in-coordination were 1.94%, 4.52% and 3.13%, 9.38% in sheep and goat, respectively.

Results showed that the hind legs were more commonly affected than fore legs in lightning strike. Edematous swelling on the lateral abdominal region was recorded in 1.94% of sheep. The fore legs in-coordination and edematous swelling in lateral abdominal region were recovered within 3 days of post lightning period. More than 50% of the sheep and goats had anorexia. From the results it was clear that anorexia in sheep and goats were the major post effect of lightning strike. Anorexia was also frequently recovered within 3 days of post lightning period.

The economic losses of lightning in sheep and goat flock were presented in Table 2. The total loss by mortality was about Rs. 1,09,000/- in sheep and Rs. 31,000/- in goat flock. The pregnant sheep lightning death loss

Table 2. Economic losses due to lightning strike in sheep and goat flock

S.No	Particulars	Lost amount (Rs.)	
		Sheep	Goat
1.	Loss due to lightning death:		
	i. Pregnant ewes/does@ Rs. 7,000/sheep & Rs. 8,000/ goat	56,000	-
	ii. Non-pregnant ewes/does@ Rs. 6,000/sheep & Rs. 7,000/goat	24,000	21,000
	iii. Yearlings@ Rs. 4,000/sheep & Rs. 5,000/goat	20,000	10,000
	iv. Lamb/kids@ Rs. 1,500/sheep & Rs. 2,000/goat	9,000	-
	Total loss by lightning death	1,09,000	31,000
2.	Loss due to total eye blindness@ Rs. 3,000 in each sheep (adult)	6,000	-
3.	Loss due to unilateral eye blindness@ Rs. 2,000 in each sheep (adult)	6,000	-
4.	Loss due to hind legs in-coordination@ Rs. 2,500 in each sheep (adult) & Rs. 3,500 in each goat (adult)	5,000	3,500
	Grand total	1,26,000	34,500
	Total loss in sheep and goat flock	1,60,500	
5.	Cost of total population:		
	i. Rams/bucks@ Rs. 10,000/sheep & Rs. 12,000/goat	30,000	12,000
	ii. Pregnant ewes/does	3,15,000	40,000
	iii. Non-pregnant ewes/does	1,80,000	91,000
	iv. Yearlings	1,00,000	25,000
	v. Lambs/kids	78,000	16,000
	Grand total	7,03,000	1,84,000
6.	Cost of total population in sheep and goat flock	8,87,000	
7.	Economic loss percentage in total population	17.92%	18.75%
8.	Total economic loss percentage in sheep and goat flock due to lightning	18.09%	

Effect of lightning strike on sheep and goat flock



Fig. 1. The death carcass of sheep and goat due to lightning strike



Unilateral eye blindness



Total eye blindness

Fig. 2. The eye blindness of sheep due to the effect of lightning strike

was more when compare to others animals death. The total eye blindness and unilateral eye blindness caused the economic loss of Rs. 6,000/- each in sheep flock. Similarly, hind legs in-coordination caused the economic loss of Rs. 5,000/- for sheep and Rs. 3,500/- for goat flock. Results showed that the mortality due to lightning caused major economic loss in the sheep and goat flock. It coincides with earlier report, the loss of animals cause much higher economical impact than property damage (Gomes, 2012). The cost of total population was Rs. 7,03,000/- in sheep and Rs. 1,84,000/- in goat flock. The grand total loss due to lightning was about Rs. 1,26,000/- and Rs. 34,500/- in sheep and goat flock respectively. It was 17.92% in sheep and 18.75% in goat flock of total economics. The total economic loss due to lightning in sheep and goat flock was Rs. 1,60,500/-. It was 18.09% of the total economics of the sheep and goat flock. It indicated that the lightning strike caused huge economic losses to the farmer under field

condition. No references were found in previous study among the total economic losses due to lightning strike in sheep and goat flock.

The effect of lightning strike was mortality, total eye blindness, unilateral eye blindness, fore legs in-coordination, hind legs in-coordination, edematous swelling on lateral abdominal region and anorexia. The mortality due to lightning was caused major economic loss in the sheep and goat flock as compared to other impact. Overall, the lightning strike causes much more economic losses and affects the livelihood of the sheep and goat farmers under field condition.

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